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**From:** John Blum <john.blum@mcmillen-llc.com>  
**Sent:** Thursday, January 03, 2013 2:53 PM  
**To:** Eric Rothwell  
**Cc:** Cory Warnock; Emily Andersen; 'John Blum'  
**Subject:** Thompson's paper of habitat connectivity  
**Attachments:** Fish Passage Oregon method 1972.pdf

Hi, Eric:

It was good meeting you again at the kickoff meeting in Anchorage for the Grant Lake Project, and I really look forward to working with you as we begin the studies.

I apologize for the delay in getting back to you. I have been looking for a presentable copy of Thompson's work on connectivity from the Instream Flow Workshop (1972). I have not been able to find a copy of the entire proceedings, but I have the write-up from his work and the discussion surrounding it. Believe it or not, the faxed version (which I have included) is better than the other one I have! If you happen to be able to find a hard copy of the proceedings, let me know, and try to secure that as well. I am doing a library search on the west and haven't yet been able to get one.

The writeup that I most often see re: Thompson's work is as follows: (as cited in an instream flow report for Peshastin Creek in E. WA):

Methods to estimate preferred stream flows for salmon and trout were reported by Thompson (1972) after 10 years of research on depth and velocity in streams in Oregon. Thompson concluded that the depth over "the shallow bars most critical for adult passage" was the feature that determined the likelihood of successful migration. Thompson's recommended minimum depths of 0.8 feet for Chinook and 0.6 feet for large trout to achieve successful passage have been used by biologists in the Northwest since the 1970s.

The "Oregon method," as it is now commonly called, concludes that the passage flow is adequate when the depth criteria is met on at least 25 percent of the transect width and on at least a 10 percent continuous portion. Rather than relying on individual transects, Thompson recommends the average flow of all transects.

The reference for the report is:

Thompson, K. 1972. Determining Stream Flows For Fish. Presented at Instream Flow Requirement Workshop, Pacific Northwest River Basins Commission. March 1972.

Once you take a look at the pdf file that I've included, the take home message is, briefly:

For all species: 25% of the wetted width must meet or exceed the depth criteria (0.8 ft for Chinook; 0.6 ft for Coho, Chum, Steelhead, and large trout, and 0.4 ft for trout), with 10% of the wetted width being continuous.

Maximum velocities are also given: 8.0 ft/s for Chinook, Coho, Chum, Steelhead, and large trout, and 4.0 ft/s for trout. I know that Fish Xing also has values for sustained, prolonged, and burst swimming speeds, that we might want to consider for updating swimming speed values.

I hope you had a good holiday, Eric. Give me a call if you have any questions.

John

**John Blum**

Environmental Division Manager/Sr. Fisheries Scientist

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1st-4th brand fax transmittal memo 7671	
From	J. Caldwell
To	Olympia
Phone #	206-945-4854
Fax #	
# of pages	17
510-935-5368	

# DETERMINING STREAM FLOWS FOR FISH LIFE

Ken Thompson  
Environmental Management Section,  
Oregon State Game Commission

Presented at  
PACIFIC NORTHWEST RIVER BASINS COMMISSION  
Instream Flow Requirement Workshop

March 15-16, 1972

RECEIVED  
MAR 20 1992  
WAYNE S. LIFTON

Prior to 1955 the administration of Oregon's water resources was seriously impaired by the authority vested in a large number of public agencies and single-purpose policies to regulate and control water use. This resulted in friction and duplication of activities and a resulting state of confusion as to what was primary and what was secondary beneficial use of the water resources. Most efforts made to control water for its maximum beneficial uses were foredoomed to failure.

The 1955 Oregon Legislature enacted a water code which significantly modified the administration of this resource. Foremost, the State Water Resources Board was established and directed to develop beneficial water use programs for the several drainage basins of the state. Pertinent sections of law relating to this code reads as follows:

"The Board shall proceed as rapidly as possible to study... existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fishlife uses and for pollution abatement, all of which are declared to be beneficial uses..."

And,

"The maintenance of minimum perennial stream flows sufficient

to support aquatic life and to minimize pollution shall be fostered and encouraged if existing rights and priorities under existing laws will permit."

It is this last section which made the stream flow requirement determinations necessary.

Our first approach to determining minimum stream flows for fish was by what we now label as the "Crystal Ball" technique. Without extra time, men, or money our area biologists accepted the challenge - recommend the flow where minimum desirable fish populations and aquatic environment could be maintained during the low flow season.

It soon became obvious that this approach not only lacked continuity, but setting a single minimum flow for the entire year was folly. Even if the flow recommended were adequate in late summer, it would result in disaster during the late fall and spring spawning periods when water requirements of fish are substantially greater.

In 1961 the Oregon State Game Commission set out to determine by field study the specific stream flow requirements of fish life by season of the year. With an objective in mind and reasonable assurance that no one had developed methodology or even generalized "yardsticks" which could be used for our purpose, we launched a program that has taken us through the 18 drainage basins of Oregon, a half million dollars, and provided the state with recommended minimum and optimum flows by month in several hundred of its most important streams for game fish.

With this experience behind us, we can reflect on a variety of criteria



and methodology and those which have been most useful.

Techniques for determining stream flow recommendations which we have tested might be classified into four basic categories: Those which apply field measurements, techniques which employ a variety of conversion factors, techniques which involve field observation and the application of judgement, and those methods based on various formulas. For those who appreciate the jargon, they are more simply the "Gurley", the "Slide Rule", the "Eye-Ball", and the "Crystal Ball" techniques. I once overheard a biologist comment - "There are two fundamental differences in these techniques - those employed behind a desk are easy; those in the field are reliable." Undeniably, those requiring field examinations give the biologist first hand knowledge of the relation between the discharge in a stream and the depth and velocity characteristics of that flow. In short, they give him results which he can more forcefully defend. On the other hand, a comprehensive minimum flow program based on conversion factors or various equations can be designed almost overnight and with very little expense.

These techniques, as we have used them, have two common denominators. Each is based on criteria which reflect flow depth and velocity requirements of fish and each technique expresses flow requirements in terms of one or more of four biological activities: Passage, spawning, incubation, and rearing.

Even though we have had the opportunity to explore, test, and even inspire several methods for determining stream flow recommendations for

fish life, certain techniques have demonstrated the best balance between cost and reliability.

With a favorable priority, adequate state and federal funding, and ten years to accomplish our objective, we selected field measurement and observation techniques as those to rely upon most. I will attempt to summarize the criteria and methodology Oregon Game Commission have emphasized in their flow requirement surveys.

The following criteria and guidelines provide the basic tools for translating flow conditions required for the four basic activities of salmonids into the discharge needed to create those conditions. (Figs. 1-3)

To determine the flow to recommend for passage in a given stream, the shallow bars most critical to passage of adult fish are located and a linear transect marked which follows the shallowest course from bank to bank. At each of several flows, the total width and longest continuous portion of the transect meeting minimum depth and maximum velocity criteria are measured (Fig. 4). For each transect, the flow is selected which meets the criteria on at least 25 percent of the total transect width and a continuous portion equaling at least 10 percent of its total width (Fig. 5). The results averaged from all transects is the minimum flow we have recommended for passage. I might caution that the relationship between flow conditions on the transect and the relative ability of fish to pass has not been evaluated.

Spawning flow recommendations can be formulated by a similar analysis.

## SALMONID PASSAGE CRITERIA

Species	Minimum Depth	Maximum Velocity
Chinook	0.8'	8.0 fps
Coho, chum, steelhead, and large trout	0.6'	8.0 fps
Trout	0.4'	4.0 fps

Fig. 2

## SALMONID SPAWNING CRITERIA

	ChF	ChS	Co	CS	St	Br	K	Other
Water	1.0	1.0	1.0	1.5	1.0	0.7	0.8	trout
Velocity (fps)	to 3.0	to 3.0	to 3.0	to 3.2	to 3.0	to 2.1	to 2.1	to 3.0

Water							0.4	0.4
Depth (ft)	0.8	0.8	0.6	0.6	0.6	0.8	or 0.6	or 0.6

Sample	440	158	251	177	363	115	106	
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# GUIDELINES FOR RECOMMENDING REARING FLOWS

1. Adequate depth over riffles
2. Riffle--pool ratio near 50:50
3. Approximately 60% of riffle area covered  
by flow
4. Riffle velocities 1.0 to 1.5 fps
5. Pool velocities 0.3 to 0.8 fps
6. Most stream cover available as shelter for fish

# PASSAGE CROSS-SECTION DATA

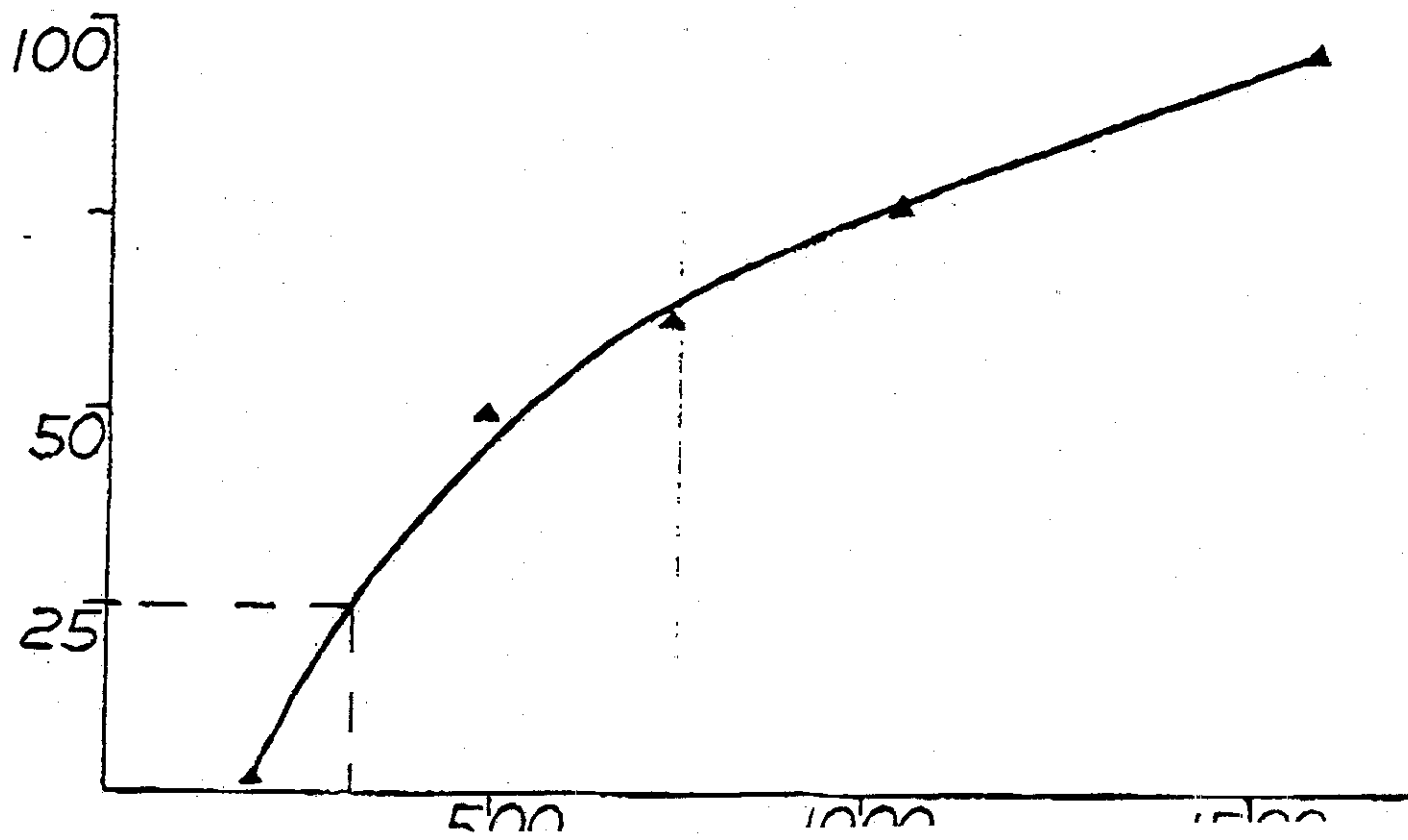
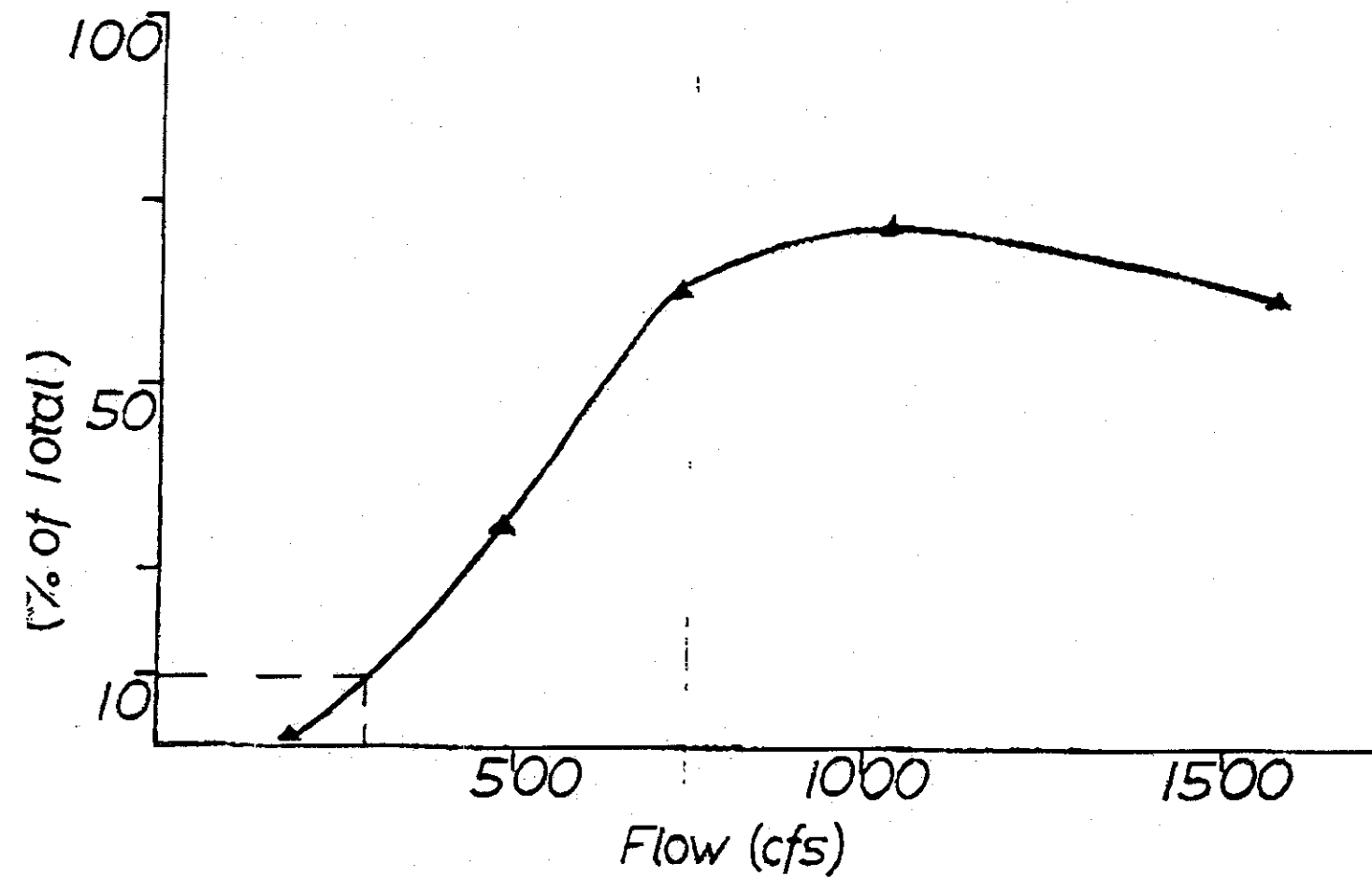
Mar. 3 2004 10:44AM

ENTRIX

No. 0651 P. 9

Flow	Date	Total width	Width wetted	Width usable feet	Width usable %	Long. cont. port. usable %
190	9-24-71	1000'	460'	22	2	11'
1035	9-28-71	1000'	820'	754	75	722'
1570	9-29-71	1000'	1000'	950	95	620'
739	10-13-71	1000'	940'	627	62	627'
479	10-14-71	1000'	810'	490	49	304'

Fig. 5



Three gravel bars are selected which represent the typical dimensions of those occurring in the study stream. On each gravel bar is marked a transect which coincides with the area where spawning is most likely to occur. At each of several flows, the total portion of the transect is measured where flow conditions meet depth and velocity criteria (Fig. 7<sup>6-</sup>). The mean relationship discharge has with gravel area usable for spawning is then assessed from all transect measurements (Fig. 8). An optimum spawning flow is that which provides suitable flow depth and velocity conditions over the most gravel. The discharge which created suitable flow conditions over 80 percent of the gravel available at an optimum spawning flow we have recommended for minimum spawning. This generally coincides with the flow most efficient for creating flow conditions suitable for spawning over the most gravel. In other words, the flow which makes available the most gravel per unit of flow. Not only does this explanation omit several essential ingredients of the procedure; but, fails to mention observation techniques which normally are employed to reinforce the conclusions of the measurement technique. We are prepared to elaborate on these omissions during tomorrow's discussions. Once again, to our knowledge no one has attempted to evaluate the relation flow conditions have with spawning success for any species.

Because the relationship which surface flows have with the intra-gravel environment varies with each stream and realizing the time-consuming nature of determining these relationships, we have resorted to combining judgement with field observations to derive incubation flow recommendations. At each of several flows, an estimate is made of the flow required to cover gravel areas used for spawning and to create an intra-gravel environment conducive to successful egg incubation and fry emergence.



DO NOT WRITE IN THESE SPACES



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84	0.8	2.0			



FLOW (cfs)

7

10

15

22

36

45

61

USABLE WIDTH (ft)

2

6

9

12

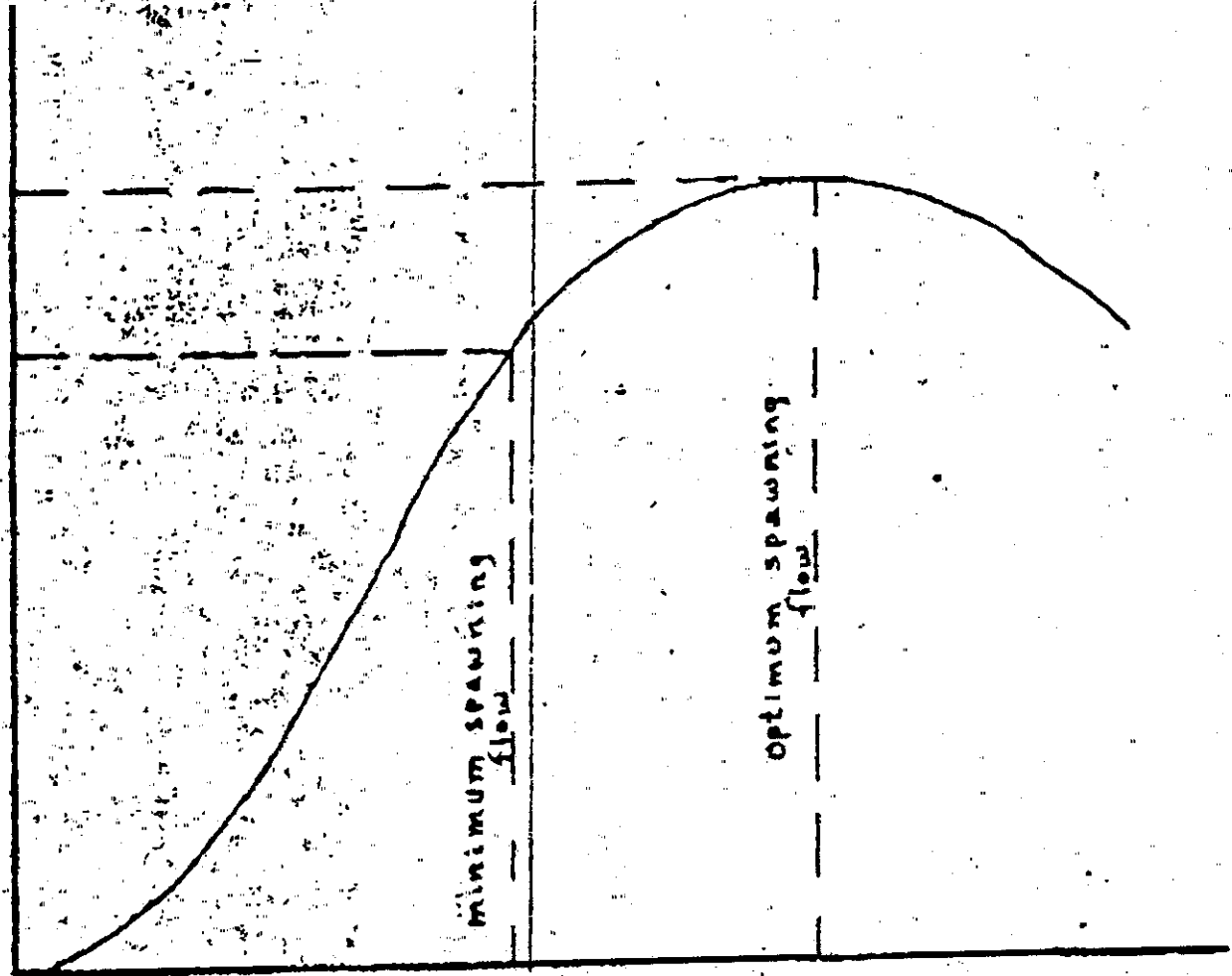
15

22.5

18



Stream Width Usable for Spawning (ft.)



minimum spawning  
flow

optimum spawning  
flow

Flow (cfs)

The flow recommended is that which the various observed estimates seem to indicate. This generally is equivalent to about two-thirds the flow required for spawning.

The period of the year when fish are not migrating, spawning, or when eggs or fry are not in the gravel, we have loosely defined as the rearing period. Because this period encompasses many activities whose relationships with stream flow are highly complex, we have, by necessity, rested on our laurels of good judgement to almost a dangerous degree. It is for this period that literature knows so much, yet so little about its relation with flow. It is for rearing that we know least about flow requirements and unfortunately the period in the life of a salmonid that probably is most critical to its survival. A combination of measurements, observations, and judgement have been employed to determine recommended rearing flows. At each of several different flows, an estimate is made of the flow required to create a suitable stream environment for rearing. These conditions are enumerated in figure 2 as a list of guidelines. The flow we would recommend for rearing, which generally is less than for any other biological activity, would be the flow which the various estimates seemed to indicate.

Perhaps because the issue of rearing is so hazy or maybe the intrigue of its vast interrelated ecological systems - whatever, rearing seems to be the focus of considerable research. We have spent a great deal of time during the past three years characterizing the environmental niches of stream rearing juvenile salmon and trout with the hope of a more reliable tool for recommending rearing flows. The Game Commission's research staff initiated an extensive literature search last fall as a prelude to

a quarter million dollar study of stream flow - juvenile fish production relationships. By this summer, we expect to know whether such a study is actually feasible.

With a flow recommendation for each of the four biological activities for each important species in the study stream, the chore of determining the stream flow regimen required becomes relatively simple. A chart depicting the life history periodicities is prepared for each study stream or stream section (Fig. 9). The flows required for passage, spawning, incubation, and rearing for each species are assigned to their respective periods illustrated on the chart. The flow selected for any month or two-week period is the highest flow required to accommodate any biological activity during that period. The highest flows required by month for twelve consecutive months is the regimen we have customarily selected. There are at least two inviolable ground rules which have evolved in our methodology. Regardless of how tempting and how realistic it might be, flow recommendations are based on the biological requirements of fish and are not adjusted for seasonally natural flow deficiencies. Second, we do not recommend flows for relatively unimportant species if the flow would be harmfully excessive to an important species.

Much of our time has been devoted to writing reports which convey our recommendations and which lend perspective to fishery resource values. Even though the format has changed, they generally include the following: Stream flow recommendations for fish life by stream and month, fish species distribution and abundance, a description of the biological requirements of salmonids, limiting factors to fish in the study area, fish resource

# Life History Periodicity and Minimum Flow Regimen for Existing Salmonid Populations in Reynolds Creek, John Day Basin

Species Life History Phase and Minimum Flow	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
<b>Steelhead</b>												
Spawning 18cfs												
Incubation 12cfs												
Smolt migration 12cfs												
Adult migration 15cfs												
Rearing 5cfs												
<b>Rainbow</b>												
Spawning 12cfs												
Incubation 5cfs												
Adult migration 5cfs												
Rearing 5cfs												
<b>Cutthroat</b>												
Spawning 12cfs												
Incubation 5cfs												
Adult migration 5cfs												
Rearing 5cfs												
<b>Dolly Varden</b>												
Spawning 12cfs												
Incubation 5cfs												
Adult migration 5cfs												
Rearing 5cfs												

Recommended Minimum  
Flow Regimen

JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
15	15	18	18	10	15	12/5	5/12	12/5	5	5	15

values, stream flow and temperature measurements, and a variety of photographs.

With an efficient crew, at least eight months, and about \$100 per study stream, these field examination techniques could be employed almost anywhere to determine stream flows required for fish life.

With the \$100, however, you have not purchased stream flow protection. Shelves are filled with reports of studies and recommendations to investigations to be studied. But, until the recommendations are made law, our objective has not been met nor stream flow protection for fish resources engendered. I believe we should endeavor to provide data whose quality is commensurate with the value of the resource at stake and, in a professional manner, promote its cause long after the report has collected dust on the shelf.

Pitney, W.E., Determination of Stream Flows For Fish Life.  
Environmental Management Section, O.S.G.C.





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**From:** Cory Warnock  
**Sent:** Thursday, January 03, 2013 7:32 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** StLouis, Deidre S -FS; Stovall, Robert -FS; Mike Salzetti; Emily Andersen  
**Subject:** RE: Grant Lake Special Use Permit

Thanks for the information Kathy,

I have written Deidre back asking about the potential for talking sometime late next week. Once I hear from her, we can get things firmed up.

Looking forward to the conversation,

Cory

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**From:** Van Massenhove, Katherine B -FS [mailto:kvanmassenhove@fs.fed.us]  
**Sent:** Thursday, January 03, 2013 5:04 PM  
**To:** Cory Warnock  
**Cc:** StLouis, Deidre S -FS; Stovall, Robert -FS  
**Subject:** RE: Grant Lake Special Use Permit

Hi Cory,

Kenai Hydro LLC was issued special use permit SEW457 in June 2009 for conducting investigative studies related to the Grant Lake/Grant Creek/Falls Creek hydroelectric proposals. The bill you received recently is the annual \$200 fee for this investigative permit. This permit is valid until 12/31/2013, I have attached to the email for your record. I have only recently taken over the administration of the permit so I don't have a lot of background information. I will need to know more about your upcoming study season to know if this permit covers those activities. We can discuss further when we meet with Deidre St. Louis.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Stovall, Robert -FS  
**Sent:** Thursday, December 20, 2012 4:19 PM  
**To:** Van Massenhove, Katherine B -FS  
**Subject:** FW: Grant Lake Special Use Permit

Kathy:

I noticed that you weren't cced so I thought I would forward to you. If you could answer Cory question that would be greatly appreciated.

Thank you and Happy Holidays.

Robert

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**From:** Cory Warnock [<mailto:cwarnock@longviewassociates.com>]  
**Sent:** Thursday, December 20, 2012 2:33 PM  
**To:** Stovall, Robert -FS; StLouis, Deidre S -FS  
**Cc:** Emily Andersen; Mike Salzetti  
**Subject:** RE: Grant Lake Special Use Permit

Thanks Robert,

After sending you the email this morning, I received a message from Mike Salzetti (HEA) with a bill from the USFS attached for an existing Special Use Permit. I wasn't aware that this was already in place. I'm assuming that this can be used for the purposes of our upcoming study season as well? Deidre and Kathy, if you could please confirm this and let me know if any specific modifications/updates need to be made to facilitate our study season (terrestrial work, etc.), I'd appreciate it.

Thanks and I'll look forward to hearing from you,

Cory

**Cory Warnock**  
**Long View Associates**  
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**From:** Stovall, Robert -FS [<mailto:rstovall@fs.fed.us>]  
**Sent:** Thursday, December 20, 2012 11:36 AM  
**To:** Cory Warnock; StLouis, Deidre S -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Grant Lake Special Use Permit

Cory:

Happy Holidays to you and yours. I hope you have a happy and healthy holiday season.

I will be heading out of State on the Dec 24<sup>th</sup> to visit my Sister in Santa Cruz, CA and will be out of state until Jan 9<sup>th</sup>.

The best people for you to discuss Global Special Use permit would be Deidre StLouis our Forest Rec/Min/Lands/Heritage Staff Officer and currently our Special Uses Team Leader. Kathy Van Massenhove Special Uses Administrator (Lands) is another person whom would be able to answer this question.

Deidre and Kathy, could you please help Cory with his question. Please cc me any response.

Thank you and Happy Holidays.

Robert

Deputy District Ranger  
Chugach NF, Seward RD  
334 Fourth Avenue  
Seward, AK 99664  
Seward Office # 907 743-9474; KLWC Office # 288-7707  
Govt Cell # 907 399-3966

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**From:** Cory Warnock [<mailto:cwarnock@longviewassociates.com>]  
**Sent:** Thursday, December 20, 2012 8:40 AM  
**To:** Stovall, Robert -FS  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Special Use Permit

Hi Robert,

It was good seeing you at the Grant Lake meeting last week. I'm wondering if you and I can't set up a time to talk about the need and process for acquiring a global Special Use Permit for activities associated with the project. I'd like to have a little more dialogue with you regarding the appropriate approach and process for moving forward. I understand that the holidays are here and you may not be in the office for a while so I'll let you tell me a time that might work for you over the remainder of the month and/or into early January.

Thanks, Robert. I'll look forward to hearing from you,

Cory

**Cory Warnock**  
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# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Eric Rothwell

*Agency/Organization:* NOAA

*Phone No./E-mail Address:* (907) 271-1937

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*Date:* 1/7/13

*Time:* 11:00 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Cory Warnock had a call with Eric Rothwell to discuss the geomorphology portion of the Water Resources Study Plan. Eric wanted to discuss an email from Paul Pittman and to let Cory know generally, what he was thinking and where he planned on going with his comments related to the study plans. Eric expressed a commitment to being open and proactive with his thoughts/comments as it relates to Grant Lake as long as HEA operates in a similar fashion. In addition, he stated that he reviewed the 2010 formal comments and from what he could tell, HEA did a very good job implementing most of them.

As it relates to geomorphology, he is concerned about the lack of detail in the plan and would like to see more specificity related to:

- Shields Equation – Explain why it is likely appropriate to use here and what it required as inputs. He stated that he isn't sure if it's appropriate or not but a clearer picture of why it should be and what it entails is needed.
- Bed Mobility Analysis – He thinks that this is needed but sees no description of the inputs/data that will be incorporated to conduct the analysis. Additional text related to the inputs and how the analysis is executed is needed.
- Overall Expansion – His primary concern is not that the methods being proposed are inadequate. Rather, that the methods being proposed are not adequately detailed. An expansion of their description is needed so that the reader can fully understand what will be done and what data will be used to make conclusions

He acknowledged that he realized that he didn't see the geomorph piece as a huge issue. He was just looking for some additional detail.

The call lasted approximately 30 minutes.

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Monday, January 07, 2013 3:18 PM  
**To:** Barbara Stanley; Brenda Trefon; Brent Goodrum; Cassie Thomas; David Schade; Doug Mutter; Doug Ott; Doug Palmer; Eric Rothwell; Ginny Litchfield; Jan Konigsberg; Jason Mouw; Jeffry Anderson; Jim Ferguson; Joe Klein; Judith Bittner; K.J. Muschovic; Katherine McCafferty; Ken Hogan; Kevin Laves; Kim Sager; Krissy Plett; Lynnda Kahn; Michael Walton; Mike Cooney; Monte Miller; Pamela Russell; Phil Brna; Phil North; Ricky Gease; Robert Stovall; Robin Swinford; Shina Duvall; Sue Walker; Ted Deats; Tom Cappiello; Travis Moseley; Valerie Conner; david.griffin@alaska.gov; patricia.berkhahn@alaska.gov  
**Cc:** Mike Salzetti; Emily Andersen  
**Subject:** Grant Lake Natural Resource Studies Meeting Minutes  
**Attachments:** 12-12-12 Natural Resources Meeting Summary.doc

**Categories:**

**Grant Lake Hydroelectric Project (FERC No. 13212) Natural Resources Study Stakeholder Group:**

Thank you all for your attendance (in-person and via phone) at our December 12<sup>th</sup> Grant Lake Natural Resource Studies Meeting. Attached, you'll find the minutes from that meeting. My apologies for not getting them out sooner but our internal review took a bit longer than is typical due to the holidays. I would appreciate your review of the meeting minutes along with the permit table and study plans that were provided at the meeting. Again and as we articulated at the meeting, we did our best to identify all of the permits we viewed necessary to conduct the work outlined in the study plans. We have added to that any suggestions that we heard at the meeting but if any outstanding permit needs exist, please let us know. We are currently working internally and with the Kenai River Center to put together the appropriate set of Multi-Agency permits for submittal into their process. Additionally, we appreciate your review of the study plans given the modifications that have taken place to incorporate the Stakeholder comments received during the formal comment period. As we stated at the meeting, we'd appreciate your review and comment on any points that you have outstanding questions on and/or need additional detail or clarification. As a reminder, both the permit table and the study plans can be retrieved from the Kenai Hydro website at:

[http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

I appreciate that returning from the holidays and catching up can make for a busy January. That said, if we can receive any comments you may have on the items discussed above by February 1, 2013, we should be able to keep on schedule with all of our 2013 field study planning efforts. I hope you all had a great holiday season and don't hesitate to let me know if you have any questions/comments.

Cory

***Cory Warnock***  
*Senior Licensing and Regulatory Consultant*

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**Grant Lake Hydroelectric Project (FERC No. 13212)**  
**Natural Resources Studies Meeting**  
**Residence Inn Midtown, 1025 35<sup>th</sup> Avenue, Anchorage, AK**  
**December 12, 2012, 8:00 am to 5:00 pm**

**In Attendance**

Dwayne Adams, USKH  
Amal Ajmi, ERM *[via phone]*  
Audrey Alstrom, Alaska Energy Authority (AEA)  
Emily Andersen, Long View Associates (LVA)  
Jeff Anderson, U.S. Fish and Wildlife Service (USFWS)  
Patti Berkhahn, Alaska Department of Fish and Game (ADF&G) *[via phone]*  
John Blum, McMillen LLC (McMillen)  
Valerie Conner, Alaska Center for Environment  
Ted Deats, Alaska Department of Natural Resources (ADNR) *[via phone]*  
Shina Duvall, ADNR *[via phone]*  
Gary Fandrei, Cook Inlet Aquaculture Association (CIAA) *[via phone]*  
John Gangemi, ERM  
Ricky Gease, Kenai River Sportfishing Association (KRSFA) *[via phone]*  
David Griffin, ADNR (Alaska State Parks)  
Ken Hogan, Federal Energy Regulatory Commission (FERC) *[via phone]*  
Jan Konigsberg, Hydro Reform Coalition (HRC) *[via phone]*  
Denise Koopman, Army Corps of Engineers (ACOE)  
Ginny Litchfield, ADF&G *[via phone]*  
Katie McCafferty, ACOE *[via phone]*

Mark Miller, BioAnalysts (BA) *[via phone]*  
Monte Miller, ADF&G  
Sally Morsell, Northern Ecological Services (NES) *[via phone]*  
Travis Moseley, U.S. Forest Service (USFS) *[via phone]*  
Paul Pittman, Elemental Solutions (ES) *[via phone]*  
Krissy Plett, ADNR *[via phone]*  
Eric Rothwell, National Oceanic and Atmospheric Administration (NOAA Fisheries)  
Pam Russell, ADNR *[via phone]*  
Kim Sager, ADNR *[via phone]*  
Mike Salzetti, Kenai Hydro, LLC (KHL)  
Charles Sauvageau, McMillen  
Lesli Schick, ADNR  
Levia Shoutis, ERM  
John Stevenson, BA  
Ron Stanek, Cultural Resource Consultants, Inc. (CRC) *[via phone]*  
Robert Stovall, USFS  
Cassie Thomas, National Park Service (NPS) *[via phone]*  
Sue Walker, NOAA Fisheries  
Cory Warnock, LVA  
Mike Yarborough, Cultural Resource Consultants (CRC)

**Meeting Summary**

**Introductions and Agenda**

Cory Warnock (LVA) began the meeting with introductions and then reviewed the proposed meeting agenda (see [Attachment 1](#)):

- Project Overview and Update
- Licensing Path Forward
- Natural Resources Studies
  - Aquatic Resources
  - Water Resources
  - Terrestrial Resources
  - Cultural Resources
  - Recreation and Visual Resources
- Closing

## Project Overview and History

Mike Salzetti (KHL) presented an overview and history of the Grant Lake Hydroelectric Project (Project) (see PowerPoint included as [Attachment 2](#)). Mike S. gave a general description of the utility, Homer Electric Association (HEA), noting that Kenai Hydro, LLC (KHL), the applicant for the Project, is a wholly-owned subsidiary of HEA (*Slide 3<sup>1</sup>*). Mike S. indicated that the purpose for the Project is three-fold (*Slides 4-7*): 1) to meet the Board of Director's goal for an increase in its renewable energy portfolio; 2) to become a more independent utility by adding to its generation capacity, and 3) to create an alternate, reliable energy source in light of the anticipated impending shift to higher gas prices.

Mike S. briefly described the history of the proposed Project to date (*Slides 8-10*), explaining that feasibility studies were conducted for four potential sites (Grant Lake, Falls Creek, Ptarmigan Lake, and Crescent Lake), two of which (Grant Lake and Falls Creek) were carried forward and environmental baseline studies were conducted in 2009. The results of these studies were used in the development of the Pre-Application Document (PAD), filed with FERC August 2009, and in the development of the formal draft study plans.<sup>2</sup> The study program got underway in 2010, but was suspended by KHL later that year following FERC scoping, which led to significant stakeholder comments on the draft plans, in order to take the comments into consideration and revisit the draft study plans. Since that time, KHL has received a second preliminary permit (March 2012), hired McMillen as the Natural Resources Study consultant, and made significant updates to the study plans to address stakeholder comments.

Mike S. introduced the key parameters of the Project (*Slide 11*), noting that there are currently two proposals under consideration: one with a 2-foot dam, and the other without a dam. He reminded the group that the original proposal, as described in the PAD, was for a 10-foot dam. Mike reviewed a series of aerial views (*Slides 12-17*) showing the location of the proposed Project. The proposed Project is generally located to the west of the Moose Pass area (*Slide 12*). Mike S. noted that the original proposal included two potential transmission line access road options, but that one had since been eliminated ("Option 1" in *Slide 13*) to avoid its running parallel to the proposed path of the Iditarod National Historic Trail (INHT). Mike S. described the general layout of the proposed Project facilities (*Slide 14*). Mike S. pointed out that not all issues related to the INHT have been resolved – the proposed INHT route currently runs through the proposed site of the Project powerhouse – but KHL will be working with the relevant agencies and organizations to come up with a potential re-route of the INHT around the powerhouse area. Mike S. stated that due to a large waterfall on Grant Creek that creates a natural anadromous barrier, no salmonids can access the lake and there are no resident salmonids in the lake. The only know species to inhabit Grant Lake are stickleback and sculpin (*Slide 15*). Mike S. indicated that the need for the Project to have a dam is partially dependent on what is determined to be necessary for bypass flows, but noted that given the relatively steep topography of the lake and shoreline, the impact on resources in the lake due to lake level changes, are expected to be minimal (*Slides 16-17*).

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<sup>1</sup> For all PowerPoint presentations given during the meeting, slide numbers refer to the PDF page number.

<sup>2</sup> In May 2010, a revised Project description was filed with FERC, which indicated that the Falls Creek diversion had been removed from the Project proposal, and the associated impacts for which would no longer be studied.



Mike S. concluded his presentation with a summary of the key benefits for building the Project (*Slide 18*).

- *Comment:* Jeff Anderson (USFWS) asked if the current Project proposal is documented anywhere.  
*Response:* Cory Warnock (LVA) indicated that the revised study plans contain the current proposal. Mike S. added that the description in the PAD (August 2009) together with the FERC-filed updated Project descriptions (May and August 2010) (available on the Project website), also reflect the changes made to the current to the original proposal.
- *Comment:* David Griffin (ADNR) asked what from the feasibility analysis, led to the ultimate decision to move forward with Grant Lake.  
*Response:* Mike S. indicated that it was a combination of the expected environmental impacts and economical factors. Valerie Conner (Alaska Center for Environment) noted that the other options were viewed as more controversial, primarily due to recreational and visual resources issues.
- *Comment:* Travis Moseley (USFS) noted that, related to the INHT, KHL should anticipate needing to negotiate with ADNR related to rights-of-way and land ownership.  
*Response:* Mike S. agreed and said that he expected the interested parties to include the USFS, ADNR, and Kenai Borough, among others.
- *Comment:* Jan Konigsberg (HRC) asked if the cost of Project construction is yet known or what financing mechanisms may be used. Jan also asked whether the energy generated by the Project would be used for HEA customers or put on the wholesale market.  
*Response:* Mike S. replied that the Project cost will be determined by the yet-to-be hired engineering consultant (a request for proposal (RFP) for which will go out this winter), but shared that the preliminary estimate is approximately \$35 million. Mike S. indicated a portion of the funding may be covered by KHL and some was going to be sought via grants. As for the intended use of the power, Mike S. stated that the energy would primarily be used by their customers.
- *Comment:* Valerie Conner asked the reason why the expected rated generator output to be the same (5 megawatts [MW]) for the originally proposed 10-foot dam and for the currently proposed no dam and 2-foot dam options.  
*Response:* Mike S. clarified that the 5-MW is the maximum capacity for use during peaking periods, but that a Project will typically run at less than full capacity. He noted that a higher dam (10-foot versus 2-foot or no dam), allows for more storage capacity for use during high-use periods.

## Licensing Overview

Cory Warnock (LVA) presented an overview of the licensing process (see PowerPoint included by [Attachment 3](#)). Cory briefly reviewed the licensing process to date (*Slides 2-3*), reiterating many of the same points made by Mike S. earlier. Cory noted that when formal stakeholder

comments were filed in April-July 2010, KHL developed a matrix of the comments by resource area, and that since, KHL has updated the matrix with responses that include, as appropriate, cross-references to the relevant page/section of the respective study plan where a given comment is addressed (see Draft Study Plans Comment/Response Table included as Attachment 4).

- *Comment:* Eric Rothwell (NOAA Fisheries) asked the reason for selection of the Traditional Licensing Process (TLP).  
*Response:* Cory indicated that while the process decision preceded his involvement with the Project, it is his understanding that the decision was made in consultation with stakeholders at the time. Ken Hogan (FERC) added that because the Integrated Licensing Process (ILP) is the default process, an applicant has to file with FERC a request to use the TLP, which FERC then reviews and either denies or approves.

Cory reviewed the main objectives of the meeting (*Slide 4*), which are to: 1) identify and modify, as needed, current stakeholder contacts; 2) introduce the McMillen Natural Resources Studies team; 3) review proposed studies, by resource area, and 4) distribute the final study plans.

Cory explained that KHL's general plan is to move forward with the final study plans, which will be implemented in 2013/14, and noted that FERC has been consulted regarding KHL's general approach and has confirmed its consistency with the TLP requirements (*Slides 5-6*). To this end, Cory indicated that some team members (Mike S., John Blum, John Stevenson, Chuck Sauvageau, Gary Fandrei, and himself) were at the Project for an initial site visit the day before (December 11). Cory also laid out the steps and schedule for the 2<sup>nd</sup> stage consultation (*Slides 7-8*), noting that KHL is currently at the beginning of the stage, with the commencement of the study program, and that it would conclude with the filing of a Draft License Application (DLA) and meeting thereafter to discuss the study results, reports, and DLA (in summer 2014).

- *Comment:* Jeff Anderson asked whether there would be an opportunity to comment on the final study plans. Monte Miller (ADF&G) echoed the need for stakeholders to have an opportunity to submit written comments in light of the time that has lapsed since the draft study plans were discussed, and the significant changes that have since been made to them.  
*Response:* Cory noted that consistent with the TLP, the formal commenting on draft study plans was completed in 2010; that said, Cory added that questions and suggested clarifying edits to study plans would be accepted. Cory encouraged stakeholders to communicate any questions (via email or phone) directly with the appropriate resource area lead as specified in the team organizational chart (see *Slide 11* and Attachment 5). Ken Hogan emphasized that any suggested substantive edits to study plans should be focused on any proposed significant changes in the status of a particular resource area (RTE designation) since the initial study planning phase, or a significant change in the proposed Project infrastructure that necessitates a corresponding modification to a study plan. Mike Salzetti noted that no significant changes related to RTE species or Project infrastructure existed. Jan Konigsberg pointed out that there is additional opportunity to comment on studies and make additional study requests as part of commenting on the DLA, and Ken Hogan added, also again as part of commenting on the Final License Application (FLA). Monte Miller also noted that if there is a dispute regarding a study

request that FERC does not concur with, the agency or organization requesting the study has the discretion to conduct it at its own expense.

Cory summarized KHL's overarching commitments to making the licensing process a success (*Slide 9*), noted that the Project website will be the conduit for sharing of Project-related materials throughout the process (*Slide 10*), and reviewed once again the Natural Resources Studies Team organizational chart (*Slide 11*).

- *Comment:* Sue Walker (NOAA Fisheries) asked if the Project website includes the formal stakeholder and FERC draft study plan comment letters.  
*Response:* Cory concurred, and stated that the website is currently up to date with all relevant Project materials. Mike S. also noted that historic existing information about the Project is available on the website.
- *Comment:* Monte Miller asked if the Project website has a dedicated area for the public to post comments.  
*Response:* Cory indicated that it currently does not, but noted that it was a good idea, and something KHL would look into the possibility of adding to the website.

## **Fish and Aquatics**

John Blum (McMillen), the Aquatics Resources task lead, started the presentation for the Fisheries and Aquatics Study Plan (see Attachment 6), by introducing the other members of the Aquatics Resources team and the eight major components of the Aquatics Resources Study (*Slides 2-3*), which include: 1) Fish Weir Installation and Monitoring; 2) Resident and Rearing Fish Abundance and Distribution; 3) Salmon Spawning Distribution and Abundance; 4) Trail Lake Narrows Fish Study; 5) Aquatic Habitat Mapping; 6) Instream Flow Study; 7) Macroinvertebrate Studies, and 8) Periphyton Studies.

Gary Fandrei (CIAA) described the objectives, orientation of the crew, field camp setup, weir installation, monitoring and schedule for the Fish Weir Installation and Monitoring study component (*Slides 4-7*) – field work to occur May through mid-November and comprehensive Aquatics Resources Study report to be submitted January 2014 – and photos of a sample weir and typical field camps (*Slides 8-9*). Gary noted that the monitoring spans a relatively long period of time to try to capture all fish species. He also noted that in the event of a significant flood, the weir pickets would be pulled out.

- *Comment:* Jeff Anderson (USFWS) asked what locations are under consideration for setting up the field camp.  
*Response:* Gary responded that the current plan to set up as close to the weir as possible, probably somewhere in the lower 200 yards of Grant Creek, but not directly on the streambank.

John Stevenson (BA) introduced the Grant Creek Resident and Rearing Fish Abundance and Distribution study component, starting with a review of the available background information, USFWS (1961) and Arctic Environmental Information and Data Center (AEIDC; 1983)(*Slides*

10-13), and summarized the study details of the 2009/2010 KHL work (*Slides 14-23*). John S. noted that the field work in 2010 was suspended early, and therefore, the results for which were incomplete. John S. then outlined the proposed effort for 2013, noting that the intent is to continue the study where it had left off in 2010, conducting field work in the same 5 reaches, with the addition of winter habitat and fish monitoring and rainbow trout habitat use and spawning using radiotelemetry in response to stakeholder comments (*Slide 24*). John S. outlined the proposed data analysis (*Slides 25-27*) and field work and reporting schedule (*Slides 28-29*) – field work to occur February through March (winter work) and May through mid-October and comprehensive Aquatics Resources Study report to be submitted January 2014.

Mark Miller (BA) introduced the Grant Creek Salmon Spawning and Abundance study component, starting with a review of the available background information, ADF&G (1951/1981) and AEIDC (1983)(*Slide 30*). Mark summarized the study details of the 2009/2010 KHL work (*Slides 31-35*). Mark noted that most spawning ended within Reach 4, and also that escapement estimates for Chinook and sockeye in 2010 (231 and 6,293, respectively) were significantly higher than those from the earlier work (19 and 61, respectively).

- *Comment:* Sue Walker (NOAA Fisheries) asked for clarification regarding the data analysis used for the historical counts compared to that of the 2010 work.  
*Response:* Mark replied that the historical counts were characterized as single time, visual peak counts, whereas, the 2010 work used area-under-the-curve and visual counts collected over a study season.

Mark then outlined the proposed effort for 2013, describing the field work, data analysis, reporting and work schedule (*Slides 25-28*) – field work to occur late July through early November and a comprehensive Aquatics Resources Study report to be submitted January 2014. Mark also reviewed the stakeholder comments that were incorporated into the two fisheries study components (*Slides 39-41*).

Related to the Trail Lake Narrows Fish Study, Mark stated that no previous work has been conducted in Trail Lake Narrows in association with the potential bridge site location (*Slide 42*). Mark outlined the proposed 2013 effort, including the field work, data analysis, reporting, and work schedule (*Slides 43-45*) – field work to occur late July through early August and a comprehensive Aquatics Resources Study report to be submitted January 2014.

John B. introduced the Grant Creek Aquatic Habitat Mapping study component, starting with a review of the study details, including stakeholder consultation during study planning, of the 2009/2010 KHL work (*Slides 46-48*). John B. then outlined the proposed 2013 effort, noting that the intent is to ground truth the 2010 work, and modifying as needed. John showed an aerial photo of the transect locations of key habitats, the work schedule, and reviewed the comments from the draft study plan that were incorporated into the current plan (*Slides 49-53*) – field work to occur April through May and a comprehensive Aquatics Resources Study report to be submitted January 2014.

- *Comment:* Jeff Anderson asked whether a winter survey would be considered in light of the potential change in flows due to Project operations.

*Response:* John B. indicated that they can utilize the data collected from the Resident and Rearing Fish Abundance and Distribution winter work to evaluate aquatic habitat.

John B. introduced the Grant Creek Instream Flow Study component, starting with a review of the 2009/2010 KHL work (*Slides 54-55*). John B. noted that no high flow water surface area (WSE) measurements were taken and that, as a result, data analysis was not completed. John B. then outlined the proposed 2013 effort, noting that the primary objective is to verify the information collected at the same 18 transects of the 2009-10 effort and determine what has changed since then. John B. described the field work, data analysis, reporting, and work schedule, and showed photos of flows in select reach locations (*Slides 56-62*) – field work to occur April through November and study report to be submitted January 2014. John B. explained that he had discussed the Project with Thomas Payne, to develop an appropriate suite of models for Grant Creek. Also, for Reach 5, they would be utilizing Thompson (1972) to assess connectivity for upstream passage into representative pools (*Slide 58*). John B. pointed out that the study report would be detailed, to include calibration and habitat suitability index (HSI) data, the Instream Flow Incremental Methodology (IFIM) information, and Reach 5 calibration data (*Slide 59*). John B. also reviewed the stakeholder comments on the draft study plan that were incorporated into the current plan (*Slide 63*).

- *Comment:* Eric Rothwell (NOAA Fisheries) noted that he was not familiar with Thompson (1972), and asked 1) without having existing velocity measurements, whether there was a way to verify the use of the Thompson method in Grant Creek; and 2) whether any stream in the Thompson paper was similar to Grant Creek.

*Response:* John B. indicated that velocity measurements would be taken as part of the 2013 field effort, which could be used to verify the use of Thompson in Grant Creek, and noted that he would locate the paper and forward it to Eric.

- *Comment:* Valerie Conner (Alaska Center for Environment) asked what the threshold is for a “reasonable” impact of a hydropower facility on the surrounding environment and who makes that decision.

*Response:* Cory Warnock explained that the studies are designed to determine the existing environment and that the study information coupled with the engineering information should allow for the determination of the Project impact. Ken Hogan added that the “threshold” decision is ultimately FERC’s.

Sally Morsell (NES) introduced the Grant Creek Macroinvertebrate Study and Periphyton Study components, starting with a review of the work completed by KHL in 2009 (*Slides 64-67 and Slides 69-70, respectively*) and then outlined the proposed 2013 efforts. The primary objective of these studies is to replicate the 2009 effort and to combine the two sets of results to further establish the baseline condition. Sally described the field work, sample processing and identification, and data analysis and reporting for both efforts (*Slides 68 and 71, respectively*), the work schedule, and the stakeholder comment that were incorporated into the study plan (*Slides 72-73*) – field work to occur mid-August and a comprehensive Aquatics Resources Study report to be submitted January 2014.

- *Comment:* Monte Miller (ADF&G) asked whether a single sampling in August is a sufficient representation of the stream's productivity, or if potential early season development is not being captured.  
*Response:* Sally replied that because the study is not intended to be a benthic macroinvertebrate ecological study, the single-sample being collected in two different years accomplishes the objective to characterize the macroinvertebrate and periphyton populations.

John B. briefly reviewed the stakeholder consultation that occurred during the development of the draft aquatics study plans in 2009 and 2010 (*Slides 74-77*) and then reviewed the permits anticipated for the various components of the Aquatics Resources Study (*Slides 78-79*) – for weir installation/monitoring and fisheries investigations, ADF&G Fisheries Resource Permit and Fish Habitat Permit, USFS Special Use Permit (SUP), and KPB Floodplain Permit – and asked that if any permits appear to be missing from the list, to inform KHL and/or McMillen.

- *Comment:* Pam Russell (ADNR) stated that she does not see ADNR identified in the presentation, and recommended submittal of a Multi-Agency Permit Application. Jenny Litchfield (ADF&G) added that a permit may be required for the macroinvertebrate study, which does not appear to be included on the current permit lists.  
*Response:* Cory Warnock replied that the plan is to submit a Multi-Agency Permit Application, which is identified in a summary table of 2013 study permitting requirements, available as a meeting handout and on the Project website (see [Attachment 7](#)). Cory added that KHL appreciates any input folks have regarding necessary permits.

## Water Resources

Chuck Sauvageau (McMillen), the Water Resources task lead, started the presentation for the Water Resources Study Plan (see [Attachment 8](#)) by introducing the other members of the Water Resources team and the three major components of the Water Resources Study (*Slides 2-5*), which include: 1) Water Quality (WQ) and Temperature Study; 2) Hydrology Study, and 3) Geomorphology Study. Chuck showed a map depicting the location of thermistors, gages, and the natural outlet sampling point for the WQ and hydrology studies (*Slide 6*).

Chuck introduced the Water Quality and Temperature Study component, starting with a review of existing information for Grant Lake, USGS (1950's), AEIDC (1981-1982), and 2009/2010 KHL work (*Slide 7*), and for Grant Creek, USGS (1950-1958), AEIDC (1982), and 2009/2010 KHL work (*Slide 9*). Chuck then outlined the proposed 2013 effort (*Slides 8, 10 and 13*), noting that the September 2013 water quality sampling is intended to complete the data collection efforts that occurred in June/August of 2009 and 2010. Related to collection of water quality and temperature data in Trail Creek Narrows, Chuck pointed out that there is no historical information for that specific area; as such, the 2013 effort would include three water chemistry sampling efforts in spring, summer, and fall (*Slide 12*).

Chuck introduced the Hydrology Study component, starting with a review of the historical work completed (*Slide 14*). He then outlined the proposed 2013 effort (*Slides 15-16*).

- Comment:* Eric Rothwell (NOAA Fisheries) asked whether winter flows would be collected as part of the Hydrology Study.

*Response:* Chuck indicated that winter flows could be collected provided there are personnel available to do so. Chuck noted that one concern is that the relatively short battery life of the loggers (3-4 weeks) requires regular replacement, which could pose a potential safety concern in light of the inclement weather conditions. Eric suggested point measurements rather than continuous ones, to which, Chuck indicated this would be a possibility.
- Comment:* Eric Rothwell stated that between the Aquatics Resources Study, habitat information is being collected, and Hydrology Study, where discharge measurements are being taken for the development of a stage-discharge rating curve, the studies do not seem to propose a step for conducting an impacts analysis, which might include the development of a routing model and that perhaps it would be worthwhile to consider expanding the 2013 data collection effort, to ensure all necessary data are available for development of such a model, should the need arise.

*Response:* Chuck replied that the intent of the Water Resources Study is to collect existing information, the initial building blocks of a routing-type model. Cory Warnock pointed out that since operation scenarios have yet to be developed; it might be a challenge to identify all necessary data parameters before the 2013 study effort gets underway.
- Comment:* Sue Walker (NOAA Fisheries) asked if there is an overview of the proposed Project operations that could be shared.

*Response:* Referring back to the Overview and History presentation for the key Project parameters (Slide 11), Mike Salzetti explained that the proposal has not changed significantly since the revised Project description was filed in August 2010, with the exception of the proposed access route/transmission line alignment.

Paul Pittman (ES) introduced the Geomorphology Study component, noting that minimal work has been conducted to date for both Grant Lake shoreline erosion or Grant Creek sediment transport (*Slides 17-18*). Paul then outlined the proposed efforts for 2013 (*Slides 17-18*).

- Comment:* Eric Rothwell asked how the impact of Project operations on the existing geomorphic environment would be assessed (e.g., would there be a shear stress analysis to assess shoreline erosion impacts in Grant Lake).

*Response:* Paul acknowledged that changes to lake elevation could change the littoral zone, and similarly, a change in creek flows could impact the transport processes. Paul indicated that the Shields equation would likely be used to quantify the sediment transport impacts. Eric suggested detailing the equations and impacts analysis in the study plan. Paul and Eric agreed to have a follow up discussion regarding this topic.

Chuck reviewed the permitting needs (Multi-Agency Permit Application for WQ/temperature and geomorphology and a Fish Habitat Permit for hydrology) and work schedule for each of the three Water Resources Study components (*Slides 19-20*) – field work for WQ/temperature to occur September (Grant Lake and Grant Creek) and April through September (Trail Creek

Narrows), for hydrology April through mid-November, and for geomorphology mid-April through mid-June, with a comprehensive Water Resources Study report to be submitted January 2014.

- *Comment:* Katie McCafferty (ACOE) noted that ACOE's oversees permitting related to fill of wetlands, and based on the discussion, it does not appear that such a permit would be applicable to the Water Resources Study. She will, however, plan to review the Multi-Agency Permit Application to confirm.

*Response:* Cory thanked Katie for the comment.

- *Comment:* Sue Walker asked if temperature monitoring will be done within salmon redds, and if not, whether it could be. Sue added that defining the operational proposal now would be beneficial to allow for study of the potential impact of Project operations on temperature as it relates to redds, noting that spawning is a key resource value, and thus, it is important to assess the Project impacts on upwelling and/or downwelling within spawning redds.

*Response:* Mike S. stated that it is a challenge to refine the operational proposal before completion of the environmental analysis, specifically before knowing the minimum flows needed in the bypass reach. John Stevenson (BA) commented that monitoring within the redds is not currently planned. He noted concern with potentially disrupting redds, in particular when needing to regularly replace batteries in the sensors, and wondered if it would be acceptable to sacrifice a few redds in order to take the desired measurements. Eric Rothwell reiterated earlier concerns about the need to evaluate the Project impacts. Sue Walker stated that once the initial data are in, the Water Resources Study would possibly need to be expanded to assess egg survival.

- *Comment:* Jeff Anderson (USFWS) noted that the high flow measurement currently planned is for 200 cfs, and asked whether, after initial measurements are taken, the high flow value will be modified, as needed. Jeff also asked if un-manned measurement collection was considered.

*Response:* John Blum responded yes, the high flow could change, but noted that instream flow can be modeled 2.5 times the high flow value. Chuck indicated that the field crew may utilize an existing cable system and un-manned ADCP to collect high flow discharge data.

<<LUNCH BREAK>>

## Terrestrial Resources

John Gangemi (ERM), the Terrestrial Resources task lead, started the presentation for the Terrestrial Resources Study Plan (see [Attachment 9](#)) by introducing the other members of the Terrestrial Resources team and the seven major components of the Terrestrial Resources Study and the study work schedule (*Slides 2-5*), which include: 1) Vegetation-type Mapping; 2) Sensitive Plant and Invasive Plant Survey; 3) Mapping of Wetlands and Other Waters of the



U.S.; 4) Raptor Nesting Surveys; 5) Breeding Landbird and Shorebirds Surveys; 6) Waterbird Surveys, and 7) Terrestrial Mammal Surveys. Field work for the three botanical components to occur July 2013, for raptors June-July 2013 and 2014, for landbirds/shorebirds May-June 2013, waterbirds and terrestrial mammals, November-December 2013 and February-March 2014, and a comprehensive Terrestrial Resources Study report to be submitted January 2014.

In the absence of the study lead, Katy Beck (Beck Botanical Services), John G. introduced the Vegetation-type Mapping and Sensitive and Invasive Plant Survey components, explaining that vegetation type mapping exists for the general Project area (USFS 2007), but that no work has been done to date related to sensitive and invasive plants (*Slide 8*). John G. outlined the proposed 2013 effort, including the goals, study area, pre-field steps, field sampling, data analysis, reporting, intended communications with stakeholders, and work schedule (*Slides 6-7 and 9-12*), pointing out that a Biological Evaluation (BE) would be developed related to the sensitive plants survey and would be submitted as part of a comprehensive Terrestrial Resources Study report in January 2014, then finalized in May 2014 based on USFS' feedback.

Levia Shoutis (ERM) introduced the Mapping of Wetlands and Waters of the U.S. component, starting with a description of the goals and assessment area of the mapping exercise (*Slides 15-16*), and then a review of the 2009/2010 KHL work (*Slides 17-19*). Levia then outlined the proposed 2013 effort, including pre-field tasks, field sampling, data quality control, reporting, communication with stakeholders, and work schedule (*Slides 20-24*).

Amal Ajmi (ERM) introduced the four terrestrial wildlife study components, describing the objectives, the 2009/2010 KHL work, and proposed 2013 effort for each (*Slides 25-37*). Cory Warnock noted that due to the summer 2014 goshawk nesting survey work, and the winter 2013-2014 waterbird and terrestrial mammal surveys, the data for these components would be submitted as an addendum to the already completed Terrestrial Resource Report (January 2014).

## **Cultural Resources**

Mike Yarborough (CRC), the Cultural Resources task lead, started the presentation for the Cultural Resources Study Plan (see [Attachment 10](#)) by introducing the other members of the Cultural Resources team and the two major components of the Cultural Resources Study (*Slide 2*), which include: 1) Cultural Resources, and 2) Subsistence Use.

Mike Y. reviewed the cultural resources work conducted in the Project area to date USFS, CH2M Hill (1980), AEDIC (1983), and EBASCO (1984), and most recently, the work that commenced in 2010, but was suspended after initiation of Section 106 consultation (*Slides 3-4*). Mike Y. then outlined the proposed 2013 effort, which will start with a re-initiation of the Section 106 consultation, to define the Area of Potential Effect (APE)(*Slides 5-6*). Mike Y. pointed out that related to historic trails, there are two pieces to assess relative to cultural resources: the commemorative INHT, as well as other trails that may run through the Project area.

Mike Y. showed a map of the study area and reviewed the work schedule (*Slides 7-9*) – literature review and Section 106 consultation to occur early 2013, field work summer 2013, draft Historic

Properties Management Plan (HPMP) in winter 2013/2014, and a comprehensive Cultural Resources Study report January 2014. Mike Y. explained that the USFS' probability model (developed through a Programmatic Agreement with the State Historic Preservation Office [SHPO]) would be utilized for the historic and archaeological field study. Mike Y. noted that field work would commence once the ground was thawed and there was no snow, typically before vegetation begins to fill in.

Mike Y. reviewed the stakeholder comments received on the draft study plan and KHL's responses as well as the permitting requirements (USFS and ADNR)(*Slides 10-12*).

In the absence of the study lead, Ronald Stanek (CRC), Mike Y. introduced the Subsistence Use Study component, starting with a general definition of subsistence and noting that from a regulatory perspective, it is defined under both federal and state laws, the Kenai Peninsula being mostly a "non-subsistence area" by state law, and a "rural area" by federal law (*Slides 13-14*). Mike Y. stated that there had been no previous work done on subsistence use relative to the Project area, but that there is some relevant work that has been done on the Kenai Peninsula (Reed, Seitz et al. 1994, and Fall et al. 2000) and near the Project area (Davis, Fall, and Jennings 2003, and Fall et al. 2004) (*Slide 16*). Mike showed a data table and maps of the type of information that is collected for a subsistence use study (*Slides 17-19*). Mike then outlined the proposed 2013 effort, including the literature review, stakeholder comments received on the draft study plan, and work schedule, noting that no permits are required for the study (*Slides 20-23*) – literature review/field work to occur 2013 and a comprehensive Cultural Resources Study report to be submitted January 2014.

- *Comment:* Valerie Conner (Alaska Center for Environment) asked whether the Kenai River will be included as part of the study area and whether the APE to be defined as part of the Cultural Resources component, will be applied across all resource areas.  
*Response:* Mike Y. replied that the Kenai River will be taken into consideration as part of the information gathering effort of the Subsistence Use Study component. Regarding the APE, Mike Y. stated that the APE is specific to cultural resources, which are focused on historic resources, whereas, other resources are of the present, and therefore, the study areas for each study will be defined as such. (*Ron Stanek joined via phone*) Ron added that as part of the information gathering, he will follow up with all communities that qualify as subsistence areas, either by federal or state law.
- *Comment:* Travis Moseley (USFS) noted that as a cooperating agency related to tribal consultation, maybe there should be a call with the USFS to discuss the study area relative to subsistence use.  
*Response:* Mike Y. noted that as part of the Section 106 consultation, KHL will be already be talking with all interested tribes, native organizations, and village corporations at which point, subsistence use can also be discussed.

## **Recreational and Visual Resources**

Dwayne Adams (USKH), the Recreational and Visual Resources task lead, started the presentation for the Recreational and Visual Resources Study Plan (see [Attachment 11](#)) by

introducing the other members of the Recreational and Visual Resources team and the two major components of the Recreational and Visual Resources Study (*Slide 2*), which include: 1) Recreational Use Study, and 2) Visual Resources Study.

Dwayne described the general study area for both study components, noting that it will likely be more expansive than the area being assessed in the other studies, and that it will be informed by a scenic viewing analysis (*Slide 3*). Dwayne also reviewed the work conducted in the area to date, most of which was done in association with the INHT (*Slide 4*). Dwayne then outlined the proposed 2013 effort (*Slides 5-9*), noting that the effort will be a continuation of the work started but then suspended in 2010 as well as focus on the Trail Lakes Narrows access route.

- *Comment:* Monte Miller (ADF&G) asked if there would be field cameras deployed on the trails.

*Response:* Dwayne responded that the plan is for the field crew to be on the trails at opportune times to determine use at high use periods and to interview some users; therefore, there is no need for cameras.

Dwayne explained that one of the stakeholder comments received on the draft study plan was to include the INHT for access and routing for effects on users, and that KHL planned to study that as a separate effort, the steps of which, Dwayne outlined (*Slides 11-14*).

Dwayne reviewed the balance of draft study plan comments received and KHL's corresponding responses and anticipated permit needs (i.e., a Special Use Permit [SUP] from the USFS) (*Slide 15*).

- *Comment:* Cassie Thomas (NPS) asked if an assessment of the natural soundscapes would be part of the Recreational Use Study and if so, what would be the methodology used to determine baseline conditions, similar to the use of key observation points (KOP) in visual impacts assessments.  
*Response:* Dwayne indicated that noise would be part of the Recreational Use Study, specifically the impact of Project construction and operation on quality of life characteristics; however, taking baseline noise readings in the field was not currently planned, though it would not be significantly more effort to do so. Dwayne noted that the assessment could not be completed, however, until the Project operational scenario is better understood. Cassie suggested looking at the Visual Resources Study Plan proposed for the Susitna-Watana Hydroelectric Project (P-14241).
- *Comment:* David Griffin (ADNR) asked if KHL knows yet by what modes of transportation the Project area will be accessed by for the various studies.  
*Response:* Mike S. responded that a helicopter will be used to drop off equipment, a boat will be used on the lake, and a floatplane may be used to move equipment to and from the lake.
- *Comment:* David Griffin (ADNR) asked if geotechnical work is planned yet.

*Response:* Cory Warnock indicated that such an effort may be a component of the future engineering study. Mike S. added that some work has already been done by Jacobson during the 2009/2010 work.

## Closing

Cory Warnock stated that the draft notes from the meeting would be issued in approximately two weeks, at which time, KHL would request that stakeholders provide by January 20, 2013 comments on the meeting notes as well as comments/questions/points of clarification on the final study plans (ideally, as a single comprehensive response from each agency/organization), and suggested edits/additions to the Permitting Requirements table. Cory reiterated that all materials discussed during the meeting, including the final study plans, are available on the Project website.

- *Comment:* Monte Miller (ADF&G) asked when the next study plan meetings would be held.  
*Response:* Cory replied that if and when additional meetings are warranted, is dependent on the input provided by the stakeholders related to the final study plans.

## Action Items

- **KHL** to consider developing a section of the project website for the public to post comments regarding the project, licensing process, study program, etc.
- **John Blum (McMillen)** to locate Thompson (1972) and provide to Eric Rothwell (NOAA Fisheries).
- **Paul Pittman (ES) and Eric Rothwell (NOAA)** to have a follow up conversation about possible equations to include in the Water Resources study plan that might be used to estimate the potential change in sediment transport processes resulting from Grant Lake Project operations.
- **Cory Warnock (LVA)** to email stakeholders about providing by January 20: 1) comments on meeting notes; 2) comments/questions/requests for clarification on study plans; and 3) suggested modifications to the Permitting Requirements table.

## Attachments

Attachments are available on the Natural Resources Studies Meeting (December 12, 2012), Work Groups page at [www.kenaihydro.com](http://www.kenaihydro.com).

- Attachment 1: Meeting Agenda
- Attachment 2: Grant Lake Project Overview and History PowerPoint presentation
- Attachment 3: Licensing Overview PowerPoint presentation
- Attachment 4: Draft Study Plans Comment/Response Table (dated 12/1/12)
- Attachment 5: Grant Lake Team Organization and Contact Chart
- Attachment 6: Fisheries and Aquatics PowerPoint presentation
- Attachment 7: 2013 Study Permitting Requirements
- Attachment 8: Water Resources PowerPoint presentation
- Attachment 9: Terrestrial Resources PowerPoint presentation
- Attachment 10: Cultural Resources PowerPoint presentation
- Attachment 11: Recreational and Visual Resources PowerPoint presentation

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**From:** Cory Warnock <corey.warnock@mcmillen-llc.net>  
**Sent:** Monday, January 07, 2013 7:02 PM  
**To:** StLouis, Deidre S -FS  
**Cc:** Cory Warnock; Stovall, Robert -FS; Emily Andersen; Van Massenhove, Katherine B -FS  
**Subject:** Re: Grant Lake Special Use Permit

Sounds great. Looking forward to it.

Cory

On Jan 7, 2013, at 5:10 PM, "StLouis, Deidre S -FS" <[dstlouis@fs.fed.us](mailto:dstlouis@fs.fed.us)> wrote:

Hi Cory, 2:00 pm on the 9<sup>th</sup> would work. We can use my conference number instead of my direct line. 888-858-2144, pass code 6672116.

Deidre

---

**From:** Cory Warnock [<mailto:cwarnock@longviewassociates.com>]  
**Sent:** Wednesday, January 02, 2013 8:30 AM  
**To:** StLouis, Deidre S -FS; Stovall, Robert -FS  
**Cc:** Emily Andersen; Van Massenhove, Katherine B -FS  
**Subject:** RE: Grant Lake Special Use Permit

Hi Deidre,

Hope you are having an enjoyable holiday season. I'm wondering if we can't move the call up to the week of your return? Maybe the 9<sup>th</sup>? Let me know if something like this will work for you.

Thanks,

Cory

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**From:** StLouis, Deidre S -FS [<mailto:dstlouis@fs.fed.us>]  
**Sent:** Friday, December 21, 2012 8:28 PM  
**To:** Stovall, Robert -FS; Cory Warnock  
**Cc:** Emily Andersen; Van Massenhove, Katherine B -FS  
**Subject:** RE: Grant Lake Special Use Permit

Hi Cory, I am out of the office after today until January 7. Just to suggest a day and time to talk, how about January 16 at 11:00 a.m.? You can call me at 907-743-9534. I will need some background on this from you as I have not been involved in the past.

Deidre St. Louis  
Public Services Staff Officer  
Chugach National Forest, Alaska Region  
907-743-9534

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**From:** Stovall, Robert -FS  
**Sent:** Thursday, December 20, 2012 10:36 AM

**To:** Cory Warnock; StLouis, Deidre S -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Grant Lake Special Use Permit

Cory:

Happy Holidays to you and yours. I hope you have a happy and healthy holiday season.

I will be heading out of State on the Dec 24<sup>th</sup> to visit my Sister in Santa Cruz, CA and will be out of state until Jan 9<sup>th</sup>.

The best people for you to discuss Global Special Use permit would be Deidre StLouis our Forest Rec/Min/Lands/Heritage Staff Officer and currently our Special Uses Team Leader. Kathy Van Massenhove Special Uses Administrator (Lands) is another person whom would be able to answer this question.

Deidre and Kathy, could you please help Cory with his question. Please cc me any response.

Thank you and Happy Holidays.

Robert

Deputy District Ranger  
Chugach NF, Seward RD  
334 Fourth Avenue  
Seward, AK 99664  
Seward Office # 907 743-9474; KLWC Office # 288-7707  
Govt Cell # 907 399-3966

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**From:** Cory Warnock [<mailto:cwarnock@longviewassociates.com>]  
**Sent:** Thursday, December 20, 2012 8:40 AM  
**To:** Stovall, Robert -FS  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Special Use Permit

Hi Robert,

It was good seeing you at the Grant Lake meeting last week. I'm wondering if you and I can't set up a time to talk about the need and process for acquiring a global Special Use Permit for activities associated with the project. I'd like to have a little more dialogue with you regarding the appropriate approach and process for moving forward. I understand that the holidays are here and you may not be in the office for a while so I'll let you tell me a time that might work for you over the remainder of the month and/or into early January.

Thanks, Robert. I'll look forward to hearing from you,

Cory

**Cory Warnock**

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Katherine VanMassenhove, Deidre StLouis

*Agency/Organization:* USFS

*Phone No./E-mail Address:* [kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us), [dstlouis@fs.fed.us](mailto:dstlouis@fs.fed.us)

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*Date:* 1/9/13

*Time:* 3:00 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Cory Warnock had a call with Deidre StLouis and Katherine VanMassenove of the USFS to discuss the applicability of the existing Special Use Permit that HEA has with the USFS in relation to the Grant Lake Project. Given that both were relatively new to the Project, they were seeking some background information (infrastructure and natural resource based) related to Grant Lake. Cory informed them of the general aspects of the Project, as they are currently proposed and emailed them a link to the Kenai Hydro website so they could review all of that information along with the study plans. Deidre indicated that a review of the study plans would be very helpful so that she could make a determination as to whether the methods that were being proposed now were consistent enough with the methods in 2010 that a continued use of the existing permit would suffice. Cory informed Deidre that all modifications made to the study plans were based on the formal comment process and were from requisite agencies; none were directly from HEA based up infrastructural or ground disturbing decisions. Additional discussion related to perceived opponents and proponents to the Project took place along with general discussion related to why this was a good candidate Project.

Katherine asked about the Iditarod Historic Trail issue and what progress had been made. Cory informed her of the access road change and how it was much less intrusive on the proposed, commemorative trail. He also discussed the issue of the trail as it related to the powerhouse and stated that additional consultation regarding a re-route around the powerhouse would be taking



place in parallel with the licensing process. Katherine stated that she thought she remembered seeing some correspondence from the USFS (letter) associated with a halting of all licensing activities until the INHT issue was solved and asked Deidre to look for that correspondence. Cory stated that he wasn't familiar with any cease and desist order associated with the INHT issue and stated that some discussion related to the issue took place at the December 12<sup>th</sup> meeting with Robert Stovall and he generally seemed on board with the licensing approach going forward. Katherine agreed to talk with Robert and do a bit more research and Cory requested that she let him know if HEA needed to dig into their files for any additional documentation.

Prior to the end of the call, Cory let the USFS know that HEA was in the process of paying their annual due for the permit and was looking forward to additional conversation to determine if the existing Special Use Permit was adequate for the 2013 study season. He amplified the fact that this permit was intended for the studies only and that no geotech, construction, infrastructural decisions, etc. would be conducted under this permit.

All parties agreed to speak soon, once the USFS had a chance to review the study plans and develop a path forward for the permit. The call lasted approximately 40 minutes.

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Friday, January 11, 2013 2:28 PM  
**To:** 'Miller, Monte D (DFG)'; 'Cory Warnock'  
**Cc:** 'Ayers, Scott D (DFG)'  
**Subject:** RE: Fish Resource Permit

Thanks, Monte. I appreciate the quick follow-up. Good chatting with you today.

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
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C – 360-739-0187  
F – 360-542-2264

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**From:** Miller, Monte D (DFG) [<mailto:monte.miller@alaska.gov>]  
**Sent:** Friday, January 11, 2013 2:24 PM  
**To:** Cory Warnock  
**Cc:** Ayers, Scott D (DFG)  
**Subject:** Fish Resource Permit

Cory,

The new FRP person is Scott Ayers who is now located in our Anchorage offices.

Contact Information:

e-mail: [scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

Telephone: 907 267-2517

Address: Division of Sport Fish  
333 Raspberry Road  
Anchorage, Alaska 99518

Scott will not be available during the week of January 14-18, 2013.

I told him to expect your call....he is in this afternoon.

Monte D. Miller  
Statewide Hydropower Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish / RTS  
333 Raspberry Road  
Anchorage, Alaska, 99518-1565  
(907) 267-2312

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Friday, January 11, 2013 2:20 PM  
**To:** scott.ayers@alaska.gov  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Permitting

Hi Scott,

Monte Miller gave me your number as it appears today is Bob's last day. Sounds like you'll be taking over for him as it relates to permitting. I'm currently working with Homer Electric Association on their licensing process for the Grant Lake Project on the Kenai Peninsula. We are currently going through the Multi-Agency permitting process and I was hoping to touch base with you about a couple specific issues related to the permits we are looking to secure so that when you see your portion of the Multi-Agency Permit from the Kenai River Center, everything is understood. If you could give me a time in the not so distant future that would work to have a brief phone call, I'd appreciate it.

Thanks and I'll look forward to hearing from you,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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F – 360-542-2264

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**From:** Amal Ajmi  
**Sent:** Monday, January 14, 2013 10:48 AM  
**To:** 'jeff.selinger@alaska.gov'  
**Subject:** Introduction

Hello Mr. Selinger,

My name is Amal Ajmi and have recently come on board with the Grant Lake Hydro project. Figure I would introduce myself. I have been a resident of Fairbanks for 20+ years. I have worked with songbirds in the interior for 15+ years. I have many hours as an observer for wildlife (moose, bison, swan, raptor nests, and caribou) aerial surveys for both the state and for the USARMY as their wildlife biologist from 2005 – 2012. I am also a pilot (PA-11). I am new to the world of consulting and to this project. I have been given the responsibilities of completing:

- Goshawk Nest Ground-Based Surveys (Broadcast Acoustical Surveys),
- Breeding Landbirds and Shorebirds,
- Winter Waterbird Survey, and
- Winter use by moose (surveys).

I have been informed that all other terrestrial work for this project has been deemed completed by the client, and no further investigations are required. I have also been informed that I will be utilizing the established methodology to complete the four remaining surveys for the terrestrial component of this project. I am contacting you with regards to the winter moose surveys. A rough schedule for the moose aerial survey work:

- Winter use by moose in the Grant Lake Project Area. Two “standard” line transect aerial survey flights would most likely be flown November-December 2013, and February-March 2014. (Roughly a 10 x 10 mile area).

I have already spoken with Mr. Laves USFS regarding this work, and have reconfirmed the “No fly Zones” for Sheep and Goats and flight level restriction below 500 AGL. I wanted to check in with you for any other restrictions, or requests ADFG might have regarding these surveys. I have been in contact with Meekin’s Air Service as I know he conducts surveys for ADFG. I would like to utilize his skill / cub, if possible for this portion of my assigned work. However, I do not know the Kenai’s moose survey schedule, and don’t want to step on any toes. Although this work is a year away, I would like to make sure we are in agreement and can plan ahead. I am open to your suggestions and any assistance you might provide.

Regards,

Amal Ajmi  
Senior Wildlife Scientist

OASIS Environmental Inc., an ERM Company  
748 Gaffney Rd., Suite 102  
Fairbanks, AK 99701

907-458-8273

[amal.ajmi@erm.com](mailto:amal.ajmi@erm.com)  
[www.erm.com](http://www.erm.com)

## Memorandum

**Date:** January 16, 2013

**W.O.#:** 1371300

**To:** File

**cc:** Sharepoint

**From:** Dwayne Adams

**Subject:** Telecon w/ USFS-Robert Stovall

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I contacted Robert Stovall to see about meeting to discuss a permit for visual/rec studies, about information that they might have concerning user patterns in and around Grant Lake, and about the current status of INHT with respect to USFS activities.

1-We need to talk to Sitka Pence regarding permits-907-288-7720

2-We need to talk to Irene Lindquist regarding information about use patterns-907-288-7748

3-An easement has been established. If we intend to seek changing that easement we need to begin with Judy Bittner (SHPO) and let her know what it is we seek to do. After talking to her we need to talk to Dan Seavey.

---

**From:** Van Massenhove, Katherine B -FS <kvanmassenhove@fs.fed.us>  
**Sent:** Friday, January 18, 2013 10:47 AM  
**To:** Cory Warnock; StLouis, Deidre S -FS; Stovall, Robert -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Special Use Permit Discussion (Grant Lake)

Hi Cory,  
I will take a look at this next week and figure out a good time to talk.  
Thanks for checking in,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Thursday, January 17, 2013 5:37 AM  
**To:** StLouis, Deidre S -FS; Van Massenhove, Katherine B -FS; Stovall, Robert -FS  
**Cc:** Emily Andersen  
**Subject:** Special Use Permit Discussion (Grant Lake)

Hi Deidre and Katherine,

Thank you for the call last week related to the Special Use Permit for the Grant Lake Project. Per our discussions during that call, I'm wondering if you've had a chance to review the study plans and associated documentation and if you might be willing to set up another call to discuss the applicability of the existing permit based upon that review. As I mentioned, we are currently in the process of obtaining our other necessary permits for the 2013 field season and have a strong desire to be as proactive as possible as it relates to ensuring that all of our permits are secured soon. When you have a chance, if you could let me know of a time that would work for a follow-up call, I'd appreciate it.

Thanks and talk with you soon,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Tuesday, January 22, 2013 1:03 PM  
**To:** 'Van Massenhove, Katherine B -FS'  
**Cc:** Emily Andersen; Mike Salzetti  
**Subject:** RE: Kenai Hydro Website  
**Attachments:** GrantLakePermitsRequired.pdf; Grant Lake Methods (Special Use Permit).pdf

Hi Kathy,

Per our emails back and forth, I've attached 2 documents:

- The first is the permit table that we put together for our Agency meeting on December 12<sup>th</sup>. It describes all of the permits that we will need/have for the 2013 studies. You'll notice that the USFS is listed under items 10 (Cultural Resources), 11 (Visual/Recreation) and 12 (Terrestrial). As it relates to numbers 10 and 11, these are global requests that are typical of these types of proceedings. The Cultural piece may require some effort around Grant Lake, on USFS land. The Rec/Vis piece will not require the permit but in an effort to be comprehensive, our consultant (USKH) would like to have the permit in their possession in case anyone questions them being near the Project. Terrestrial (12) will need to conduct work around Grant Lake as part of their studies.
- The 2<sup>nd</sup> document that I've attached contains just the methods sections for these 3 resource areas from the study plans. This should simplify your review process extensively.

I would like to restate that it is my impression that the existing permit should suffice for these efforts as no significant scope changes have been made since the permit was initially issued. All additions have been made per agency request and essentially, make the studies more quantitative. The existing permit seems, to me, to cover all aspects of the 2013 program, as it is currently laid out.

Please let me know if you need anything else or have any more questions. I look forward to discussing this further and reaching a consensus on the appropriate path forward. Let me know when you'd like to discuss.

Thanks,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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F – 360-542-2264

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**From:** Van Massenhove, Katherine B -FS [mailto:kvanmassenhove@fs.fed.us]  
**Sent:** Tuesday, January 22, 2013 11:04 AM

**To:** Cory Warnock  
**Subject:** RE: Kenai Hydro Website

Sorry, not at the office today, working remotely with email. Will be in tomorrow, though.  
I don't need the application, a short write up a word document or such is fine. Thanks!

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Tuesday, January 22, 2013 10:00 AM  
**To:** Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS; Emily Andersen  
**Subject:** RE: Kenai Hydro Website

The application form came through fine. Does the app need to be filled out if the existing permit is deemed applicable? I can have our team put together a brief synopsis of what will be done on USFS lands. That's not a problem. But, I don't want to go through the exercise of filling out the new form and the associated evaluation process unless it is necessary. Clarification would be appreciated to I can act appropriately with my team. I've left you a voicemail on your work phone. Are you available for a brief chat today?

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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5771 Applegrove Ln.  
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C – 360-739-0187  
F – 360-542-2264

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Tuesday, January 22, 2013 10:53 AM  
**To:** Cory Warnock; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS; Emily Andersen  
**Subject:** RE: Kenai Hydro Website

Hi Cory,  
Not all of the study plans open properly on my computer, the recreation one opens in a very small window and will not let me expand. Either way, I really will need you to pull the information out of these studies and send me a write up in a word document or on the application you sent. I cannot go through each study and pick out what I think is what you will be doing, it is up to you to provide this information and it is our preference to have on the SF-299 attached to the last email I sent you.  
Let me know if you need that application form resent.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315



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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Tuesday, January 22, 2013 9:43 AM  
**To:** Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS; Emily Andersen  
**Subject:** RE: Kenai Hydro Website

Hi Katherine,

To be clear, the only work that will be done on USFS lands in 2013 is associated with work done around Grant Lake. The natural resource study plans on the website spell out the tasks that will be done on and around the lake. They current study plans can be found at: [http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

Let me know if you have any other questions and when I time will work for a follow-up call.

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Tuesday, January 22, 2013 10:37 AM  
**To:** Cory Warnock; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS  
**Subject:** RE: Kenai Hydro Website

Hi Cory,

I took a look at the website, however I'm not seeing anywhere that spells out the type of work you are looking to do on FS lands this summer. This is the information I need to know if the work is within the scope of what is currently authorized for investigative studies, or if a new permit or permit amendment is necessary. Please submit a write up of the scope of work that you need to accomplish on USFS lands in 2013.

Thanks,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Wednesday, January 09, 2013 2:09 PM

**To:** Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS

**Cc:** Stovall, Robert -FS

**Subject:** Kenai Hydro Website

[http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

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## Permitting Requirements

Item No.	Firm*	Study Plan Area**	Permit Required	Agency	Process Time (Days / Months)	Notes / Comments
1	MCM	Grant Creek	Fish Habitat Permit	Alaska Department of Fish and Game	90 days (estimate)	For Task 2.2, Stream Gauge Installation
2	MCM	Grant Lake	Multi Agency Permit Application (Phase 1)	Multiple – Housed at Kenai River Center	30 days	For Task 2.1, Re-establish Thermistor String
3	ES	Grant Creek	Multi Agency Permit Application (Phase 1)	Multiple – Housed at Kenai River Center	30 days	For Task 2.3, Grain-size measurements (bulk sampling)
4	CIAA	Fish Weir	Fisheries Resource Permit	ADF&G	0.5 to 3 mos.	ADF&G will review permit applications starting in Jan. and review them in the order received. Process time depends on when application received. Can request the permits be expedited. (Note, CIAA has already submitted FRPs for other 2013 weir projects)
5	CIAA	Fish Weir	Habitat	ADF&G	0.5 to 3 mos.	See previous comment
6	CIAA	Fish Weir	Land Use	ADNR	0.5 to 1.5 mos.	
7	CIAA	Fish Weir	Flood Plain	Kenai Peninsula Borough	0.5 to 1.5 mos.	
8	BA	Grant Cr. Reaches 1-5; Trail River Narrows	Multi-Agency Permit	Multi-Agency	Typically 30 Days	The submission of the multi-Agency Permit is the first step in this



**Grant Lake Hydroelectric Project  
Natural Resource Study Plans**

						process. The Kenai River Center will then determine if and what additional permits may be required.
9	CRC	Cultural Resources	Alaska Cultural Resource Permit	Alaska Department of Natural Resources	2 to 3 weeks	Issued by the Office of History and Archaeology
10	CRC	Cultural Resources	Special Use Permit	USDA Forest Service	Approximately 1 month	Each Federal agency issues their own permit for archaeological investigations under the Archaeological Resources Protection Act of 1979.
11	USKH	Visual/Recreation	Special Use Permit	USFS	0.5 to 1 mos.	To address any interviews we may conduct.
12	ERM	Terrestrial Resources (all studies)	Special Use Permit	USFS	Est. 1 month (TBD)	Details TBD. Likely need permit for: aircraft, land use, camp.
13	ERM	Terrestrial Resources (all studies)	Land Use	ADNR	Est. 1 month (TBD)	Details TBD. Likely need permit for: land use, camp.

*\*Key: OASIS/ERM (ERM), McMillen (MCM), Elemental Solutions (ES), USKH, Cultural Resources Consultants (CRC), BioAnalysis (BA), Cook Inlet Aquaculture Association (CIAA)*

## **Grant Lake Cultural Methods**

### **1 Methods**

This study plan outlines a methodology for cultural resources research for the proposed Project, with the objective of assessing potential impacts to cultural resources resulting from Project construction and operation. The proposed methodology follows the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation, which establishes a comprehensive approach to the identification, evaluation, and management of historic properties.

Cultural resources in the proposed APE will be studied using a combination of literature review, consultation, and field survey. Consultations with Tribal governments and organizations and the State Historic Preservation Office (SHPO), which began in 2009 and 2010, will continue and may include additional interested consulting parties as they are identified.

#### **1.1 Study Area**

The proposed undertaking has the potential to affect historic properties near the shores of Grant Lake and Grant Creek and along the proposed alignments of Project facilities. Project operations, as proposed, would cause the lake level to fluctuate between a minimum of 687 ft MSL to a maximum of 700 ft MSL, potentially affecting cultural sites or exposing previously-unidentified sites. Flows in Grant Creek will be altered and a powerhouse, retention pond, and tailrace will be constructed near the channel. Clearing, construction, and maintenance of the intake, penstock, access road, and transmission line could also potentially disturb cultural sites.

Consequently, the area that would be impacted by powerhouse construction; areas along Grant Creek that may experience increased use; and within Project construction areas, areas to be used for road access, and transmission line alignments (Figure 2) will also be assessed. This area would encompass all probable effects, with a conservative buffer to fully identify all potential historic properties that may be directly or indirectly affected by the Project.

#### **1.2 Consultation**

Consulting parties will be contacted in writing and invited to attend work group meetings to share knowledge of cultural resources and any concerns regarding potential Project effects to historic properties. The initial Section 106 consultation meeting was held June 24, 2010 to review the proposed APE. Consultation needs to be completed on the APE prior to field surveys in order to get feedback from the consulting parties on the updated Project design. Further consultation will be necessary to review survey results and recommended determinations of eligibility for listing in the NRHP, as appropriate. If no additional cultural resources are identified during surveys, and there are no further concerns raised by consulting parties, these meetings would complete the Section 106 consultation. A list of identified Section 106 consulting parties includes:

- Kenai Peninsula Borough
- City of Seward

- City of Kenai
- Qutekcak Native Tribe
- Kenaitze Indian Tribe
- Village of Salamatoff
- Native Village of Eklutna
- Kenai Natives Association, Inc.
- Salamatof Native Assoc., Inc.
- Cook Inlet Region, Inc. (CIRI)
- Chenega Corporation
- Chugach Alaska Corporation
- Ninilchik Natives Association, Inc.
- Alaska Railroad Corporation
- U.S. Forest Service, Chugach National Forest
- Office of Historic and Archaeology (OHA), State Historic Preservation Officer (SHPO)
- Alaska Department of Natural Resources

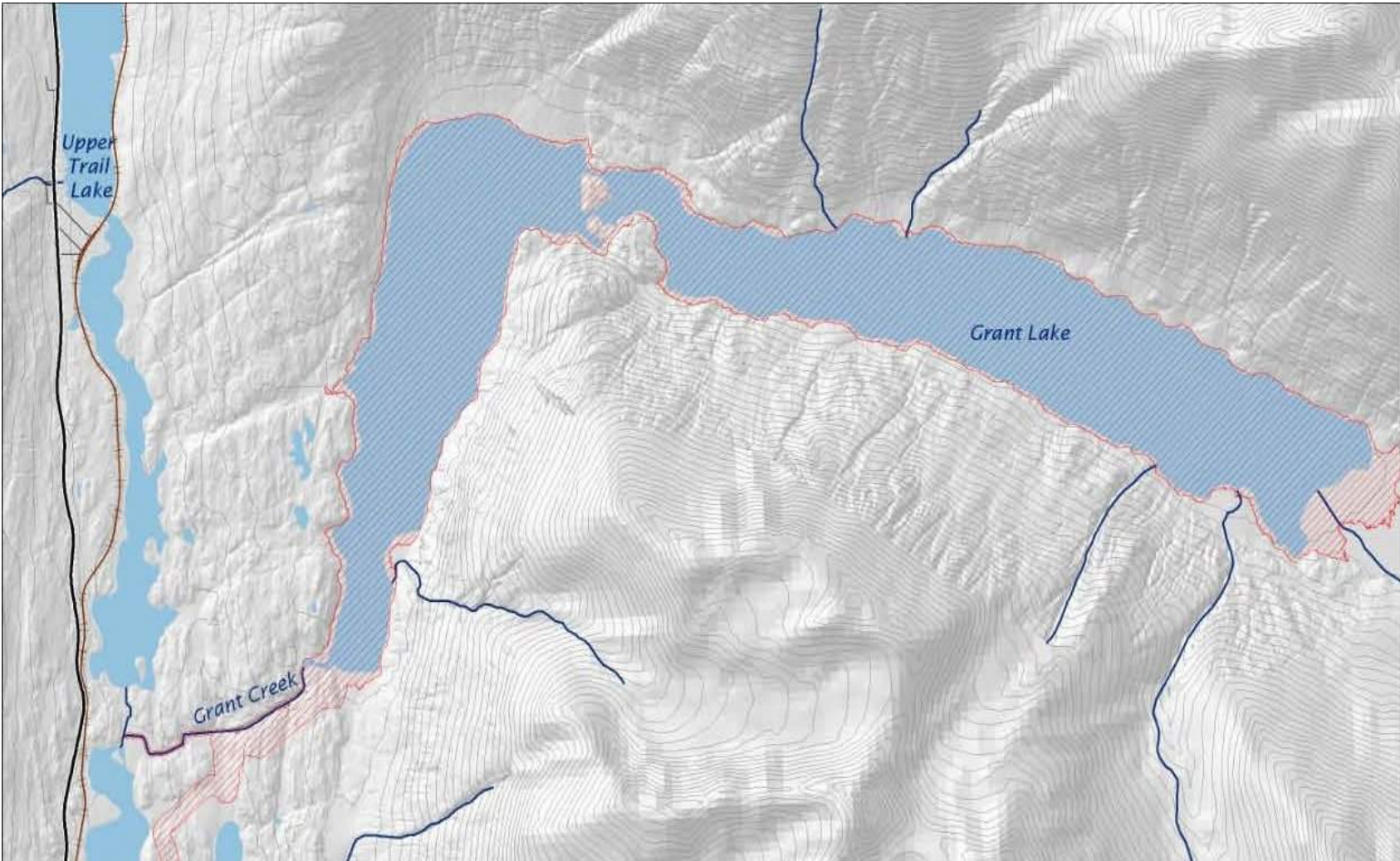
### **1.3 Subsistence and Cultural Use Study**

Through consultation with identified Tribal governments and organizations, an assessment will be conducted to determine subsistence use, in tandem with biological and wildlife studies and cultural resources consultation. This effort will establish areas of traditional cultural use and evaluate Project effects on potential continued subsistence use areas in the proposed APE. The field methods for this work will depend primarily on consultation with Tribal governments and organizations during the pre-fieldwork, cultural resources consultation, as well as research and coordination with the U.S. Fish and Wildlife Service and Alaska Department of Fish and Game, along with terrestrial and aquatic studies conducted for the FERC licensing process. The Subsistence and Cultural Use Study is intended to primarily be a desktop exercise that will use both historical data and data obtained during the 2102/2013 formal studies to draw conclusions related to potential effects. Potential effects on subsistence use in the area will be assessed in the study report.

### **1.4 Historical and Archaeological Field Study Design**

Probability areas will be established prior to field mobilization, based on topographic features and the locations of previously recorded sites. Areas that represent low topography, or are adjacent to streams or lake shores will be considered to possess a higher probability for having cultural resources than steep mountainsides. These latter areas, although possessing a lower probability for cultural resources, may still possess such features as mine adits. These areas will be examined as thoroughly as possible (e.g., surveying the Grant Lake shoreline by boat), depending on terrain and safety precautions.

The field effort will involve cultural resources specialists meeting the Secretary of Interior standards for historic preservation professionals (36 CFR 61). Pedestrian surveys will be conducted by walking in parallel transects no more than 15 meters (50 feet) apart within the Project APE, and visually observing the ground for surface indications of cultural materials (including but not limited to lithic scatters, cabins, mining properties, cache pits and semi-subterranean houses, and historic can and bottle scatters). Survey of built environment resources (i.e., structures, cabins, bridges, and mining features) will occur concurrently with the archaeological pedestrian survey.



**Figure 1. Proposed Area of Potential Effect (APE).**

Sub-surface shovel tests measuring 30 cm x 30 cm (1 square ft) will be conducted during surveys in areas determined to represent locations of high probability for cultural resources. Shovel tests will be excavated to a depth of up to 1 meter (39 inches); any soil strata containing cultural materials will be recorded as to depth and characteristics. All recovered artifacts will be photographed, measured, and described. After detailed field recording, all cultural materials will be re-deposited in place to minimize disturbance.

In the event that human remains are encountered either on the ground surface or contained within a shovel test, examination will proceed only until remains can be unequivocally determined to be human and the area is protected and secured against further erosion. The principal archaeologist will then notify appropriate project leaders and assist in contacting and consultation support with appropriate Tribal governments and organizations, agency officials, and SHPO and FERC, as appropriate.

#### **1.4.1 Cultural Resources Evaluation**

The project team will use NRHP criteria to evaluate significance and eligibility for listing of identified resources as part of the reconnaissance level survey process. For those archaeological resources that have been identified but not formally evaluated for eligibility for listing in the NRHP, a one square meter test unit will be excavated within site boundaries to evaluate vertical integrity of any identified cultural deposits, as appropriate. All recovered artifacts from sub-surface evaluations will be photographed, measured, described, and recorded in detail. Artifacts will not be collected, except in the rare cases of items that may be considered threatened by erosion or looting. Any materials collected will be curated at a facility meeting the Secretary of the Interior's standards for appropriate cultural resource storage.

Upon completion of the survey and evaluation efforts, a report will be prepared including Alaska Heritage Survey Records (AHSR) site forms, and Determinations of Eligibility (DOEs), with recommendations on eligibility of identified sites within the APE. Cultural resources that have been determined not eligible for listing on the NRHP will be photo-documented, and any changes observed in the character of the resource from its previous recordation will be recorded, and AHSR site card documentation at the Office of History and Archaeology (OHA) will be updated.

Any data collected as a result of the field effort would include field notes, UTM locational information, photographs, field maps, and descriptions. These data will be used to create graphics for report documentation, as well as aid in assessing adverse effects, and making determinations of eligibility on historic properties within the proposed Project APE. Recorded sites and boundaries, where known, will be plotted on map figures for project planning purposes, to identify possible avoidance and/or minimization efforts. Following the significance evaluation, a formal recommendation on determination of eligibility will be prepared for FERC review and subsequent review and concurrence by consulting parties, pursuant to 36 CFR 800.4(2).

Further consultation with Tribal governments and organizations, SHPO, other interested consulting parties, and FERC will follow to address any potential adverse effects to historic properties. A Historic Properties Management Plan will be prepared for the Project.



## **Grant Lake Recreation/Visual Methods**

## **2 Methods**

### **2.1 Study Area**

Figure 1 shows the Moose Pass and Grant Lake area. The study area includes recreational and visual resources potentially affected by the Project. In general, these resources are on lands between the Seward Highway and the far eastern end of Grant Lake. The study area includes not only the entire shoreline of the lake that might be affected by fluctuating water level but the areas within the watershed from which the shoreline is readily visible. The study area extends south to Vagt Lake.

### **2.2 Study Design**

The Recreation and Visual Resources Study is composed of two components that will include a combination of office- and field-based efforts: Study Component #1, Recreation Use Study and Study Component #2, Visual Resources Study. A review of existing information will be conducted for both study components as an initial study task. The fieldwork for the study components will be combined whenever possible and will include the following activities to meet study objectives:

- Conduct a summer site visit by foot and boat to survey and document existing and planned trails and access points and other recreational use areas to determine potential effects of fluctuating lake level, creek flow, and Project construction and operation.
- Conduct a winter site visit by foot, skiing, or snowmachine to document winter use areas to determine potential effects of Project operations.
- Consult with land management agencies and stakeholders regarding recreation and visual resources.
- Visit pre-selected sites for visual assessment by walking on existing and planned trails and other travel ways, such as the frozen lake surface, to view known scenic features, and take photographs and record locations with GPS at potential sites for renderings including an aerial view that would typify scenic overflights of the lake.

#### **2.2.1 Study Component #1 – Recreation Use Study**

The objective of the recreation study is to assess recreation use within the study area to evaluate potential Project impacts on recreational resources. Work includes the identification of data sources, a literature review, a preliminary assessment of levels and type of recreational use, and identification of potential agency personnel and others with whom to consult by phone or in person. This task was begun in late spring 2010. Follow-up will be required to determine if all pertinent existing information has been obtained and to confirm contacts within the agencies and community.

The study will include a review of management plans, studies, and data that have been developed by resource agencies or government bodies, including the USFS, State, KPB, and review of information collected in 2010 through site visits and discussions with stakeholders. The literature review will provide

an understanding of other existing and proposed activities within the region as well as an understanding of the expectations of users and the public as described in the Chugach Forest Plan (USFS 2002).

The FERC Scoping Meetings in June 2010 and the Project study plan comment meeting held afterward provided an opportunity for consultation with agencies and the public. Stakeholders attending the meeting included local residents, local business owners, and summer and winter recreational users. Input was requested primarily at the time of FERC scoping. Follow-up after data collection is completed, in targeted meetings or telephone conversations, will be necessary.

Existing regional plans and studies and stakeholder interviews are meant to provide information about users of recreation resources, duration of use, and activities. Both winter and summer use will be analyzed. Review of the information collected in 2010 may indicate data gaps that need to be addressed in addition to completing the winter use survey.

A recreation features map for the study area was prepared prior to the June 2010 field visit using existing GIS layers, existing aerial photography, and available satellite imagery coupled with field data. The map was used to locate known recreation areas and access points. The map included information on private land ownership parcels within the study area. Trail location information is available for the Project vicinity from the USFS and the KPB. IKONOS satellite imagery is available for part of the Project vicinity, as well as several aerial photography sets from different years.

Foot and boat surveys provided direct information on the condition of trails and boat access points, and provided information about current use. Trail and boat access points in the Project vicinity that may be affected by water level fluctuation were photographed to illustrate potential change. Track lines and waypoints along study area trails were recorded by GPS (subsequently entered into the Project GIS database) and illustrative views photographed. A winter survey is planned to collect direct information on winter use and access in the Project vicinity. Data locations will be recorded using GPS and photographs and entered into the GIS database for the Project.

Results of stakeholder interviews and meetings and field investigations of study area recreation use will be used in conjunction with existing information on the study area to evaluate potential effects of the Project.

The study report will include a recreation resources map which will display land ownership with indication of state and federal recreational management intent; existing trails and routes (including water travel corridor), constructed and proposed INHT segments and any associated land rights for the trail, formal or informal camp sites and boat access points, and similar information regarding recreation features and patterns. The report will summarize management intent of agencies, information gathered from community and recreation users, describe use patterns indicated on the map, assess potential recreational impacts, and outline potential methods of mitigation, as necessary.

### **2.2.2 Study Component #2 – Visual Resources Study**

The objective of this study component is the analysis of Project effects on visual resources. Key viewpoints for evaluation will be determined by the updated Project design; by recreation site visits; by

examining available GIS scenic, elevation, contour, and other pertinent layers; and through input from land management agencies and stakeholders. This will be coordinated with the interviews discussed as part of the recreation analysis and was accomplished in part during the meetings held at the time of FERC scoping for the Project in June 2010. Photos taken from these key viewpoints will serve for the existing and simulated scenery conditions for the assessment of changes that may be posed by the Project.

Visual simulations of the view from five viewpoints, showing Project facilities and operations, are currently planned. More views might be necessary if changes are made to Project design. The number of views will be commensurate with the scope and extent of the Project. Examples of key viewpoints may include a view of the Trail Lakes Narrows access road crossing area from the Seward Highway, a view of the intake structure and lake shoreline, a view of proposed facilities from the Seward Highway or Alaska Railroad, an aerial view, or a view of the access road or powerhouse from the from the right-of-way for the proposed INHT. Fieldwork will verify key viewpoints. Simulations will be based on Project photos taken from the site visit. Simulations will be based on similar facilities that have been constructed for similar projects. Three dimensional simulation using 3D models is not proposed at this time as project design is not sufficiently developed. In addition to the views and simulations of Project facilities listed above there will be two aerial views of the Project vicinity, one to include Grant Lake and one Moose Pass.

The analysis of Project effects on visual resources will rely on evaluation criteria and processes described below. For the affected shoreline of Grant Lake that lies within USFS boundaries, existing scenery management information in the Chugach Forest Plan will be reviewed (USFS 2002). The scenery management analysis completed as part of that plan also will be reviewed. Specifically, the review will cover criteria for “landscape units,” “scenic integrity,” “concern levels,” “scenic attractiveness,” and “landscape visibility” (USFS 1995). An understanding of the scenic criteria will help determine the degree to which proposed Project facilities and operations (fluctuating lake levels) may affect those designations or conflict with USFS visual management objectives. The USFS documentation will be applied generally to state lands, to the extent applicable.

Evaluation of change to the existing character will include an examination of proposed Project components and operations with respect to the ability of the landscape to accept change. This evaluation is based on the “seen areas” and “distance zones” as determined by computer analysis, the “scenic integrity,” and the magnitude of change to existing “scenic attractiveness.” Within this will be an analysis of vegetation, soils, colors, texture, and other landscape attributes; an analysis of these components to accept change; a description of the potential effect of the change; and a description of the effect on stakeholders. This information will be weighed against the objectives that were delineated within the USFS, State, and KPB land management plans (USFS 2002, ADNR 2001, and KPB 2005), to the extent such objectives exist. Analysis will include an evaluation of potential protection, minimization, and mitigation options. Work will include the evaluation of seen areas from the specified viewpoints, analysis of the location of facilities and infrastructure, and the evaluation of design options to minimize visual impacts.

The study report will include a map of the visual environment, an aerial or satellite image or map simulating lake level fluctuation, and a visual resources assessment document. The map will show visual resource management objectives in different areas, any views identified as particularly valuable, and the key viewpoints. The report will present the information and analysis described above and will present before-and-after photographic images from the selected viewpoints, showing visual simulation of the Project components in the landscape. All data collected during the Recreation and Visual Resources studies should be linked into a Master Arc Soft (Arc Map) geo database.

## **Grant Lake Terrestrial Methods**

### **3 Botanical Resources Study Methods**

#### **3.1 Study Area**

From west to east the study area extends from east of the Seward Highway and Alaska Railroad adjacent to Moose Pass, to just past the eastern shoreline of Grant Lake. From south to north the study area extends south along the highway to just south of Grant Creek and north to just beyond the north shoreline of Grant Lake. The study area includes all proposed Project facilities along Grant Creek and the Seward Highway (Figure 1).

#### **3.2 Study Design**

The Botanical Resources Study has four components that will include a combination of office- and field-based efforts: Study Component #1, General Vegetation Type Mapping; Study Component #2, Sensitive Plant Survey and Invasive Plant Survey; Study Component #3, Wetland and Waters Mapping; and Study Component #4, Timber Resource Assessment.

A review of existing information will be conducted for all four study components as an initial study task. The fieldwork for the study components will include the following activities:

- Conduct a sensitive plant survey to produce the baseline information for a Biological Evaluation for plants.
- Conduct an invasive plant survey (concurrent with sensitive plant survey) to produce a technical report and a plan for managing invasive plants.
- Conduct delineations of wetlands and other “waters of the U.S.” (collectively referred to as “wetlands”), in areas not mapped in 2010, sufficient to determine the locations of resources subject to authority of the Clean Water Act and Executive Order 11990. The wetland survey will include a detailed survey of areas not surveyed in 2010 that are directly affected by the Project and a general survey of the larger Project vicinity.
- Conduct a timber stand survey in areas not previously surveyed by the USFS, if any.

##### **3.2.1 Study Component #1 – General Vegetation Type Mapping**

#### **Vegetation Type Mapping**

The objective of this study is to refine the existing vegetation type map for the Project vicinity using existing GIS layers, existing aerial photography, and available satellite imagery (Figure 2). The map will be used to plan routes for the sensitive and invasive plant surveys, to assist in delineating wetlands prior to fieldwork, to locate timber stand survey plots in areas not previously surveyed, and provide habitat information for the wildlife study. Private lands will not be accessed for surveys.

Vegetation cover information is available for the Project vicinity from the USFS and the Kenai Peninsula Borough. Vegetation layers, including the CovType and the TimType layers, are out-of-date as they were created in the late 1960s and early 1970s; however, they may be used as the basis for new mapping. IKONOS satellite imagery for part of the Project vicinity, as well as aerial photography was obtained in

2010. Several aerial photography sets from different years that can be used for interpretation of vegetation types are also available.

## **Methods**

To refine the vegetation type map for the study area, the following tasks will be performed:

- Acquire and compile existing GIS vegetation cover type layers from available sources, including the USFS and the Kenai Peninsula Borough. The Project acquired the USFS cover type layer in 2010.
- Examine any visible vegetation boundaries in aerial photos or other imagery to fix or update type polygon boundaries. The Project has already acquired and compiled some existing aerial photography and satellite imagery from the USFS, the Kenai Peninsula Borough, and private sources to overlay on the existing cover type layers.
- Determine specific locations to conduct the sensitive and invasive plant surveys, the detailed wetland delineation, and a timber stand survey if one is needed. Specific areas for survey will be those that may experience physical disturbance during Project construction or operation. These areas include the perimeter of Grant Lake, which may be affected by changes in the water surface elevation; a corridor including the Grant Lake outlet and Grant Creek, which will encompass construction of an intake and diversion structure, a powerhouse, a retention pond, and a tailrace; and the Trail Lakes Narrows access corridor route, to encompass road construction and a transmission line corridor that may include electrical transmission line towers and anchor locations, if the transmission line is located overhead (whether the transmission line will be underground or overhead has not been decided).
- Produce a final vegetation type map that displays vegetation type polygon boundaries, the study area, and specific Project components and impact areas.
- Use the vegetation type map to produce a table of vegetation types and calculate the percent acres of each vegetation type present in the study area in general, in areas potentially affected by the Project, and in directly affected key wildlife habitats (see Wildlife Resources Study for key species).
- Produce a technical report that includes a description of vegetation in the Project vicinity and assesses potential impacts of the Project.

### **3.2.2 Study Component #2 – Sensitive Plant Survey and Invasive Plant Survey**

The study area for the sensitive plant and invasive plant surveys includes:

- 2 vertical feet around Grant Lake,
- a 50-foot margin along the proposed road and transmission line,
- a 100-foot margin around all other proposed project features.

#### **Sensitive Plant Survey**

The objective of the sensitive plant survey is to satisfy USFS requirements for a Biological Evaluation for plants on lands under its jurisdiction. Sensitive plants, as referenced throughout this study plan, are plant species formally identified by Region 10 of the USFS in 2009. These plant species are listed in Appendix A. There are no federally listed threatened or endangered plant species known to occur in the study area. The USFS documents its protection of sensitive plant species in conjunction with Projects on

lands under its jurisdiction through preparation of a Biological Evaluation for plants. The objectives of the Biological Evaluation for plants are specified in the Forest Service Manual Part 2672.41 (USFS 1995) as: (1) to ensure that actions do not contribute to loss of viability of any native or desired nonnative plant or animal species; (2) to incorporate concerns for sensitive species throughout the planning process; and (3) to ensure that activities will not cause a species to move toward federal listing as a threatened or endangered species. In addition, the Chugach Land and Resource Management Plan (USFS 2002) directs the USFS to “avoid, minimize, or mitigate the effects of human activities in areas containing sensitive plant populations” (page 3-27). It further directs the USFS to conduct surveys to determine abundance and distribution of sensitive plants in areas affected by management activities (page 5-8).

The purpose of this study is to develop the information necessary for Kenai Hydro LLC to meet USFS goals and objectives related to sensitive plant species. This study will determine the locations and abundance of sensitive plants on USFS lands in areas potentially affected by the Project to allow preparation of a Biological Evaluation for plants. Updated Project design will potentially reduce the effects to sensitive plants on USFS lands. The following tasks are necessary after the study for completion of the Biological Evaluation:

- Determine the proposed Project’s potential effects on sensitive plant species (including possible PM&E measures).
- Develop appropriate mitigation measures if needed to avoid, minimize, reduce over time, and compensate for adverse effects on sensitive plants.
- Assess the risk the Project would pose to sensitive plants based on the consequence and likelihood of adverse effects.

After these analyses are documented in the Biological Evaluation, KHL will submit the Biological Evaluation for plants to the USFS and FERC.

### **Sensitive Plant Survey Methods**

The study methods are based on the Procedures for Sensitive Plant Biological Evaluations, May 2002, contained in Stensvold (2002); data forms are included here as Appendix B. The study will begin with a review of existing information on the sensitive plants and their habitats that may be found in the Project vicinity. The body of existing information includes:

- List of Alaska Region Sensitive Plants (2009) (see Appendix A).
- USFS protocols for sensitive plant surveys and Biological Evaluations (Stensvold 2002; Appendix B).
- Known habitat preferences and general geographic distributions of listed sensitive plants (Forest Service sensitive plant manual [Stensvold 2002]).
- Known geographic locations of sensitive species on the Kenai Peninsula (USFS digital records; Alaska Natural Heritage Program database).
- Existing vegetation mapping of the Project vicinity (USFS GIS database).
- Existing aerial photography (IKONOS).
- Locations and results of past surveys for sensitive plants on the Kenai Peninsula (USFS files).

The aforementioned records and documents may be obtained from the Chugach National Forest Supervisor's Office, the USFS Alaska Region Botanist, and the Alaska Natural Heritage Program. Based on the available information, staff will identify locations of habitats suspected to support sensitive species within the study area. Habitat may also be identified through interpretation of aerial photographs, existing GIS vegetation layers, known plant locations, consultation with USFS and other resource experts, and incidentally in conjunction with other environmental studies being performed for the licensing study program.

The following survey tasks will be performed:

- Conduct a Level 5 (intuitive controlled) intensity survey in areas potentially affected by the Project using a two-person crew. This level allows intensive searches in those areas with the highest potential for finding sensitive plants. Areas of focus for the sensitive plant survey will be habitats known or suspected to support sensitive plants in the Chugach National Forest, as directed in the Procedures for Sensitive Plant Biological Evaluations within the USFS sensitive plant manual (Stensvold 2002). These may include heath, alpine and subalpine areas, wet meadows, shallow fresh water, forest edges, rock outcrops, well drained open areas, open forests, waterfalls, and stream banks. The exact areas of focus will be determined after review of available information and based on professional judgment in the field.
- Keep records of field surveys according to current USFS protocols for sensitive species surveys, including use of the R10 2008 TES Plant Element Occurrence Form, the R10 2009 Pre-Field Review Worksheet, and the National 2008 USFS Plant Survey Field Form (Appendix B). Survey locations will be recorded with GPS. Habitats likely to support sensitive plants will be thoroughly searched. The searches will employ the concepts of the timed meander method (Goff et al. 1982) without following that method exactly; each area will be searched until the surveyors are comfortable that further searches would not find any sensitive species. Any sensitive plant populations discovered will be described according to current USFS protocols. A voucher specimen from each sensitive plant population will be collected, pressed, and submitted to the Herbarium, University of Alaska-Fairbanks, if the population includes over 20 individuals and if a voucher is needed for positive identification.
- Identify in the field, or collect for identification, any unknown plants observed in the field.
- Compile field data and develop GIS coverage of survey areas and any sensitive plant sightings.
- Submit voucher specimens and report sensitive plant locations to the USFS and Alaska Natural Heritage Program.
- Prepare a technical report describing the results of the sensitive plant survey and assessing potential Project impacts to any identified populations of sensitive plants. Ultimately, a Biological Evaluation for plants will also be drafted for USFS lands affected by the Project.

### **Invasive Plant Survey**

Invasive plants, for the purposes of this study, are those that are not considered native to Alaska (considered synonymous with exotic for this study). The objective of the survey is to locate and document populations of invasive plants in areas potentially affected by Project construction and operation. This information will be used in preventing the spread of invasive plants due to Project related activities. The Chugach National Forest Land and Resource Management Plan (USFS 2002) cites as a goal to "prevent introduction and spread of exotic plants and reduce areas of current infestation," and as objectives to "identify infestations of exotic plant species" and "treat infestations with a high



potential to spread” (page 3-4). It suggests incorporating exotic plant control into Project planning and design (page 3-25), and conducting surveys to determine abundance and distribution of exotic plants, particularly in areas affected by management activities (page 5-8). Many invasive species are known to exist on USFS lands and on the Kenai Peninsula (Duffy 2003, DeVelice 2004).

A subset of invasive plants is designated as “noxious weeds”, which are plants that are especially destructive and difficult to control. Importation, labeling, and sale of their seed are legally controlled under Alaska Administrative Code 11 AAC 34.020. USFS guidance directs the USFS to manage and control noxious weeds (USFS 1995).

### **Invasive Plant Survey Methods**

The survey will be conducted at the same time as the sensitive plant survey, and will take place within areas on USFS lands potentially affected by the Project (Figure 1). Areas of likely infestation for invasive species include roadsides, soil disturbance areas, motorized vehicle travel routes, boat traffic routes, exiting trails, lake and stream access points, developed or social recreation sites, and other disturbances and human use areas.

The following tasks will be performed:

- Compile and review existing information on any nearby known locations of invasive vascular plants.
- Identify and map potential disturbances caused by Project activities using available GIS layers for roads, trails, access points, cleared areas, or other infrastructure features.
- Identify previous data collection points in the GIS database from prior studies (Duffy 2003, DeVelice 2004, and Bella 2009).
- While conducting the sensitive plant survey, observe any invasive species. If invasive species are identified, record the location with a GPS unit. If large populations of a particular species are found, record only one data point to represent the general area of infestation. If a particular species is found at many sites close to one another, record only one data point. Record at least one data point for each unique invasive species that is encountered. Use judgment in the field to decide if a population represents a unique infestation or is likely to have spread from an adjacent infestation.
- Complete the field form recommended by AKEPIC, which is also recommended for use by the USFS for invasive plant surveys on USFS land (Appendix C). Record GPS location information, data, observers, observer affiliation, detailed site information, detailed location information, and specific species information. This includes: exotic plant species code, infested area, canopy cover, disturbance age, stem count, collection information, control action, and aggressiveness. Details on what these field form terms mean is included on the field form. Not all fields must be filled out, but investigators will answer as many as possible. The important point in this study is to note location by GPS, species name, and approximate size of the infestation.
- Collect and preserve voucher specimens from populations that are not known from this area.
- Submit field form data copies to AKEPIC for the statewide database record.
- Prepare a technical report for the study area that describes the current infestations of invasive species. Assess the impact that Project activities may have on existing populations and also the potential of Project activities to introduce new populations.

- Develop a plan for managing invasive plants, based on potential Project effects. Include in the draft and final license applications, and the construction BMP's.
- 

### **3.2.3 Study Component #3 – Mapping Wetlands and other Waters of the U.S.**

The objective of this study is to identify and describe wetlands and other potential “waters of the U.S.” (collectively referred to as “wetlands”) that will be impacted by the proposed Project, (Figure 1).

Following the update of Project design and a review of mapping completed in 2010, potentially affected areas that have not yet been surveyed can be determined. The wetland mapping component will provide information to prepare a wetland report sufficient to apply for a permit from the US Army Corps of Engineers (USACE). The wetland report will describe locations near the Project that are potentially subject to the authority of Section 404 of the Clean Water Act or Executive Order 11990.

#### **Methods**

Wetland and waters of the U.S. mapping will include the following tasks:

- Prepare a preliminary wetland delineation map prior to field work using existing NWI mapping and interpretation of the most current aerial photography or satellite imagery, the vegetation type map from this study, and other available vegetation mapping (e.g. the Kenai Peninsula Land Cover map).
- Conduct a field survey of wetlands and waters in the road/transmission corridor, facility locations, at the inlet of Grant Lake, and at the dam site (if included in the Project plans). The Grant Lake shoreline and Grant Creek corridor will also be included if deemed necessary based on field observations of suitable wetland terrain in these areas during pre-field site visits. The 2012 wetland survey will include the following:
  - Collect detailed information on soil conditions, hydrology, and plant community composition in representative upland and wetland sites using guidelines from the 1987 wetland delineation manual (USACE 1987) and 2007 Alaska Regional Supplement (USACE 2007). Use standard 2007 Alaska Regional Supplement data sheets (Appendix D).
  - Collect functional assessment data for each wetland. The functional assessment method used will be discussed with the USACE prior to field sampling.
  - Coordinates of wetland boundaries will be collected by GPS in the field
  - The width or buffer of the wetland assessment area surrounding all project components will be determined based on what was used by HDR in 2010 (this is not known at this time).
- Prepare a final wetland and waters of the U.S. map for areas potentially disturbed by Project activity using field delineation results. Map will include wetlands and other waters by NWI class (Cowardin 1979), and field data collection locations. Prepare a table of acres per NWI class using data and maps.
- Prepare a wetland and waters of the U.S. report that will include a detailed map of areas potentially disturbed by Project activity, the general map of the entire study area, methods and findings, a wetland functional assessment, and copies of the field data forms.

### **3.2.4 Study Component #4 – Timber Resource Assessment**

The objective of this study (if needed) is to assess timber resources on USFS lands that may be affected by Project construction and operation. The study would estimate and calculate value for the volume of trees with commercial value, including Sitka, white, and Lutz spruce; paper birch; and mountain hemlock. These are referred to as the “species of interest” for this study.

The Project vicinity was partially delineated into timber stands in a past study (Caveney and McCusker 2005). Plot-level stand exams were conducted to a level of detail sufficient to calculate timber volume. Existing information may reduce or eliminate the need for fieldwork to obtain data sufficient to conduct the assessment. The updated Project design may reduce the area of timber affected. If, based upon project design and pool elevation fluctuation, it is determined that there will be no impact on the Forest Service Land timber that surrounds the lake, this study will not be necessary. At this time, the bidder is requested to develop a budget for this task with the understanding that it may be eliminated from the overall scope as decisions related to Project development are made.

#### **Methods**

The following tasks will be performed:

- Request a copy of existing field data for the Grant Lake Wildlife Habitat Vegetation and Fuels Report (Caveney and McCusker 2005) from the USFS. Review plot locations to determine the extent of coverage and if existing data cover the potential inundation area around Grant Lake (Figure 3). Determine areas, if any, of spruce bark beetle kill within the area affected by the Project using a Kenai Peninsula Borough GIS layer. Exclude these areas from field data collection. Field data collection may not be necessary if data exist, or if the area has been severely affected by spruce bark beetle kill.
- If field data collection is necessary, identify individual vegetation stands that include the species of interest in the potential inundation area using the vegetation type map. Calculate the number of acres in the target field data collection area for each vegetation type with species of interest. Types will include Sitka spruce, white spruce, Lutz spruce, mixed hardwood-softwood, birch, hemlock, and hemlock-spruce. Place one plot per acre in Project activity areas that require field data collection such that all types with species of interest are included. If one plot per acre is impractical for time or access reasons, scale back to one plot for every five acres with coverage in all types. Place plots within stand boundaries to avoid ecotonal/transition areas.
- Collect timber cruise data in the planned field plots using standard timber cruise field equipment. Assemble a crew of two people. Locate plots by GPS and paper map. Record the plot location using a GPS unit. Record data either in a field notebook or with a handheld field computer with a field form designed to include the data collection fields. Record date, observers, slope, aspect, canopy cover in percent class (0, 1-15, 16-30, 31-45, 45-60, 61-75, 75-90, 90+), and vegetation type (DeVelice et al. 1999). Sample trees in the plot with a BAF 30 prism for variable area plots. Record the species of each live tree that is in the plot. Record the DBH in cm using a diameter tape. Record the tree height in meters using a clinometer. Include notes on snags, site characteristics, and other site features if applicable.
- Enter timber cruise data into a database for volume calculations. Apply standard timber volume calculation formulas to calculate volume per acre (in board-feet per acre) for each species. Incorporate current market values for each species of interest using up-to-date information on

rates from the U.S. Department of Agriculture. Compile volume calculation totals and value assessments in a table form.

- Prepare a technical report which presents results of analysis of timber volume and value for areas affected by the Project, assesses the impacts of the Project on timber resources, and includes a GIS map of data plot locations and timber resources.

### **3.3 Data Analysis: Objectives and Methods**

The results of the vegetation type mapping component will be used to analyze the potential impacts of the Project on vegetation in the study area. The mapping component will be used to calculate the total and percent acres of each vegetation type present in the study area and in areas affected by the Project. Data will be presented in a summary table and in GIS mapping. Vegetation type mapping will also be used to support the Wildlife Resources Study.

The sensitive and invasive plant surveys require no specific data analysis. However, the technical reports will include an assessment of potential Project impacts. The results of the sensitive plant survey will be discussed in a technical report and ultimately used to complete a Biological Evaluation for plants. Sensitive plant data will be included in the Project GIS database. Results of the invasive plant survey will be discussed in a technical report and included in a GIS map.

The wetland delineation report will analyze the area of wetlands in the study area. Using GIS mapping of wetland delineation results, the area of total wetlands of each NWI class and other types of “waters of the U.S.” in the study area and area of wetlands potentially affected by the Project will be calculated. Total area and percentages of the types of wetlands will be presented in a summary table and in GIS mapping.

The timber resource survey technical report will present results of analysis of timber volume and value for Project activity areas and assess potential impacts of the Project. Data from the timber resource survey will be entered into a database for volume calculations. Standard timber volume calculation formulas will be used to calculate volume per acre (in board-feet per acre) for each species, and current market values will be incorporated for each species of interest using up-to-date information on rates from the US Department of Agriculture. Results will be compiled in a table and entered into the Project GIS database.

## **4 Wildlife Resources Study Methods**

### **4.1 Study Area**

The wildlife study area includes the area east of the Seward Highway and Alaska Railroad adjacent to Moose Pass, extending past the eastern shoreline of Grant Lake. The study area extends south along the highway to south of Grant Creek. The study area includes all proposed Project facilities along Grant Lake, Grant Creek, proposed access road and transmission line routes, and the Seward Highway (Figure 1).

### **4.2 Field Study Design**

The Wildlife Resources Study is composed of four main field based survey efforts: Study Component #1, Raptor Nesting Surveys; Study Component #2, Breeding Landbirds and Shorebirds; Study Component #3, Waterbirds; and Study Component # 4, Terrestrial Mammals. All or part of these study components was completed in 2010. Changes to update Project design may require more effort for some of the components.

A review of existing information was conducted for all four study components as an initial study task. An information review prior to future field work should be updated to include the results of the 2010 surveys. The fieldwork for the study components includes the following activities:

- An aerial and boat survey for nesting raptors, including bald eagles, in suitable habitats near the Project.
- Observations of bald eagle breeding and feeding activities in areas potentially affected by the Project during all studies. This study is completed with the exception of including the goshawk nest survey data in a Raptor Nest Survey Report.
- A ground-based goshawk nest survey in areas directly affected by the Project.
- Point-count surveys to document breeding landbirds and shorebirds in the study area.
- Harlequin duck nesting surveys, waterbird nesting surveys, waterbird brood-rearing surveys and a survey for winter waterbird use in the study area.
- An aerial survey for brown and black bear spring den emergence in suitable habitat near the Project.
- An aerial winter survey of moose use of areas potentially affected by the Project, especially the inlet delta at the east end of Grant Lake.
- A boat-based mountain goat and Dall sheep survey of suitable habitat around Grant Lake.
- A bat survey of historic cabin on Grant Lake.
- Incidental observations of other terrestrial mammal locations, habitats, and behavior during all wildlife studies.

#### **4.2.1 Study Component #1 – Raptor Nesting Surveys**

Raptor species are included in these studies because of their legal or conservation status, sensitivity to disturbance, and traditional use of nesting territories. All raptors are currently protected by the Migratory Bird Treaty Act (16 U.S.C. 703-712) and bald and golden eagles are afforded special protection under the Bald and Golden Eagle Protection Act (16 USC, Section 668). Additionally, the northern goshawk and osprey (Osprey are not likely to occur in the study area during the breeding season [USFS

2010]) are listed as USFS SSI (USFS 2005). A 660-foot buffer around bald eagle nests is recommended to minimize the chances that eagles might abandon an active nest (USFWS n.d.).

These laws require any significant development project to identify and protect current nest sites because many raptor species are susceptible to human disturbance during the nesting season. Determining the location of raptor nests is a critical item that needs to be established to avoid impacts to nesting raptors from other field study events and Project development.

The primary objective of the raptor survey is to determine the distribution, abundance, and nesting status of large diurnal raptors near the Grant Lake/Grant Creek Project. The survey effort will focus on protected, sensitive, or high-profile species such as bald and golden eagles, northern goshawks, and ospreys although all raptor species that are observed will be recorded. The objectives of the 2010 raptor survey included the following:

- Locate, identify, and map tree and cliff-nesting raptor nest locations.
- Compile a list of raptor species nesting in the Project vicinity.
- Assess potential Project effects and propose potential strategies to avoid and minimize impacts to raptors.

#### **Raptor Survey Area**

The survey area for raptors includes the proposed development footprint of the Project (access roads, transmission line, Grant Creek, Grant Lake, powerhouse and tunnel) and a buffer of 660 feet around Project development features. Tree-nesting raptor habitats in the Project vicinity include mixed broadleaf/coniferous forests, broadleaf forest, and coniferous forests. Suitable habitats for cliff-nesting raptors are not abundant near the Project but include several rocky cliff faces and outcroppings above Grant Lake. Potential nesting habitat for raptors, at that time, was delineated during the AEIDC field studies conducted in the Project vicinity in 1981-1982 (APA 1984) and is shown on Figure 4.

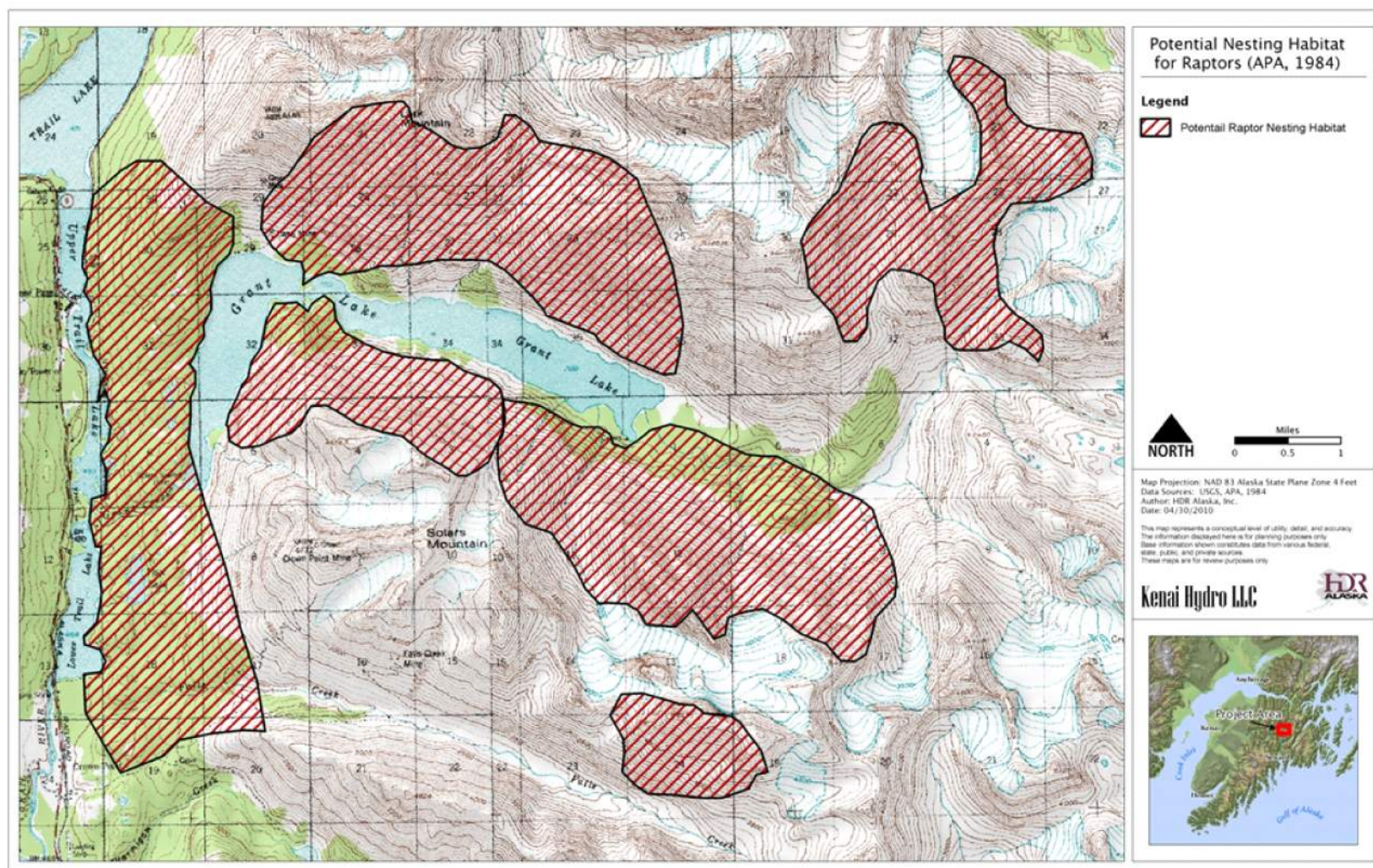
**Raptor Nest Survey Methods.** Bald eagle nest surveys were conducted by the USFS in 2010 and that information supplied to the Project. No further bald eagle nest surveys are needed. Incidental observations and data collection on bald eagle use (e.g. breeding and feeding) in areas affected by the Project will continue while other Project related studies are conducted. At the request of the USFS, all observations for cliff and tree nesting raptors around Grant Lake were made by boat during the 2010 waterbird surveys (a permit from the USFS is required for aerial surveys and surveys must follow regulations found in Appendix E). Observations for tree nesting raptors near proposed Project facilities were made during the 2010 breeding bird survey of proposed Project facilities.

**Goshawk Nest Ground-Based Survey Methods.** The goshawk nest survey requires two years of surveys to complete. A survey was conducted in 2010, but will need to be reinitiated after Project design is updated.

A ground-based survey for northern goshawk nests and territories will be conducted along all proposed linear Project facilities (access road and transmission line; powerhouse, retention pond, and tailrace; intake and penstock). The survey methods are based on the Broadcast Acoustical Survey Method as

detailed in the USFS Survey Methodology for Northern Goshawks in the Pacific Southwest Region and in Woodbridge and Hargis, 2006 (USFS, 2000; Woodbridge, et al. 2006).





**Figure 2. Potential Raptor Nesting Habitat, 1982.**



Using aerial photography in an office-based exercise, locations for calling stations will be identified every 200 meters along linear Project facilities. Pre-selected calling stations will be found in the field using a GPS receiver. Two separate survey events will be conducted: the first mid-June and the second late June to early July. At each calling station, the surveyors will use a broadcast speaker amplifier to broadcast a 10 second recording of an adult northern goshawk alarm call and wail call. The broadcast speaker will be tested in the field to verify that it is audible at least 200 meters from the source as long as there was no wind or moving water noise nearby. After each broadcast, the surveyors will watch and listen for 30 seconds before continuing with the next broadcast. At each calling station, the calls will be broadcast at 60 degrees, 120 degrees, and 300 degrees. This 3-call sequence will be completed twice at each call station. After the last sequence, the surveyors will walk to the next station, listening and watching carefully for goshawk signs and presence along the way. The food-delivery call will not be used as indicated in the USFS methodology for northern goshawks.

At each survey calling station, the following information will be recorded on the data form (data form to be developed):

- Start and stop times
- Weather conditions
- Description of the detection, if any
- Age of birds detected, if any
- Location of detection, if any, relative to survey station and transect, including details about habitat
- Photos numbers

#### **4.2.2 Study Component #2 – Breeding Landbirds and Shorebirds**

The breeding landbird and shorebird surveys of the Grant Lake outlet area, penstock, powerhouse, transmission line, and south access road alignment (now abandoned as an access alternative) were completed as planned in summer 2010. Breeding landbird and shorebird surveys will need to be completed for the Trail Lakes access and transmission line route (Figure 1).

Concerns regarding landbirds have increased in recent years because of population declines of neotropical migrants and an increased awareness of threats to landbird populations, both on the breeding and wintering grounds and during migration (Boreal Partners in Flight Working Group 1999; USFWS 2008). Several species of landbirds are listed on the State of Alaska list of Species of Special Concern (ADF&G 1998) and likely occur in the proposed Project vicinity. These include the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler.

The objective of the breeding landbird study is to collect baseline data on breeding landbirds and shorebirds near the Project. This information is required for the licensing process and will aid in quantifying and evaluating impacts of loss of breeding bird habitats by development of the proposed Project features.

The specific objectives of the breeding landbird and shorebird studies are to:

- Assess landbird and shorebird species use of the study area during the breeding season;

- Qualitatively determine the occurrence and estimate the numbers of landbird and shorebird species of conservation concern that occur in the study area;
- Estimate the relative abundance and distribution of breeding landbirds and shorebirds in the study area; and
- Describe habitat use in the study area by breeding landbirds and shorebirds.

### **Breeding Landbird and Shorebird Study Area**

The study area for breeding landbirds and shorebirds includes the following proposed Project facilities:

- Grant Lake outlet delta area near the proposed tower intake (includes 500 feet on either side of Tower Intake)
- Trail Lakes Narrows access road alignment (100 feet on either side of the centerline of new road), as access allows
- Powerhouse, retention pond, tailrace, and penstock (100 feet on either side of the centerline)
- Transmission line corridor (includes up to 100 feet on both sides of centerline of transmission line), as access allows

Grant Creek is not included in the study area for landbirds because it is virtually impossible to detect singing male songbirds along a loud creek corridor. Only the outlet delta area of Grant Lake is included in the study area for breeding landbirds. The forested habitat type along the shoreline of Grant Lake is common in the study area and will be sampled during surveys of the transmission line and access road. That data can then be extrapolated to similar habitat around Grant Lake. In addition, the steep shoreline features would make foot-based point-count surveys difficult. The study area described above will include a sampling of all habitat types that are considered potential habitat for landbirds near the Project.

### **Breeding Landbird and Shorebird Methods**

Point-count surveys for landbirds and shorebirds are conducted using the methods described below.

Surveys are scheduled in early June to coincide with peak passerine singing and breeding activity in southcentral Alaska. The intent of the survey effort is to sample enough points to ensure that all breeding landbirds in the area are documented and to accurately assess the habitat preferences of breeding bird species. Breeding birds are surveyed using point-count methods based on an established protocol as described in the Alaska Landbird Monitoring System (Handel 2003). Point-count surveys are designed primarily to detect singing male passerine birds defending territories and have become the standard method for surveying breeding landbirds in remote terrain in Alaska (USGS 2006). Using aerial photography in an office based exercise, point-count locations will be selected within the available habitats in the survey area. The survey points will be selected non-randomly in order to make sure that all habitat types evident on the photography are included. Sample points will be located within each habitat type and points will be at least 437 yds (400 m) apart.

Pre-selected point-count locations will be accessed on foot and located using a GPS receiver. Pre-selected point-count locations may be modified slightly in the field if they are found inaccessible. Point-count surveys will be conducted between 0400–1200 h by observers trained in distance estimation and

who are experts in identifying birds by sight and song. The point-counts will be conducted in standard 10-minute intervals at each sample point location. All species encountered either visually or aurally will be recorded, as well as the detection mode, behavior, habitat type, and other observations. Data will be collected on a standardized data sheet (data form to be developed) and multiple photos of the habitat at each point location will be taken. Point-count survey observations will be categorized into distance-estimated categories (e.g. 0-50 m, 50-100 m, 100-200 m) by measuring distance to landmarks on either side of the vocalizing bird by using visual estimation or a laser rangefinder. Habitat types will be categorized in the field to at least level III of the Alaska Vegetation Classification, and further classified to Level IV when possible (Viereck et al. 1992).

Incidental observations of wildlife encountered while in transit between surveys points or while conducting surveys for other wildlife will be documented. The surveyors will document and obtain GPS coordinates for incidental sightings of birds of conservation concern, state of Alaska Species of Special Concern, MIS, or SSI species or nest sites that were observed in transit between survey points.

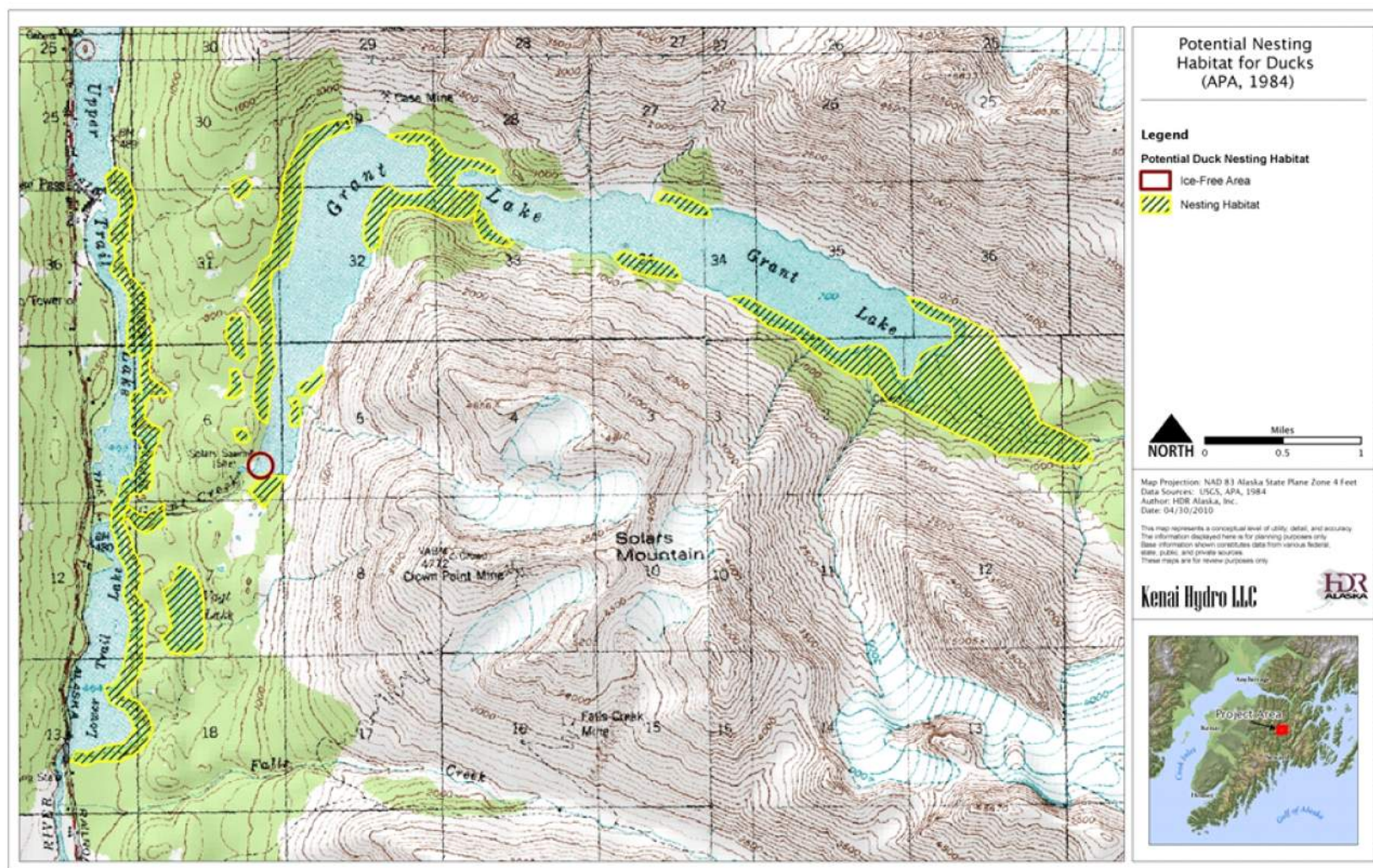
#### **4.2.3 Study Component #3 – Waterbirds**

Waterbird surveys to determine the distribution and abundance of waterbirds nesting in the study area were completed during the 2010 summer field season. The winter use survey of open water habitat on Grant Lake has yet to be conducted.

Waterbird nesting habitat is limited within the study area. There are no known concentrations of any waterbird nesting or feeding areas near the Project and to date, the USFS has not conducted any surveys on Grant Lake (APA 1984; Benoit 2009). Several species of waterbirds that nest in Alaska and have been recorded in the Project vicinity are currently considered of conservation concern. These species include the trumpeter swan, harlequin duck, and yellow-billed loon. The harlequin duck may nest along Grant Creek. Harlequin ducks were formerly listed as a species of special concern by the USFWS. Although their current conservation status is unclear, they are listed in the Sea Duck Joint Venture Species Status Report and are of particular concern to resource agencies (Seaduck Joint Venture 2008). Trumpeter swan nesting has not been documented in the study area (Benoit 2009). The USFS states that because past trumpeter swan surveys have determined that no suitable nest habitat exists near the Project, these surveys are not needed (USFS, 2010 pers. comm.). Common loons and yellow-billed loons have been observed on Grant Lake and nesting habitat for loons is present on Grant Lake (APA 1984). Potential nesting habitat for waterfowl was delineated on Grant Lake during the AEIDC surveys conducted in 1981-1982 and is shown on Figure 5.

In addition to potential nesting habitat for waterbirds, there is an area of Grant Lake that was observed during the 1981-1982 field studies to be ice-free during winter months. This area of open water near the outlet of Grant Lake may provide winter feeding habitat for waterbirds (APA 1984) (Figure 5).

The purpose of the waterbird study is to allow determination of the effects of fluctuations and flow changes on waterbird nesting habitat on Grant Lake and Grant Creek and to determine if winter waterbird feeding habitat is present on Grant Lake. For this study, waterbirds are defined as freshwater waterfowl (ducks, geese, and swans), shorebirds, gulls, loons, and terns.



**Figure 3. Potential Nesting Habitat for Ducks, 1982.**

The specific objectives are to:

- Describe species composition of waterbirds using Grant Lake and Grant Creek during breeding season;
- Determine locations of nesting areas for waterbirds to allow determination of effects of potential water level fluctuations on nesting habitat;
- Determine the occurrence and numbers of waterbird species of conservation concern that occur in the study area; and
- Determine winter use by waterbirds in open water habitat of Grant Lake.

### **Waterbird Study Area**

The survey area for nesting and wintering waterbirds includes Grant Lake. For nesting harlequin ducks, the survey area included the lower reach of Grant Creek below the Gorge Reach.

### **Waterbird Survey Methods**

**Harlequin Duck Surveys.** The harlequin duck survey of Grant Creek has been completed. Observations of American dipper were included as a species of interest noted by the National Park Service (NPS, pers. comm., 2010). Other species that may be encountered along fast moving streams such as American dipper, and common and red-breasted merganser were documented.

**Waterbird Breeding Surveys.** The waterbird breeding survey of Grant Lake has been completed.

**Waterbird Brood-Rearing Survey.** A boat-based survey for brood-rearing waterbirds was conducted in mid-July, 2010 on Grant Lake.

**Winter Waterbird Survey.** Winter waterbird surveys have yet to be conducted and will verify whether the outlet of Grant Lake remains ice-free and affords winter habitat. This area was documented as a winter feeding area for a flock of mallards during the 1981-1982 field studies (APA 1984). Open water habitat that supports waterbirds on the Seward Ranger District is limited in the winter (Benoit 2009). In order to determine if this area is still being used by waterbirds in the winter, researchers will conduct two snowshoe surveys or, if a special use permit can be obtained from the USFS, aerial surveys of the outlet area of Grant Lake in winter to document waterbird use and the amount of open water habitat available. Surveyors will document species, number of individuals, and percent open water. While transiting to and from Grant Lake, surveyors will document any wildlife species or tracks observed in the study area.

#### **4.2.4 Study Component #4 – Terrestrial Mammal Surveys**

Approximately 30 species of terrestrial mammals have been documented or are thought to occur in the Project vicinity (APA 1984). Mammal surveys for the 2010 studies focused on brown and black bears, moose, mountain goats, Dall sheep, and bats, but observations of other species will be recorded incidentally during all wildlife surveys. Several components of the wildlife study plan were completed in 2010. However, records of wildlife observations will continue to be collected as other studies are performed.

**Bears.** Brown and black bears are found throughout the Project vicinity during the spring, summer, and fall. They may be found in a variety of habitat types. The distribution of both species of bears is affected strongly by food availability. Emerging grasses, forbs, other herbaceous plants, and moose are critical foods in spring, whereas spawning salmon and berries are critical foods in late summer. Both species enter dens during October or November and remain there until early to mid- April, with maternal females entering dens before and emerging later than males (APA 1984).

Disturbance to denning bears could result in human/bear conflicts and abandonment of dens and/or cubs. Brown bears are known to den at all elevations, from alpine snow chutes in the Kenai Mountains down to small upland areas scattered around the Kenai Lowlands. Brown bears denning in the Project vicinity could be disturbed by the development of an access road and transmission line. The analysis for this study will include a discussion of the potential direct and indirect effects on brown bears resulting from construction of the access route and transmission line, as well as the anticipated effects of increased human-wildlife interaction due to use of the new access road.

Peak brown bear denning activity in the Project vicinity was documented as mid-May during aerial denning surveys conducted in 1982 (APA 1984). A bear den emergence aerial survey will be conducted in early to mid-May as bears are leaving their dens in the spring (before snow melts and leaves emerge in the area). Exact timing of surveys and information regarding existing dens in the area will be determined through coordination with the USFS, USFWS and ADF&G. The den emergence survey will encompass all potential denning habitat in the Project vicinity that may be potentially impacted by the Project. Aerial surveys will comply with the USFS guidelines listed in Appendix E: USFS Special Use Permit Mitigation Requirements for Aircraft Use. Recently vacated dens will be identified by the characteristic presence of soil over the snow in den entrances and the presence of fresh tracks around dens or trails leading away. The location, species, and number of cubs and adults will be recorded as well as any prominent movement corridors that are visible in the snow.

The USFS collected some brown bear denning information while completing a bald eagle nest survey on May 6, 2010. The survey areas included habitat along Grant Creek (covers area of Trail Lakes Narrows access route) and around Grant Lake. No further denning surveys are needed for the license application; although, brown bear denning surveys may be required prior to construction. Impacts from increased public access into the Grant Lake/Grant Creek drainage area by way of the proposed access road and other Project features will be discussed in the technical report.

**Moose.** Moose inhabit the Project vicinity, but were not particularly abundant during 1981-1982 field studies. Figure 6 shows summer and winter ranges and travel routes, with one travel route identified that crosses the bench between Grant and Trail lakes as documented during the 1981-1982 field studies. Snow depth and a corresponding lack of winter forage limit moose numbers in the Project vicinity (APA 1984). While little moose monitoring has been conducted, ADF&G estimates moose populations at between 700 and 1,000 in the Eastern Kenai Peninsula Game Management Unit 7 based on harvest information (McDonough 2007).

No specific summer surveys for moose are proposed, however all observations of moose during summer 2010 wildlife survey events were recorded. All incidental observations of moose include the following data: number of moose, approximate location using a GPS receiver, habitat type observed in, sex and age (if possible), and behavior.



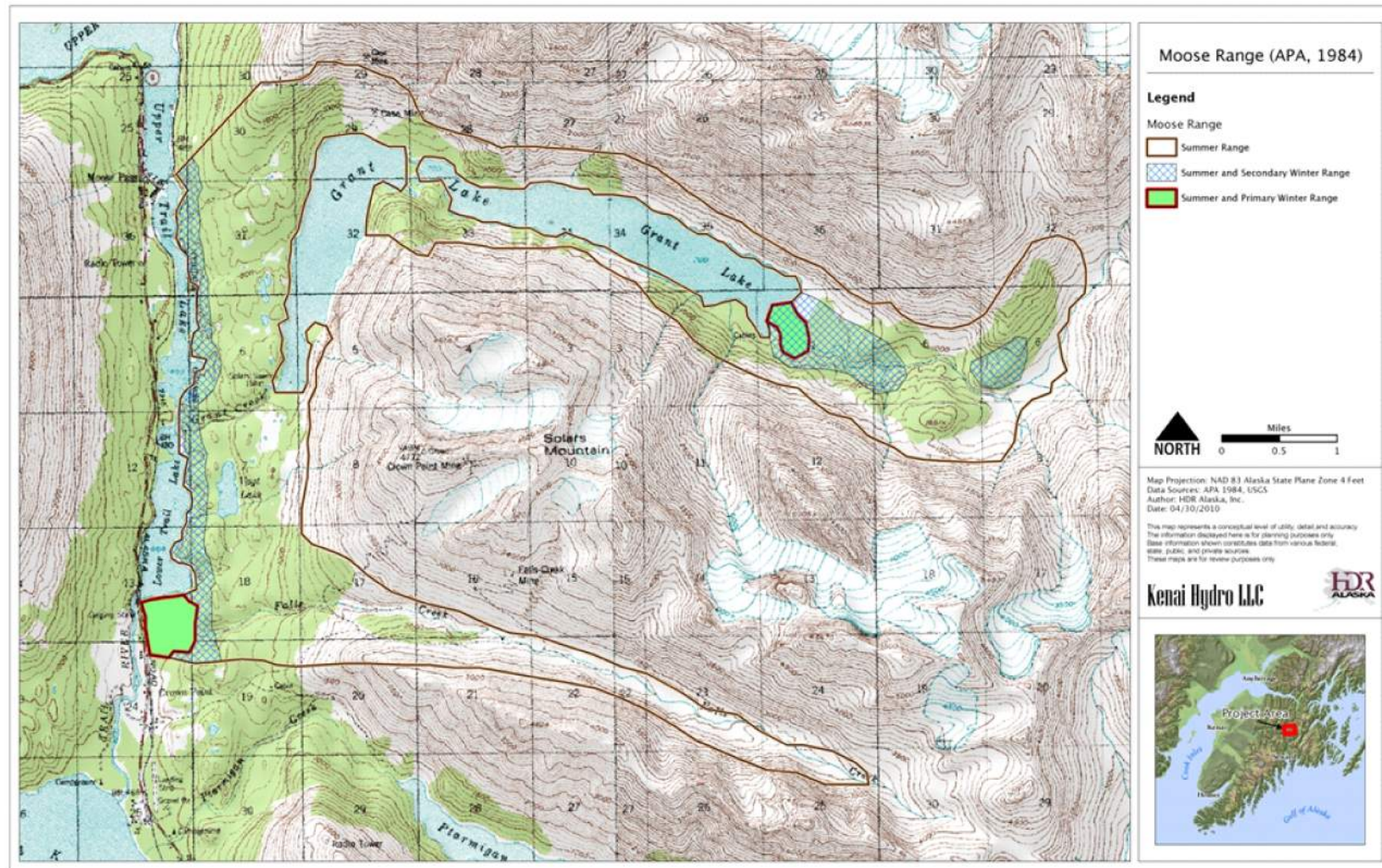


Figure 6. Potential moose range, 1982.



The inlet delta of Grant Lake has been reported as a winter forage area for moose. Two winter surveys of the study area will be conducted to determine the presence and travel paths of moose during the winter. Surveys will use aircraft following USFS requirements (see Appendix E), if permitted. The results of the winter survey plus information collected as incidental observations will be included in a wildlife technical report. The report will assess the potential impacts of the Project to moose in the area.

**Mountain goats and Dall sheep.** Both mountain goats and Dall sheep are known to use suitable habitat surrounding Grant Lake. They were observed during the previous studies in the 1980's (APA, 1984). Although their preferred habitat is outside areas expected to be directly affected by the Project, mountain goats and Dall sheep could be impacted by disturbance during construction.

This survey is complete except for incidental observations made during other studies. Observations of suitable habitats around Grant Lake were made in 2010 using binoculars and spotting scopes from a boat. Results of the observations and an assessment of potential Project impacts will be included in the wildlife technical report.

**Bats.** The most common bat in Alaska is the little brown bat (*Myotis lucifugus*). Little brown bats were not sighted near the Project during surveys for mammals completed in 1981-1982 (APA, 1984). However, the USFS noted that bats have been reported using the historic cabin on the west shore of Grant Lake. A bat survey of the historic cabin was conducted in 2010 using standard USFS bat survey protocols for abandoned buildings and mine sites (Reynolds n.d.). No sign of bats was found. At this time the survey is considered complete.

#### **4.3 Data Analysis: Objectives and Methods**

- **Study Component #1 – Raptors** – Prepare a technical report that includes methodology, results, and figures showing the location of raptor nests, and briefly discusses potential Project effects.
- **Study Component #2 – Breeding Landbird and Shorebirds** – Prepare a technical report and associated figures and maps based on field data collected for the study area. The technical report will provide detail about avian species and habitat use within the study area and discuss potential Project effects. Estimates of relative abundance and distribution of breeding landbirds and shorebirds throughout areas potentially affected by the Project will be derived by inference and interpolating habitat-linked field observations to vegetation mapping conducted for the Botanical Resources studies outlined above. This is necessary for areas not surveyed due to inaccessibility, such as much of the shoreline of Grant Lake, or due to interference in songbird detection, such as the Grant Creek corridor
- 
- **Study Component #3 – Waterbirds** – Prepare a technical report and associated figures and maps based on field data collected for waterbirds in the study area. Briefly discuss potential Project effects.
- **Study Component #4 – Terrestrial Mammals** – Prepare a technical report that includes

methodology, results, and figures showing the location in the study area of bear dens, moose wintering use, mountain goat and Dall sheep habitat/sightings, and the abandoned historic cabin surveyed for the presence of roosting bats. Estimates of relative abundance and distribution of wildlife throughout areas potentially affected by the Project will be derived by extrapolating habitat linked field observations to vegetation mapping (e.g. vegetation type, slope and aspect) conducted for the Botanical Resources studies outlined above. The report will also discuss potential Project effects related to construction and operation and increased public access.

Locations of sensitive wildlife and plants may be treated as confidential in accordance with management agency direction. Results of Wildlife Resource Surveys will be used to evaluate potential impacts of the proposed Project.

---

**From:** cory.warnock@mcmillen-llc.com  
**Sent:** Wednesday, January 23, 2013 10:05 AM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen; Mike Salzetti  
**Subject:** Re: Kenai Hydro Website

Sounds good. Thanks.

On Wed, 23 Jan 2013 18:00:27 +0000

"Van Massenhove, Katherine B -FS" <kvanmassenhove@fs.fed.us> wrote:

Hi Cory,

Thanks for breaking this out, I will read through this morning and let you know the next steps.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
kvanmassenhove@fs.fed.us<mailto:kvanmassenhove@fs.fed.us>  
(907) 754-2315

From: Cory Warnock [mailto:cory.warnock@mcmillen-llc.com]  
Sent: Tuesday, January 22, 2013 12:03 PM  
To: Van Massenhove, Katherine B -FS  
Cc: Emily Andersen; Mike Salzetti  
Subject: RE: Kenai Hydro Website

Hi Kathy,

Per our emails back and forth, I've attached 2 documents:

\* The first is the permit table that we put together for our Agency meeting on December 12th. It describes all of the permits that we will need/have for the 2013 studies. You'll notice that the USFS is listed under items 10 (Cultural Resources), 11 (Visual/Recreation) and 12 (Terrestrial). As it relates to numbers 10 and 11, these are global requests that are typical of these types of proceedings. The Cultural piece may require some effort around Grant Lake, on USFS land. The Rec/Vis piece will not require the permit but in an effort to be comprehensive, our consultant (USKH) would like to have the permit in their possession in case anyone questions them being near the Project. Terrestrial (12) will need to conduct work around Grant Lake as part of their studies.

\* The 2nd document that I've attached contains just the methods sections for these 3 resource areas from the study plans. This should simplify your review process extensively.

I would like to restate that it is my impression that the existing permit should suffice for these efforts as no significant scope changes have been made since the permit was initially issued. All additions have been made per agency request

and essentially, make the studies more quantitative. The existing permit seems, to me, to cover all aspects of the 2013 program, as it is currently laid out.

Please let me know if you need anything else or have any more questions. I look forward to discussing this further and reaching a consensus on the appropriate path forward. Let me know when you'd like to discuss.

Thanks,

Cory

Cory Warnock  
Senior Licensing and Regulatory Consultant

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5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O - 360-384-2662  
C - 360-739-0187  
F - 360-542-2264

From: Van Massenhove, Katherine B -FS  
[mailto:kvanmassenhove@fs.fed.us]  
Sent: Tuesday, January 22, 2013 11:04 AM  
To: Cory Warnock  
Subject: RE: Kenai Hydro Website

Sorry, not at the office today, working remotely with email. Will be in tomorrow, though.  
I don't need the application, a short write up a word document or such is fine. Thanks!

From: Cory Warnock [mailto:cory.warnock@mcmillen-llc.com]  
Sent: Tuesday, January 22, 2013 10:00 AM  
To: Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS  
Cc: Stovall, Robert -FS; Emily Andersen  
Subject: RE: Kenai Hydro Website

The application form came through fine. Does the app need to be filled out if the existing permit is deemed applicable? I can have our team put together a brief synopsis of what will be done on USFS lands.

That's not a problem. But, I don't want to go through the exercise of filling out the new form and the associated evaluation process unless it is necessary. Clarification would be appreciated so I can act appropriately with my team. I've left you a voicemail on your work phone. Are you available for a brief chat today?

Cory

Cory Warnock  
Senior Licensing and Regulatory Consultant

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Ferndale, Wa. 98248

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C - 360-739-0187

F - 360-542-2264

From: Van Massenhove, Katherine B -FS  
[mailto:kvanmassenhove@fs.fed.us]  
Sent: Tuesday, January 22, 2013 10:53 AM  
To: Cory Warnock; StLouis, Deidre S -FS  
Cc: Stovall, Robert -FS; Emily Andersen  
Subject: RE: Kenai Hydro Website

Hi Cory,

Not all of the study plans open properly on my computer, the recreation one opens in a very small window and will not let me expand. Either way, I really will need you to pull the information out of these studies and send me a write up in a word document or on the application you sent. I cannot go through each study and pick out what I think is what you will be doing, it is up to you to provide this information and it is our preference to have on the SF-299 attached to the last email I sent you.

Let me know if you need that application form resent.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
kvanmassenhove@fs.fed.us<mailto:kvanmassenhove@fs.fed.us>  
(907) 754-2315

From: Cory Warnock [mailto:cory.warnock@mcmillen-llc.com]  
Sent: Tuesday, January 22, 2013 9:43 AM  
To: Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS  
Cc: Stovall, Robert -FS; Emily Andersen  
Subject: RE: Kenai Hydro Website

Hi Katherine,

To be clear, the only work that will be done on USFS lands in 2013 is associated with work done around Grant Lake. The natural resource study plans on the website spell out the tasks that will be done on and around the lake. They current study plans can be found at:  
[http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

Let me know if you have any other questions and when I time will work for a follow-up call.

Cory

Cory Warnock  
Senior Licensing and Regulatory Consultant

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5771 Applegrove Ln.

Ferndale, Wa. 98248

O - 360-384-2662

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From: Van Massenhove, Katherine B -FS  
[mailto:kvanmassenhove@fs.fed.us]  
Sent: Tuesday, January 22, 2013 10:37 AM  
To: Cory Warnock; StLouis, Deidre S -FS  
Cc: Stovall, Robert -FS  
Subject: RE: Kenai Hydro Website

Hi Cory,

I took a look at the website, however I'm not seeing anywhere that spells out the type of work you are looking to do on FS lands this summer. This is the information I need to know if the work is within the scope of what is currently authorized for investigative studies, or if a new permit or permit amendment is necessary. Please submit a write up of the scope of work that you need to accomplish on USFS lands in 2013.

Thanks,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
kvanmassenhove@fs.fed.us<mailto:kvanmassenhove@fs.fed.us>  
(907) 754-2315

From: Cory Warnock [mailto:cory.warnock@mcmillen-llc.com]  
Sent: Wednesday, January 09, 2013 2:09 PM  
To: Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS  
Cc: Stovall, Robert -FS  
Subject: Kenai Hydro Website

[http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

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---

**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Friday, January 25, 2013 1:30 PM  
**To:** 'Van Massenhove, Katherine B -FS'  
**Cc:** Emily Andersen; Michael Yarborough  
**Subject:** RE: Kenai Hydro Website

Thanks, Kathy. Talk to you soon.

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

---

**From:** Van Massenhove, Katherine B -FS [mailto:kvanmassenhove@fs.fed.us]  
**Sent:** Friday, January 25, 2013 1:28 PM  
**To:** Cory Warnock  
**Subject:** RE: Kenai Hydro Website

Thanks Cory,

Thanks for understanding the need to be concise, and I definitely understand where you were coming from in wanting to paint the entire picture and I appreciate having the additional information being new to the project. I'm attaching the application for the ARPA permit. Please submit the application to me when complete and I will work with the forest archeologist to review.

Thanks,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [mailto:cory.warnock@mcmillen-llc.com]  
**Sent:** Friday, January 25, 2013 11:13 AM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** 'Emily Andersen'; 'Mike Salzetti'; Michael Yarborough  
**Subject:** RE: Kenai Hydro Website

Hi Kathy,

Thanks for your response. I'm currently working with my natural resource team to confirm that the items you list below are inclusive of all primary activities that will be taking place on USFS land. Once I hear back from them I will let you know. My apologies for providing an abundance of information, I can sympathize with your having to weed through some unnecessary text. I was walking that fine line between giving you too much and ensuring what I did get you wouldn't require additional inquiries. I guess I chose to err a bit on the side of caution!

With regard to the ARPA permit, I've spoken with our Cultural contractor (Mike Yarborough, Cultural Resource Consultants) about the shovel tests and he has a multitude of experience both with these methods and the need for ARPA permits. To that end, if you could provide me with the permit application, I will get it to him so he can fill it out and return it as soon as possible. Would the primary copy of the permit application go to you?

Again, thank you for your time and attention to this and I will be in touch soon both in regard to the completeness of your list below and the filled-out ARPA permit.

Thanks,

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

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[www.mcmillen-llc.com](http://www.mcmillen-llc.com)

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Ferndale, Wa. 98248

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C – 360-739-0187

F – 360-542-2264

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]

**Sent:** Friday, January 25, 2013 11:54 AM

**To:** Cory Warnock

**Cc:** Emily Andersen; Mike Salzetti

**Subject:** RE: Kenai Hydro Website

Hi Cory,

There is still way more information than I need in the second document you sent. I had to weed through the document for the pertinent information, and here is what I was able to determine relates to the special use permit for investigative studies:

Historical and Archaeological Field Studies:

1. Pedestrian surveys of with parallel transects no more than 15 meters apart within the project APE for indications of cultural materials and built environment resources.
2. Sub-surface shovel tests measuring 30 cm x 30 cm, excavating to a depth of up to 1 meter.

Recreation/Visual Field Studies:



1. Site visits in summer by foot and boat to survey and document existing and planned trails, access points and other recreational use areas
2. Site visits in winter by foot, skiing or snow machine to document winter use areas.
3. Visit pre-selected sites for visual assessment by walking on existing and planned trails and other travel ways.

#### Botanical Resources Field Studies:

1. Conduct sensitive plant and invasive plant studies for 2 vertical feet around Grant Lake, 50` margin along proposed road and transmission lines, and a 100` margin around all other proposed project features.
2. Conduct a level 5 intensity survey in areas potentially affected by the project.
3. Observe any invasive species while conducting the sensitive plant survey.

#### Wetlands

1. Field survey of wetlands and waters in the road/transmission corridor, facility locations, at the inlet of Grant Lake and at the dam site.
2. Collect information on soil conditions, hydrology, and plant community composition in representative upland and wetland sites.
3. Collect functional assessment data for each wetland.
4. Collect coordinates of wetlands boundaries

#### Timber Resources

1. Collect timber cruise data in the planned field plots using standard timber cruise field equipment.
2. Sample trees in the plot with a BAF 30 prism for variable area plots.
3. Record the DGBH in cm using a diameter tape
4. Record the tree height in meters using a clinometer. Note conditions.

#### Wildlife

1. Aerial and boat survey for nesting raptors, including bald eagles
2. Observe bald eagle breeding and feeding activities in APE by the project during all studies.
3. Ground-based goshawk nest survey
4. Point-count surveys to document breeding lands birds and shorebirds in the study area.
5. Harlequin duck nesting surveys, water bird nesting surveys\*, water bird brood-rearing surveys and winter water bird use.
6. Aerial survey for brown and black bear spring den emergence
7. Aerial winter survey of moose use of area
8. Boat-based mountain goat and Dall sheep survey
9. Bat survey of historic cabin on Grant Lake
10. Incidental observations of other terrestrial mammals locations, habitats and behaviors during studies.

\*it appears some of the water bird work surveys have been completed.

It will be up to you to determine if I've missed anything in the document that you are requesting to do and is not outlined above. Besides the extra time it takes to boil your document down to these pertinent points, there is a risk that something may be missed. So, in the future please be sure to structure your requests for special use permit to contain only the information needed to authorize the use that is happening on the Forest Service lands. You may consider it like this, if the work requires "boots on the ground". (Of course that ground needs to be lands managed by USFS for us to have jurisdictional authority to authorize use.)

Based on the outline above, with the exception of the work for the sub-surface shovel tests all other activities are currently authorized under your investigative studies permit for this project (SEW457). I was originally thinking that we would amend your existing permit to include any additional uses, however that may not be appropriate in this case. More likely, what we would do is authorize the archeologist that is contracted to do the surveys under an ARPA

permit for the work. Let me know if you need an application for an ARPA permit to pass along to the person doing the work.

The only other thing I wanted to point out, and I think you are aware of this, the USFS is not the regulatory agency for wetlands. You will need to work with the Corps of Engineer for any permits they may require work in wetlands (even for the lands under USFS jurisdiction).

So, unless I've missed something I think we are okay with all requested use with the exception of the sub-surface pits and that will be handled with the archeologist that conducts the surveys through the ARPA permit.

Give me a call, or shoot me an email if you have questions/concerns.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]

**Sent:** Tuesday, January 22, 2013 12:03 PM

**To:** Van Massenhove, Katherine B -FS

**Cc:** Emily Andersen; Mike Salzetti

**Subject:** RE: Kenai Hydro Website

Hi Kathy,

Per our emails back and forth, I've attached 2 documents:

- The first is the permit table that we put together for our Agency meeting on December 12<sup>th</sup>. It describes all of the permits that we will need/have for the 2013 studies. You'll notice that the USFS is listed under items 10 (Cultural Resources), 11 (Visual/Recreation) and 12 (Terrestrial). As it relates to numbers 10 and 11, these are global requests that are typical of these types of proceedings. The Cultural piece may require some effort around Grant Lake, on USFS land. The Rec/Vis piece will not require the permit but in an effort to be comprehensive, our consultant (USKH) would like to have the permit in their possession in case anyone questions them being near the Project. Terrestrial (12) will need to conduct work around Grant Lake as part of their studies.
- The 2<sup>nd</sup> document that I've attached contains just the methods sections for these 3 resource areas from the study plans. This should simplify your review process extensively.

I would like to restate that it is my impression that the existing permit should suffice for these efforts as no significant scope changes have been made since the permit was initially issued. All additions have been made per agency request and essentially, make the studies more quantitative. The existing permit seems, to me, to cover all aspects of the 2013 program, as it is currently laid out.

Please let me know if you need anything else or have any more questions. I look forward to discussing this further and reaching a consensus on the appropriate path forward. Let me know when you'd like to discuss.

Thanks,

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

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5771 Applegrove Ln.  
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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Tuesday, January 22, 2013 11:04 AM  
**To:** Cory Warnock  
**Subject:** RE: Kenai Hydro Website

Sorry, not at the office today, working remotely with email. Will be in tomorrow, though.  
I don't need the application, a short write up a word document or such is fine. Thanks!

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Tuesday, January 22, 2013 10:00 AM  
**To:** Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS; Emily Andersen  
**Subject:** RE: Kenai Hydro Website

The application form came through fine. Does the app need to be filled out if the existing permit is deemed applicable? I can have our team put together a brief synopsis of what will be done on USFS lands. That's not a problem. But, I don't want to go through the exercise of filling out the new form and the associated evaluation process unless it is necessary. Clarification would be appreciated to I can act appropriately with my team. I've left you a voicemail on your work phone. Are you available for a brief chat today?

Cory

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Tuesday, January 22, 2013 10:53 AM  
**To:** Cory Warnock; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS; Emily Andersen  
**Subject:** RE: Kenai Hydro Website

Hi Cory,

Not all of the study plans open properly on my computer, the recreation one opens in a very small window and will not let me expand. Either way, I really will need you to pull the information out of these studies and send me a write up in a word document or on the application you sent. I cannot go through each study and pick out what I think is what you will be doing, it is up to you to provide this information and it is our preference to have on the SF-299 attached to the last email I sent you.

Let me know if you need that application form resent.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Tuesday, January 22, 2013 9:43 AM  
**To:** Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS; Emily Andersen  
**Subject:** RE: Kenai Hydro Website

Hi Katherine,

To be clear, the only work that will be done on USFS lands in 2013 is associated with work done around Grant Lake. The natural resource study plans on the website spell out the tasks that will be done on and around the lake. They current study plans can be found at: [http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

Let me know if you have any other questions and when I time will work for a follow-up call.

Cory

***Cory Warnock***  
*Senior Licensing and Regulatory Consultant*

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Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Tuesday, January 22, 2013 10:37 AM  
**To:** Cory Warnock; StLouis, Deidre S -FS  
**Cc:** Stovall, Robert -FS  
**Subject:** RE: Kenai Hydro Website

Hi Cory,

I took a look at the website, however I'm not seeing anywhere that spells out the type of work you are looking to do on FS lands this summer. This is the information I need to know if the work is within the scope of what is currently

authorized for investigative studies, or if a new permit or permit amendment is necessary. Please submit a write up of the scope of work that you need to accomplish on USFS lands in 2013.

Thanks,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]

**Sent:** Wednesday, January 09, 2013 2:09 PM

**To:** Van Massenhove, Katherine B -FS; StLouis, Deidre S -FS

**Cc:** Stovall, Robert -FS

**Subject:** Kenai Hydro Website

[http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

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Version: 2013.0.2890 / Virus Database: 2639/6054 - Release Date: 01/24/13

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**From:** Cory Warnock  
**Sent:** Friday, January 25, 2013 6:04 PM  
**To:** Michael Yarborough; Dwayne Adams; John Gangemi  
**Cc:** Mike Salzetti; Emily Andersen  
**Subject:** Fwd: Grant Lake Special Use Permit  
**Attachments:** DM\_signed\_20090611.pdf; ATT00001.htm; \_Certification\_.htm; ATT00002.htm

All,

See correspondence below. With the exception of the potential cultural dig sites, looks like the existing permit is all we'll need. Tentative good news. I'll keep you posted.

Cory

Begin forwarded message:

**From:** "Van Massenhove, Katherine B -FS" <[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)>  
**Date:** January 25, 2013, 4:52:46 PM PST  
**To:** "Stovall, Robert -FS" <[rstovall@fs.fed.us](mailto:rstovall@fs.fed.us)>  
**Cc:** Cory Warnock <[cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com)>  
**Subject:** FW: Grant Lake Special Use Permit

Hi Robert,

I've been working with Cory Warnock to ensure that the proper permits are in place for the investigative studies that will continue for the Grant Lake Hydro Project. I have determined that almost all of the studies that are planned for this year on the Grant Lake Hydro project fit within the existing SUP for investigative studies, with the exception of the cultural study that involve digging pits. This will be handled through an ARPA permit, and I will work with Sherry Nelson once an application is received. I sent the application to Cory today.

I need to run something by you regarding access for the current permit. There is a need to access the study area for the winter water bird use evaluation by snowmobile or plane. The permit specific states that access is by foot or boat. The Decision Memo says that access to the area is by the same means as is available to the public. As these areas are open to winter motorized use, I think we are within the context of the original decision to allow the access by snow machine or plane to happen, do you agree? If so, I will need to do a quick amendment to the permit to allow for access in the winter by plane or snow mobile, but I don't believe a separate Decision Memo is needed as it would still be within the scope of the original decision.

Please let me know if you are okay with amending the permit to read that access to the study area is by the same means as available to the public as set by the 2002 Revised Forest Plan. I've attached the decision memo for your review.

Thanks,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]

**Sent:** Friday, January 25, 2013 1:35 PM

**To:** Van Massenhove, Katherine B -FS

**Cc:** Emily Andersen; Mike Salzetti

**Subject:** Grant Lake Special Use Permit

Hi Kathy,

I've spoken with our natural resource leads and below you will see the minor modifications that they made to your list. You'll see that all of them are clarifying points that either point out that a study piece that is currently not proposed or already completed, or discusses a minor tweak. Based upon your message, it appears that the existing permit will work for our needs with the exception of the Cultural shovel sites which will be handled under the ARPA permit. I've already forwarded the permit app along to our cultural lead and expect a relatively expeditious turn-around. If you could confirm my statement above related to the validity of the existing permit, I'd appreciate it and as always, I'm more than happy to discuss in further detail.

Thanks,

Cory

---

#### Botanical Resources Field Studies

1. Conduct sensitive plant and invasive plant studies for 2 vertical feet around Grant Lake, 50' margin along proposed road and transmission lines, and a 100' margin around all other proposed project features.
2. Conduct a level 5 intensive survey in areas potentially affected by the project.
3. Observe any invasive species while conducting the sensitive plant survey.

#### Wetlands

1. Field survey of wetlands and waters in the road/transmission corridor, facility locations, at the inlet of Grant Lake and at the dam site.
2. Collect information on soil conditions, hydrology, and plant community composition in representative upland and wetland sites.
3. Collect functional assessment data for each wetland.
4. Collect coordinates of wetlands boundaries

#### Timber Resources - **Not proposed at this time**

1. Collect timber cruise data in the planned field plots using standard timber cruise field equipment.
2. Sample trees in the plot with a BAF 30 prism for variable area plots.
3. Record the DGBH in cm using a diameter tape
4. Record the tree height in meters using a clinometer. Note conditions.

#### Wildlife

1. Aerial and boat survey for nesting raptors including bald eagles – **Completed by HDR in 2009/2010**

2. Observe bald eagle breeding and feeding activities in APE by the project during all studies - **BE monitoring was completed in previous field seasons. BE activities will be documented if observed.**
3. Ground-based goshawk nest survey
4. Point-count surveys to document breeding lands birds and shorebirds in the study area.
5. Harlequin duck nesting surveys, water bird nesting surveys\*, water bird brood-rearing surveys and **winter water bird use** - **May access study area via snowmobile or plane.**
6. Aerial survey for brown and black bear spring den emergence - **Completed**
7. Aerial winter survey of moose use of area
8. Boat-based mount goat and Dall sheep survey – **Not planned at this time**
9. Bat survey of historic cabin on Grant Lake – **Completed by HDR in 2009/2010**
10. Incidental observations of other terrestrial mammals locations, habitats and behaviors during studies.

\*it appears some of the water bird work surveys have been completed.

***Cory Warnock***

*Senior Licensing and Regulatory Consultant*

McMillen, LLC

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**From:** Kahn, Lynnda [mailto:lynnda\_kahn@fws.gov]  
**Sent:** Monday, January 28, 2013 10:36 AM  
**To:** Cory Warnock  
**Cc:** Jeffry Anderson  
**Subject:** Re: FW: FW: Call w/USFWS after Grant Lake Stakeholder Meeting

Cory - I have been in training much of the time since returning on January 8th. Jeff gave me a copy of the Study Plans last week, prior to his departure for the east coast for training, and he is gone until Feb. 11th. Doug Palmer retired and Jeff is now the Acting Field Office Supervisor. I am currently reviewing the study plans but the USFWS will not be able to meet the deadline previously requested. Once Jeff gets back in the office and has had a chance to settle in, he and I will go over the Study Plans and provide comments as necessary. I am hopeful we can get something to you by February 22nd. If you have any questions, feel free to give me a call. Thanks Cory.

Lynnda

On Tue, Jan 22, 2013 at 12:32 PM, Cory Warnock <[cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com)> wrote:

Hi Lynnda,

Just touching base regarding the email below. I'm assuming that since I haven't heard from you, Jeff's attendance was helpful in regard to your getting up to speed on Grant Lake? If and when you have time to confirm this assumption, I'd appreciate. It would be good to close the loop as I want to make sure that I'm communicating all of the necessary information via the appropriate channels. Always willing to discuss.

Thanks,

Cory

***Cory Warnock***

*Senior Licensing and Regulatory Consultant*

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---

**From:** Cory Warnock  
**Sent:** Thursday, December 20, 2012 9:34 AM  
**To:** 'Kahn, Lynnda'  
**Cc:** [Jeffry.Anderson@fws.gov](mailto:Jeffry.Anderson@fws.gov); Mike Salzetti; Emily Andersen  
**Subject:** RE: FW: Call w/USFWS after Grant Lake Stakeholder Meeting

Hi Lynnda,

As promised, just touching base with you after our December 12<sup>th</sup> meeting. I understand that you are out until January 8<sup>th</sup> but I wanted to get this message to you prior to me taking off for a couple days over the holiday. I was happy to see Jeff in attendance and I'm sure that he'll be able to relay most of the pertinent topics we discussed during the meeting. If you'd still like to have a call similar to the one that I outlined below, I'd be more than open to setting something up. When you return, feel free to drop me an email and let me know. In the interim, I wanted to let you

know that all of the meeting materials can be found on Kenai Hydro's website at:

[http://www.kenaihydro.com/work\\_groups/index.php](http://www.kenaihydro.com/work_groups/index.php)

Happy holidays and I'll look forward to hearing from you in the new year,

Cory

**From:** Kahn, Lynnda [[mailto:lynnda\\_kahn@fws.gov](mailto:lynnda_kahn@fws.gov)]

**Sent:** Monday, November 19, 2012 8:40 AM

**To:** Cory Warnock

**Cc:** [Jeffry\\_Anderson@fws.gov](mailto:Jeffry_Anderson@fws.gov); Emily Andersen

**Subject:** Re: FW: Call w/USFWS after Grant Lake Stakeholder Meeting

Cory - Jeff is going to be up in Anchorage for other meetings on the 12th. If he has time he will try to make it.

If not, I will not return until Jan. 8th. A phone call will have to wait until later that week or the following week. Thanks.

Lynnda

On Fri, Nov 16, 2012 at 1:34 PM, <[cwarnock@longviewassociates.com](mailto:cwarnock@longviewassociates.com)> wrote:

Hi Lynnda,

I haven't heard back from you regarding the potential to set up a phone call, as discussed below. Let me know if this would be of interest,

Cory

**From:** Cory Warnock

**Sent:** Friday, November 09, 2012 9:14 AM

**To:** Lynnda Kahn

**Subject:** Call w/USFWS after Grant Lake Stakeholder Meeting

Hi Lynnda,

Unfortunately, we were unable to accommodate a December 4<sup>th</sup> meeting date. The meeting will be held on December 12<sup>th</sup>, in Anchorage. We will provide remote access via a webinar and conference call line if remote access is an option. Additionally, all meeting documents (study

plans, presentations and meeting minutes), will be posted to the Kenai Hydro website for review. In addition to these steps, I'd like to offer to have a call with you and any other individuals at your agency to personally go over any questions/comments you may have associated with the meeting materials and the process going forward. I think this call would be more efficiently conducted after the meeting on the 12<sup>th</sup>. To that end and if you are interested, I'll let you propose a date and time after the 12<sup>th</sup> that will work for you. My hope is that some personal communication after your document review will assist in bridging the gap that may exist due to your inability to attend.

HEA has every intent of being as inclusive and proactive as possible during the remainder of the licensing process and we look forward to working collaboratively with the USFWS. Feel free to contact me at your convenience related to your availability for both the aforementioned conversation and any other questions/concerns you may have,

Cory

**Cory Warnock**  
**Long View Associates**

[www.longviewassociates.com](http://www.longviewassociates.com)

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F – 360-542-2264

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Lynnda Kahn | Fish & Wildlife Biologist | (907) 260-0131

U.S. Fish & Wildlife Service | Kenai Fish & Wildlife Field Office  
43655 Kalifornsky Beach Rd. | Soldotna, AK 99669-8296

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Version: 2013.0.2890 / Virus Database: 2639/6054 - Release Date: 01/24/13

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**From:** Amal Ajmi  
**Sent:** Tuesday, January 29, 2013 9:41 AM  
**To:** Jeff Selinger (jeff.selinger@alaska.gov)  
**Subject:** Moose Surveys for Grant Lake

Hello again Mr. Selinger,

Thank you for taking the time to briefly discuss the possibility of conducting aerial surveys to investigate winter use of moose in the Grant Lake area. I looked over my notes and recall speaking with Jose Decreft regarding the surveys, he was not very interested at the time of our conversation. I also had Matt Keller, Dave Philkills and Mike Litzen on my list.

I would like to propose the following providing there is still interest:

- I found a Palmer pilot Mike Meekin (Meekin's Air Service) who is interested in doing the work. He comes highly recommended by Fish and Game and other contract pilots. He has extensive moose survey work experience and is familiar with the area. I think this would be cheaper also than driving to Nikiski or Homer. Weather factors in and it would be cheaper to hold out in Anchorage waiting out weather and working on other projects.
- Fly a modified survey utilizing contours rather than straight line (like ADFG does here in the interior), maybe like sheep surveys (although I have never flown any). Starting high looking for tracks and spending more time in the riparian areas where more brows and cover are available. You mentioned North Grant Lake, tributaries, and Trail River.
- There are 2 survey flights that have been requested by the client. The first would be flown sometime in November – December (snow dependent), the second in February – March. Both in the same winter (2013-2014) to evaluate winter use.
- Survey an area of: 14,180 acres surrounding the entire lake and surrounding areas.
- I have looked into the flight level restrictions, and have only found restrictions for rotary aircraft. Am I to understand that they are the same (500 AGL) for fixed wing also? Do you know where I can get a full list of restrictions / rules and regs to stay in compliance?
- Any sheep or goats seen (in the high country) on this survey will also be recorded.

Your thoughts? I know you are busy gearing up for the BOG meetings, and would appreciate any assistance. I look forward to hearing from you. Thanks again.

Amal Ajmi  
Senior Wildlife Scientist

ERM Alaska, Inc.  
748 Gaffney Rd., Suite 102  
Fairbanks, AK 99701

907-458-8273 (Direct)

[amal.ajmi@erm.com](mailto:amal.ajmi@erm.com)  
[www.erm.com](http://www.erm.com)

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Friday, February 01, 2013 10:16 AM  
**To:** 'Van Massenhove, Katherine B -FS'  
**Cc:** Emily Andersen  
**Subject:** RE: Permit amendment to allow for access by helicopter and snow machine

Thanks!

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, February 01, 2013 10:01 AM  
**To:** Cory Warnock  
**Subject:** RE: Permit amendment to allow for access by helicopter and snow machine

Thanks Cory,  
An electronic scan works great.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Wednesday, January 30, 2013 12:13 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Permit amendment to allow for access by helicopter and snow machine

Thanks, Kathy.

I have sent this along to HEA for their signature. Once I get that, I will get it to you for the District Ranger to sign. I assume that a scanned, signed copy will work?

Again, thanks for your attention to this, it's much appreciated,

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

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F – 360-542-2264

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]

**Sent:** Tuesday, January 29, 2013 5:39 PM

**To:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))

**Subject:** Permit amendment to allow for access by helicopter and snow machine

Hi Cory,

Attached is the amendment that will allow for access to the area by the same means allowable to the general public. The way the permit is worded, access is limited to boat or foot. Steven Gilbert was the person who signed for Kenai Hydro, LLC so we'll probably want to have him sign the amendment. Let me know if someone will be signing. Once signed by Kenai Hydro, the district ranger will sign and I'll return the executed permit to you. The important thing to remember, the permit is not valid until signed by both parties.

Kathy Van Massenhove

Special Uses Service Team

Chugach National Forest/ Glacier RD

[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)

(907) 754-2315

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Monday, February 04, 2013 8:29 AM  
**To:** 'Thomas, Cassie'; Cory Warnock; 'Mike Salzetti'  
**Cc:** Emily Andersen; Dwayne Adams  
**Subject:** RE: Grant Lake Natural Resource Studies Meeting Minutes

Thanks, Cassie. We are in the process of waiting a few more days for comments to come in. We will then be having some internal discussion about the best way to deal with each response and get the stakeholders a brief memo documenting the manner that HEA will be addressing them.

In regard to your workgroup question, with the exception, at times, of Cultural Resources, our general intent is going to be to have one "work group" that typically deals with all issues surrounding Recreation/Visual, Aquatics, Water Resources and Terrestrial. HEA's hope, in most instances, is to hold joint webinar/conference calls and meetings that deal with multiple resource areas during the same call/meeting; very similar to our December 12<sup>th</sup> meeting in Anchorage.

Again, once we compile all the comments and develop the appropriate path for addressing them, I'll be notifying all of you related to the next steps. In the meantime, if you have any questions, don't hesitate to give me a call.

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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5771 Applegrove Ln.  
Ferndale, Wa. 98248  
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F – 360-542-2264

**From:** Thomas, Cassie [mailto:cassie\_thomas@nps.gov]  
**Sent:** Friday, February 01, 2013 5:35 PM  
**To:** Cory Warnock; Mike Salzetti  
**Subject:** Re: Grant Lake Natural Resource Studies Meeting Minutes

Hi Mike and Cory,

I have a few comments on the 12/12/12 Grant Lake meeting notes and study plans for recreation and aesthetics.

#### Meeting Notes

On p.13, in my exchange with Dwayne Adams on the subject of collecting baseline soundscape data, I believe I suggested he consider using the *Aesthetic* (not Visual) Resources study plan from the Watana project (P-14241) as a template for methodology. Natural sounds are considered to be part of the aesthetic resources setting for that project so that is where background sound data collection methods are addressed.



## Study Plans

NPS would like to reiterate its request that baseline soundscape data be collected for this project so that project-related impacts on natural sounds can be assessed. For your consideration, FERC approved the Watana Aesthetics Resources study plan today, with a modification NPS had suggested, i.e. the collection of baseline sound data in all seasons. I would be happy to provide a copy of the revised study plan for this resource, along with FERC staff's modifications, to you if this would be helpful.

While the proposed Grant Lake project would be much smaller than Watana, project construction and operation will nonetheless generate noise that could have an impact on recreational experiences, as acknowledged in KH's response to our comment #104 in the 1-27-11 comment/response table. We can only avoid, minimize, or mitigate those impacts if we know the level of background sound, and which areas, activities, and times of year are most sensitive to noise.

NPS looks forward to meeting with KH, its consultants, and other stakeholders on this project. Relevant to this, it sounds like some of the other workgroups have started to hold regular meetings. Do you know when we might expect the "Human Environment" workgroup to convene?

Thanks for your consideration of these comments, and please let me know if you have any questions.

Cassie Thomas

Program Analyst  
WASO Park Planning & Special Studies Division  
AK Coordinator, NPS Hydropower Assistance Program

907 350-4139  
11081 Glazanof Dr., Rm 108  
Anchorage AK 99507

[illegible]

On Mon, Jan 7, 2013 at 2:17 PM, Cory Warnock <[cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com)> wrote:

**Grant Lake Hydroelectric Project (FERC No. 13212) Natural Resources Study Stakeholder Group:**

Thank you all for your attendance (in-person and via phone) at our December 12<sup>th</sup> Grant Lake Natural Resource Studies Meeting. Attached, you'll find the minutes from that meeting. My apologies for not getting them out sooner but our internal review took a bit longer than is typical due to the holidays. I would appreciate your review of the meeting minutes along with the permit table and study plans that were provided at the meeting. Again and as we articulated at the meeting, we did our best to identify all of the permits we viewed necessary to conduct the work outlined in the study plans. We have added to that any suggestions that we heard at the meeting but if any outstanding permit needs exist, please let us know. We are currently working internally and with the Kenai River Center to put together the appropriate set of Multi-Agency permits for submittal into their process. Additionally, we appreciate your review of the study plans given the modifications that have taken place to incorporate the Stakeholder comments received during the formal

comment period. As we stated at the meeting, we'd appreciate your review and comment on any points that you have outstanding questions on and/or need additional detail or clarification. As a reminder, both the permit table and the study plans can be retrieved from the Kenai Hydro website at:  
[http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php)

I appreciate that returning from the holidays and catching up can make for a busy January. That said, if we can receive any comments you may have on the items discussed above by February 1, 2013, we should be able to keep on schedule with all of our 2013 field study planning efforts. I hope you all had a great holiday season and don't hesitate to let me know if you have any questions/comments.

Cory

***Cory Warnock***

*Senior Licensing and Regulatory Consultant*

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[www.mcmillen-llc.com](http://www.mcmillen-llc.com)

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**From:** Salzetti, Mikel <MSalzetti@HomerElectric.com>  
**Sent:** Wednesday, February 06, 2013 1:31 PM  
**To:** 'Van Massenhove, Katherine B -FS'  
**Cc:** Emily Andersen; Cory Warnock  
**Subject:** RE: Permit amendment to allow for access by helicopter and snow machine  
**Attachments:** SEW457\_KenaiHydro\_Amendment1 Signed.pdf

Kathy:

Attached is a signed Kenai Hydro Special Use Permit Amendment #1 document.

Thanks for your help,

**Mike Salzetti**

Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Wednesday, January 30, 2013 12:40 PM  
**To:** 'Van Massenhove, Katherine B -FS'  
**Cc:** Salzetti, Mikel; Emily Andersen  
**Subject:** RE: Permit amendment to allow for access by helicopter and snow machine

Kathy,

I just spoke with Mike Salzetti of HEA (Grant Lake Project Manager). He's informed me that Steven Gilbert is no long with HEA/KHL and Mike would be the one designated to sign the amendment. Please confirm that this will work for you needs and we'll act accordingly.

Thanks,

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

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F – 360-542-2264

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Tuesday, January 29, 2013 5:39 PM  
**To:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** Permit amendment to allow for access by helicopter and snow machine

Hi Cory,

Attached is the amendment that will allow for access to the area by the same means allowable to the general public. The way the permit is worded, access is limited to boat or foot. Steven Gilbert was the person who signed for Kenai Hydro, LLC so we'll probably want to have him sign the amendment. Let me know if someone will be signing. Once signed by Kenai Hydro, the district ranger will sign and I'll return the executed permit to you. The important thing to remember, the permit is not valid until signed by both parties.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Sunday, February 10, 2013 8:34 PM  
**To:** 'Van Massenhove, Katherine B -FS'; Cory Warnock  
**Cc:** Mike Salzetti; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Thanks for all your help, Kathy.

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, February 08, 2013 3:14 PM  
**To:** Cory Warnock  
**Subject:** Executed Amendment for access by snowmobile and helicopter

Hi Cory,

Attached is the signed and fully executed amendment to the permit for the investigative studies on Grant Lake. You are now authorized access by the same means available to the general public, which include helicopter and snow mobile access.

Please let me know if you have any questions,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Sagner, Helen -FS  
**Sent:** Thursday, February 07, 2013 9:54 AM  
**To:** Van Massenhove, Katherine B -FS; Pence, Sitka -FS  
**Cc:** Stovall, Robert -FS  
**Subject:**

Per Robert; I have scanned and attached the required documents for you.

Thanks in advance.

Auth ID: SEW457  
Contact ID: KENAI HYDRO LLC  
Use Code: 413

FS-2700-23 (v. 10/09)  
OMB No. 0596-0082

U.S. DEPARTMENT OF AGRICULTURE  
FOREST SERVICE  
AMENDMENT  
FOR

SPECIAL-USE AUTHORIZATION

Amendment#: 1

This amendment is attached to and made a part of the special use authorization for investigative studies issued to Kenai Hydro, LLC on 06/24/2009 which is hereby amended as follows:

Access to the permit area is by the same means as is available to the public as outlined in the Chugach National Forest Land Resource Management Plan and noted on Appendix A-1 and A-2.

This Amendment is accepted subject to the conditions set forth herein, and to conditions outline in Appendix A-1 and Appendix A-2 to December 31, 2013 attached hereto and made a part of this Amendment.

Holder <i>Mikel Salze</i>	<i>Robert A. Stovall</i> FOR
<i>Generation Engineering Manager</i>	TRAVIS MOSELEY, District Ranger
Date <i>2/6/2013</i>	Date <i>2-7-2013</i>

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

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call toll free (866) 632-9992 (voice). TDD users can contact USDA through local relay or the Federal relay at (800) 877-8339 (TDD) or (866) 377-8642 (relay voice). USDA is an equal opportunity provider and employer.

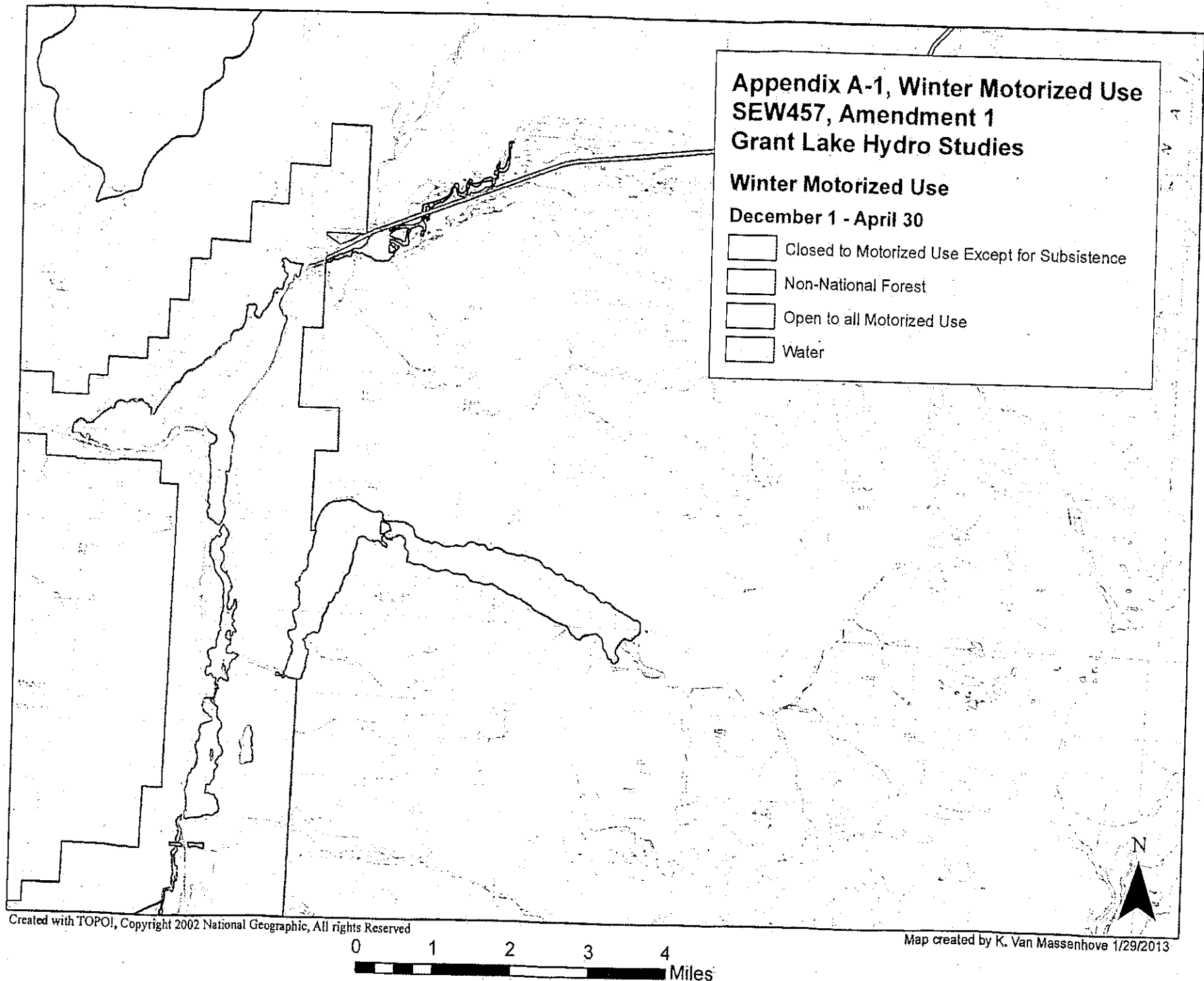
The Privacy Act of 1974 (5 U.S.C. 552a) and the Freedom of Information Act (5 U.S.C. 552) govern the confidentiality to be provided for information received by the Forest Service.

**Appendix A-1, Winter Motorized Use  
SEW457, Amendment 1  
Grant Lake Hydro Studies**

**Winter Motorized Use**






**December 1 - April 30**

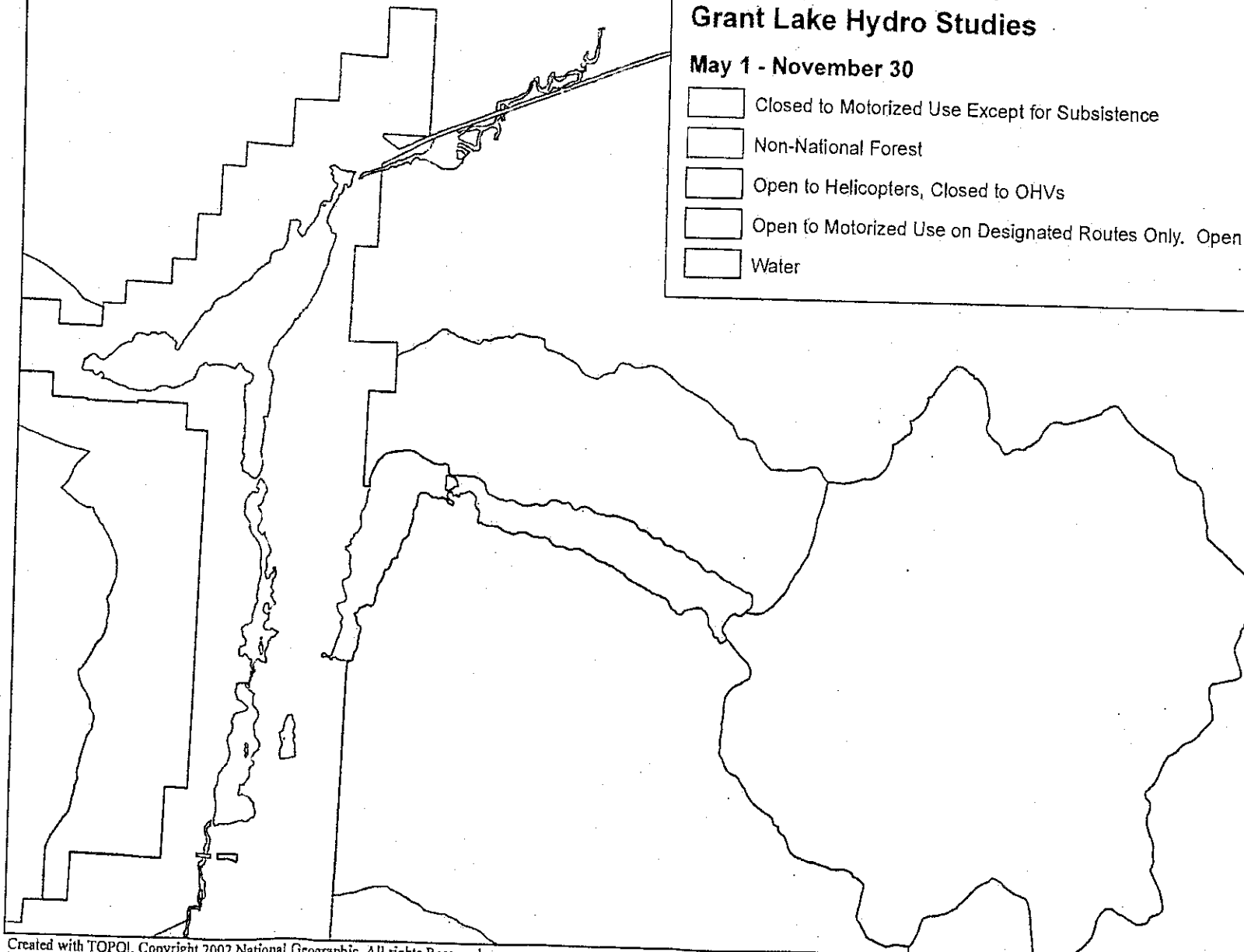
-  Closed to Motorized Use Except for Subsistence
-  Non-National Forest
-  Open to all Motorized Use
-  Water



**Appendix A-2, Summer Motorized Use  
SEW457, Amendment 1  
Grant Lake Hydro Studies**

**May 1 - November 30**

-  Closed to Motorized Use Except for Subsistence
-  Non-National Forest
-  Open to Helicopters, Closed to OHVs
-  Open to Motorized Use on Designated Routes Only. Open to Helicopters
-  Water



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0 1 2 3 4  
Miles

Map created by K. Van Massenhove 1/29/2013



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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Monday, February 11, 2013 11:49 AM  
**To:** Emily Andersen  
**Subject:** FW: Kenai Hydro Application  
**Attachments:** MULTI-AGENCY\_PERM\_APP\_GRANT\_CREEK.PDF

***Cory Warnock***

*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

---

**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
**Sent:** Tuesday, February 05, 2013 1:39 PM  
**To:** Russell, Pamela J (DNR)  
**Cc:** Cory Warnock  
**Subject:** RE: Kenai Hydro Application

Pam:

Attached is a map with all of the GPS point identified.

Please let me know if there is anything else that you need with regard to this application.

Best Regards,

**Mike Salzetti**

Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Russell, Pamela J (DNR) [<mailto:pamela.russell@alaska.gov>]  
**Sent:** Wednesday, January 30, 2013 11:12 AM  
**To:** Salzetti, Mikel  
**Subject:** RE: Kenai Hydro Application

Mike,

That will work for me.

Thanks

Pamela Russell  
Div. of Parks and Outdoor Recreation  
Natural Resource Specialist III  
514 Donald E Gilman River Center  
Soldotna, AK 99669  
907-714-2471

---

**From:** Salzetti, Mikel [MSalzetti@HomerElectric.com]  
**Sent:** Wednesday, January 30, 2013 8:27 AM  
**To:** Russell, Pamela J (DNR)  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** RE: Kenai Hydro Application

Pam:

We'll work with our GIS folks to get this information to you. What I plan to submit is a single map of the basin with the locations of everything (weir site, man camp, stream gauge and thermologger string) on it with specific GPS locations noted for each.

Will that work for you?

**Mike Salzetti**  
Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Russell, Pamela J (DNR) [<mailto:pamela.russell@alaska.gov>]  
**Sent:** Tuesday, January 29, 2013 1:48 PM  
**To:** Salzetti, Mikel  
**Subject:** Kenai Hydro Application

Hi Mike,

After reviewing the applications I noticed that specific locations, with GPS way points were not included. In order for me to move forward with these applications I need this information.

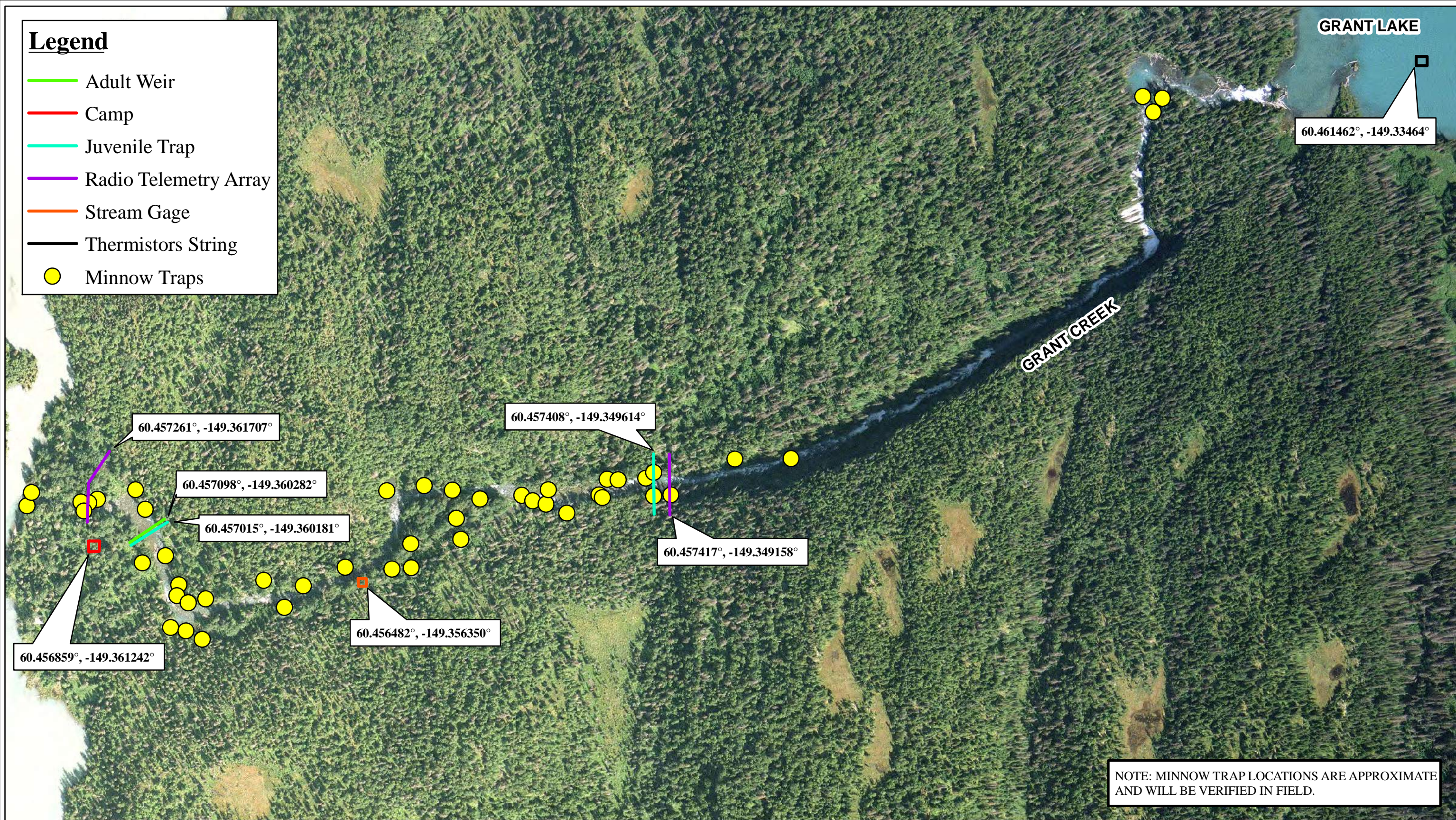
Thanks

Pamela Russell  
Div. of Parks and Outdoor Recreation  
Natural Resource Specialist III  
514 Donald E Gilman River Center  
Soldotna, AK 99669  
907-714-2471



**Legend**

- Adult Weir
- Camp
- Juvenile Trap
- Radio Telemetry Array
- Stream Gage
- Thermistors String
- Minnow Traps



REV	DATE	BY	

WARNING  
0 1/4 1/2  
IF THIS BAR DOES NOT  
MEASURE 1/2" THEN  
DRAWING IS NOT TO SCALE.

**McMILLEN, LLC**

THE SONNA BUILDING  
910 MAIN ST., SUITE 258 OFFICE: 208.342.4214  
BOISE, ID 83702 FAX: 208.342.4216



MULTI-AGENCY PERMIT APPLICATION  
GRANT CREEK AQUATIC AND WATER RESOURCE SITES



DESIGNED C. WARNOCK  
DRAWN J. WOODBURY  
CHECKED C. WARNOCK  
ISSUED DATE 2/1/2013

DRAWING  
SCALE:



---

**From:** Eric Rothwell - NOAA Federal <eric.rothwell@noaa.gov>  
**Sent:** Monday, February 11, 2013 4:45 PM  
**To:** Cory Warnock  
**Cc:** Emily Andersen  
**Subject:** Re: Grant Lake Geomorph Comments  
**Attachments:** Grant Creek WR and AR Draft Study Plan notes jan17.pdf

Hi Cory,

Sorry that we have not submitted formal comments by the February 1 deadline. Our intent was to review the entire study plans and comment, but Sue hasn't had the opportunity to review.

Please find my comments on the Aquatic Resources Study Plan and the Water Resources Study Plan. Thank you for your patients.

Best Regards,  
Eric

On Mon, Feb 11, 2013 at 1:24 PM, Cory Warnock <[cory.warnock@mcmillen-llc.net](mailto:cory.warnock@mcmillen-llc.net)> wrote:

Hi Eric,

As you know, we set a Feb. 1 deadline for comments related to the Grant Lake Study Plans. You and I have had some dialogue related to some geomorph questions that you had and I know that you had intended to make some clarifying requests related to the Water Resources Plan. I wanted to check in with you and let you know that my plan is to get the study plans finalized late next week. So, if you have time to get me the clarifying points prior to that, it would be appreciated.

Thanks Eric and I hope all is well,

Cory

--

**Eric Rothwell**  
*Hydrologist*  
*NOAA Fisheries*  
*U.S. Department of Commerce*  
[eric.rothwell@noaa.gov](mailto:eric.rothwell@noaa.gov)

## Water Resources and Aquatic Resources – Draft Study Plan Comments

Eric Rothwell, NOAA-NMFS

### **Aquatic Resources Final Study Plan**

Two of the Aquatic Resources Draft Study Plan overall goals are relevant to our review, these are to assess:

*Impact of Project operations on sediment transport (relative to the availability of spawning gravels) due to changes in flow in Grant Creek.*

*Impact of Project operation (fluctuation lake levels in Grant Lake, changes in seasonal flow in Grant Creek, reduced flows between the dam and powerhouse on Grant Creek) on fish abundance and distribution.*

Overall goals of the draft study plan appear to address NMFS need to assess project effects to anadromous habitat but the methods to achieve those goals are not always clear and need to address deficiencies.

#### *4.6 Grant Creek Aquatic Habitat Mapping*

The habitat delineation will be conducted at a mesohabitat level, with the following categories: fastwater pools; fastwater riffles; margins with undercut bank; margins without undercut bank; large woody debris dams; margin shelves associated with large wood debris; backwater pools; sloughs; and pockets. We request that each of the mesohabitat categories be defined in the revised study plan. It appears from the draft study plan that the mesohabitats will be mapped from remote imagery at one flow, it is unclear if changes in habitat delineation with flow will be accounted for, or if it is necessary to assess project effects on habitat distribution and size. Ground truthing of the mesohabitat mapping may provide some insight into the need to correct the classification and if accounting for changes in habitat area with flow is necessary. Study plan revisions should discuss the need and methods for quantifying habitat availability over a range of discharges and be able to predict habitat availability under project operation scenarios. Understanding the range of habitats available over the range of baseline and operating flows will be necessary to assess project effects.

*The study component to “Analyze and identify the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek” appears to utilize the mesohabitat mapping effort and fish observations to identify fish habitat use and make inferences as to what factors influence habitat use. The methodology to achieve this task should identify how factors will be determined, as many of the factors may be microhabitat features that are not identifiable through remote imagery. The results of the aquatic habitat mapping and fish observations should be a baseline understanding of species and lifestage habitat use, and then use this information to inform the effort to develop site specific habitat criteria (as discussed in the instream flow section).*

#### *4.7 Grant Creek Instream Flow Study*

Two modes of operations are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at specific output level, level control of Grant Lake will occur during periods of low inflow to Grant Lake. The revised study plan should include a description of how project operations likely to occur in a dry, average, and wet year will be assessed in the instream flow study to adequately analyze project effects to fish habitat.

Due to the nature of Grant Creek we believe a series of single transect analysis, in combination with the mesohabitat mapping and site specific understanding of the microhabitat factors that influence habitat use, should be sufficient to understand the flow habitat relationships for spawning and rearing areas.

We see little value in the wetted perimeter analysis, as many of the habitats utilized for rearing will probably occur near margins, woody debris, or other pocket habitats. We agree that modeling flow effects to lateral connectivity to margins, areas of thermal refugia, side-channel, off-channel, and undercut bank habitats will be an important component of the instream flow study.

The proposed egg incubation component lacks the detail to determine if it is appropriate or sufficient to assess project effects on spawning success. After identification of spawning locations by species the analysis should consider factors that influence spawning success under baseline conditions and then assess how the project may change those conditions, including habitat availability and quality (structure, substrate, access, temperature, etc.). Additional factors including surface/groundwater exchange, proximity to rearing habitat (if applicable), and biologic factors should be considered.

Additionally, the revised study plan for instream flow should include:

- The number and location of instream flow cross-sections, or how they will be determined based on the habitat mapping and fish observations.
- Methods for analyzing project effect from operations downstream for instream flow, temperature, and bedload transport.
- Detailed methodologies describing what the egg incubation study component will consist of, what data is necessary, and why the methods are appropriate.

### **Water Resources Draft Study Plan**

#### *4.2.1 Water Quality and Temperature*

The objectives for the water quality and temperature include collection of baseline data to provide basis for environmental assessment and allow comparison with future study years; and obtain baseline information on the seasonal temperature regime to provide input data required for modeling of potential Project impacts to stream temperatures under various operational scenarios. It is unclear how the baseline data would be used to model stream temperature effects associated with project operations or if the proposed data collection is sufficient to meet the modeling needs.

Monitoring of temperature and flows at multiple locations (including and understanding of winter flow and temperature) in Grant Creek should provide a good baseline understanding of longitudinal temperature. Temperature data collection, Page 8 and 9, proposed to collect temperature data throughout the year, this is important but it is unclear how many years of winter temperature data is available? We also encourage that thermal refugia be examined in habitats used by spawning and rearing fish. Although baseline conditions will be captured it is unclear how project operations will be routed downstream to conduct the instream flow and temperature analysis of project operation effects. There is mention of quantifying seepage and/or accretion of flow for a few time periods. For hydraulic analysis it may be appropriate, in the case of Grant Creek except for ramping analysis, to assume operation flows are translated downstream instantaneously, but this assumption would not be applicable for assessment of water quality and temperature effects associated with operations. Rather a routing of flow and water quality parameters (temperature) downstream would be necessary to assess project effects.

Additional temperature data loggers will be placed at 2-3 selected off channel sites, and will emphasize locations that may be influenced by groundwater. We encourage additional sites selected by the Aquatic Resources study team at locations of biological significance, both spawning and rearing locations with the goal of characterizing the temperatures of habitats chosen by spawning fish and to characterize thermal heterogeneity.

#### 4.2.3 Grant Lake and Grant Creek Fluvial Geomorphology

Objectives – Provide a basis for predicting and assessing potential changes to material movement, sedimentation, and gravel recruitment that may occur in Grant Creek with changes in flow, especially as related to the long-term maintenance of fish spawning substrate.

“The validity of sediment transport models and their attendant assumptions will be discussed in light of project requirements”. During the Dec. 2012 meeting the use of Shield’s Equation was proposed to assess incipient motion. Description of why Shield’s equation and how it will be applied is necessary in the revised study plan. We request that the RSP discuss the methods for modeling spawning gravel recruitment and data needs, along with assumptions.

The three phase work plan described for the Grant Creek spawning substrate recruitment study is a solid conceptual approach but methodologies need more detail to be understood and assessed. The first phase is an assessment of the substrate at existing spawning areas including aspects of embeddedness and substrate size. This is achieved through Wolman pebble counts and embeddedness indices with the addition of bulk samples. The embeddedness indices should be described in the revised study plan with a description of why they are appropriate. Also the location and number of sampling locations should be provided in the revised study plan; the number should be sufficient to characterize spawning in each of the spawning reaches.

The second phase is the quantification of material transport conditions under the existing and project flow regimes. During the December 12, 2012 natural resources study meeting the methods were described as consisting of a desktop analysis ( geomorphic mapping and characterization); field

sediment characterization; field geomorphic characterization; and prediction of potential geomorphic response to stream flow under management scenarios. The applicant's contractors described using Shield's Equation, as was conducted by Inter-Fluve on Cooper Creek; with the intent to evaluate the availability of spawning gravel under proposed operating scenarios. More detail about the methodologies to predict geomorphic response to instream flow changes is needed to assess whether they are appropriate.

It is unclear how Shield's equation will be applied, or where it will be applied. Shields expressed incipient grain motion as a dimensionless ratio of critical bed shear stress to grain weight per unit area; the experiments used mixed bed material that was nearly uniform; the dimensionless critical shear stresses are not grain-size specific but are derived from bulk measures of sediment movement; and a variety of bed forms and relative roughness were not accounted for (Buffington 1999<sup>1</sup>). Revisions and modifications of Shields curve have recognized that incipient motion of a particular grain size is a statistical problem depending on geometry, grain shape, sorting, and packing (Buffington and Montgomery 1997<sup>2</sup>). Will relative roughness be accounted for through shear stress partitioning, to account for sorting, grain size shape, bed form, and channel shape?

We request that the revised study plan for water resources describe the approach being taken to assess project effects to sediment transport for long-term maintenance of fish spawning substrate. This should include the equations used and why they are appropriate, a description of how modeling approaches or equations will be validated with baseline information; what value is used for Shields parameter (dimensionless critical shear stress) and why, and how the equation will be applied to quantify the effects associated with project operations, and limitations of the study. Additionally it is unclear how operations will be routed downstream to the spawning areas to assess transport conditions? And where will the shear stress calculations be performed?

Route operations downstream and predict changes in transport as a calculation of a shear stress threshold to achieve incipient motion may be the correct approach but the equations and methods used should be described, with assumptions and why the model/equation are appropriate.

---

<sup>1</sup> Buffington, J.M. 1999. The Legend of A.F. Shields. *Journal of Hydraulic Engineering*. vol. 125, No. 4.

<sup>2</sup> Buffington, J.M. and D.R. Montgomery. 1997. A Systematic Analysis of Eight Decades of Incipient Motion Studies, with Special Reference to Gravel-Bedded Rivers. *Water Resources Research*, vol. 33, No.8, p. 1993-2029.



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**From:** Salzetti, Mikel <MSalzetti@HomerElectric.com>  
**Sent:** Tuesday, February 12, 2013 10:24 AM  
**To:** Salzetti, Mikel  
**Cc:** Cory Warnock (cory.warnock@mcmillen-llc.com); Emily Andersen (emily.andersen@mcmillen-llc.com)  
**Subject:** RE: Multiagency application for Grant Creek Research projects  
**Attachments:** Reply to KRC Habitat Concerns - 02-12-2013.docx

Patti:

Please see attached response to your questions.

I would be happy to answer any further questions that you may have.

Best Regards,

**Mike Salzetti**  
Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Salzetti, Mikel  
**Sent:** Monday, February 11, 2013 6:07 PM  
**To:** 'Berkhahn, Patti'  
**Subject:** RE: Multiagency application for Grant Creek Research projects

Patti:

I hope to have something to you tomorrow.

Mike

---

**From:** Berkhahn, Patti [<mailto:PBerkhahn@borough.kenai.ak.us>]  
**Sent:** Monday, February 11, 2013 9:48 AM  
**To:** Salzetti, Mikel  
**Subject:** FW: Multiagency application for Grant Creek Research projects

Do you have any updates on the river access issue? I do not want to see the permitting process derailed for too long.

Patti Berkhahn  
Habitat Biologist III  
ADFG, Habitat Division  
River Center  
514 Funny River Road  
Soldotna, AK 99669  
907 714-2476  
(State agency housed in Kenai Peninsula Borough Building)

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**From:** Berkhahn, Patti  
**Sent:** Tuesday, February 05, 2013 8:47 AM  
**To:** Salzetti, Mikel ([MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com))  
**Subject:** FW: Multiagency application for Grant Creek Research projects

Patti Berkhahn  
Habitat Biologist III  
ADFG, Habitat Division  
River Center  
514 Funny River Road  
Soldotna, AK 99669  
907 714-2476  
(State agency housed in Kenai Peninsula Borough Building)

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**From:** Berkhahn, Patti  
**Sent:** Wednesday, January 30, 2013 3:26 PM  
**To:** 'msalzeti@homerelectric.com'  
**Cc:** Litchfield, Ginny; Czarneski, John; Russel, Pam - State Address; COE - Kenai Office ([CEPOA-RD-Kenai@usace.army.mil](mailto:CEPOA-RD-Kenai@usace.army.mil))  
**Subject:** Multiagency application for Grant Creek Research projects

Mike, per our recent phone conversation, I am inquiring how research staff for the Kenai Hydro project on Grant Creek will access the river for smolt trap and weir work. Our concern is for bank habitat damage that will be created with staff exiting and entering the river for installation, demobilization, daily tasks and maintenance. The application does not request installation of stairs to the riverbed in any of the locations. Hardening the bank with sandbags or other such items for access will not be allowed. Please advise me of your plans to mitigate bank damage for stream access. I am placing your application on hold and will not be able to finalize your permit until I hear back from you.

Thank you,

Patti Berkhahn  
Habitat Biologist III  
ADFG, Habitat Division  
River Center  
514 Funny River Road  
Soldotna, AK 99669  
907 714-2476  
(State agency housed in Kenai Peninsula Borough Building)

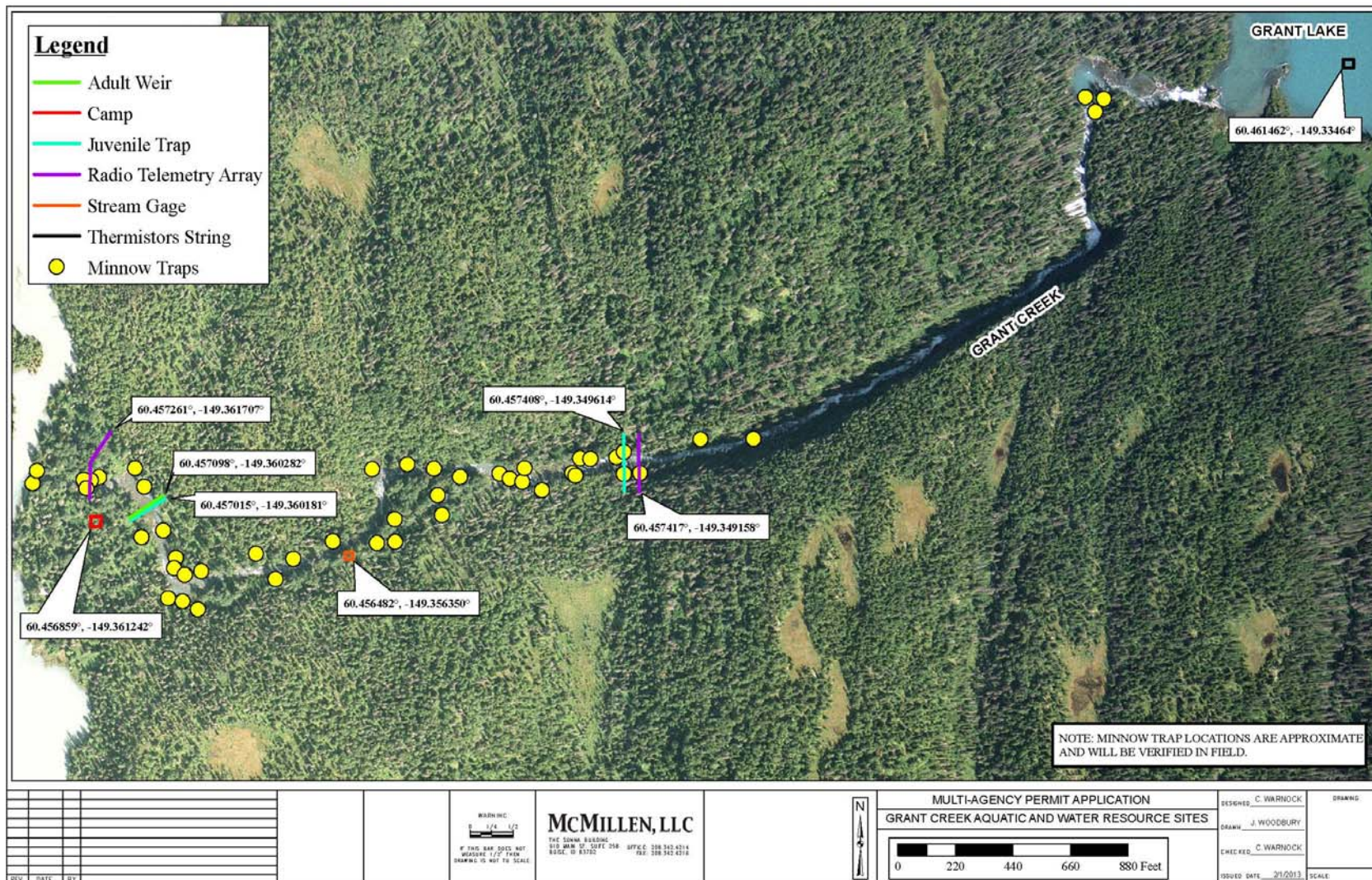
We anticipate that there will be three access points (see attached map) that will be used on a regular basis for the aquatic resource investigations:

1) Adult Weir (60.457098°, -149.360282°) - The adult weir design incorporates a walkway to access the weir. Except for initial weir construction, creek access will be from the weir itself and not down the bank. The weir site was chosen because the banks in the vicinity of the weir are naturally armored with cobbles and boulders and therefore resist erosion; therefore, erosion from installation and demobilization will be kept to a minimum. Until the weir is built we will have to move materials (by hand) from the bank to the stream. During this period we will be walking directly from the stream bank to the Creek. Weir construction will take less than a day. After that, we will be able to access the Creek via the weir.

2) Lower Juvenile Trap Site (60.457015°, -149.360181°) - For the lower juvenile trap (located just upstream of the weir), we will access and install the trap where it is naturally armored, with large cobble/boulder substrate.

3) Upper juvenile trap site (60.457408°, -149.349614°) - For the upstream juvenile trap, which is the downstream portion of the canyon (referred to as the Reach 4/5 break in our study plan), we will be accessing the juvenile trap using a walkway due to the depth of the trap location. The bank in this area is also naturally armored, and with large cobble causing erosion from installation and demobilization to be kept at a minimum.

Walkways consist of 8' x 19" aluminum frames with plywood decks fit on 1 ½" pipe. The walkway is available from Safeway, Inc in Anchorage.







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**From:** Berkhahn, Patti [<mailto:PBerkhahn@borough.kenai.ak.us>]

**Sent:** Tuesday, February 12, 2013 2:17 PM

**To:** Salzetti, Mikel

**Subject:** F&G Fish Habitat Permit for Grant Creek studies

Your Fish Habitat permit is attached. A hard copy will be sent to you when all River Center Agencies have reviewed your multiagency permit application.

Patti Berkhahn

Habitat Biologist III

ADFG, Habitat Division

River Center

514 Funny River Road

Soldotna, AK 99669

907 714-2476

(State agency housed in Kenai Peninsula Borough Building)



THE STATE  
of **ALASKA**  
GOVERNOR SEAN PARNELL

**Department of  
Fish and Game**

DIVISION OF HABITAT  
Kenai Peninsula Office

514 Funny River Road  
Soldotna, Alaska 99669-8255  
Main: 907.714.2475  
Fax: 907.260.5992

**FISH HABITAT PERMIT FH 13-V-0112**

ISSUED: February 12, 2013  
EXPIRES: December 31, 2014

Kenai Hydro, LLC  
Mike Salzetti  
280 Airport Way  
Kenai, AK 99611

Dear Mr. Salzetti:

**RE: Fisheries Research, Stream Gauge, Sediment Analysis**  
Grant Creek – Stream No. 244-30-10010-2225-3004  
Sections 7, 12, T 4N, R 1E, S. M.  
River Center Tracking No. 9829, 9830, 9831

Pursuant to AS 16.05.871(b), the Alaska Department of Fish and Game (ADF&G), Division of Habitat, has reviewed your proposal to conduct natural resource studies for the proposed Grant Lake Hydroelectric Project on Grant Creek. This is a multifaceted research project which will include fisheries research, hydrology, and geomorphology studies. Outside the authority of this permit and above ordinary high water (OHW), a temporary field camp will be constructed to house staff and insert radio tags in captured fish.

**Project Description**

Fisheries research includes a fish collection weir, up to two floating fish traps, and installation of two underwater radio telemetry antenna arrays. The weir will be installed using a battery-operated drill and small generator. The weir will be a fixed picket design with a walkway across the top of the weir allowing access to both sides of Grant Creek. During high water events, the pickets will be removed to allow debris and fish to pass freely. The weir will be adequately staffed to prevent fish from stacking up behind the weir and will be operational from late April until freeze-up. Primary components of the weir will be removed and stored in an upland location during winter months. The free-floating smolt traps will either be inclined plane or rotary screw trap and will be anchored to the stream bank with ropes or cables attached to anchor stakes or trees. Up to four coaxial leads will attach the radio telemetry antenna arrays to a

weighted line and will be submerged so they rest on the stream bed, perpendicular to the stream flow. A solar panel located above OHW will provide backup power. If it is determined that underwater antennas are not the best option, aerial Yagi antennas will be mounted to adjacent trees.

The hydrology investigation requires continuous stage recording of the surface waters of Grant Creek. The stream gauge consists of a staff gauge and a continuous stage data logger, each anchored individually to the stream bank and near the shoreline. The data loggers record pressure, which will be related to water surface elevation of the staff gauge. The data loggers will be set to record depth at 15-minute intervals. Each staff gauge will be 4-inches wide by 4-feet long and mounted vertically in the stream channel. The data loggers will be housed in a shoreline enclosure with the bubbler line protected in 1-inch conduit above OHW and 2-inch galvanized pipe below OHW.

The fluvial geomorphic investigation will involve temporary excavation of a number of shallow test pits (typically about 1-meter diameter and less than 1 meter in depth) with a hand-held shovel. Excavations will occur on unvegetated gravel bars out of water. A portion of the sample will be returned to the excavated area immediately following measurement. Typically the larger sediment ( $> 5$  cm) will be returned to the site, while the smaller material may be collected and taken to the lab for further analysis. Typical volumes of sediment removed from the site will be  $< 2$  cubic feet. The surface of the excavated area will be *foot compacted* and graded to avoid pits and resemble the existing topography.

To prevent stream bank habitat degradation during access to Grant Creek the following steps shall be taken: 1) Adult Weir ( $60.457098^{\circ}$ ,  $-149.360282^{\circ}$ ) - The adult weir design incorporates a walkway to access the weir. Except for initial weir construction, creek access will be from the weir itself and not down the bank. The weir site was chosen because the banks in the vicinity of the weir are naturally armored with cobbles and boulders and therefore resist erosion; therefore, erosion from installation and demobilization will be kept to a minimum. Until the weir is built we will have to move materials (by hand) from the bank to the stream. During this period we will be walking directly from the stream bank to the Creek. Weir construction will take less than a day. After that, we will be able to access the Creek via the weir. 2) Lower Juvenile Trap Site ( $60.457015^{\circ}$ ,  $-149.360181^{\circ}$ ) - For the lower juvenile trap (located just upstream of the weir), we will access and install the trap where it is naturally armored, with large cobble/boulder substrate. 3) Upper juvenile trap site ( $60.457408^{\circ}$ ,  $-149.349614^{\circ}$ ) - For the upstream juvenile trap, which is the downstream portion of the canyon, we will be accessing the juvenile trap using a walkway due to the depth of the trap location. The bank in this area is also naturally armored, and with large cobble causing erosion from installation and demobilization to be kept at a minimum. Walkways consist of 8' x 19" aluminum frames with plywood decks fit on 1 1/2" pipe. Sand bags shall not be used to gain access or harden the banks along the stream bank.

### **Anadromous Fish Act**

Grant Creek has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). Grant Creek provides spawning and migration habitat for coho, Chinook, and sockeye salmon and other species of resident fish.



In accordance with AS 16.05.871(d), project approval is hereby given subject to the project description above and the following stipulations:

1. The Division of Habitat shall be contacted at (907) 714-2475 three days prior to project initiation.
2. There shall be no new permanent pipes, duck bill anchors, or similar devices driven into the bed of the tributaries. All structures must be removed from the riverbed when the project is complete.
3. Wooden structures placed in or over the stream shall not be treated with any preservative containing pentachlorophenol or creosote. Wood preservatives must be applied using pressure treatment rather than painted on or allowed to soak into the wood.
4. Streambanks shall not be disturbed. If streambanks are inadvertently disturbed by activities attributable to this project, they shall be immediately stabilized to prevent erosion and the resultant sedimentation of streams which could occur both during and after operations.
5. Facilities shall be operated and maintained as required to prevent unnecessary sampling mortality and ensure that fish mortality caused by delays in migration do not occur.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. For any activity that significantly deviates from the approved plan, you shall notify the Division of Habitat and obtain written approval in the form of a permit amendment before beginning the activity. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any stipulation contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is the responsibility of the Division of Habitat. Therefore, it is recommended you consult the Division of Habitat immediately when a deviation from the approved plan is being considered.

For the purpose of inspecting or monitoring compliance with any condition of this permit, you shall give an authorized representative of the state free and unobstructed access, at safe and reasonable times, to the project site. You shall furnish whatever assistance and information as the authorized representative reasonably requires for monitoring and inspection purposes.

This letter constitutes a permit issued under the authority of AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to activities regulated by the Division of Habitat; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other permits; state, federal, or local. You are still required to comply with all other applicable laws.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. The department reserves the right to require mitigation measures to correct disruption to fish and

game created by the project and which was a direct result of the failure to comply with this permit or any applicable law.

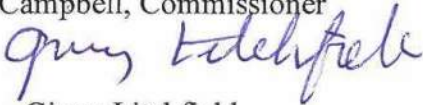
You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

This permit decision may be appealed in accordance with the provisions of AS 44.62.330-630.

Any questions or concerns about this permit may be emailed to [patricia.berkhahn@alaska.gov](mailto:patricia.berkhahn@alaska.gov) or call (907) 714-2476.

Sincerely,

Cora Campbell, Commissioner



By: Ginny Litchfield  
Kenai Peninsula Area Manager  
ADF&G, Division of Habitat

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Enclosure: Maps, photos

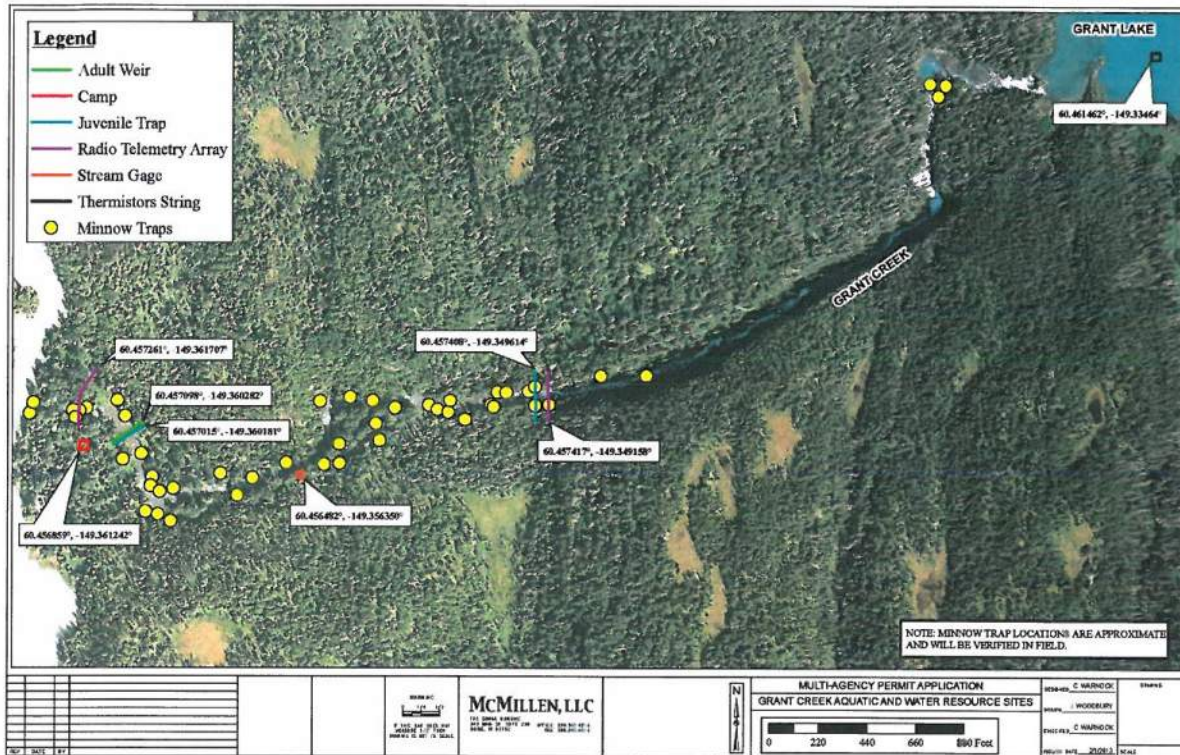
cc: KRC File

By email only:

AWT Soldotna  
ADF&G Soldotna

COE – KFO





Map of proposed project showing locations of camp, adult weir, smolt traps, etc.

Figure 1: Proposed Grant Creek Stream Gage Location

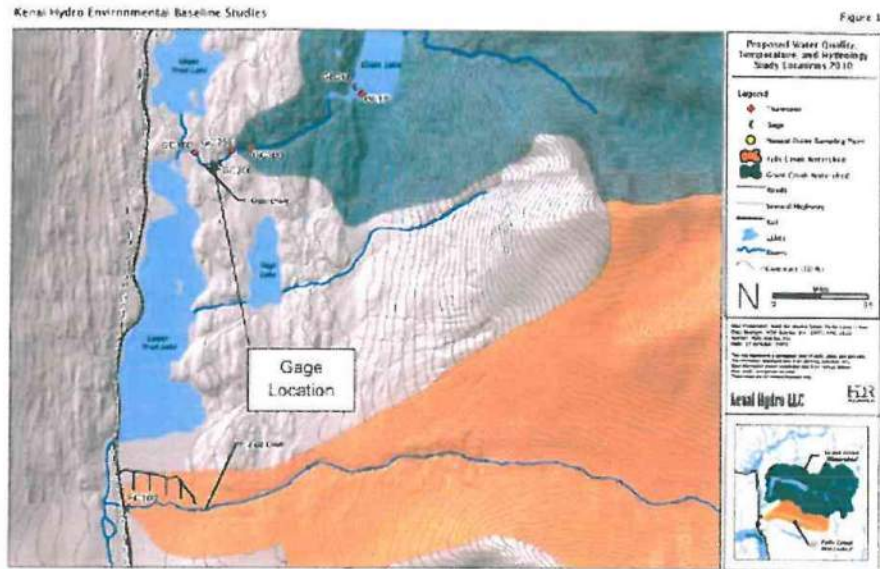


Figure 2. Examples of Design Analysis data logger, bubbler line, and staff gage installation.



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**From:** Ayers, Scott D (DFG) <[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)>  
**Sent:** Wednesday, February 13, 2013 12:20 PM  
**To:** Cory Warnock  
**Cc:** Emily Andersen  
**Subject:** RE: Grant Lake Permitting  
**Attachments:** FRPApp\_fill\_doc\_2013-1.docx

Hello Cory,

A Title 16 Fish Habitat Permit crossed my desk this morning for the Grant Creek Hydro project, under Mike Salzetti of Kenai Hydro, LLC. After reviewing the permit I wanted to get in touch with Kenai Hydro to remind them that a Fish Resource Permit was also required for them to handle any fish in the process of their work. As you reached out to me earlier this year about permitting for this project I thought I'd try contacting you first. I've attached the permit application to this message and will also require a study plan of the proposed fisheries work that is intended. I currently have 90 applications on my desk, so the sooner this can be submitted the better. Please let me know if this message needs to be directed to someone else.

Wishing you all the best.

Cheers,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Friday, January 11, 2013 1:20 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Permitting

Hi Scott,

Monte Miller gave me your number as it appears today is Bob's last day. Sounds like you'll be taking over for him as it relates to permitting. I'm currently working with Homer Electric Association on their licensing process for the Grant Lake Project on the Kenai Peninsula. We are currently going through the Multi-Agency permitting process and I was hoping to touch base with you about a couple specific issues related to the permits we are looking to secure so that when you see your portion of the Multi-Agency Permit from the Kenai River Center, everything is understood. If you could give me a time in the not so distant future that would work to have a brief phone call, I'd appreciate it.

Thanks and I'll look forward to hearing from you,

Cory

***Cory Warnock***

*Senior Licensing and Regulatory Consultant*

McMillen, LLC

[www.mcmillen-llc.com](http://www.mcmillen-llc.com)

5771 Applegrove Ln.

Ferndale, Wa. 98248

O – 360-384-2662

C – 360-739-0187

F – 360-542-2264



**STATE OF ALASKA**  
**DEPARTMENT OF FISH AND GAME**  
**Fish Resource Permit Application**  
**— Fillable Form —**

A **FISH RESOURCE PERMIT** is required to take, possess, hold alive, or tag FISH AND THEIR EGGS (except goldfish and decorative tropical fish) FOR SCIENTIFIC OR EDUCATIONAL PURPOSES.

--	--

(Name of Applicant)

(Organization or School)

--

(type in complete mailing address including City, State, and Zip Code)

--	--	--

(your Telephone Number)

(Fax Number)

(Email Address)

--

(type in the name and address of the organization with which you are under contract)

**I am making application to capture fish of the following species, life stage, and number for the specified disposition** (disposition examples: identify and release, measure and release, genetic sample and release, tag and release, sacrifice, transport live, hold alive, etc.):

*Note: If additional space is necessary, attach a separate file to provide a table formatted as required.*

**Species Common Name   Species Scientific Name   Life Stage   Number   Disposition\***




\*If capturing at multiple sample locations give details of species, life stage, number, and disposition in your study plan.

**I understand permits are only valid for dates within a calendar year; I am requesting this permit for the following period: (a new application is required each year)**

--	--	--

**Year:** (20\_\_)

**From:** (month and day)

**To:** (month and day)

**I wish to obtain the above fish [finfish, shellfish, amphibians] by means of:**

--

(Specify gear type(s): minnow traps, hoop traps, fyke nets, gillnets, dip nets, spat collectors, etc.)

**from the following location(s):**

--

(Specify location(s), i.e., X River at latitude/longitude, or ESE of Pt. Barrow, or on Kodiak Island, etc.)



The purpose of the activities for which a permit is being requested: (a brief purpose statement)

(This area will expand as you type.)



**NOTE:** A STUDY PLAN or RESEARCH PROPOSAL explaining the purpose and need, the objectives, and the procedures you will use must be included in/with this permit application:

(This area will expand as you type or you may attach the study plan or research proposal.)

Final disposition of collected specimens\* not released live at the site of capture will be (e.g. after conclusion of study, frozen and disposed of in landfill):

\*(specimens may not be consumed, sold, traded, bartered, or used in any commercial manner)

The following people will participate in field collections under terms of this requested permit:


I certify that all statements entered on this application are true, that I will abide by all conditions and restrictions of a permit if issued, and promise to submit a report of activities carried out under terms of such permit:

--	--	--	--

(Last fish resource permit number, if any)

(Name: First, MI, Last)

(Title)

(Date)

### Submit Complete Application For:

#### **Freshwater environment collections**

(Division of Sport Fish):

**By Email:** [scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

#### **By Mail:**

Attn: Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish - HQ  
333 Raspberry Road  
Anchorage, AK 99518

**Phone:** (907) 267-2517

#### **Marine environment collections and permits involving propagation**

(Division of Commercial Fisheries):

**By Email:** [dfg.fmpd.permitcoordinator@alaska.gov](mailto:dfg.fmpd.permitcoordinator@alaska.gov)

#### **By Mail:**

Attn: Permit Coordinator  
Alaska Department of Fish and Game  
Division of Commercial Fisheries-HQ  
P.O. Box 115526  
Juneau, AK 99811-5526

**Phone:** (907) 465-4724



---

----- Forwarded message -----

From: **Michael R Yarborough** <[mry@crcalaska.com](mailto:mry@crcalaska.com)>

Date: Wed, Feb 13, 2013 at 8:17 AM

Subject: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: Frank Winchell <[frank.winchell@ferc.gov](mailto:frank.winchell@ferc.gov)>, Judith Bittner <[judy.bittner@alaska.gov](mailto:judy.bittner@alaska.gov)>, Shina Duvall <[shina.duvall@alaska.gov](mailto:shina.duvall@alaska.gov)>, Ed DeCleva <[edecleva@fs.fed.us](mailto:edecleva@fs.fed.us)>, "Sheri D.Buretta" <[bwelty@chugach-ak.com](mailto:bwelty@chugach-ak.com)>, Ben Ellis <[ben.ellis@alaska.gov](mailto:ben.ellis@alaska.gov)>, Lee Stephan <[president@eklutna-nsn.gov](mailto:president@eklutna-nsn.gov)>, Richard Encelewski <[ntc@ninilchiktribe-nsn.gov](mailto:ntc@ninilchiktribe-nsn.gov)>, Jaylene Peterson-Nyren <[exec@kenaitze.org](mailto:exec@kenaitze.org)>, Penny Carty <[snainc@alaska.com](mailto:snainc@alaska.com)>, Vernon Stanford <[kna@alaska.net](mailto:kna@alaska.net)>, Sophie Minch <[info@ciri.com](mailto:info@ciri.com)>, Karen Rogina <[info@chenega.com](mailto:info@chenega.com)>, Arne Hatch <[finance@qutekcak.net](mailto:finance@qutekcak.net)>, Jolund Luther <[info@cityofseward.net](mailto:info@cityofseward.net)>

All:

Homer Electric Association, Inc. (HEA) is sending this email as a mechanism to propose a potential date for a meeting to discuss a suitable Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project. The project's Section 106 Initiation of Consultation meeting was held on June 24, 2010. Since this meeting, the access road has been shortened and rerouted to accommodate the Iditarod National Historic Trail. The cultural resources study plan has been amended to reflect this change and to respond to comments received from consulted parties.

At this stage in the project, we seek to continue consultation under Section 106 of the National Historic Preservation Act (36 CFR 800.3) to determine a final APE. Revised study plans, which include an updated project description, were distributed to stakeholders on December 12, 2012. Based upon internal discussions, we have identified February 25, 2013, as a potential meeting date. Given that this meeting will likely be relatively short (less than 2 hours), HEA would like to propose conducting the meeting via a webinar. We will provide a link that will allow you to load an application and login to the meeting. The whole process only takes about a minute. In addition, a

toll free number will be provided for the audio portion of the meeting. The link and phone number will be provided in an email. This approach will alleviate the issue of requiring folks to travel to Anchorage for such a short meeting. If computer capability is an issue, or individuals would prefer to attend in person, HEA will provide a space for representatives to participate in the meeting in-person. The proposed meeting would be scheduled to begin at 9:00 am with the intent of adjourning at or before 11:00 am.

We understand the difficulty in attempting coordinate so many schedules and will be as flexible as possible in adjusting the meeting date to accommodate as many people as we can. Our intent is to evaluate everyone's responses to this e-mail and establish a date based upon that correspondence. Let us know if February 25 will work for you. If not, HEA has identified February 27, 2013, as a second option.

Thanks in advance for your responses and ongoing participation.

Michael R. Yarborough  
Senior Archeologist  
Cultural Resource Consultants LLC  
3504 E. 67th Avenue  
Anchorage, Alaska 99507

Anchorage: [\(907\) 349-3445](tel:9073493445)  
Cell: [\(907\) 306-6069](tel:9073066069)

---

----- Forwarded message -----

From: **Frank Winchell** <[frank.winchell@ferc.gov](mailto:frank.winchell@ferc.gov)>

Date: Wed, Feb 13, 2013 at 10:56 AM

Subject: Re: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: Michael R Yarborough <[mry@crcalaska.com](mailto:mry@crcalaska.com)>

Mike:

I'm available for a February 25th meeting via the Internet and telephone, I'm also open for February 27th as an alternative.

Thanks,

Frank

---

----- Forwarded message -----

From: **Duvall, Shina A (DNR)** <[shina.duvall@alaska.gov](mailto:shina.duvall@alaska.gov)>

Date: Wed, Feb 13, 2013 at 4:02 PM

Subject: RE: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: Michael R Yarborough <[mry@crcalaska.com](mailto:mry@crcalaska.com)>

Cc: "Bittner, Judith E (DNR)" <[judy.bittner@alaska.gov](mailto:judy.bittner@alaska.gov)>

Mike,

February 25 and 27 both work for me at present. Also, the webinar format is fine with me. Thanks for coordinating this!

Best regards,

Shina

Shina duVall, RPA

Archaeologist, Review and Compliance Coordinator

Alaska State Historic Preservation Office / Office of History and Archaeology

550 W. 7th Ave., Suite 1310

[907-269-8720](tel:907-269-8720) (phone) [907-269-8908](tel:907-269-8908) (fax)

[shina.duvall@alaska.gov](mailto:shina.duvall@alaska.gov)

---

**From:** Salzetti, Mikel [mailto:MSalzetti@HomerElectric.com]  
**Sent:** Wednesday, February 20, 2013 6:22 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Cory Warnock  
**Subject:** RE: Grant Lake Permitting

Scott:

Attached is a completed Fish Resource Permit Application which also includes a copy of the Aquatic Resources Study Plan and a satellite image noting key aquatic resource study sites. Please let me know if you have any question or need any further information.

I would also appreciate it if you could give me an indication as to when you would anticipate granting a permit if everything on our application is in order. I noted your backlog and I am concerned about getting the permit in time to start some late winter study work that we have scheduled to start during the last part of March.

Best Regards,

**Mike Salzetti**  
Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Ayers, Scott D (DFG) [mailto:[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)]  
**Sent:** Thursday, February 14, 2013 8:48 AM  
**To:** Salzetti, Mikel  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** RE: Grant Lake Permitting

Mike:

Thank you for your quick reply. Having started this position in mid-January, I am still in the process of learning the ins and outs of the permitting world. While I do not know what permit applications are included in the Multi-Agency Permit Packet, I do know that a Fish Habitat Permit was issued for your work that disturbs the ground underlying the stream bed. I received a copy of your Fish Habitat Permit, realized that your project would also require a Fish Resource Permit, noted that I did not yet have one from your group, and sent the application your way. I do not know if there are any further permits outside of the Multi-Agency Permitting process that you will need to obtain.

Wishing you well.  
Cheers,

-Scott

---

**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
**Sent:** Wednesday, February 13, 2013 3:27 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** RE: Grant Lake Permitting

Scott:

Thanks for the information. We were under the impression that the Multi-Agency Permit Packet that we submitted to the Kenai River Center was the permit clearing house for all state permits, including all ADF&G permits. We'll get the application that you sent filled out and returned to you as soon as possible. Are you aware of any other permits that are outside of the Multi-Agency Permitting process that we will need to obtain?

Once you receive the permit application, please do hesitate to give me a call if you should have any questions.

Best Regards,

**Mike Salzetti**  
Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Wednesday, February 13, 2013 1:59 PM  
**To:** Salzetti, Mikel  
**Subject:** FW: Grant Lake Permitting

Hello Mr. Salzetti,

I am writing to you to inform you that you will be required to submit a Fish Resource Permit to complete the work that is outlined on the Fish Habitat Permit for the Grant Creek Hydro project. There is a copy of the application attached to this message. I had attempted to pass this message to Cory Warnock of McMillen LLC who had been in touch with me earlier this year concerning permitting, but it appears that he is out of his office until February 20. Please let me know if I can be of any further assistance.

Cheers,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

---

**From:** Ayers, Scott D (DFG)  
**Sent:** Wednesday, February 13, 2013 11:20 AM  
**To:** 'Cory Warnock'  
**Cc:** 'Emily Andersen'  
**Subject:** RE: Grant Lake Permitting

Hello Cory,

A Title 16 Fish Habitat Permit crossed my desk this morning for the Grant Creek Hydro project, under Mike Salzetti of Kenai Hydro, LLC. After reviewing the permit I wanted to get in touch with Kenai Hydro to remind them that a Fish Resource Permit was also required for them to handle any fish in the process of their work. As you reached out to me earlier this year about permitting for this project I thought I'd try contacting you first. I've attached the permit application to this message and will also require a study plan of the proposed fisheries work that is intended. I currently have 90 applications on my desk, so the sooner this can be submitted the better. Please let me know if this message needs to be directed to someone else.

Wishing you all the best.

Cheers,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Friday, January 11, 2013 1:20 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Permitting

Hi Scott,

Monte Miller gave me your number as it appears today is Bob's last day. Sounds like you'll be taking over for him as it relates to permitting. I'm currently working with Homer Electric Association on their licensing process for the Grant Lake Project on the Kenai Peninsula. We are currently going through the Multi-Agency permitting process and I was hoping to touch base with you about a couple specific issues related to the permits we are looking to secure so that when you see your portion of the Multi-Agency Permit from the Kenai River Center, everything is understood. If you could give me a time in the not so distant future that would work to have a brief phone call, I'd appreciate it.

Thanks and I'll look forward to hearing from you,

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

McMillen, LLC

[www.mcmillen-llc.com](http://www.mcmillen-llc.com)

5771 Applegrove Ln.

Ferndale, Wa. 98248

O – 360-384-2662

C – 360-739-0187

F – 360-542-2264

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No virus found in this message.

Checked by AVG - [www.avg.com](http://www.avg.com)

Version: 2013.0.2899 / Virus Database: 2639/6118 - Release Date: 02/20/13





# STATE OF ALASKA

## DEPARTMENT OF FISH AND GAME

### Fish Resource Permit Application

— **Fillable Form** —

A **FISH RESOURCE PERMIT** is required to take, possess, hold alive, or tag FISH AND THEIR EGGS (except goldfish and decorative tropical fish) FOR SCIENTIFIC OR EDUCATIONAL PURPOSES.

Mike Salzetti	Homer Electric Association	
(Name of Applicant) (Organization or School)		
280 Airport Way, Kenai, AK 99611		
(type in complete mailing address including City, State, and Zip Code)		
907-283-2375	907-335-6213	msalzetti@homerelectric.com
(your Telephone Number) (Fax Number)		(Email Address)
N/A		
(type in the name and address of the organization with which you are under contract)		

**I am making application to capture fish of the following species, life stage, and number for the specified disposition** (disposition examples: identify and release, measure and release, genetic sample and release, tag and release, sacrifice, transport live, hold alive, etc.):

*Note: If additional space is necessary, attach a separate file to provide a table formatted as required.*

Species Common Name	Species Scientific Name	Life Stage	Number	Disposition*
Chinook Salmon	Oncorhynchus tshawytscha	Juvenile & Adult	1000s	All fish returned alive to stream after identification or sampling. Measure, tag and release a sample of fish (see section 4). Genetic samples obtained and fish released. Combined juvenile and adult sampling and handling is expected to be in the thousands (weir, smolt trap, stream sampling methods)
Sockeye Salmon	Oncorhynchus nerka	Juvenile & Adult	1000s	All fish returned alive to stream after identification or sampling. Measure, tag and release a sample of fish (see section 4). Genetic samples obtained and fish released. some fish Combined juvenile and adult sampling and handling is expected in the thousands (weir, smolt trap, stream sampling methods)
Coho Salmon	Oncorhynchus kisutch	Juvenile & Adult	100s	All fish returned alive to stream after identification or sampling. Measure, tag and release a sample of fish (see section 4). Genetic samples obtained and

				fish released. Combined juvenile and adult sampling and handling is expected to be in the hundreds (weir, smolt trap, stream sampling methods)
Rainbow Trout	Oncorhynchus mykiss	Juvenile & Adult	100s	All fish returned alive to stream after identification or sampling. Measure, tag and release a sample of fish (see section 4). Combined juvenile and adult sampling and handling is expected to be in the hundreds (weir, smolt trap, stream sampling methods).
Dolly Varden	Salvelinus malma	Juvenile & Adult	100s	All fish returned alive to stream after identification or sampling. Measure, tag and release a sample of fish (see section 4). Combined juvenile and adult sampling and handling is expected to be in the hundreds (weir, smolt trap, stream sampling methods)
Arctic Grayling	Thymallus arcticus	Juvenile & Adult	<100	All fish returned alive to stream after identification or sampling. Measure and release a sample of fish (see section 4). Combined juvenile and adult sampling and handling is expected to be rare at less than 100 (weir, smolt trap, stream sampling methods)
Sculpin sp.	Cottus sp.	Juvenile & Adult	100s	All fish returned alive to stream after identification or sampling. Measure and release a sample of fish (see section 4). Combined juvenile and adult sampling/handling is expected to be in the hundred (stream sampling methods)

\*If capturing at multiple sample locations give details of species, life stage, number, and disposition in your study plan.

**I understand permits are only valid for dates within a calendar year; I am requesting this permit for the following period: (a new application is required each year)**

2013	March 25	November 30
------	----------	-------------

Year: (20\_\_)

From: (month and day)

To: (month and day)

I wish to obtain the above fish [finfish, shellfish, amphibians] by means of:

**minnow traps, electrofishing, beach seine, 2 smolt traps (incline or screw), dip nets, angling, and weir.**  
(Specify gear type(s): minnow traps, hoop traps, fyke nets, gillnets, dip nets, spat collectors, etc.)

from the following location(s):

**Various locations in Grant Creek from (60.457442°/-149.362571°-Mouth) to ( 60.461236°/-149.337609°- Grant Lake outlet) & Trail Lake Narrows ( 60.459298°/-149.362731°): Lat and longs obtained from Google Earth imagery.**

(Specify location(s), i.e., X River at latitude/longitude, or ESE of Pt. Barrow, or on Kodiak Island, etc.)

**The purpose of the activities for which a permit is being requested: (a brief purpose statement)**

See attached study plan (sections 1-Intro, 2-Overall Goals, & 3.3-Need for Additional Information). Together with existing information, the goals of the study efforts described in the study plan are to document existing conditions in the Grant Lake watershed and assess how these conditions may be impacted (positively or negatively) by the proposed Grant Lake Hydro Electric Project.

(This area will expand as you type.)



**NOTE: A STUDY PLAN or RESEARCH PROPOSAL explaining the purpose and need, the objectives, and the procedures you will use must be included in/with this permit application:**

See attached study plan (sections 4.2, 4.3, 4.4, 4.5 & 4.10)

(This area will expand as you type or you may attach the study plan or research proposal.)

**Final disposition of collected specimens\* not released live at the site of capture will be (e.g. after conclusion of study, frozen and disposed of in landfill):**

See attached study plan (sections 4.2, 4.3, 4.4, 4.5 & 4.10): Fish collections are only for scientific baseline studies related to the Grant Creek HEA hydro-license application. Fish will be released alive at or near the point of capture. Scale and genetic samples will be taken on live fish at the weir and returned to the stream.

\*(specimens may not be consumed, sold, traded, bartered, or used in any commercial manner)

**The following people will participate in field collections under terms of this requested permit:**

John Stevenson (BioAnalysts)	Other seasonal BioAnalysts staff yet to be hired	
Denny Snyder (BioAnalysts)	Pete Delachapelle (McMillen)	
Mark Miller (BioAnalysts)	Andrew Scott (McMillen)	
Keith Watson (BioAnalysts)	Brian Johnson (McMillen)	
Gary Fandrei (CIAA)	Other seasonal CIAA staff yet to be hired	
John Blum (McMillen)	Nathan Weber (CIAA)	
Charles Sauvageau (McMillen)	Ron Carlson (CIAA)	
Tim Riley (McMillen)		

**I certify that all statements entered on this application are true, that I will abide by all conditions and restrictions of a permit if issued, and promise to submit a report of activities carried out under terms of such permit:**

N/A	Salzetti, Mike	Fuel Supply & Generation Engineering Manager, Homer Electric Association	2/20/2013
-----	----------------	--	-----------

(Last fish resource permit (Name: First, MI, Last)  
number, if any)

(Title)

(Date)

**Submit Complete Application For:**

**Freshwater environment collections**

(Division of Sport Fish):

**By Email:** [scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

**By Mail:**

Attn: Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish - HQ  
333 Raspberry Road  
Anchorage, AK 99518

**Phone:** (907) 267-2517

**Marine environment collections and  
permits involving propagation**

(Division of Commercial Fisheries):

**By Email:** [dfg.fmpd.permitcoordinator@alaska.gov](mailto:dfg.fmpd.permitcoordinator@alaska.gov)

**By Mail:**

Attn: Permit Coordinator  
Alaska Department of Fish and Game  
Division of Commercial Fisheries-HQ  
P.O. Box 115526  
Juneau, AK 99811-5526

**Phone:** (907) 465-4724



Legend

Adult Weir

Camp

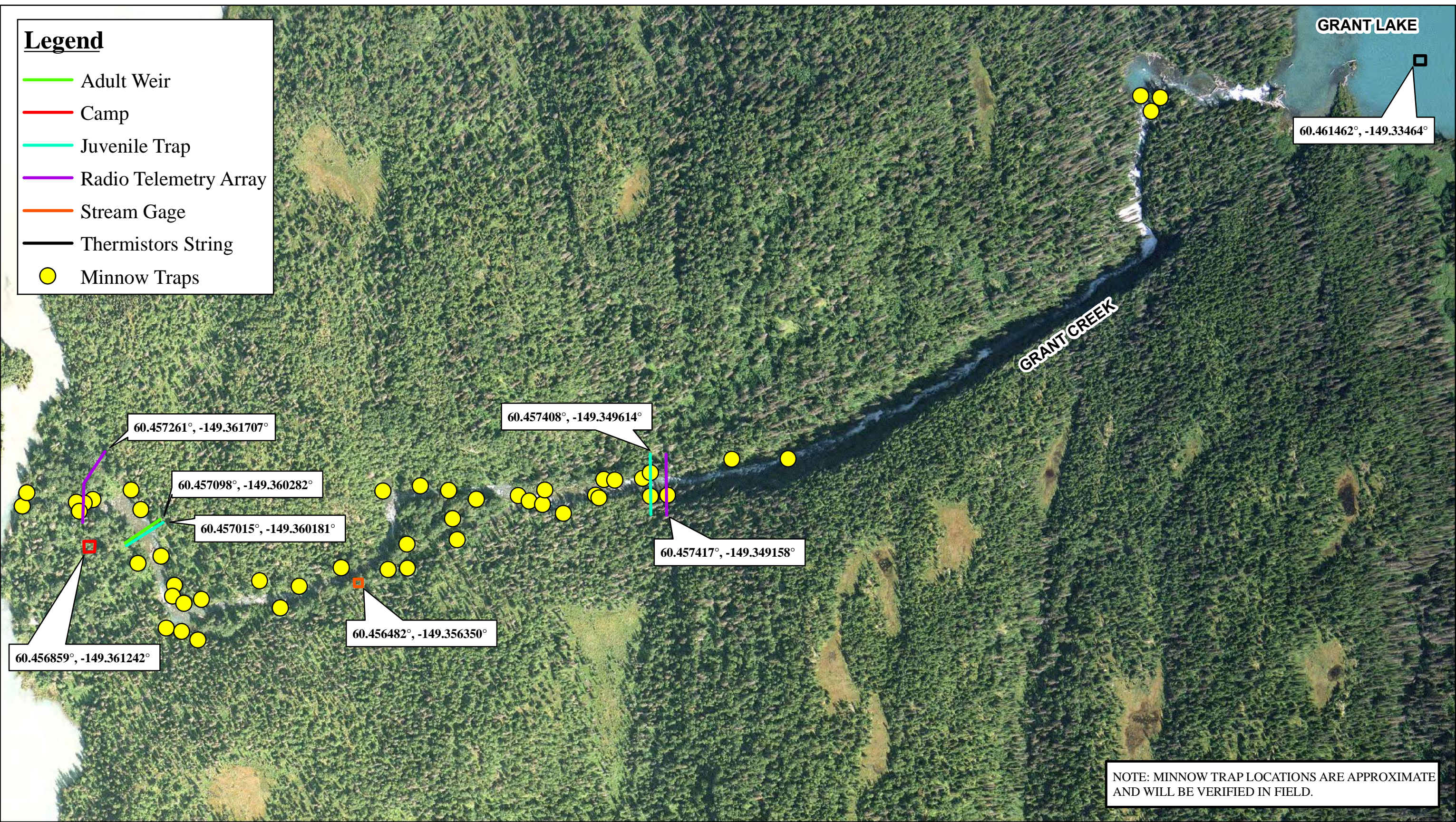
Juvenile Trap

Radio Telemetry Array

Stream Gage

Thermistors String

Minnow Traps



REV	DATE	BY	

WARNING

01/41/2

IF THIS BAR DOES NOT  
MEASURE 1/2" THEN  
DRAWING IS NOT TO SCALE.

McMILLEN, LLC

THE SONNA BUILDING  
910 MAIN ST., SUITE 258  
BOISE, ID 83702

OFFICE: 208.342.4214  
FAX: 208.342.4216



MULTI-AGENCY PERMIT APPLICATION

GRANT CREEK AQUATIC AND WATER RESOURCE SITES

0220440660880 Feet

DESIGNED	C. WARNOCK	DRAWING
DRAWN	J. WOODBURY	
CHECKED	C. WARNOCK	
ISSUED DATE	2/1/2013	
SCALE:		



Grant Lake Project  
(FERC No. 13212)

# **Aquatic Resources**

## *Final Study Plan*

**Prepared for:**  
**Kenai Hydro, LLC**  
**3977 Lake Street**  
**Homer, AK 99603**

*November 2012*

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### **List of Abbreviations and Acronyms**

<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>AEIDC</b>	Arctic Environmental Information and Data Center (University of Alaska)
<b>AHRS</b>	Alaska Heritage Resources Survey
<b>APA</b>	Alaska Power Authority
<b>ARWG</b>	Aquatic Resources Work Group
<b>AWC</b>	Anadromous Waters Catalog
<b>BLM</b>	Bureau of Land Management
<b>°C</b>	Degrees Celsius
<b>cfs</b>	cubic feet per second
<b>cm</b>	centimeter
<b>CPUE</b>	catch per unit effort
<b>°F</b>	Degrees Fahrenheit
<b>DNR</b>	Alaska Department of Natural Resources
<b>EPA</b>	Environmental Protection Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FL</b>	Fork Length
<b>fps</b>	feet per second
<b>ft</b>	feet
<b>G&amp;A</b>	general and administrative
<b>GPS</b>	global positioning system
<b>GWh</b>	gigawatt hours
<b>HEP</b>	Hydroelectric Evaluation Program
<b>IFIM</b>	instream flow incremental methodology
<b>in</b>	inch
<b>KHI</b>	Kenai Hydro Inc.
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>kWh</b>	kilowatt hours
<b>LLC</b>	Limited liability company
<b>mg/L</b>	milligrams per liter
<b>mi</b>	mile

<b>MIF</b>	minimum instream flow
<b>mm</b>	millimeter
<b>MSL</b>	Mean sea level
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NWI</b>	National Wetlands Inventory
<b>O&amp;M</b>	Operations & maintenance
<b>RM</b>	river miles
<b>RVDs</b>	Recreation visitor days
<b>TL</b>	total length
<b>TWG</b>	technical working group
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	U.S. Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>YOY</b>	Young of the year

# **Aquatic Resources Study Plan Grant Lake Hydroelectric Project (FERC No. 13211/13212)**

## **1 Introduction**

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD), along with a Notice of Intent to file an application for an original license, for a combined Grant Lake/Falls Creek Project (FERC No. 13211/13212 ["Project" or "Grant Lake Project"]) under Part I of the Federal Power Act. On September 15, 2009, FERC approved the use of the Traditional Licensing Process for development of the license application and supporting materials. As described in more detail below, the proposed Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake.

The Project will be located near the community of Moose Pass, Alaska in the Kenai Peninsula Borough, approximately 25 miles north of Seward, Alaska and just east of the Seward Highway (State Route 9).

This Aquatic Resources study plan is designed to address information needs identified in the PAD, during the Traditional Licensing Process public comment process, and through early scoping conducted by FERC. A study report will be produced that presents existing information relative to the scope and context of potential effects of the Project. This information will be used to analyze Project impacts and propose protection, mitigation, and enhancement measures in the draft and final license applications for the Project.

## **Proposed Project Description**

The PAD Project proposal included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

The proposed Project would be composed of a diversion dam at the outlet to Grant Lake, an intake structure in Grant Lake, a tunnel, a surge tank, a penstock, a powerhouse, a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, an overhead or underground transmission line, and a pole-mounted disconnect switch where it ties into the existing City of Seward distribution line or Chugach Electric's transmission line. The powerhouse would contain two Francis turbine generating units with a combined rated capacity of 5.0 MW with a total design flow of 385 cfs.

Two modes of operation are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at a specific output level. Level control, or balancing of outflow to inflow, will likely only occur during periods of low natural inflow to Grant Lake when the reservoir is at or near minimum pool elevation. Due to the small size of the Project in relation to the size of the interconnected system, the Project is not likely to be used to load follow.

Prior to reinitiating planning efforts for natural resource studies, KHL was evaluating two potential access road routes. The Falls Creek route would be approximately 3 miles long beginning at the south end of Lower Trail Lake, and the Trail Lake Narrows route would be about one mile long beginning at the Seward Highway. In early 2012, KHL determined that the Trail Lake narrows route was the most feasible and has eliminated the Falls Creek route from consideration. The Trail Lake Narrows route has not been fully assessed from a natural resource perspective and will be comprehensively evaluated in 2013 as part of this study effort.

## **2 Overall Goals Identified during Project Scoping**

Together with existing information, the goals of the study efforts described in this plan are to provide baseline information, and where applicable, information on alternative flow regimes, which will allow an assessment of potential Project impacts on aquatic resources in the study report. These impact assessments will identify potential protection, mitigation, and enhancement measures to be presented in the draft and final license applications.

The goals of this suite of studies are to provide supporting information on the potential resource impacts of the proposed Project that were identified during development of the PAD, public comment, and FERC scoping for the License Application, as follows:

- Impact of Project operation on sediment transport (relative to the availability of spawning gravels) due to changes in flow in Grant Creek.
- Impact of Project operation (fluctuating lake levels in Grant Lake, changes in seasonal flow in Grant Creek, reduced flows between the dam and powerhouse on Grant Creek) on fish abundance and distribution.
- Impact of Project construction and operation on biological productivity and abundance of fish food organisms in Grant Creek and Grant Lake.
- Impact of Project intake structure operation on fish populations.
- Impact of Project construction on fish habitat in Grant Creek.
- Impact of Project facilities (increased access) on fish populations due to potential increased recreational fishing.
- Impact of Project construction and operation on commercial, sport, and subsistence fisheries supported by the Kenai River watershed.

Specific objectives and quantitative objectives are presented below for each individual study component.

## **3 Existing Information**

Information relating to aquatic resources has been collected during previous investigations into the potential development of hydroelectric generation at Grant Creek as well as during pre-licensing studies conducted by KHL in 2009 and early 2010.

### 3.1 Pre-2009 Studies

Previous FERC licensing efforts in the 1960s and 1980s for a proposed hydroelectric project at Grant Lake included studies of fish resources in Grant Lake and Grant Creek. Arctic Environmental Information and Data Center (AEIDC 1983) conducted fish sampling from 1981 to 1982 as part of a comprehensive environmental baseline study effort and the USFWS (1961) conducted limited sampling from 1959 to 1960. An instream flow study was completed in 1987 as part of a preliminary FERC license application prepared by Kenai Hydro, Inc. (not related to the current Kenai Hydro, LLC; Envirosphere 1987, KHI 1987a, and KHI 1987b).

**Grant Creek Fish Resources** - Both anadromous and resident fish are present in Grant Creek, including salmon, trout, and other species. Spawning Chinook (*Oncorhynchus tshawytscha*), Sockeye (*Oncorhynchus nerka*), and Coho (*Oncorhynchus kisutch*) salmon, as well as Rainbow trout (*Oncorhynchus mykiss*) and Dolly Varden (*Salvelinus malma*) are found in the lower reaches of Grant Creek (APA 1984; Johnson and Klein 2009; Figure 1). Rearing Chinook, Coho and Rainbow trout are also present (APA 1984, Johnson and Klein 2009). Round whitefish (*Prosopium cylindraceum*) and Arctic grayling (*Thymallus arcticus*) were caught during angling surveys but are not assumed to spawn in Grant Creek (APA 1984).

Upper Grant Creek is impassable to salmon 0.5 mile (APA 1984) to 1 mile (Johnson and Klein 2009) upstream of the mouth; fish habitat is most likely concentrated within the lower portion of stream. Habitat for juvenile fish exists mainly in stream margins, eddies, deep pools, and side channels offering reduced velocities (APA 1984). Substrate material is coarse throughout the entire length of the creek due to high water velocity that tends to wash away smaller gravels (APA 1984). Isolated areas of suitable spawning gravels occur in the lower half of the stream (APA 1984).

Periodic minnow trapping on Grant Creek from July 1959 through January 1961 captured juvenile Chinook salmon, Coho salmon, Dolly Varden char, and sculpin (extent of sampling area unknown; USFWS 1961). Minnow trapping and electrofishing in the lower reaches of Grant Creek for week-long periods in October 1981 and March, May, June, and August 1982 yielded higher catches of trout, salmon, and Dolly Varden in the fall and summer than in winter and spring (AEIDC 1983). Catches of Dolly Varden were generally most abundant in the minnow traps, followed by juvenile Chinook, juvenile Rainbow trout, and juvenile Coho. Juvenile Chinook were the most commonly caught fish during electrofishing surveys (APA 1984).

APA (1984) estimated that Grant Creek supported 250 Chinook spawners and 1,650 Sockeye spawners. The stream was also estimated to support 209 8-inch “trout” (including Dolly Varden and Rainbow trout) (APA 1984). Spawning Coho were not observed (APA 1984) but have been recorded as being present at unknown levels in the stream by the AWC (Johnson and Klein 2009). Maximum counts from intermittent stream surveys by ADFG were 76 Chinook (1963) and 324 (1952) Sockeye salmon.<sup>1</sup>

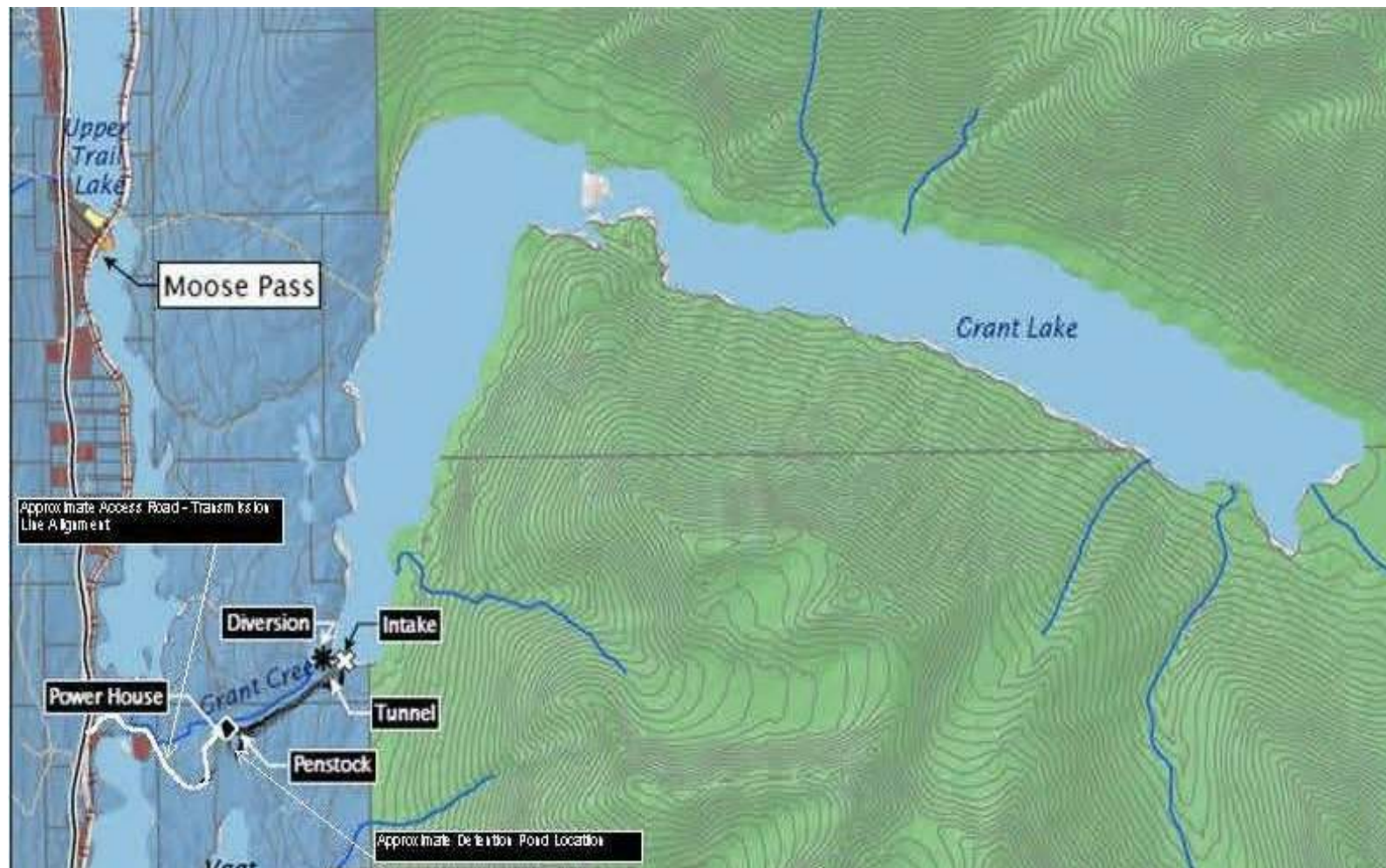
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<sup>1</sup>Anadromous Waters Catalog Stream Nomination #08-153,  
<http://www.sf.adfg.state.ak.us/SARR/FishDistrib/Nomination/FDDNomHome.cfm>

**Grant Lake Fish Resources** - Sampling during 1981-1982 found no fish in any of the tributaries to Grant Lake (AEIDC 1983). Sculpin and Threespine stickleback were the only fish found to inhabit Grant Lake. A series of impassable falls<sup>2</sup> near Grant Lake's outlet prevents colonization of the lake by salmonids via Grant Creek (APA 1984). Density of Threespine stickleback was ten times higher in the lower basin than the upper basin of Grant Lake (AEIDC 1983).

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<sup>2</sup> 2007 ADFG Stream survey referenced in Anadromous Waters Catalog Stream Nomination #08-153, <http://www.sf.adfg.state.ak.us/SARR/FishDistrib/Nomination/FDDNomHome.cfm>



**Figure 1. Fish and aquatic resources study area.**

Because of the impassable falls below Grant Lake's outlet, no anadromous fish species occur in Grant Lake and its tributaries (USFWS 1961, AEIDC 1983, APA 1984), and Grant Lake is not included in the Anadromous Waters Catalog (AWC) published by ADF&G (Johnson and Daigneault 2008). Grant Lake appears to support only resident populations of sculpin—including Slimy sculpin (*Cottus cognatus*) and Coast Range sculpin (*Cottus aleuticus*)—and Threespine stickleback (*Gasterosteus aculeatus*) (AEIDC 1983, USFWS 1961, Johnson and Klein 2009). Although Sisson (1984) reported that Dolly Varden and a few Rainbow trout occupied Grant Lake, subsequent investigations (USFWS 1961, AEIDC 1983, Marcuson 1989) have documented only sculpin and stickleback. From 1983-1986, coho salmon fry were stocked in Grant Lake by ADF&G, with limited success, though some enhanced returns to Grant Creek were recorded (Marcuson 1989).

**Instream Flow** - Environmental analyses that emphasized the relationship between stream flow and aquatic habitats (instream flow studies) were conducted on Grant Creek in the 1980s by Kenai Hydro, Inc. (KHI; unrelated to Kenai Hydro, LLC). These documents were compiled in support of a license application for hydropower development on Grant Creek. The documents include reports and written communications between KHI and state and federal agencies in 1986 and 1987 relative to a FERC license application for the proposed Grant Lake Hydroelectric Project (FERC No. 7633-002). Included were draft and final reports of a limited but complete Instream Flow Incremental Methodology (IFIM) investigation and negotiated minimum instream flows and ramping rates (Envirosphere 1987, KHI 1987a, and KHI 1987b). A technical memorandum was drafted and shared with the Instream Flow Technical Working Group (TWG) participants in 2009 detailing the results of the previous instream flow study efforts (HDR 2009b).

### 3.2 2009 and 2010 Aquatic Resources Studies

The 2009 aquatic resources study program was intended to begin the process of acquiring resource information needed for FERC licensing and other regulatory requirements. Emphasis was on updating existing information, acquiring more complete information required for specific issue analysis, and providing background information needed to develop more focused studies after initiation of the formal FERC licensing process. The studies were continued in 2010 but the program was discontinued in July, 2010 to revise the study plans as a result of comments received during the FERC scoping process. Most of the studies planned for 2010 were not completed.

**Fish** - The 2009 fisheries study (HDR 2009a) focused on the following objectives:

- Determine the relative abundance and distribution of juvenile fish in Grant Creek.
- Determine the relative abundance and distribution of resident Dolly Varden and Rainbow trout in Grant Creek.
- Estimate abundance and run timing of spawning salmon.
- Estimate abundance and run timing of spawning adult resident fish.
- Determine fish presence and distribution in Grant Lake.

Consistent with studies conducted by AEIDC (1983), Grant Creek was divided into study Reaches 1 through 6. Reaches 1 through 4 were roughly 0.25 mi each in length and Reaches 5 and 6 were established based on geomorphologic characteristics (HDR 2009a; Figure 2).



Kenai Hydro Environmental Baseline Studies

Figure 2

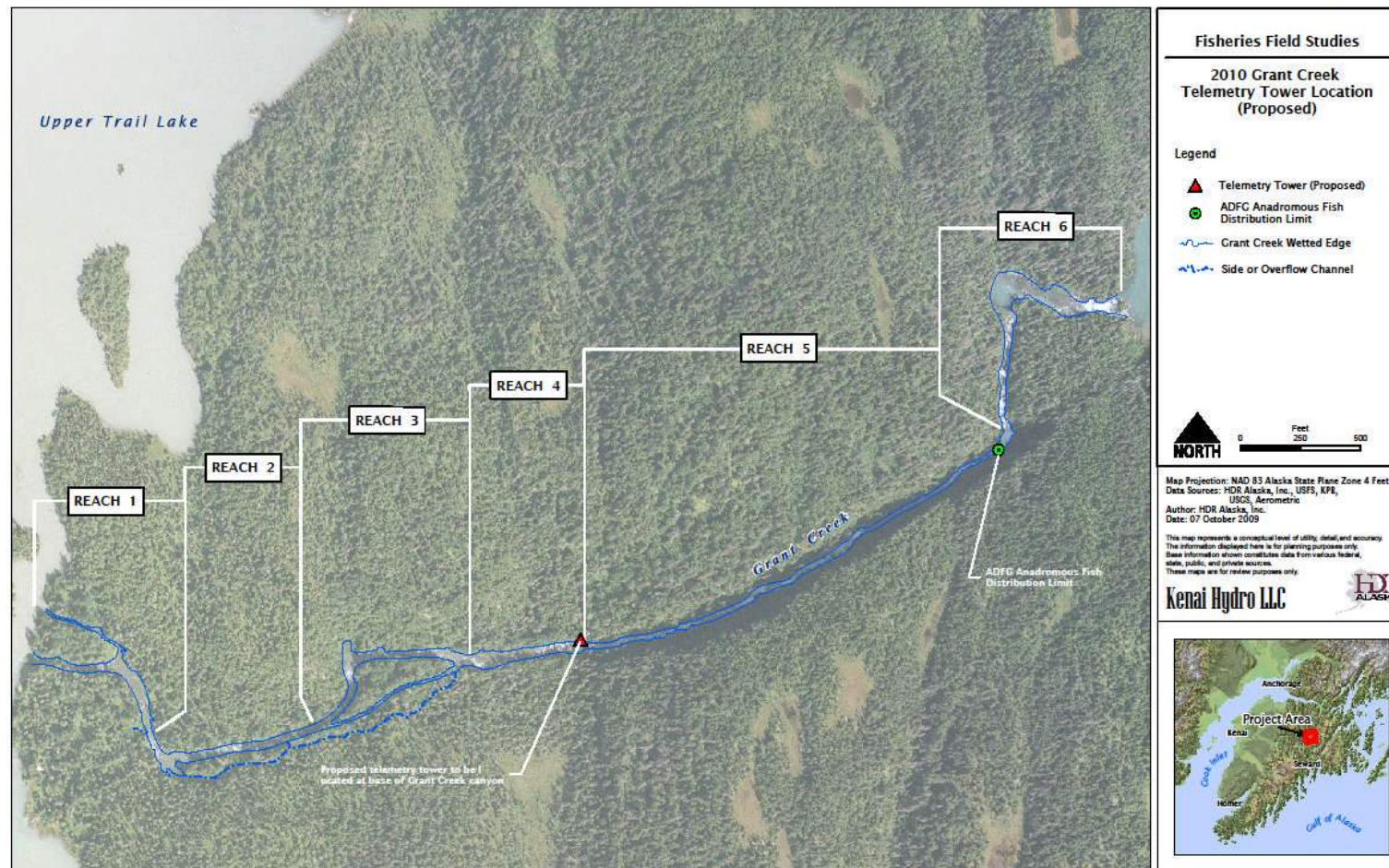


Figure 2. Study reaches designated on Grant Creek and proposed telemetry tower location.

Relative abundance and distribution of juvenile fish were determined by minnow trapping and calculating the catch-per-unit-effort (CPUE) for each reach. Reaches 1 through 4 were sampled relatively evenly, with nine to 13 minnow traps per reach. Terrain was difficult to access in Reaches 5 and 6, so these reaches were sampled less frequently and with only three and five sites, respectively. A total of 50 baited minnow traps were placed throughout the creek in Reaches 1 through 6; mesh size was 0.25 inch. The creek was sampled monthly, with the exception of Reach 6, which was sampled in June and August only. Dolly Varden were found to be the most abundant species in Grant Creek and distributed throughout Grant Creek Reaches 1 through 5, although they had a greater relative abundance in Reaches 4 and 5. Coho salmon was the next most abundant species and individuals were distributed throughout Reaches 1 through 5. However, coho appeared to have the greatest relative abundance in Reach 1. Chinook salmon was the next most abundant species. There was a noticeable decrease in Chinook abundance in upstream reaches, and they were not caught above Reach 4. Other fish present in small numbers were Sockeye salmon, Rainbow trout, sculpin, and threespine stickleback. Most salmon captured were young-of-the-year with few larger juveniles present (HDR 2009a).

Relative abundance of larger size resident salmonids (i.e., Rainbow trout and Dolly Varden) was determined by calculation of angling CPUE (HDR 2009a). A total of 18 angling sites were established along the creek, and each site was fished for 30 minutes approximately every 10 days, from early June through late September. Rainbow trout ( $n = 68$ ) were found to be more abundant than Dolly Varden ( $n = 9$ ) and were caught throughout the creek, although their relative abundance was higher in Reaches 3 through 5 than in Reaches 1 and 2. Dolly Varden were captured in Reaches 1, 2, and 3; their relative abundance was highest in Reach 1. This study was also aimed at determining the timing of spawning of adult resident fish; however, it appeared that spawning, if present, occurred before or after the 2009 study period, since little evidence of spawning fish was seen (HDR 2009a). Rainbow trout angling studies were continued in the spring and early summer of 2010 to confirm the presence of spawning and determine fish numbers. The progression of reproductive condition and the presence of adult rainbow trout in spawning condition confirmed that spawning did occur in Grant Creek in 2010. Capture success was too low to allow population estimates. Adult rainbow trout were observed in the upper portions of the canyon reach.

Abundance and run timing of spawning anadromous fish was estimated through data collected during foot surveys (HDR 2009a). Foot surveys occurred approximately every 10 days beginning in mid-June and ending in late September. Both Sockeye and Chinook salmon were seen in the lower five reaches. Chinook salmon reached Grant Creek first around the beginning of August. Sockeye salmon did not arrive until the end of August. Escapement of Chinook salmon was estimated to be 231 fish, and escapement of Sockeye salmon was estimated at 6,293.

Fish distribution and presence in Grant Lake and its tributaries were assessed using minnow traps, electrofishing, and gill nets (HDR 2009a). Sampling occurred at nine gill netting sites, 18 electrofishing sites, and 28 minnow trapping sites. Threespine stickleback was the dominant species in the lake followed by sculpin. No other species of fish was captured (HDR 2009a).

**Instream Flow** - The collaborative process for a study of “instream flow” effects in Grant Creek was initiated in 2009 (HDR 2009a). The primary goal of the 2009 instream flow study program was to establish a Technical Work Group (TWG) consisting of state and federal resource agency staff, KHL staff, and interested members of the local community. Once established, the TWG

met three times during the 2009 study season to review the results of the 2009 aquatic baseline study efforts, discuss and agree upon an acceptable instream flow evaluation method, and request additional information to support the selection of an instream flow method (HDR 2009a).

As part of the instream flow study, and at the request of the TWG, a sampling event was conducted from 23 to 25 June 2009 on Grant Creek to characterize the types of aquatic habitats used by resident fish and rearing fish (HDR 2009a). Aquatic habitat was described at each sample site by recording macro-, meso-, and micro- habitat characteristics. During the June sampling event, snorkeling was the primary method used to document fish presence. Electrofishing was used primarily to confirm species identification and calibrate fish length estimates (HDR 2009a).

Collaboratively, the TWG and KHL decided to select an instream flow study methodology based on the knowledge obtained from the summer 2009 aquatic resources and hydrology studies (HDR 2009a). Data and analyses from these studies were shared with the TWG in July and September. Based on the knowledge gained of Grant Creek's fish and hydrologic resources, KHL presented a proposed instream flow approach to the TWG on 23 September (HDR 2009a). Physical stream data required for instream flow modeling per the proposed approach were collected at 18 transects during low- and mid-flow conditions in 2010.

**Macroinvertebrates, Plankton, and Periphyton** - Benthic macroinvertebrate and periphyton samples were collected in Grant Creek in August, 2009 (HDR 2009a). Macroinvertebrate population density and taxa diversity can be used to assess stream water and habitat health and macroinvertebrates are an important source of food for fish. Periphyton (algae attached to large rocky substrate) is used to assess chlorophyll *a* content, an indicator of primary productivity. The sampling event was scheduled to occur during the time of year that typically displays the peak of diversity and population densities.

Sampling in 2009 was postponed due to a large rain event (HDR 2009a). This rain event may have scoured Grant Creek, dislodging many larger genera of macroinvertebrates and washing them out of the system. The macroinvertebrates that were found were typically smaller genera, although taxa diversity was at levels expected for south central Alaska streams. Periphyton is not affected as easily by high flow.

Zooplankton and phytoplankton were collected in Grant Lake in August (HDR 2009a). Phytoplankton samples were analyzed for chlorophyll *a* concentrations similar to periphyton in the creek. Concentrations in the lake were lower than that found in the creek.

### **3.3 Need for additional information**

Early study programs and the 2009-2010 baseline study program conducted by KHL have provided a significant amount of background information regarding aquatic resources in the Project area. Following analysis of the 2009 and 2010 study results, information gaps were identified for further study to support the FERC licensing process and accompanying permit requirements. Proposed additional field studies are intended to provide information on the following general topics. Specific objectives for study components will be described below for each component.

- Juvenile fish use of winter habitats.

- Better definition of fish use of microhabitats and overall species composition and relative abundances in Reaches 1 through 4.
- Extent of Rainbow trout spawning in Grant Creek.
- Use of Reach 5 by juvenile and adult fish, with additional emphasis on spawning Chinook salmon use of Reach 5.
- Delineation of aquatic habitats available in Grant Creek; identify key habitats for fish and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.
- Estimation of salmon spawning escapement in Grant Creek.
- Examination of how important individual habitat units may be affected by changes in flow due to the operation of the proposed Project using instream flow assessment methods.
- Baseline diversity and abundance characteristics of benthic macroinvertebrates in Grant Creek.
- Baseline primary productivity of Grant Creek as measured by chlorophyll *a* concentration in phytoplankton samples.
- Fish resources and habitat use of the Trail Lake Narrows at the proposed bridge site.

## **4 Methods**

Aquatic resources of Grant Creek will be studied through an integrated study program with three main disciplines: fish biology, instream flow, and an aquatic ecology element that includes macroinvertebrates and periphyton. Specific methods for aquatic resources are described below.

### **4.1 Study Area**

Water bodies to be investigated as part of the Aquatic Resources Study Plan include Grant Lake and Grant Creek, located near the community of Moose Pass, Alaska, approximately 25 miles north of Seward, Alaska, and just east of the Seward Highway (State Route 9). The proposed Project location is in the Kenai Peninsula Borough. The study area is shown in Figure 1.

### **4.2 Field Study Components**

Field studies will include the following principal components, each designed to address one or more specific concerns:

1. Grant Creek salmon spawning distribution and abundance:
  - Use of a counting weir to inventory upstream migrating salmon.
  - Supplemental foot surveys of Grant Creek to determine distribution and abundance of spawning salmon.

- Telemetry study of Chinook and Sockeye salmon spawning distribution, with emphasis on the inaccessible canyon section of Grant Creek (Reach 5).
2. Grant Creek resident and rearing fish distribution and abundance:
    - Use of a counting weir to inventory the movements and abundance of adult resident species.
    - Telemetry study of Rainbow trout to determine the distribution of spawning and feeding areas in Grant Creek.
    - Surveys to determine fish presence in suspected overwintering habitats.
    - Surveys of Grant Creek to estimate distribution and abundance of juvenile fish by habitat type, with emphasis on areas not surveyed in 2009 including Reach 5.
    - Juvenile fish outmigration monitoring in spring and fall.
  3. Grant Creek aquatic habitat mapping:
    - Synthesis of fish use and aquatic habitat data for Grant Creek.
    - Delineation of aquatic habitats in Reaches 1 through 5 of Grant Creek.
    - Surveys to ground-truth office-based habitat delineation, fill spatial data gaps, and verify fish use of aquatic habitats.
    - Identification of key habitats based on observed fish use.
    - Analysis of habitat factors that distinguish key habitats from other habitats available in Grant Creek.
  4. Grant Creek Instream Flow Study, including the following components:
    - Habitat availability analysis using measurements of stream geometry at the 18 previously selected transect sites.
    - Fish use of meso- and microhabitats.
    - Integration of flow and temperature monitoring.
    - Analysis and modeling to predict habitat response to changes in flow regime.
  5. Benthic macroinvertebrates in Grant Creek:
    - Sampling using pseudo-replication Surber sampling methods to estimate population density in riffle/run habitats.
    - Macroinvertebrate identification to genus level (when possible) identification for use in calculating population metrics.
  6. Periphyton in Grant Creek:
    - Collecting periphyton samples from riffle areas at two locations within Grant Creek.
    - Analyzing chlorophyll a concentration in individual samples.
  7. Trail Lake Narrows Aquatic Resource and Habitat Use
    - Seasonal fish abundance and distribution in the vicinity of the proposed bridge

- crossing site
- Assessment of the aquatic habitats at the bridge crossing – Fish habitat use and distribution

### **4.3 Grant Creek Fish Weir**

A weir is being proposed as a principal means of fish capture and inventory for several of the study components. Because of its application to multiple studies, weir methodology is being described in this separate section. Its specific applicability to each of the study components will be described in the appropriate sections below.

Grant Creek is a high gradient stream with substantial flow variation over the course of the open water study season. Consequently, a weir on Grant Creek will need to be designed to accommodate the difficult stream conditions. Many different weir designs have been used in fisheries research that could potentially be adapted to Grant Creek conditions. Resistance board, floating picket weir has been used successfully in fast streams in Alaska and other western states (Stewart, 2002). Such designs use a resistance board and floating pickets to allow debris and high water to pass over the top of the weir. This design minimizes the amount of maintenance required during weir operation and reduces the chance that high water will damage the weir. Regardless of the weir design selected, the spaces between pickets must be small enough to intercept adult sized Rainbow trout. A Grant Creek weir could be custom constructed, borrowed from fish research agencies, or purchased from one of several vendors. Resistance board weirs generally consist of the following components: a trap box to hold fish diverted by the weir, floating panels hinged to the stream bottom, a rail system to attach the panels to the stream bottom, and rigid picket modules at each bank. Other designs consist of rigid pickets extending across the stream. Potential configurations are highly variable depending on the stream characteristics and project needs. The primary intent of the weir is to catch upstream migrating fish. Some designs will also allow downstream passage.

Ideally, the spacing of the weir pickets should be such that it will capture fish of a size range from adult Rainbow trout to adult salmon. However, it is recognized that there are limitations to how closely spaced the pickets can be and still be practical in a high gradient stream. Consequently, a maximum 3 inch spacing is specified to assure capture of all salmon species. Closer spacing would be desirable so that some larger resident species would also be captured.

It may be desirable for the weir to be opened to allow unobstructed passage of fish during part of the open water season when few fish are moving within the stream or when high water makes weir monitoring impractical. When the weir is in place, it will be monitored at least twice per day and trapped fish will be released upstream of the weir. All fish caught in the weir will be identified to species and enumerated. Captured fish will also be measured if time allows and fish quantity is not too large to allow safe handling. Additional processing of fish is described below for the individual study components.

The Grant Creek weir will be installed at a suitable location as close to the stream mouth as possible during low flow in late April - early May of 2013 prior to breakup. It will be left in place until freeze-up at which time all components will be removed from the stream.

## **4.4 Grant Creek Salmon Spawning Distribution and Abundance**

The purpose of this study component is to characterize spawning salmon distribution, run timing, and relative abundance in Grant Creek. This study effort will consist of two principal components and several subcomponents:

- Use of a counting weir to obtain a direct count of all salmon entering Grant Creek during the open water season.
  - Weir counts will be compared to counts from foot surveys similar to those conducted during 2009 to calibrate earlier surveys and obtain an estimate of observer error when viewing fish from the stream bank.
- A radio telemetry study to further assess the spawning distribution of Chinook and Sockeye salmon, with emphasis on Reach 5 (Canyon Reach). Coho salmon may be included in the study if conditions allow.

### ***4.4.1 Salmon Escapement to Grant Creek – Relative Species Abundance***

#### **Project-Related Objectives**

- Assessment of numbers and species of salmon in Grant Creek as a whole.
- Identification of key species and critical time periods as required for environmental assessment.
- Identification of key species and critical time periods as may be applied to design of Project mitigation measures.
- Calibration of escapement estimates from foot surveys conducted in 2009.

#### **Quantitative Objectives**

- The primary objective is to obtain a nearly complete count of salmon of each species entering Grant Creek. It is recognized that some fish will likely escape the weir and that extreme flow events can interrupt complete counts. Such events, if they occur, will be documented. Use of the complete count methodology requires no specific statistical analysis.

During 2009 foot surveys, salmon counts were conducted approximately every 10 days from mid-June through September resulting in escapement estimates for Chinook and Sockeye salmon using an area-under-the-curve method based on a trapezoidal approximation using linear interpolation to estimate the number of fish present in the stream for the days not surveyed (Neilson and Geen, 1981; English et al., 1992; Bue et al. 1998). Survey life (the number of days a fish is alive in the survey area) and observer efficiency (the proportion of fish actually seen by the observers) were estimated based on professional judgment. Because of marginal visibility and untested estimates of stream life and observer efficiency (both required for area under the curve estimates), the accuracy of the 2009 estimates was questionable. It was decided that the use of a counting weir, while difficult in Grant Creek, was a preferable method for relative abundance estimation. Use of a weir will have several additional benefits as follows:

- It will provide exact timing of stream entry.
- It will allow capture of fish for age and length measurements.



- It will allow capture of fish for radio tag implantation (see below).
- It will allow monitoring of larger resident species as well as salmon.
- It will make possible a calibration of the 2009 foot surveys by comparing known fish numbers with visual estimates.

A weir, as described in Section 4.3 above, will be established near the mouth of Grant Creek prior to the start of the Chinook salmon run (mid-July) and will continue to be monitored until freeze-up. The time period will encompass the full run of Chinook and Sockeye salmon and most of the coho salmon run, if possible. The intent will be to keep the weir in place until the coho salmon run is completed; however, icing conditions might require premature removal of the weir. Information regarding the abundance and timing of coho salmon is currently scarce; consequently, the success of a weir at capturing cohos is unknown. If coho salmon are continuing to move upstream after the weir is removed, the run will continue to be monitored using foot surveys, at least through November. All salmon passing through the weir will be counted and representative samples will be sexed, measured, and tagged with Floy spaghetti tags. Scale samples will be taken from selected fish for aging. To determine the uniqueness of Grant Creek salmon, limited tissue samples for genetic analysis will be collected from selected fish, provided that a cooperative agreement can be arranged with ADF&G to conduct the appropriate analyses.

During times when the weir is being operated in capture mode, salmon will be directly counted by examining all fish in the capture box and releasing them upstream. During salmon runs, personnel will monitor the weir and empty the catch box at least twice per day, more often if necessary.

Foot surveys of lower Grant Creek (Reaches 1-4) will be conducted at least once a week during the Chinook and Sockeye salmon runs using procedures similar to those used in 2009. Numbers of fish visually observed will be compared to numbers of fish known to be present based on weir counts. Locations of fish will be documented using GPS coordinates and paper maps. Floy tags and radio tags will be recorded at the weir if carcasses are encountered.

Personnel on site will document as much incidental information as time allows. For example, carcasses floating downstream into the weir can be counted and tag numbers recorded to provide insight into the duration of stream life (date originally tagged vs. date the carcass was found).

#### ***4.4.2 Distribution of Spawning Salmon in Grant Creek***

##### **Project-Related Objectives**

- Identification of critical spawning habitats as required for general assessment of Project impacts.
- Identification of habitat areas appropriate for use in instream flow analysis.
- Provide input for Project mitigation needs by identifying sensitive stream segments.

##### **Quantitative Objectives**



- Numbers of radio tagged fish must be adequate to provide an acceptable representation of the spawning populations of each species. Hypothesis: distribution of tagged fish is identical to the distribution of the entire population.

During the 2009 preliminary investigations, the crew was unable to access Reach 5 (Figure 2), except for the first 100 meters beyond the reach-break between Reaches 4 and 5. Reach 5 was also not accessed in the 1980s by previous investigators (AEIDC 1983). High-velocity flows and cascades prevented safe wading of the stream, and precipitous terrain prevented walking along the edge of the stream. As a result, the upstream extent of salmon spawning activity in Grant Creek has not been adequately characterized. Turbid water due to glacial runoff in Grant Creek also lowered observer efficiencies and added to uncertainty of escapement estimates and spawning distribution in the remainder of the stream. A radio telemetry study is proposed to overcome the above shortcomings with emphasis on delineating spawning distribution within Reach 5 (Canyon Reach).

A representative number of Chinook, Sockeye, and possibly coho salmon will be captured near the mouth of Grant Creek in the weir described in Section 4.3 above. The number of Chinook and Sockeye salmon to be tagged will be based on the total escapement numbers estimated in 2009. Chinook salmon will be radio tagged starting in early August, with the goal of distributing the tags proportionately throughout the run, which is expected to last from mid to late August. Sockeye salmon will be radio tagged from August 20 to about September 10. The timing of the coho salmon run is currently unknown, so professional judgment and pertinent literature will be used to assess run timing for Coho. There will be 65 tags allocated for Chinook, 65 tags for Sockeye, and 20 tags for Coho.

Once fish are captured, coded transmitters will be inserted into their stomachs. Tags will be lubricated with glycerin and pushed down the esophagus into the stomach using a PVC tube. All radio-tagged fish will also be tagged with Floy spaghetti tags. Radio tags will be programmed to have a 60-day battery life and will include a feature that codes for the death of the fish. A fixed radio telemetry receiver will be installed at the reach-break between Reaches 4 and 5 (Figure 2) to detect when fish enter or exit Reach 5. Tracking surveys using a hand-held mobile receiver will be conducted at least weekly during the period when tagged fish are present in the stream. Frequent telemetry surveys will provide valuable information on stream life (*s*) and position information of tagged fish as part of area-under-the-curve estimation and spawning locations, respectively. A trail has been established along a safe route on the canyon rim paralleling Reach 5. Once a fish is detected, the crew will use triangulation techniques to identify the tagged fish's position. Locations of the tagged fish will be recorded using GPS coordinates as well as marked on hand-held maps.

Installation of a fixed-telemetry site near the confluence of Grant Creek will likely be pursued, which will provide information regarding Rainbow trout exodus from Grant Creek. If deployed, the system will consist of either underwater or aerial antennas monitoring each channel, and be combined so that they are monitored as a single antenna. Our approach will be based on the configuration of each channel, potential ambient electrical noise, and the challenges associated with each type of system.

Movements of all radio tagged fish will be mapped and analyzed. Information will be combined with the results of foot surveys as described in Section 4.4.1 to delineate likely spawning locations for each species and probable proportions of salmon that spawn in various stream reaches. Dates of fish death as indicated by the radio tags will be combined with carcass information and tagging dates to estimate stream life duration.

## **4.5 Grant Creek Resident and Rearing Fish Abundance and Distribution**

The purpose of this study component is to characterize distribution and abundance of all species of resident and rearing fish and run timing of Rainbow trout in Grant Creek. This study effort will consist of the following components:

- Weir inventory and telemetry study to assess run timing, relative abundance, and spawning habitat location for Rainbow trout.
- Investigation of juvenile fish presence in Reach 5 of Grant Creek using minnow traps and other sampling techniques.
- Minnow trap and video sampling in late winter/early spring at likely overwintering habitats to determine salmonid overwintering presence in Grant Creek.
- Snorkel sampling to determine fish use of mesohabitats in Grant Creek.

### **4.5.1 Adult Rainbow Trout Abundance, Distribution, and Spawning in Grant Creek**

#### **Project-Related Objectives**

- Assessment of relative numbers of Rainbow trout in Grant Creek as a whole.
- Identification of sensitive time periods as required for environmental assessment.
- Identification of important spawning and feeding habitats as required for general assessment of Project impacts.
- Provide input for Project mitigation needs by identifying sensitive stream segments.

#### **Quantitative Objectives**

- Obtain a count of adult Rainbow trout entering Grant Creek during the open water season. It is understood that some trout will likely escape the weir or be too small to be captured.
- Determine distribution of trout by tracking radio-tagged fish. Ideally, the numbers of radio-tagged fish should be adequate to provide a acceptable representation of the total Grant Creek population.

Angling surveys in 2009 and 2010 documented that modest numbers of adult and subadult Rainbow trout were widely distributed in Grant Creek during the open water season and confirmed that some spawning occurs in the creek. Catch-and-recapture numbers in 2010 were too small to allow mark-and-recapture population estimates, and spawning locations remain largely unknown. To obtain more complete information on abundance, distribution, and timing of movements, it is proposed that additional study occur in 2013 that combines angling with possible weir capture of larger fish.

**Weir and Angling Study** - The weir will be installed prior to break-up during low-flow conditions; consequently, it will be in place prior to spring spawning migrations, which typically occur as water temperature approaches 4 °C. The final weir design is unknown and picket spacing may be such that most Rainbow trout will be able to bypass the weir. If the weir is effective at catching larger size trout then the weir will be operated in capture mode during the spawning period, and all trout will be measured and sexed and their reproductive condition will be assessed if possible. Depending on the effectiveness of the weir at catching trout, additional fish may be captured by angling during the spring and early summer period. During the remainder of the open water season, trout caught in the weir will be counted and representative numbers will be measured. Two-way passage will be the preferred mode of weir operation in the fall when trout are likely to be moving out of Grant Creek.

**Radio Telemetry Study** - A representative number of mature Rainbow trout will be captured during the early weeks of the spawning migration for surgical implantation of radio transmitters into the abdominal cavity. Capture method will be by weir capture, angling, or a combination of both. Surgical methods will generally follow those described by Summerfelt and Smith (1990). Fish within the dominant size range of mature Rainbow trout (500 - 700 mm) will likely weigh 1,800-6,000 grams (Russell, 1977). It is advised that radio tags should not exceed 2 percent of body weight, thus a tag weighing less than about 35 grams would be suitable. The tags will be individually coded allowing identification of specific fish and will incorporate motion sensing capability that allows remote sensing of motion history, providing information on whether a tagged fish is dead or alive. Forty radio tags will be secured for the Rainbow trout telemetry study.

A fixed radio telemetry receiver will be installed at the reach-break between Reaches 4 and 5 (Figure 2) to detect when fish enter or exit Reach 5. A second fixed-telemetry site will likely be located downstream of the weir near the Grant Creek confluence (as discussed above). Tracking surveys using a hand-held mobile receiver will be conducted at least weekly, and more frequently when possible during the spawning period. A trail has been established along a safe route on the canyon rim paralleling Reach 5. Once a fish is detected, the crew will use triangulation techniques to identify the fish's position. Locations of the tagged fish will be recorded using GPS coordinates as well as marked on hand-held maps.

Movements of radio-tagged fish will be mapped and analyzed to determine the locations of probable spawning and feeding habitats.

#### ***4.5.2 Resident and Rearing Fish Use of Study Reach 5***

##### **Project-Related Objectives**

- Assessment of rearing fish use of habitats within the high gradient Canyon Reach as required for impact assessment within the portion of Grant Creek that will be most altered by the Project.
- Assessment of the juvenile fish productivity of Reach 5 relative to the remainder of Grant Creek.
- Assessment of the need for mitigation measures within Reach 5.

##### **Quantitative Objectives**

- Because of the difficulty in safely accessing much of Reach 5 and the dominant turbulent flow, habitat areas sampled were selected purely on the basis of accessibility and feasibility of sampling. These reconnaissance level investigations are non-quantitative in nature. They provide presence/absence information and relative species abundance data for the sample sites. Statistical analyses are not appropriate under these circumstances.
- Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, trap efficiency can be calibrated by releasing marked samples of fish, and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field.

On-site Sampling - During 2009 minnow trap sampling, crews were unable to access Reach 5, except for the first 100 m beyond the reach-break between Reaches 4 and 5 (Figure 2). Most of Reach 5 was also not accessed in the 1980s by previous investigators (AEIDC 1983). High-velocity flows and cascades prevented safe wading of the stream, and steep terrain prevented safe upland access without climbing gear. To assess the presence of juvenile fish in Reach 5, juvenile fish sampling will be expanded to areas not reached in 2009.

An initial reconnaissance of Reach 5 was conducted in late winter 2010 when the creek was frozen and could be accessed on foot at the bottom of the gorge; information was gathered regarding potential summer access points, likely fish habitat, and potential sample sites.

Juvenile fish use of Reach 5 was assessed using the same minnow trapping methods that were employed during 2009, except that special equipment was used to access the creek in Reach 5 in a safe manner. Routine access of Reach 5 during high-flow conditions was accomplished by using roped protection. Sample site locations were based on the ability to safely access this reach from the canyon rim, influenced by the following criteria:

- Safe access via rappel/belay techniques.
- Proximity to safe anchor sites.
- Proximity to likely fish habitats.

Two sampling events were conducted in 2010, May and July. The initially planned September sampling event was not completed. A crew of two set minnow traps in as many locations as possible with 3 to 4 traps each within likely fish habitats, such as plunge pools and eddies. The three sites trapped in 2009 in the lower 300 meters of Reach 5 were also re-sampled, for a total of five sites in Reach 5. Target species were Chinook and coho salmon, Dolly Varden, Rainbow trout, and sculpin. CPUE was defined as the catch per trap-hour.

All sampling sites were marked by a GPS, staked, and flagged for future identification. Habitat characteristics were recorded. Fish captured were identified to species, measured, and released near the point of capture. Salmonid length measurements were based on fork length (tip of the snout to the fork in the tail), and other fish length measurements were based on total length (tip of snout to end of tail).

The procedures described above for the 2010 sampling will be repeated in September to complete the originally planned sampling schedule. Additional sampling techniques including electrofishing, seining, and underwater video may also be employed where feasible. Special effort will be dedicated to determining whether adult Dolly Varden use portions of Reach 5 for

spawning. Weir operation, as described in Section 4.3, may provide information on the timing of upstream movements of adult Dolly Varden. If sufficient numbers of spawning condition Dolly Varden are observed, mobile surveys of radio tagged fish will be utilized to identify their final destination. Given the historical data associated with Dolly Varden numbers in Grant Creek, HEA believes 10 radio tags will be sufficient for this analysis.

Outmigrant Monitoring - In addition to the sampling described above, outmigration of juvenile fish from Reach 5 will be monitored in the spring using a small inclined plane trap. The trap will be anchored near the boundary between Reaches 4 and 5, immediately downstream from the proposed Project powerhouse and tailrace outfall. The intent will be to determine the outmigrant contribution of the Canyon Reach (Reach 5) relative to the remainder of Grant Creek. Species of primary interest will be juvenile Chinook, coho, and Sockeye salmon and young-of-the-year Rainbow trout. Sockeye salmon fry are known to move out of Grant Creek within a few weeks of emergence; consequently, the outmigrant trap will need to be installed in early spring at the same time as the counting weir. Young fish entering the trap will be held in a fine mesh live box, which will be monitored at least once per day, more often if large numbers of fish are entrapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total outmigrant production from Reach 5. Resident and Rearing Fish Use of Winter Habitats

### **Project-Related Objectives**

- Determine the extent of fish and habitat use of Grant Creek during winter conditions as required for Project environmental assessment.
- Determine the need for winter mitigation measures, especially as related to storage pond release rates.
- Contribute habitat use information for application to instream flow studies.

### **Quantitative Objectives**

- Winter sampling of selected potential habitat use areas will be essentially reconnaissance level efforts and are non-quantitative in nature. They provide presence/absence information and relative species abundance specific to each sample site. In most cases statistical analyses will not be appropriate under these circumstances. Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, then trap efficiency can be calibrated by releasing marked samples of fish and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field
- Winter Sampling - The results of the 2009 snorkel and minnow trapping surveys provided evidence that very few juvenile salmon observed were older than young-of-the-year fish (YOY; i.e., hatched in spring). Based on these results, there is some question as to whether Grant Creek provides favorable overwinter habitat for juvenile salmon and

other species. This study component will assess juvenile salmonid presence in likely overwintering habitats such as open water, springs and seeps, deep pools, and backwater areas.

Likely overwintering habitats will be identified based on existing habitat mapping, knowledge of study area, and 2009 data. Additional areas will be identified based on winter reconnaissance. In addition to likely areas of winter refuge, sampling will also be conducted, where possible, at the locations of the instream flow transects to allow instream flow modeling to include the winter period. Areas of unfrozen water will be sampled using both minnow traps and backpack electrofisher. In frozen areas where substantial unfrozen water is suspected under the ice, an ice auger will be used to gain access to water under the ice, if necessary. A baited minnow trap or bait container will be lowered into the water along with an underwater video camera. Under-ice conditions will be observed on a monitor. If fish are seen on the monitor, then video will be recorded for later review. Footage will then be analyzed in the office to determine species and age class of any fish attracted to the bait. This one-time sampling event will occur in late winter, before breakup occurs in Grant Creek. The study will likely need to be conducted before break-up in Trail Lake to ensure safe access to Grant Creek.

Spring Outmigration Monitoring - In addition to onsite winter investigations, the outmigration of juvenile fish from Grant Creek will be monitored in the spring to help determine the extent to which juvenile salmon and Rainbow trout overwinter in Grant Creek. Emphasis will be on Chinook and coho salmon smolts. Recently emerged Sockeye salmon fry will likely also be captured in the trap. An inclined plane or small rotary screw trap will be installed near the mouth of Grant Creek to intercept juvenile fish moving downstream. The trap will be installed during the low-flow period that immediately precedes spring break-up at the same time that the outmigrant trap is installed below the Canyon Reach. Young fish entering the trap will be held in a fine mesh live box that will be monitored at least once per day, more often if large numbers of fish are trapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total outmigrant production from Reach 5. Calibration of the downstream trap may be coordinated with calibration of the upstream trap, using fish trapped upstream and released for downstream capture. Estimated Chinook and coho smolt outmigration numbers based on the trap catch will provide a direct indication of the contribution of Grant Creek overwinter rearing to the Kenai River system and will be compared to catches in the upstream trap to determine the relative contributions of upstream and downstream areas to Chinook and coho production. Numbers of Sockeye salmon fry will provide an indication of hatching success and can also be compared to catches in the upstream trap to determine the relative contributions of upstream and downstream areas to Sockeye production.

#### ***4.5.3 Resident and Rearing Fish Use of Open Water Habitats in Lower Grant Creek***

##### **Project-Related Objectives**

- Assessment of rearing fish use of habitats within lower Grant Creek as required for Project impact assessment.

- Assessment of the juvenile fish productivity of Reaches 1-4 relative to the remainder of Grant Creek.
- Assessment of the need for mitigation measures within Lower Grant Creek.
- Selection of high fish use areas for incorporation in the instream flow study.

### **Quantitative Objectives**

- Sampling of selected potential habitat use areas will be essentially reconnaissance level efforts and are non-quantitative in nature. They provide presence/absence information and relative species abundance specific to each sample site. In most cases statistical analyses will not be appropriate under these circumstances.
- Obtain a count of adult Rainbow trout, Dolly Varden, and other resident species entering Grant Creek during the open water season. Use of the complete count methodology requires no specific statistical analysis.
- Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, trap efficiency can be calibrated by releasing marked samples of fish and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field.

Field Sampling - Investigations in spring, summer, and fall of 2009 and in spring of 2010 sampled a variety of slow-water habitats using minnow trapping and snorkeling techniques, identified habitat types most heavily used by rearing fish, and provided significant information regarding relative species abundance. This task continues those investigations with the intent of filling data gaps and sampling a wider variety of habitat types so that the information can be integrated with the habitat mapping information.

In Study Reaches 1-4, sample sites in which catch of juvenile salmon in minnow traps was poor or sample sites in habitats that were underrepresented by sampling in 2009 and 2010 (e.g., low-velocity habitats, backwaters, undercut banks) will be identified in the office and in the field. Each selected habitat area will be sampled using the method most appropriate to the conditions. Methods may include baited minnow traps, snorkeling, electrofishing, and seining. Sampling methods for this subcomponent will be similar to those used in Reach 5, with the exception of the method of site determination, which will be based on habitat units. Where possible, minnow trapping sites will also be electrofished or snorkeled to attempt to correct for gear bias of the minnow traps (i.e., document species that may not be captured in the minnow traps). This kind of sampling results in a variety of outputs with varying quantitative value.

Electrofishing will not be employed when spawning fish are present within 10 meters of the study site. Instream work will be minimized in the vicinity of spawning fish. Any activity that causes displacement of spawners from spawning areas will be avoided.

Weir Data - The counting weir described in Section 4.3 will be in place throughout the open water season and may allow monitoring of the upstream and possibly downstream movements of larger resident fish throughout the season. The final design of the weir is currently unknown and it may not be effective at catching resident species. The weir may be useful for monitoring the upstream migration of Rainbow trout that occurs coincident with the salmon migration and for observing possible upstream movements of Dolly Varden spawners in the fall. All resident fish

passing the weir will be recorded. When the weir is in capture mode, the lengths of all fish will be measured if possible without harming fish or requiring extra effort. As described above, the presence of an obvious pulse of large Dolly Varden will trigger a need for foot surveys to identify spawning locations.

**Outmigrant Monitoring** - Some rearing fish move out of small streams in the fall into winter rearing areas. Others may remain in the stream through the winter. To better understand the life history of resident and anadromous species in Grant Creek, an inclined plane or rotary screw trap will be employed near the mouth of Grant Creek in the fall to intercept juvenile fish moving downstream. The trap will be installed in mid-September and will continue to operate until about mid-October, depending on fish movements. Young fish entering the trap will be held in a fine mesh live box that will be monitored at least once per day, more often if large numbers of fish are trapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total number of fall outmigrants contributed by Grant Creek. Combining the results of the spring and fall outmigration monitoring will provide an indication of the total annual productivity of the creek.

## **4.6 Grant Creek Aquatic Habitat Mapping**

### **Project-Related Objectives**

- Prepare an image of Grant Creek upon which aquatic habitat and fish use information can be superimposed.
- Develop a map of aquatic habitats that will provide a basis for describing the distribution of key habitat types.
- Identify important factors that influence fish use of key habitats for input to the instream flow analysis.

### **Quantitative Objectives**

- Habitat should be identified and mapped with sufficient resolution so that the GIS system can be used to accurately calculate surface areas.

The purpose of this study is to fully delineate and map the aquatic habitats available in Grant Creek, identify important habitats for fish (i.e., rearing and resident fish; spawning salmon), and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

It should be noted that much of the work described below has been completed including the basic structure of the GIS system and substantial information regarding fish use of various habitat types. The focus of the 2013 work will be to complete the habitat mapping, integrate all of the field data into the georeferenced database, identify data gaps, and conduct limited fieldwork to fill the gaps.



The approach of this study involves three primary phases. During the first phase, the team will spatially synthesize existing aquatic habitat and fish use data generated during various field efforts throughout the 2009 and 2010 field seasons. This exercise will be completed primarily to identify spatial data gaps. In the second phase, the team will then ground-truth habitat data in the field, collect additional habitat and fish use data in Reaches 1 through 5<sup>3</sup>, and incorporate other suitable habitat and fish use data collected in 2010 (e.g., instream flow study, Section 4.7). Finally, the team will analyze the suite of habitats and fish use data to identify important factors affecting the distribution of fish. The primary tasks associated with this approach will be:

- Prepare an office-based aquatic habitat map (i.e., based on habitat observations assembled throughout the 2009 and 2010 field seasons).
- Conduct field surveys to ground-truth the office-based mapping effort and fill spatial data gaps relative to aquatic habitat and fish use in Reaches 1 through 4. Actual collection of fish habitat use information will be accomplished by the resident and rearing tasks and the instream flow task.
- Incorporate aquatic habitat fish use data to identify key rearing, spawning, and feeding habitats for salmon and resident fish and potential overwintering habitats.
- Analyze and identify the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

The office-based mapping exercise will incorporate existing habitat data overlain by fish use data into a spatial format, using ArcMap® geographic information system (GIS) software. The initial dataset will include habitat units mapped during a microhabitat fish use reconnaissance study completed in June 2009<sup>4</sup>. The team will also plot locations of salmon spawning activity recorded during 2009 foot surveys and high-use spawning areas identified by historical data (APA 1984). The team will use the preliminary spatial fish habitat information to catalog and identify gaps in coverage.

The team will conduct surveys to ground-truth the preliminary aquatic habitat delineation (i.e., generated through the office-based exercise), redraw mapping boundaries where appropriate and confirm the location of habitat areas that are in need of additional study. The team will delineate aquatic habitats at the mesohabitat category and subcategory scale, consistent with the approach developed for the 2009 habitat reconnaissance study. Mesohabitat subcategories identified in 2009 included fastwater pools and fastwater riffles, margins with undercut bank, margins without undercut bank, large woody debris dams, margin shelves associated with large wood debris, backwater pools, sloughs, and pockets. Additional subcategory characterizations will be added if deemed necessary. Habitats identified as needing additional study will be investigated further under Task 4.5.4.

The team will identify key fish habitats in Grant Creek, based on observed fish use. This will be accomplished by analyzing the microhabitat fish use data collected in support of this study, data

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<sup>3</sup> Due to physical access limitations, the field team may be unable to ground-truth aquatic habitats delineated in portions of Reach 5.

<sup>4</sup> The 2009 fish microhabitat use reconnaissance study was initiated to gain insight into the types of habitats that fish occupy in Grant Creek. The team identified discrete microhabitat types and sampled for fish presence at 16 sites in Grant Creek.

collected in support of the instream flow study (see Section 4.7), and data collected in 2009 during the reconnaissance study (HDR 2009a). These data will be incorporated into the spatial dataset. Other fish use habitat datasets (e.g., foot surveys, telemetry surveys, electrofishing) will be considered when developing key habitat designations. Surface areas of habitat types will be calculated as needed using the capability of the GIS software.

## **4.7 Grant Creek Instream Flow Study**

### **Project-Related Objectives**

- Assist impact analysis by modeling changes in key types of fish habitat relative to potential changes in stream flow.
- Provide a basis for planning Project instream flow mitigation measures.
- Provide a starting point for stream flow discussion.

### **Quantitative Objectives**

- Provide supportable predictions of fish habitat availability in lower Grant Creek under various stream flow scenarios for key species and life history stages.

The Grant Creek instream flow study approach to be applied to lower Grant Creek Reaches 1-4 was collaboratively developed based on input from the Instream Flow Technical Working Group (TWG). Public meetings of the TWG were held in April and September 2009, and a conference call was held in May 2009; input and suggestions were solicited during these meetings and also through email and phone communications with the TWG and TWG members.

The selected instream flow study approach emphasizes a detailed study of utilized habitat types and addresses the desire of the TWG to examine how important individual habitat units may be affected by changes in flow due to the operation of the Project. Rather than applying a typical habitat study that generalizes mesohabitat units in a study reach, this approach uses several techniques to tie physical microhabitat to flow and timing, and applies *in situ* knowledge of fish habitat use in Grant Creek as tools to determine potential effects of the Project.

For an instream flow study in Grant Creek, an integrated effort provides a cost-effective way of obtaining information that most directly answers the questions the TWG members have regarding the effects of the Project on fish habitat in Grant Creek. The approach includes:

1. A series of single transect analyses, with each transect going through a known fish use area such as high-use spawning or rearing areas.
2. Fish studies that help identify microhabitat factors that affect fish use within each key habitat type.
3. Monitoring temperature and flows at multiple locations on Grant Creek in conjunction with the Water Resources study program to establish baseline stream flow and temperature changes.

These three components will be integrated and analyzed to determine effects of different flow regimes on several factors that are important in the life stages of Grant Creek resident and anadromous fish.

It is important to understand that a significant portion of the work described below has been completed. Specific study sites within high-use habitat types were selected, and transects were established at 18 locations including survey data and complete measurements of transect geometry. Depth, velocity, water surface elevation, discharge, substrate, and cover were measured at the transects during low and medium flow conditions. Incomplete data regarding microhabitat habitat suitability have been collected at various locations.

#### **4.7.1 Habitat Availability**

The purpose of the habitat availability component of the instream flow study is to measure available habitat at proposed mesohabitat sites as a function of discharge (Table 1). Available habitat will be correlated to results of the Habitat Utilization Study described below (Section 4.7.2). This information will be cross-referenced with historic hydrographs, recent hydrologic data, and potential flow scenarios in Grant Creek to determine discrete time periods when the habitat unit may be available for its designated use.

Cross section geometry, substrate, cover, and hydraulic data will be measured at each transect using techniques developed for the Physical Habitat Simulation (PHABSIM) method.

Application of PHABSIM techniques on Grant Creek is different from most other studies because transects are selected on important habitat units with known fish use, as opposed to a standard PHABSIM that attempts to represent all habitat units regardless of unique importance or known fish use. Collected data will enable several analyses including:

- A graphical plot of wetted perimeter and depth versus discharge, on which the range of flows at which habitat area is unavailable can be determined visually.
- Changes in the availability of microhabitat (depth, velocity, substrate, and cover) across a transect or at specific cells or groups of cells along the transect as a function of discharge.
- Lateral connectivity of main channel flow with side-channel, off-channel, or undercut bank habitats as a function of flow.
- Egg incubation effective habitat analysis.

Transects will be oriented across the selected habitat unit to best capture the average condition of interest in that unit, such as spawning or rearing potential. Headpins, tailpins, and a temporary benchmark will be set at each transect. Survey instrument and photo points will be established and marked. Each transect site will be fixed using a handheld GPS. Habitat unit cross sectional profiles will be surveyed using standard differential survey techniques. Cross section survey points will divide the profile into 1 - 3 foot cells. Dominant and subdominant substrate and cover will be recorded within each cell.

Water surface elevations at each transect will be measured using a survey instrument at 3 - 4 discharges ranging from a low flow of approximately 50 cfs to a high flow of approximately 200 - 300 cfs. Mean column velocities will be measured within each cell at a high flow of 170 - 200 cfs, or the highest possible flow within practical and safety limitations. If feasible and safe to do so, an additional water surface elevation will be taken above the high flow in order to extend the range of flows for the model. Numerous photos from established photopoints will be taken at each of the 3 - 4 flow levels.

Proposed cross sections (Table 1) were located during a site visit 24 September 2009. The locations were set based on presence of physical microhabitat (i.e., undercut bank, overhead

cover, bedrock outcrops, and pocket water) and observations of fish during the site visit and during snorkeling studies. The site locations will be refined and measured during spring, summer, and early fall.

**Table 1. Proposed mesohabitat assessment sites.**

Transect #	Channel Type	Fish Habitat Site	Notes
1 100	Rearing Distributary	R1FH11	Linear transect, slow water
2 110	Rearing Distributary	R1FH12	Linear transect, slow water, LWD
3 120	Spawning Main	-	Spawning riffle
4 130	Rearing Main	R1FH05	Main channel fast water, Side chnnl, small mid channel bar, vegetated, LWD upstream
5 140	Rearing Main	R1FH05	Main channel fast water, Side chnnl, small mid channel bar, vegetated, LWD upstream
6 150	Rearing Main	R1FH13	Woody debris LB LUS, fast water main channel
7 160	Rearing Main	R1FH13	Woody debris LB LUS, fast water main channel
8 200	Rearing Main	R1FH06	Backwater lobe
9 210	Rearing Main	R2FH10	Small tertiary channel Main channel, Fast water, undercut bank on
10 220	Rearing Main	R2FH10	RB
11 230	Rearing Main	R2FH10	Main channel, Fast water, undercut bank on RB, surveyed across island to backwater pool
12 300	Rearing Main	-	Backwater lobe
13 310	Spawning Main	R3FH14	Backwater, low vels, main channel fast deep
14 320	Rearing Secondary	R3FH09	LWD, Secondary channel and spawning
15 330	Rearing Secondary and Tertiary	R3FH09	LWD, Secondary channel, spawning and Tertiary channel.
16 400	Rearing Main	R3FH10	Small side channel, cobble/gravel bar - no veg, very deep undercut bank
17 410	Rearing Main	R3FH16	Small side channel, cobble/gravel bar - no veg
18 430	Spawning Main	R5FH15	Pool, deep fast, LWD upstream, shallow slow margin shelf

Channel Type	Count	Percent
Rearing Distributary	2	11.1%
Rearing Secondary or Tertiary	2	11.1%
Spawning Main	3	16.7%
Rearing Main	11	61.1%
Total	18	

#### 4.7.2 Habitat Utilization

The purpose of the habitat utilization component is to learn what meso- and microhabitat factors the fish in Grant Creek occupy to assess whether the Project would have an effect on instream habitat. To maximize the knowledge of habitat selection factors for fish in Grant Creek, observations will be made at the locations of the transects as described in the previous section.

Fish spawning and rearing microhabitat values will be recorded at programmatically-selected sites in Reaches 1 through 4. Measured microhabitat use parameters will vary by habitat units. During the TWG meeting on September 23, the following table (Table 2) was developed with input from TWG members.

**Table 2. Parameters used in the habitat utilization study.**

<b>Habitat use function by life history</b>	<b>Habitat use parameters to measure</b>
Salmon rearing	Depth, velocity, cover, wetted perimeter, habitat connectivity
Salmon spawning	Substrate, depth, velocity, temperature
Rainbow trout spawning	Substrate, depth, velocity, temperature
Incubation	Depth, wetted perimeter, temperature
Resident rearing and spawning	Salmon rearing will be used as a surrogate

Information relating to site-specific habitat suitability criteria (HSC) will be developed from these data and used in combination with HSC available in the existing literature and professional judgment to determine final HSC to be used in modeling. Development of final HSC will occur as a collaborative effort with the Instream Flow TWG. HSC will be combined with the transect measurements and mesohabitat characterizations to model changes in habitat as a function of discharge.

Habitat use data collection will be similar to the sampling approach developed in 2009, as described in the 2009 baseline study report (HDR 2009) and existing data files furnished by KHL. However, the field effort may be expanded to include multiple sampling events at varying flow regimes, as discussed below. The primary tasks associated with this approach are to:

- Identify and describe discrete mesohabitat sample areas within each sample site, based on habitat factors observed.
- Record fish species presence (or absence) within each mesohabitat sample area.

The field team established 16 sample sites in Grant Creek in June 2009. The sample sites comprise habitats expected to contain high densities of juvenile fish (i.e., backwater areas; along stream margins) as well as those not necessarily expected to contain high numbers of rearing fish (i.e., fast water near the thalweg). As a result, the team identified a number of key habitats for rearing and resident fish. The instream flow team considered the key habitats identified through the June 2009 effort and in September 2009 established cross-sections at these locations (as discussed above). The field team will sample mesohabitats associated with the selected transects. Most transects are co-located with at least one mesohabitat unit sampled in June 2009. Additional sample sites will be established if deemed necessary.

Sites will be divided into discrete mesohabitat sample areas based on habitat characteristics observed within the stream segment sampled. In 2009, the field team identified the following mesohabitat sample areas: fast water pool, fast water riffle, margin with undercut bank, margin without undercut bank, large woody debris dam, and margin shelf associated with large wood debris, backwater pools, pockets, and sloughs, and “other” channels (i.e., distributary, secondary, tertiary). One sample site may be composed of multiple mesohabitat categories. Additional mesohabitat categories will be added if encountered. Mesohabitat factors taken into consideration will include:

- Location relative to the main channel (i.e., stream margin; mid-channel; backwater slough; backwater pocket).
- Depth and flow regimes (i.e., shallow fast, shallow slow, deep fast, deep slow).

- Presence of cover (i.e., no cover; velocity; instream cover).
- Type of instream cover when present (i.e., undercut bank; woody debris; overhanging vegetation; submerged vegetation; substrate).

The field team will record fish presence (or absence) within discrete mesohabitat sample areas, so that fish presence (or fish absence) can be correlated with the microhabitat characteristics present (or absent) at each location sampled.

The team will rely on snorkeling as the primary method to document fish presence (or absence) within each mesohabitat sample area. Electrofishing will be used primarily to confirm species identification and calibrate fish length estimates. Electrofishing will be used in lieu of snorkeling, if conditions preclude the effective use of snorkeling (i.e., shallow conditions). Each fish observed during snorkeling will be identified to species and its fork length will be estimated using 20 mm size intervals.

Within rearing habitats and near stream margins, the field team will record dominant and subdominant types of cover for each separate observed group of fish. Stream depth will be recorded using a wading rod at locations of observed fish use, and fish nose depth will be estimated by the snorkeler. Mean column velocities and velocity at the fish location will be recorded using a Price-AA or Swoffer current meter attached to a USGS top-setting or standard wading rod. Water temperature will be recorded at each station, ideally mid-column and at or near the location of observed fish.

In areas of observed spawning use, high stream depth and velocity may preclude field staff from measuring all microhabitat parameters. When possible, depth and velocity will be recorded as described above. Dominant and subdominant types of substrate size will be recorded by visual estimate using categories as described in Table 3. When direct measurements are not possible, depth at the spawning habitat will be visually estimated, and a GPS point will be taken and the habitat area described. The field team will revisit spawning habitat areas in the fall when flows allow wading, and will record dominant and subdominant types of substrate types immediately outside the redd perimeter for each observed redd. In all cases, surface water temperature will be measured near mid-column in a well-mixed area near the location of the observed redd.

**Table 3. Substrate size classes used on Grant Creek instream flow study.**

Substrate Type	Size (inches)
Organics, vegetation	--
Clay, silt (fines)	<0.002
Sand (coarse)	0.002 - 0.07
Small gravel	0.07- 0.30
Medium gravel	0.30 – 1.25
Large gravel	1.25 – 2.5
Small cobble	2.5 – 5.0
Large cobble	5.0 – 10.0
Boulder	>10.0
Bedrock	--

### 4.7.3 Integration with Flow and Temperature Monitoring

Grant Creek flow and temperature studies for 2010 are described in the Water Resources Study Plan (HDR 2009c). Specifically, continuous flow and temperature monitoring stations that were set in 2009 will be continued and/or reestablished. The instream flow study relies on integration of the collected data, described in the previous sections, with the data collected per the Water Resources Study Plan. The data loggers will be downloaded at regular intervals to contribute to analysis during the field season.

### 4.7.4 Analysis Methods

Field data collected as described above will permit both empirical analysis and habitat modeling as a function of flow.

A number of different graphs can be provided and may include the “wetted perimeter versus flow” relationship, a static cross section of the channel showing substrate distribution and water surface at any flow, and/or a dynamic Excel graphic. A static example of the dynamic graphic is shown below in Figure 3. Changing the value in the “Discharge Window” will adjust the water level up or down corresponding to the stage/discharge formula imbedded in the worksheet. Wetted perimeter and average depth values in the lower right also change with the assigned discharge. Values such as percent of change in wetted perimeter can be easily added to the graphic. This type of dynamic graphic can be provided for any transect, as appropriate.

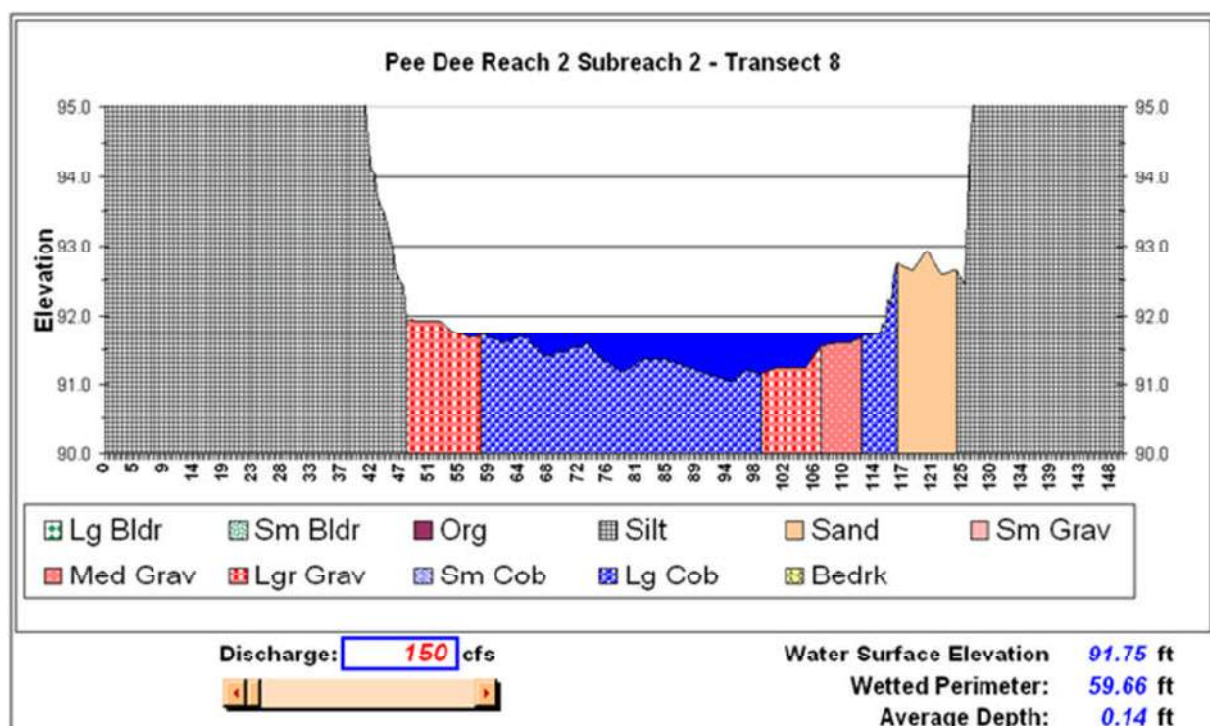


Figure 3. Example of a Channel/Flow Response cross sectional profile.

Collected data will also permit the application of the PHABSIM model for evaluation of changes in suitable habitat at select transects as a function of flow (Bovee et al. 1998). Site-specific habitat suitability will be developed from observations of microhabitat use by fish. A commercial version of PHABSIM, known as Riverine Habitat Simulation (RHABSIM), will be used.

#### **4.7.5 *Reach 5 (Canyon Reach) Analysis***

The proposed Grant Lake Hydroelectric Project would necessitate a major reduction in the flow of the portion of Grant Creek upstream from the proposed powerhouse (Reach 5). Because of the extreme flow reduction and the very high gradient of the creek in this reach, standard instream flow analysis methods are not applicable or appropriate. It is expected that available post-Project habitats will be limited to pools that contain sufficient water to support fish.

A simplified modeling effort will be employed to obtain insight into the effects that small changes in flow might have on pool depth, pool connectivity, and fish passage availability. Physical measurements will be conducted at selected step pools including basic cross section, surface area, and depth of downstream control (to determine minimum pool depth at very low flow).

Connectivity of the various pools and channels will be measured and assessed using the Oregon Method (Thompson 1972). After 10 years of research on depth and velocity in streams in Oregon, Thompson concluded that the depth over “the shallow bars most critical of adult passage” was the feature that determined the likelihood of successful migration. Thompson recommends a minimum depth of 0.6 feet for large trout and 0.8 feet for Chinook salmon to achieve successful passage. The “Oregon Method” as it is now commonly called, concludes that the passage flow is adequate when the depth criteria is met on at least 25% of the transect width and on at least a 10% continuous portion. Transect data will be collected to determine where connectivity meets this criteria and where it does not based on the three flows described above.

Connectivity will be assessed concurrently with the instream flow study being conducted downstream in Reaches 1 – 4, at the same flows, provided data can be collected safely. Photo documentation will be included in the connectivity analyses. Documentation will include transect measurements delineating each pool that is measured at each of the flow levels evaluated.

#### **4.7.6 *Instream Flow Modeling***

Input from the instream flow analyses will be used to model the effects on fish habitat under various flow regimes and will examine the habitat and energy trade-offs associated with a range of scenarios.



## **4.8 Baseline Studies of Benthic Macroinvertebrates in Grant Creek**

### **Project-Related Objectives**

- Provide a reliable measure of baseline stream productivity that can be compared from year to year and with other stream systems.
- Provide some indication of the relative “health” of the Grant Creek ecosystem by employing standard measures that are readily comparable to other Alaska stream systems.

### **Quantitative Objectives**

- Standard methods will be used that require replicate samples within uniform riffle habitat areas to minimize the effect of between sample variability. Five replicates are generally recommended for initial sampling. An analysis of variance will be employed to determine adequacy for baseline use.

Benthic macroinvertebrates inhabit every wetted habitat within a stream system. The various genera of aquatic macroinvertebrates feed on multiple trophic levels ranging from primary consumers to predators. They are the primary food source for many fish species, so the abundance of macroinvertebrates can directly affect fish populations. Benthic macroinvertebrates also serve a role in understanding long-term water quality trends within a stream system. Many benthic macroinvertebrate genera have been assigned “biotic index” values that rate their relative tolerance for environmental stress (e.g., organic pollution or sedimentation). Assigned biotic index values can be used to calculate an average score for a stream system.

Benthic macroinvertebrate samples will be collected at two stations on Grant Creek (GC 100 and GC 300) in August using the Surber sampling method. This technique is used to accurately characterize population density and taxa richness in a single habitat within a stream system and allows comparison between seasons and/or years.

Five replicate samples will be collected at each station. Each sample is collected from within the same riffle/run area of the stream. A specialized net is placed in the riffle/run, which defines a 1 ft<sup>2</sup> area that is then thoroughly examined for invertebrates by kicking, scrubbing, and moving substrate and allowing the invertebrates to wash downstream into the net. The contents of the net will be emptied into a sample jar and preserved with 70 percent ethyl alcohol.

Macroinvertebrates will be sorted from substrate material in the laboratory, identified to genus (except for Chironomidae), and counted. Data analyses will include a variety of standard metrics including taxa abundance, taxa diversity, percent dominance, and percent EPT (Ephemeroptera, Plecoptera, Trichoptera).

## **4.9 Baseline Studies of Periphyton in Grant Creek**

### **Project-Related Objectives**

- Provide a reliable measure of baseline stream productivity that can be compared from year to year and with other stream systems.
- Provide some indication of the relative “health” of the Grant Creek ecosystem by employing standard measures that are readily comparable to other Alaska stream systems.

### **Quantitative Objectives**

- Standard methods will be used that require replicate samples to minimize the effect of between-sample variability. Ten replicates are recommended for initial sampling. An analysis of variance will be employed to determine adequacy for baseline use.

Periphyton are single-celled algae that typically grow on rocky substrates in streams and rivers. Periphyton will be collected to assess chlorophyll *a* concentration, representing primary productivity, in Grant Creek. Many genera of benthic macroinvertebrates and some fishes depend on periphyton as their primary food source. Chlorophyll *a* concentration also can provide an indication of stream condition.

Periphyton will be collected by isolating a space of known area on a rock and collecting the algae from the space. This material is then sent to a laboratory to be analyzed for chlorophyll *a* content. Collection procedures will be as follows:

- Periphyton samples will be collected in August at two stream locations within Grant Creek (GC 100 and GC 300).
- Ten periphyton samples will be removed from a defined area on large gravel or cobble collected from the stream substrate.
- The material scrubbed from the rocks will be rinsed and then filtered onto glass fiber filters, preserved, and then frozen.
- The filters will be sent to a laboratory to assess chlorophyll *a* content.

## **4.10 Trail Lake Narrows Fish and Aquatic Habitats**

### **Project Related Objectives**

- Determine the extent of fish use in the vicinity of the proposed access road bridge crossing of Trail Lake Narrows in order to minimize impact to aquatic resources potentially resulting from bridge design, construction timing, and construction methodology.
- Determine habitat use to optimize bridge location and design.

### **Quantitative Objectives**

- The study will primarily be descriptive with some semi-quantitative fish sampling using catch per unit effort or standardized observations. Statistical analysis will not generally be applicable but catch methods will employ standard techniques allowing comparison with other bodies of water.

Field investigations will be conducted in the late July – early August period in the Trail Lake Narrows with emphasis placed on the vicinity of the proposed bridge site. Methods to be employed will include minnow trapping, beach seining, and snorkeling. Water clarity may be too poor for snorkeling to be effective. Use of stream bank habitats by juvenile Chinook and coho salmon will be a primary focus. It is expected that minnow trapping will be the most effective technique for juvenile captures..

Fish habitats within a cross section of the narrows will be subjectively described and will include a discussion of fish and habitat use.

## **5 Agency Resource Management Goals**

Aquatic resources including fish and their habitats are generally protected by a variety of state and federal mandates. In addition, various land management agencies, local jurisdictions, and non-governmental interest groups have specific goals related to their land management responsibilities or special interests. These goals are expressed in various statutes, plans, and directives:

- Alaska Statute 41.14.170 provides the authority for state regulations to protect the spawning, rearing, or migration of anadromous fish. Alaska Statute 41.14.840 regulates the construction of fishways and dams. State regulations relating to fish resources are generally administered by ADF&G. In addition to the state statutes, the following resource management plans and directives provide guidance and direction for protection of fish resources and aquatic habitats on lands within or adjacent to the Project area:
- Magnuson-Stevens Fishery Conservation and Management Act (PL 104-267) provides federal protection to “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” NOAA’s National Marine Fishery Service (NOAA Fisheries) is responsible for designating Essential Fish Habitat (EFH). In the case of anadromous fish streams (principally salmon), NOAA Fisheries has designated the AWC prepared by ADF&G (Johnson and Klein 2009) as the definition of EFH within freshwater habitats.
- Aquatic Resources Implementation Plan for Alaska’s Comprehensive Wildlife Conservation Strategy, September 2006. Prepared by Alaska Dept. of Fish and Game, Div. of Sport Fish.
- Our Wealth Maintained: A Strategy for Conserving Alaska’s Diverse Wildlife and Fish Resources. Prepared by Alaska Department of Fish and Game, Juneau, Alaska. xviii+824 pp.
- Kenai River Comprehensive Management Plan. Prepared by Alaska Department of Natural Resources, Division of Land and Division of Parks and Outdoor Recreation; in conjunction with Alaska Department of Fish and Game, Habitat and Restoration Division; Kenai Peninsula Borough.
- Kenai Peninsula Borough Comprehensive Plan. Prepared by KPB Planning Department. In 2005. Soldotna, Alaska.
- Kenai Peninsula Borough Coastal Zone Management Plan. Prepared by the Kenai Peninsula Borough Coastal Management Program and LaRoche and Associates. 2008. Kenai Peninsula Borough. Soldotna, Alaska.
- Kenai River Special Management Area (KRSMA), ADNR.
- Final Environmental Impact Statement and the Revised Land and Resource Management Plan for the Chugach National Forest, Chapter 3 Environment and Effects. Prepared by the U.S. Forest Service, 2002.

## **6 Project Nexus**

The proposed Project may have a number of potential impacts on aquatic resources within Grant Creek and Grant Lake. The studies described above are intended to provide sufficient information regarding the nature of the existing aquatic resources such that these potential impacts can be adequately assessed. Each study component is specifically designed to help evaluate potential impacts in the study report. The impact assessments will be presented in the study report, and will be used to inform the development of protection, mitigation, and enhancement measures to be proposed in the draft and final license applications. Some of the direct and indirect Project effects that could impact aquatic resources are itemized below:

- Alteration of the streamflow and temperature regime (depending on the depth of water withdrawal in Grant Lake) in Grant Creek as the result of potential Project operation could affect spawning and rearing habitat for anadromous fish species and habitat for all life stages of resident fish species, depending on the timing and magnitude of flow alteration.
- Changes in water surface elevations in Grant Lake would likely affect aquatic biota in littoral areas, including fish, macroinvertebrates, and macrophytes; the timing and magnitude of lake level changes would dictate the level of effects (the proposed lake level changes would range from 2 feet above to 11 feet below the natural lake elevation of approximately 698 feet). Areas of shoreline wetlands could also be affected.
- Any dredging of Grant Lake in the vicinity of the proposed intake structure could result in short-term impacts on benthic macroinvertebrate populations in the area.
- Water temperatures in Grant Lake could be influenced by operation of the proposed Project, depending on the depth of water withdrawal.

## **7 Consistency with Generally Accepted Practices**

Sampling methodology for Grant Creek and Grant Lake was designed in consultation with the public, resource agency scientists, and members of the Instream Flow TWG. Quality control of all study plans is maintained by using established methods used elsewhere to assess similar potential resource impacts and are reviewed by outside expert scientific reviewers. Methods proposed herein (use of foot surveys, minnow trapping, angling, block and removal techniques, and radio telemetry) are generally-accepted practices for assessing fish resources.

The instream flow approach, as a whole, is custom-designed for Grant Creek and its unique hydrology, geomorphology, and fish resources. However, each component of the study is a well-known and accepted technique for study application in the field. The integration of these components is accomplished through post-processing and analysis of results.

Macroinvertebrates will be collected using the sampling method described by Eaton et al. (1998). Surber sampling is a preferred method of the USGS and ADF&G. Periphyton will be collected using methods from Eaton et al. (1998).

## **8 Schedule for Conducting the Study**

- May-October 2012 – Re-engage stakeholders and conduct any tasks deemed beneficial in 2012.
- October 2012 - Apply for winter sampling permits.
- February-March 2013 – Conduct winter fish sampling.
- January 2013 (or earlier if any work to be done in 2012) – Apply for fish resources sampling permits, secure field equipment, telemetry tags, telemetry tower, traps etc., exploration of Reach 5, instream flow transect measurements.
- May 2013 – Begin Rainbow trout survey, juvenile fish habitat use sampling, instream flow habitat suitability measurements.
- June 2013 – Complete Rainbow trout survey, data entry and QC for field data, habitat map GIS work.
- July 2013 – Juvenile fish habitat use sampling, instream flow habitat suitability measurements, instream flow water surface elevation measurements, data entry and QC for field data.
- August 2013 – Begin foot surveys for spawning salmon, capture and radio tag Chinook salmon, habitat use snorkel surveys, data entry and QC for field data.
- September 2013 – Continue foot surveys for spawning salmon, tracking radio tagged Chinook salmon, juvenile fish habitat use sampling, instream flow habitat suitability measurements, instream flow water surface measurements, data entry and QC for field data.
- October 2013 – Continue foot surveys for spawning salmon, continue tracking radio tagged salmon, complete field work and demobilize field equipment, data entry and QC for field data.
- November 2013 – Continue foot surveys for spawning salmon, complete data entry and QC for field data, begin development of draft baseline study reports.
- January 2014 – Complete instream flow modeling.
- January 2014 – Complete draft study report for internal review.

## **9 Provisions for Technical Review**

KHL will provide updates and study products for review by the Aquatic Resources Work Group during the licensing process.

- December 2012: Issue final study plan to Work Group
- April through June 2013: Start of Study Season [varies by study area].
- Fall 2013: Work Group update on field activities.
- April 2014: Distribute draft study report.

- April 2014: Work Group meeting call to discuss comments on draft study report.
- May 2014: Distribute final study report.
- September 2014: File Draft License Application.
- January 2015: File Final License Application.

## 10 References

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Thursday, February 21, 2013 3:25 PM  
**To:** scott.ayers@alaska.gov  
**Subject:** Multi-Agency Permit Application

Hi Scott,

Thanks for the call. As discussed, below is link to the Multi-Agency Permit Application, for your reference. Again, please let me know if you have any questions related to our permit application.

<http://www.kenairivercenter.org/permits/pdfs/multiagency.pdf>

Thanks,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
**Sent:** Thursday, February 21, 2013 4:15 PM  
**To:** Ayers, Scott D (DFG)  
**Subject:** RE: Grant Lake Permitting

Thanks Scott. Please let me know if there is anything on my side that I can do to assist with the permitting process. We certainly appreciate your effort to accommodate our late winter study work.

Best Regards,

Mike

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**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Thursday, February 21, 2013 2:55 PM  
**To:** Salzetti, Mikel  
**Subject:** RE: Grant Lake Permitting

Hello Mike,

This email will serve as confirmation of receipt of your application for a 2013 Fish Resource Permit, you are number 105 for the year. Our standard operations are to process applications on a first come first serve basis, which would put about 60 permit applications in front of you. Due to staffing changes this year I am more behind schedule than normal. As such I am attempting, to the best of my abilities, to get to permits with projects starting earlier in the year out of the standard order. I cannot guarantee you the March 25 date that you have requested, but I will do my best to get to your permit before then.

Wishing you well.

Cheers,

-Scott

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**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
**Sent:** Wednesday, February 20, 2013 5:22 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** RE: Grant Lake Permitting

Scott:

Attached is a completed Fish Resource Permit Application which also includes a copy of the Aquatic Resources Study Plan and a satellite image noting key aquatic resource study sites. Please let me know if you have any question or need any further information.

I would also appreciate it if you could give me an indication as to when you would anticipate granting a permit if everything on our application is in order. I noted your backlog and I am concerned about getting the permit in time to start some late winter study work that we have scheduled to start during the last part of March.

Best Regards,

**Mike Salzetti**

Fuel Supply & Generation Engineering Manager

(907) 283-2375 *work*

(907) 398-5073 *Mobile*

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]

**Sent:** Thursday, February 14, 2013 8:48 AM

**To:** Salzetti, Mikel

**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))

**Subject:** RE: Grant Lake Permitting

Mike:

Thank you for your quick reply. Having started this position in mid-January, I am still in the process of learning the ins and outs of the permitting world. While I do not know what permit applications are included in the Multi-Agency Permit Packet, I do know that a Fish Habitat Permit was issued for your work that disturbs the ground underlying the stream bed. I received a copy of your Fish Habitat Permit, realized that your project would also require a Fish Resource Permit, noted that I did not yet have one from your group, and sent the application your way. I do not know if there are any further permits outside of the Multi-Agency Permitting process that you will need to obtain.

Wishing you well.

Cheers,

-Scott

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**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]

**Sent:** Wednesday, February 13, 2013 3:27 PM

**To:** Ayers, Scott D (DFG)

**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))

**Subject:** RE: Grant Lake Permitting

Scott:

Thanks for the information. We were under the impression that the Multi-Agency Permit Packet that we submitted to the Kenai River Center was the permit clearing house for all state permits, including all ADF&G permits. We'll get the application that you sent filled out and returned to you as soon as possible. Are you aware of any other permits that are outside of the Multi-Agency Permitting process that we will need to obtain?

Once you receive the permit application, please do hesitate to give me a call if you should have any questions.

Best Regards,

**Mike Salzetti**

Fuel Supply & Generation Engineering Manager

(907) 283-2375 *work*

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Wednesday, February 13, 2013 1:59 PM  
**To:** Salzetti, Mikel  
**Subject:** FW: Grant Lake Permitting

Hello Mr. Salzetti,

I am writing to you to inform you that you will be required to submit a Fish Resource Permit to complete the work that is outlined on the Fish Habitat Permit for the Grant Creek Hydro project. There is a copy of the application attached to this message. I had attempted to pass this message to Cory Warnock of McMillen LLC who had been in touch with me earlier this year concerning permitting, but it appears that he is out of his office until February 20. Please let me know if I can be of any further assistance.

Cheers,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

---

**From:** Ayers, Scott D (DFG)  
**Sent:** Wednesday, February 13, 2013 11:20 AM  
**To:** 'Cory Warnock'  
**Cc:** 'Emily Andersen'  
**Subject:** RE: Grant Lake Permitting

Hello Cory,

A Title 16 Fish Habitat Permit crossed my desk this morning for the Grant Creek Hydro project, under Mike Salzetti of Kenai Hydro, LLC. After reviewing the permit I wanted to get in touch with Kenai Hydro to remind them that a Fish Resource Permit was also required for them to handle any fish in the process of their work. As you reached out to me earlier this year about permitting for this project I thought I'd try contacting you first. I've attached the permit application to this message and will also require a study plan of the proposed fisheries work that is intended. I currently have 90 applications on my desk, so the sooner this can be submitted the better. Please let me know if this message needs to be directed to someone else.

Wishing you all the best.

Cheers,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Friday, January 11, 2013 1:20 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Permitting

Hi Scott,

Monte Miller gave me your number as it appears today is Bob's last day. Sounds like you'll be taking over for him as it relates to permitting. I'm currently working with Homer Electric Association on their licensing process for the Grant Lake Project on the Kenai Peninsula. We are currently going through the Multi-Agency permitting process and I was hoping to touch base with you about a couple specific issues related to the permits we are looking to secure so that when you see your portion of the Multi-Agency Permit from the Kenai River Center, everything is understood. If you could give me a time in the not so distant future that would work to have a brief phone call, I'd appreciate it.

Thanks and I'll look forward to hearing from you,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

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Version: 2013.0.2899 / Virus Database: 2639/6118 - Release Date: 02/20/13

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**From:** Cory Warnock <cory.warnock@mcmillen-llc.com>  
**Sent:** Friday, February 22, 2013 9:33 AM  
**To:** 'Miller, Monte D (DFG)'; 'Johnson, Shawn L (DFG)'  
**Cc:** 'Mike Salzetti'; Emily Andersen; 'Klein, Joseph P (DFG)'  
**Subject:** RE: DNA Supplies and Analysis

Hi Monte and Shawn,

Just checking in regarding the email string below to see if there has been any more communication related to DNA supplies and analysis assistance for the Grant Lake Project. Any info you could provide would be much appreciated.

Thanks,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

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**From:** Miller, Monte D (DFG) [<mailto:monte.miller@alaska.gov>]  
**Sent:** Tuesday, January 29, 2013 5:37 PM  
**To:** Cory Warnock; Johnson, Shawn L (DFG)  
**Cc:** Mike Salzetti; Emily Andersen; Klein, Joseph P (DFG)  
**Subject:** RE: DNA Supplies and Analysis

Cory,

I forwarded your request to Bill Templin on January 24. There has been some traffic in his section regarding this request since that time but I have no further information.

Monte D. Miller  
Statewide Hydropower Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish / RTS  
333 Raspberry Road  
Anchorage, Alaska, 99518-1565  
(907) 267-2312

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Tuesday, January 29, 2013 12:57 PM  
**To:** Miller, Monte D (DFG); Johnson, Shawn L (DFG)

**Cc:** Mike Salzetti; Emily Andersen  
**Subject:** RE: DNA Supplies and Analysis

Hi Monte and Shawn,

Just following up on the email below to see if you could provide any assistance related to appropriate contacts within your agency.

Thanks,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Thursday, January 24, 2013 9:30 AM  
**To:** Monte Miller; Johnson, Shawn L (DFG) ([shawn.johnson@alaska.gov](mailto:shawn.johnson@alaska.gov))  
**Cc:** Mike Salzetti; Emily Andersen ([emily.andersen@mcmillen-llc.com](mailto:emily.andersen@mcmillen-llc.com))  
**Subject:** DNA Supplies and Analysis

Hi Monte and Shawn,

I'm reaching out to both of you in hopes that you can provide some information and perhaps a contact within your agency to discuss the DNA sampling we will be conducting in 2013 associated with the Grant Lake Project. We would like to utilize ADF&G's resources and expertise if possible in this regard. We plan on collecting scale samples and conducting DNA analysis on Chinook, Sockeye and Coho and would be interested in discussing the possibility of having ADF&G provide the supplies (scale card, vials, preservative, etc) and conduct the actual analysis for the effort. I'd like to get in touch with the appropriate folks and discuss this in more detail. Any contact information you could provide would be much appreciated.

Thanks and I'll look forward to hearing from you soon,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662



---

**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
**Sent:** Tuesday, February 26, 2013 2:45 PM  
**To:** Russell, Pamela J (DNR)  
**Cc:** Leclair, Claire H (DNR); Blackwell, Jack D (DNR); Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** RE: Kenai Hydro Multi-Agency Permit Application Status

Claire:

Can you please update me on the status of our Multi-Agency Permit Application.

Thanks,

**Mike Salzetti**  
Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Salzetti, Mikel  
**Sent:** Friday, February 22, 2013 11:46 AM  
**To:** 'Russell, Pamela J (DNR)'  
**Cc:** Leclair, Claire H (DNR); Blackwell, Jack D (DNR)  
**Subject:** RE: Kenai Hydro Multi-Agency Permit Application Status

Thanks Pam, I'll look forward to hearing from Claire on the status of our permit application. We want to be as proactive and responsive as possible.

Mike

---

**From:** Russell, Pamela J (DNR) [<mailto:pamela.russell@alaska.gov>]  
**Sent:** Friday, February 22, 2013 11:38 AM  
**To:** Salzetti, Mikel  
**Cc:** Leclair, Claire H (DNR); Blackwell, Jack D (DNR)  
**Subject:** RE: Kenai Hydro Multi-Agency Permit Application Status

Good Morning Mike,

I have recently sent this permit to be processed through the Anchorage DNR office. The contact person at this time for this permit is Claire Leclair to whom I have cc's on this e-mail.

Thanks

Pamela Russell  
Div. of Parks and Outdoor Recreation  
Natural Resource Specialist III  
514 Donald E Gilman River Center  
Soldotna, AK 99669  
907-714-2471

---

**From:** Salzetti, Mikel [[MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)]  
**Sent:** Friday, February 22, 2013 11:33 AM  
**To:** Russell, Pamela J (DNR)  
**Cc:** Berkahn, Patricia G (DFG); Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** Kenai Hydro Multi-Agency Permit Application Status

Pam:

We are approaching the 30 day processing time that you had indicated and I wanted to check the status of the Multi-Agency Permit Application that we submitted. We have received a Fish Habitat Permit from the ADF&G. Upon receipt of that permit, we were contacted by Scott Ayers (ADF&G) regarding the need for a Fish Resource Permit which we have submitted as well. We want to ensure that all permits associated with our studies have been acquired and are curious based on your work with our application, if any additional permits are forthcoming.

Thank you again for your prompt response to our application.

**Mike Salzetti**

Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

No virus found in this message.

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----- Forwarded message -----

From: **Michael R Yarborough** <[mry@crcalaska.com](mailto:mry@crcalaska.com)>

Date: Tue, Feb 26, 2013 at 11:57 AM

Subject: Re: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: Frank Winchell <[frank.winchell@ferc.gov](mailto:frank.winchell@ferc.gov)>, Judith Bittner <[judy.bittner@alaska.gov](mailto:judy.bittner@alaska.gov)>, Shina Duvall <[shina.duvall@alaska.gov](mailto:shina.duvall@alaska.gov)>, Ed DeCleva <[edecleva@fs.fed.us](mailto:edecleva@fs.fed.us)>, "Sheri D.Buretta" <[bwelty@chugach-ak.com](mailto:bwelty@chugach-ak.com)>, Ben Ellis <[ben.ellis@alaska.gov](mailto:ben.ellis@alaska.gov)>, Lee Stephan <[president@eklutna-nsn.gov](mailto:president@eklutna-nsn.gov)>, Richard Encelewski <[ntc@ninilchiktribe-nsn.gov](mailto:ntc@ninilchiktribe-nsn.gov)>, Jaylene Peterson-Nyren <[exec@kenaitze.org](mailto:exec@kenaitze.org)>, Penny Carty <[snainc@alaska.com](mailto:snainc@alaska.com)>, Vernon Stanford <[kna@alaska.net](mailto:kna@alaska.net)>, Dara Glass <[dglass@ciri.com](mailto:dglass@ciri.com)>, Karen Rogina <[info@chenega.com](mailto:info@chenega.com)>, Arne Hatch <[finance@qutekcak.net](mailto:finance@qutekcak.net)>, Jolund Luther <[info@cityofseward.net](mailto:info@cityofseward.net)>

All

I sent out the following announcement earlier this month, proposing a meeting to discuss a suitable Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project.

The project's Section 106 Initiation of Consultation meeting was held on June 24, 2010. Since this meeting, the access road has been shortened and rerouted to accommodate the Iditarod National Historic Trail. The cultural resources study plan has been amended to reflect this change and to respond to comments received from consulted parties.

At this stage in the project, we seek to continue consultation under Section 106 of the National Historic Preservation Act (36 CFR 800.3) to determine a final APE. Revised study plans, which include an updated project description, were distributed to stakeholders on December 12, 2012. Given that this meeting will likely be relatively short (less than 2 hours), HEA would like to propose conducting the meeting via a webinar. We will provide a link that will allow you to load an application and login to the meeting. The whole process only takes about a minute. In addition, a toll free number will be provided for the audio portion of the meeting. The link and phone number will be provided in an email. This approach will alleviate the issue of requiring folks to travel to Anchorage for such a short meeting. If computer capability is an issue, or individuals would prefer to attend in person, HEA will provide a space for representatives to participate in the meeting in-person. The proposed meeting would be scheduled to begin at 9:00 am with the intent of adjourning at or before 11:00 am.

However, because of conflicts with Susitna-Watana meetings, many of you were not

available on the originally proposed date. Understand the difficulty in attempting to coordinate so many schedules, I would like to reschedule our discussion for March 11, 2013. Let me know if March 11 will work for you. If not, HEA has identified March 12 as a second option.

Thank you in advance for your responses and ongoing participation.

Michael R. Yarborough  
Senior Archeologist  
Cultural Resource Consultants LLC  
3504 E. 67th Avenue  
Anchorage, Alaska 99507

Anchorage: [\(907\) 349-3445](tel:(907)349-3445)  
Cell: [\(907\) 306-6069](tel:(907)306-6069)

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----- Forwarded message -----

From: **Frank Winchell** <[frank.winchell@ferc.gov](mailto:frank.winchell@ferc.gov)>

Date: Tue, Feb 26, 2013 at 1:13 PM

Subject: RE: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: Michael R Yarborough <[mry@crcalaska.com](mailto:mry@crcalaska.com)>

Mike:

March 11<sup>th</sup> or 12 will work for me.

Frank

**Kenai Hydro, LLC**

3977 Lake Street  
Homer, AK 99603

---

February 27, 2013

Secretary Kimberly D. Bose  
Federal Energy Regulatory Commission  
Attn: DHAC, PJ-12.2  
888 First Street, NE  
Washington, DC 20426

**- FILED ELECTRONICALLY -**

**RE: Second Six-Month Preliminary Permit Progress Report for the Grant Lake (Project No. 13212), September 1, 2012 – February 28, 2013**

Dear Secretary Bose:

Kenai Hydro, LLC (KHL) hereby submits its second six-month progress report, for the period of September 1, 2012 through February 28, 2013 for the proposed Grant Lake Project.

With the expiration of the first preliminary permit on September 30, 2011, KHL submitted a second Preliminary Permit Application (PPA) with FERC that was subsequently granted on March 23, 2012. In parallel with the application for a second preliminary permit, KHL developed a Request For Proposal (RFP) for completing the natural resource evaluations for the proposed project. Due to the high demand for study consultants in Alaska, the bids came in unexpectedly high and without the detail required to put an acceptable contract in place for the 2012 summer study season. As a result, KHL adjusted the study schedule to allow resource studies to begin with the winter studies in late 2012 and the summer work to occur in 2013.

In May, KHL sent the natural resources RFP out a second time. Subsequently, KHL selected a consultant to conduct the natural resources work (McMillen, LLC). Since their contract was finalized, McMillen has been working with KHL's licensing consultant to update and refine the natural resource study plans, consult with the requisite agencies and prepare for the upcoming 2013 study season.

## **Kenai Hydro, LLC**

3977 Lake Street  
Homer, AK 99603

### **ACTIVITIES DURING THE REPORTING PERIOD (September 2012 – February 2013)**

#### Stakeholder Outreach and Consultation

- Presented a project update to the Iditarod Historic Trail Alliance on November 29, 2012.
- KHL's licensing coordinator had a call with Ken Hogan (FERC) in November 2012 to discuss KHL's path forward as it relates to the TLP Process and invited Mr. Hogan to participate in the upcoming, December 12<sup>th</sup> stakeholder meeting. Mr. Hogan accepted and subsequently took part in the meeting via conference call.
- On December 12<sup>th</sup>, KHL held a meeting with natural resource agencies and stakeholders to inform them of activities associated with the licensing process. During this meeting, a project overview and update was provided, a presentation on the licensing process was given, the updated Natural Resources Study Plans were reviewed and a copy of the Updated Natural Resources Study Plans and a comment response table were provided to all attendees. During the meeting, KHL noted that per the TLP Process, formal comments were not required but offered the stakeholders the informal opportunity to review the updated plans and ask any questions or clarifying points they may have prior to the finalization of the plans.
- KHL received comments/questions from NMFS-NOAA and the National Park Service pertaining to the Water Resources Plan, Aquatic Resources Plan and the Recreation and Visual Resources Plan. KHL is currently reviewing these comments/questions and evaluating their applicability as it relates to the study plans.
- KHL worked with the Kenai River Center and its associated agencies to apply for the appropriate set of permits for the natural resource studies.
- KHL worked with the US Forest Service (USFS) to amend the existing Special Use Permit to include all necessary methods for the studies to be conducted in 2013. The amendment was approved by the USFS and received by KHL in mid-February.
- KHL maintained the Kenai Hydro website ([www.kenaihydro.com](http://www.kenaihydro.com)) by posting the latest announcements and documents for public access. This site continues to serve as a conduit for information, including a library of existing information, a calendar of events, and a repository for contact information for interested parties.

#### Environmental Studies

- KHL worked with its licensing and natural resource consultants to update the natural resource study plans and make them more robust and quantitative in nature versus qualitative, per the formal comments received from stakeholders in 2010.



## **Kenai Hydro, LLC**

3977 Lake Street  
Homer, AK 99603

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- KHL worked intensively with the licensing and natural resource consultants to logistically prepare and mobilize equipment and manpower for the upcoming 2013 study season. Primary components included:
  - Applying for all necessary permits
  - Lodging for the natural resource team
  - Transportation
  - Initial site set-up dates and methods
  - All necessary equipment purchases
  - Logistics related to equipment and boat storage
  - Coordinating resource specific schedules
  - Secure data collection and offload practices
  - QA/QC methods for data collected
  - Procurement of fish tags and stream gauging equipment
- KHL revised its natural resource study schedule based upon discussions with stakeholders and internal discussions with its selected natural resource team. Modifications were minimal, developed with stakeholder thoughts in mind and primarily based on dates that were most likely to produce the highest quality data (resource dependent).

### **Engineering**

- KHL refined a draft, Engineering RFP to support of the necessary feasibility work and analysis associated with filing the Draft License Application. A qualified engineer will be selected by KHL by April 15, 2013.

## **CONTINUING ACTIVITIES IN SUPPORT OF LICENSE APPLICATION DEVELOPMENT**

In anticipation of the upcoming 2013 study season, KHL has reinitiated consultation with stakeholders, applied for all requisite permits (based upon stakeholder input) and conducted significant logistical and mobilization preparations. The next step for KHL will be to conduct the natural resource studies outlined in their study plans, contract with an engineering consultant to begin feasibility work and continue collaboration with the natural resource agencies and public.

### **Environmental Studies**

- KHL's natural resource consultant will begin the 2013 study season with winter fish sampling in March. This will take the study team to the beginning of the bulk of their aquatics work in April which will extend to early November.
- Water Resources work will begin in April and sampling will continue into late October with the exception of stream gauging on Grant Creek which may go longer depending on weather conditions.

## Kenai Hydro, LLC

3977 Lake Street  
Homer, AK 99603

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- A bulk of the Terrestrial work will take place sporadically throughout the summer/fall of 2013 with some required 2<sup>nd</sup> year studies occurring in 2014 prior to License Application submittal.
- Cultural field work will take place in July and August of 2013.
- Recreation and Visual tasks will take place from late spring through late summer, early fall of 2013.
- All of the aforementioned field work will culminate in data analysis and study reports in late 2013 and early 2014. These tasks will be discussed in greater detail in upcoming progress reports as they near their implementation period.
- Collaboration with natural resource stakeholders will be ongoing during the study season and result in a study update meeting once a bulk of the data has been collected.
- KHL will continue efforts to engage the appropriate agencies in discussions related to the re-route of a small portion of the Iditarod National Historic Trail (INHT).

### Engineering

- KHL will finalize the engineering RFP.
- An engineering firm will be selected and feasibility work related to the License Application will begin.

### Stakeholder Outreach and Consultation

- KHL plans to continue consultation with the public, resource agencies and other stakeholders on Project plans and resource studies.
- KHL plans to continue to work on the proposed rerouting of the INHT.

Please feel free to contact me (907.283.2375 or [msalzetti@homerelectric.com](mailto:msalzetti@homerelectric.com)) with any questions regarding this filing.

Sincerely,

/s/ Mike Salzetti

Mike Salzetti  
Project Manager  
Kenai Hydro, LLC

cc: Service List and Mailing List for Project No. 13212

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Betty Charnon, Chugach NF Botanist

*Agency/Organization:* USFS

*Phone No./E-mail Address:* 907-754-2326

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*Date:* 2/27/13

*Time:* 1:00p

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*Grant Lake Licensing Team Contact:* Katy Beck, Botanical Resources

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#### *Summary of Conversation and/or E-mail Exchange:*

*I requested info on Sensitive plants, invasive weeds in the vicinity of the Grant Lake Project. She said she would send what she had to me.*

*I also asked if there was any recent vegetation maps for the area. She said that she didn't know of any.*

*She said that I would not need any special permits to do my surveys.*

---

----- Forwarded message -----

From: **DeCleva, Ed -FS** <[edecleva@fs.fed.us](mailto:edecleva@fs.fed.us)>

Date: Wed, Feb 27, 2013 at 9:52 AM

Subject: RE: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: Dara Glass <[dglass@ciri.com](mailto:dglass@ciri.com)>, Michael R Yarborough <[mry@crcalaska.com](mailto:mry@crcalaska.com)>, Frank Winchell <[frank.winchell@ferc.gov](mailto:frank.winchell@ferc.gov)>, Judith Bittner <[judy.bittner@alaska.gov](mailto:judy.bittner@alaska.gov)>, Shina Duvall <[shina.duvall@alaska.gov](mailto:shina.duvall@alaska.gov)>, "Sheri D.Buretta" <[bwelty@chugach-ak.com](mailto:bwelty@chugach-ak.com)>, Ben Ellis <[ben.ellis@alaska.gov](mailto:ben.ellis@alaska.gov)>, Lee Stephan <[president@eklutna-nsn.gov](mailto:president@eklutna-nsn.gov)>, "[ntc@niniilchiktribe-nsn.gov](mailto:ntc@niniilchiktribe-nsn.gov)" <[ntc@niniilchiktribe-nsn.gov](mailto:ntc@niniilchiktribe-nsn.gov)>, Jaylene Peterson-Nyren <[exec@kenaitze.org](mailto:exec@kenaitze.org)>, "[snainc@alaska.com](mailto:snainc@alaska.com)" <[snainc@alaska.com](mailto:snainc@alaska.com)>, Vernon Stanford <[kna@alaska.net](mailto:kna@alaska.net)>, Karen Rogina <[info@chenega.com](mailto:info@chenega.com)>, Arne Hatch <[finance@qutekcak.net](mailto:finance@qutekcak.net)>, Jolund Luther <[info@cityofseward.net](mailto:info@cityofseward.net)>  
Cc: "Stovall, Robert -FS" <[rstovall@fs.fed.us](mailto:rstovall@fs.fed.us)>, "Nelson, Sherry D -FS" <[snelson@fs.fed.us](mailto:snelson@fs.fed.us)>

Thank you, Michael. I am available March 11; unavailable March 12.

Ed

Ed DeCleva

Heritage Program Manager & Tribal Relations Specialist

Chugach National Forest

[907-743-9522](tel:907-743-9522)

---

**From:** Develice, Rob -FS [mailto:rdevelice@fs.fed.us]

**Sent:** Wednesday, February 27, 2013 4:33 PM

**To:** Levia Shoutis

**Cc:** Kathryn Beck; Amal Ajmi; Charnon, Betty -FS; Jackson, Erik -FS; Hubbard, Connie -FS; Riley, Mark D -FS; Ford, Joseph P -FS

**Subject:** RE: Veg classification- Grant Lk

Levia,

Attached are example graphics of some of the vegetation mapping available for the Trail River watershed and beyond. You can compare the orthophotography (on the first page) against the vegetation maps to get a sense of how the mapping captures the actual pattern of the vegetation. To my knowledge, the "Marv Rude Map" (on the last page) is in pretty frequent use on the Seward RD.

The overall most accurate map Forest-wide is NLCD but, possibly, the NLCD classes may be too generalized to meet your needs. Appendix A of the attached pdf provides a list of the classes for each classification.

Rob D.

PS we also have LiDAR data for the entire Kenai watershed (if you are interested). It provides a high resolution DEM and a canopy height model, etc...

---

Robert L. DeVelice, Ph.D.

Vegetation Ecologist

USDA Forest Service, Chugach National Forest

161 East 1st Avenue, Door 8

Anchorage, AK 99501-1639  
[rdevelice@fs.fed.us](mailto:rdevelice@fs.fed.us) 907-743-9437 743-9476 fax

---

**From:** Levia Shoutis [mailto:Levia.Shoutis@erm.com]  
**Sent:** Monday, February 25, 2013 1:28 PM  
**To:** Develice, Rob -FS  
**Cc:** Kathryn Beck; Amal Ajmi  
**Subject:** RE: Veg classification- Grant Lk

Hi Rob- Thanks for the additional information. The GIS metadata for the vegetation layer we're working with is cited as: "USDA Forest Service - Cover Type - general vegetation classes derived from Timber Type 1968-1973". We've also taken a look at the vegetation coverage presented in the 2007 Trail River Landscape Assessment. It looks like the citation we're working with might correspond to the 30-60 year old USFS vegetation data listed in the text of the landscape assessment (but not formally referenced). We were brought onto the project just last year, so we're still trying to confirm exactly where each data set is coming from.

You mention that the NLCD coverage has the best extent for the entire Chugach. Do you think the NLCD is also the best coverage available in GIS for the Trail River watershed?

Thanks again-

Levia Shoutis

OASIS Environmental, Inc., an ERM Company  
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Livingston, MT 59047  
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406-570-6194 Cell  
406-222-7677 Fax  
[levia.shoutis@erm.com](mailto:levia.shoutis@erm.com)  
[www.erm.com](http://www.erm.com)

---

**From:** Develice, Rob -FS [mailto:[rdevelice@fs.fed.us](mailto:rdevelice@fs.fed.us)]  
**Sent:** Thursday, February 21, 2013 5:11 PM  
**To:** Levia Shoutis  
**Cc:** Kathryn Beck; John Gangemi; Amal Ajmi; [jake.woodbury@mcmillen-llc.com](mailto:jake.woodbury@mcmillen-llc.com); Stovall, Robert -FS; Laves, Kevin -FS; Riley, Mark D -FS  
**Subject:** RE: Veg classification- Grant Lk

Levia,

I'm not sure what vegetation map you have for the Chugach. Attached is a report I prepared in 2012 in regard to the accuracy of various land cover maps covering all or part of the Forest. The National Land Cover Database (NLCD) represents the best available land cover classification spanning the Chugach National Forest but is a somewhat coarse classification (19 classes). The new vegetation map you allude to is in the process of being developed but is not yet available.

Regards, Rob

-----  
Robert L. DeVelice, Ph.D.

Vegetation Ecologist  
USDA Forest Service, Chugach National Forest  
161 East 1st Avenue, Door 8  
Anchorage, AK 99501-1639  
[rdevelice@fs.fed.us](mailto:rdevelice@fs.fed.us) 907-743-9437 743-9476 fax

---

**From:** Stovall, Robert -FS  
**Sent:** Thursday, February 21, 2013 12:14 PM  
**To:** Levia Shoutis; Laves, Kevin -FS; Develice, Rob -FS  
**Cc:** Kathryn Beck; John Gangemi; Amal Ajmi; [jake.woodbury@mcmillen-llc.com](mailto:jake.woodbury@mcmillen-llc.com)  
**Subject:** RE: Veg classification- Grant Lk

Kevin and Rob:

Would you be able to answer Levia's question on Forest Veg Mapping?

Levia, Kevin is the Terrestrial Program Manager for the Kenai Peninsula Zone working out of KLWC at 907 288-7746, and Rob Develice is the Forest Ecologist working out of the SO at 907 743-9437

Thank you,

Robert

---

**From:** Levia Shoutis [<mailto:Levia.Shoutis@erm.com>]  
**Sent:** Wednesday, February 20, 2013 7:56 AM  
**To:** Stovall, Robert -FS  
**Cc:** Kathryn Beck; John Gangemi; Amal Ajmi; [jake.woodbury@mcmillen-llc.com](mailto:jake.woodbury@mcmillen-llc.com)  
**Subject:** RE: Veg classification- Grant Lk

Hi Robert- This is Levia Shoutis, we met at the Grant Lake hydropower project agency meeting in December in Anchorage. I am trying to confirm whether the vegetation map that we have for the Chugach is the latest mapping effort for the Forest, and were wondering who we might be able to ask. I saw that there was supposed to be a new vegetation map deliverable to the Forest (via a contractor) in December 2012. Do you mind putting us in contact with the vegetation staff on the Chugach to ask whether there is indeed a new map forthcoming?

Thanks and hope you're well-

Levia Shoutis

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P.O. Box 582  
1 Ninth St. Island Dr.  
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406-222-7600 x229  
406-570-6194 Cell  
406-222-7677 Fax  
[levia.shoutis@erm.com](mailto:levia.shoutis@erm.com)  
[www.erm.com](http://www.erm.com)

---

**From:** Kathryn Beck [<mailto:calypso@openaccess.org>]  
**Sent:** Tuesday, February 19, 2013 4:20 PM

**To:** Levia Shoutis; Amal Ajmi  
**Subject:** RE: Veg classification- Grant Lk

Amal, Levia - Hi there! I am back in Bham for a bit and was going to get a start on some Prefield review stuff for the botanical portion of the Grant Lake project.  
Did either of you find any vegetation type info or vegetation maps for the project area other than the very general map included in the study plan?  
Have either of you made contact with the botanist (if there is a botanist) at the Seward District?  
I have looked around a bit on the Chugach NF website and couldn't find any specific info.  
I hope all is going well.  
Thanks, Katy

---

**From:** Levia Shoutis [<mailto:Levia.Shoutis@erm.com>]  
**Sent:** Wednesday, January 09, 2013 1:03 PM  
**To:** Kathryn Beck; Amal Ajmi  
**Subject:** Veg classification- Grant Lk

Hi Katy- I'm not sure if you're working right now, I really hope everything is going OK with your parents. Because I assume you're not working, Amal, do you mind taking a stab at this veg classification/mapping question?

The GIS layer for veg mapping provided to us by KHL, "Veg\_Class\_pre\_map\_6152010" has no metadata, and I'm trying to sleuth down exactly where this came from, and what classification was used for mapping. It has the same date in the name as the HDR wetlands pre-field mapping, so perhaps it was actually part of HDR's mapping? However, I imagine they didn't start cold, but likely copied polygons from existing veg mapping. But the cover types don't match what I'm seeing in existing Chugach NF mapping (e.g. the 1999 classification by DeVelice). Do you know what mapping Katy was going to start with (as stated in the study plan that we're "updating existing mapping"- was this from the 1960's-70's?).

Any clues would be great. HDR has already said that they don't have a budget to help w/questions. Amal, I'm hitting you up b/c I think you're going to use the veg mapping for some of your habitat assessment?

Thanks!

Levia

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---

**From:** Leclair, Claire H (DNR) [<mailto:claire.leclair@alaska.gov>]  
**Sent:** Monday, March 04, 2013 8:11 AM  
**To:** Cory Warnock  
**Cc:** [msalzetti@homerelectric.com](mailto:msalzetti@homerelectric.com)  
**Subject:** RE: Multi-Agency Permit Application (Grant Lake Project)

Cory-

I spoke with Mike Salzetti Friday concerning timing for permitting activities proposed within the Kenai River Special Management Area.

*Claire Holland LeClair*  
Deputy Director/Chief of Field Operations  
Division of Parks & Outdoor Recreation  
907-269-8702

*The Division of Parks & Outdoor Recreation provides outdoor recreation opportunities and conserves and interprets natural, cultural, and historic resources for the use, enjoyment and welfare of the people.*

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Saturday, March 02, 2013 8:16 PM  
**To:** Leclair, Claire H (DNR)  
**Cc:** Russell, Pamela J (DNR); Blackwell, Jack D (DNR); Mike Salzetti; Emily Andersen  
**Subject:** Multi-Agency Permit Application (Grant Lake Project)

Hi Claire,

My name is Cory Warnock and I'm the project manager for both the licensing and natural resource components acting on behalf of Homer Electric Association (HEA) for the Grant Lake Project. I understand that you left a message with Mike Salzetti (HEA) on 2/27 in regard to the schedule associated with receipt of the remainder of our permits for natural resource work that we will be conducting this year. It sounded as though one of the two permits you envision issuing will likely be coming our way in March and the other in April. I'm reaching out to you in hopes of receiving a bit more clarity as it relates to what specific permit you see operating on each schedule. As I think you know, we have plans to begin some late winter fish work in March and our studies will really start kicking into full-swing in April. I do have a bit of concern that the latter of the two permits may not be available until after we need it (depending in the specific permit type). HEA was very proactive in their approach to discussing the necessary permits with stakeholders last December and subsequently applying for them. In addition, we have been extremely responsive to all questions and requests for additional information that have come our way from the Kenai River Center. Our hope is that the remainder of the review process associated with our application can be as expeditious as possible with the understanding that everything must be reviewed and pass through the proper channels. If you could provide a bit

more information related to anticipated timeframes, I'd really appreciate it. I'd be more than happy to discuss our schedule in more detail if you'd like, as well. If a call would help, let me know and I'll do my best to accommodate your schedule.

Thanks and I'll look forward to hearing from you soon,

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

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# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

---

*Contact Name:* Claire LeClair

*Agency/Organization:* ADNR

*Phone No./E-mail Address:* 907-269-8702, [claire.leclair@alaska.gov](mailto:claire.leclair@alaska.gov)

---

*Date:* 3/5/13

*Time:* 11:45am PST and 4:45pm PST

---

*Grant Lake Licensing Team Contact:* Cory Warnock

---

#### *Summary of Conversation and/or E-mail Exchange:*

Ms. LeClair and Mr. Warnock had two calls during 3/5/13. The first was initiated by Ms. LeClair in response to HEA's multi-agency permit application and the corresponding review by ADNR. She and one of her associates had a series of clarifying questions related to the application that needed to be answered prior to processing the ADNR permit. The questions focused on:

- Timing of the permit
- Ground disturbing activities
- Weir and man camp infrastructure and timing
- The helicopter lift of gear into the site

Most of the questions were answered by Mr. Warnock during the first call in the morning. A follow-up call was requested by Ms. LeClair in the afternoon once she had an opportunity to confer with a co-worker. Mr. Warnock initiated that call and it was essentially a confirmation of what was stated during the call in the morning.

Ms. LeClair stated that one of two outcomes for the permit was likely. The first was that a phased approach would be taken allowing HEA to conduct the "late winter" work by front-loading those aspects into the first portion of the permit to be received in late March with an

additional portion coming in early April allowing for the remainder of the activities to take place in 2013, as outlined in the study plans. The second possibility was that ADNR would be able to process the entirety of the permit prior to late March allowing for the distribution of the comprehensive permit by late March. Both Ms. LeClair and Mr. Warnock committed to staying in touch to monitor progress and answer any questions that may come up.

Total Call Duration (2 calls): 45 minutes.

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

---

*Contact Name:* Bill Templin

*Agency/Organization:* ADF&G

*Phone No./E-mail Address:* 907-267-2234, [bill.templin@alaska.gov](mailto:bill.templin@alaska.gov)

---

*Date:* 3/7/13

*Time:* 4:45 PST

---

*Grant Lake Licensing Team Contact:* Cory Warnock

---

#### *Summary of Conversation and/or E-mail Exchange:*

Mr. Templin called Cory Warnock to discuss a previous email inquiry related to acquiring genetic sampling supplies and the potential for ADF&G's lab to conduct genetic analysis of anadromous fish samples collected during the 2013 field season on Grant Creek. Mr. Templin requested some additional information related to methods and Mr. Warnock committed to sending the Aquatics Study Plan. It was agreed that after Mr. Templin discussed the methods with his associates, a time would be set to have a call between ADF&G and the appropriate folks within the Grant Lake Project Natural Resources Team.

Call Duration: 5 minutes.

---

**From:** Cory Warnock  
**Sent:** Thursday, March 07, 2013 9:28 AM  
**To:** Miller, Monte D (DFG)  
**Cc:** Emily Andersen  
**Subject:** RE: DNA Supplies and Analysis

Thanks, Monte and I'm sorry to hear about you wife. I'm glad you made that your priority and hope things improve very soon.

Cory

---

**From:** Miller, Monte D (DFG) [<mailto:monte.miller@alaska.gov>]  
**Sent:** Thursday, March 07, 2013 9:26 AM  
**To:** Cory Warnock  
**Subject:** FW: DNA Supplies and Analysis

Cory,

Sorry for the delay. When I returned to Anchorage I had a phone message that my wife had fallen and was in the ER at the hospital. The next several days were a mess....I spent a couple of hours in the office on Monday and then was out at the AWRA conference until this morning. Bill Templin can be reached at 907 267-2234.

Monte D. Miller  
Statewide Hydropower Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish / RTS  
333 Raspberry Road  
Anchorage, Alaska, 99518-1565  
(907) 267-2312

---

**From:** Miller, Monte D (DFG)  
**Sent:** Thursday, January 24, 2013 11:06 AM  
**To:** Templin, Bill D (DFG)  
**Cc:** Klein, Joseph P (DFG); Johnson, Shawn L (DFG)  
**Subject:** FW: DNA Supplies and Analysis

Bill,

I received this request regarding genetic services for the proposed Grant Lake Hydroelectric studies from Cory Warnock. While I am not familiar with ADF&G policies regarding genetic studies and assistance to developers, this might seem to be an opportunity to expand the genetic database for Grant Lake, Upper Trail Lake and the Kenai River system. Please contact Cory to discuss what they have planned and to identify costs associated with any ADF&G assistance. Please also keep me in the loop. Thanks, I appreciate your time in this matter.

Monte D. Miller  
Statewide Hydropower Coordinator  
Alaska Department of Fish and Game

Division of Sport Fish / RTS  
333 Raspberry Road  
Anchorage, Alaska, 99518-1565  
(907) 267-2312

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Thursday, January 24, 2013 8:30 AM  
**To:** Miller, Monte D (DFG); Johnson, Shawn L (DFG)  
**Cc:** Mike Salzetti; Emily Andersen  
**Subject:** DNA Supplies and Analysis

Hi Monte and Shawn,

I'm reaching out to both of you in hopes that you can provide some information and perhaps a contact within your agency to discuss the DNA sampling we will be conducting in 2013 associated with the Grant Lake Project. We would like to utilize ADF&G's resources and expertise if possible in this regard. We plan on collecting scale samples and conducting DNA analysis on Chinook, Sockeye and Coho and would be interested in discussing the possibility of having ADF&G provide the supplies (scale card, vials, preservative, etc) and conduct the actual analysis for the effort. I'd like to get in touch with the appropriate folks and discuss this in more detail. Any contact information you could provide would be much appreciated.

Thanks and I'll look forward to hearing from you soon,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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From: **DeCleva, Ed -FS** <[edecleva@fs.fed.us](mailto:edecleva@fs.fed.us)>

Date: Thu, Mar 7, 2013 at 8:07 AM

Subject: RE: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: Michael R Yarborough <[mry@crcalaska.com](mailto:mry@crcalaska.com)>

Cc: "Nelson, Sherry D -FS" <[snelson@fs.fed.us](mailto:snelson@fs.fed.us)>, "Van Massenhove, Katherine B -FS" <[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)>, "Stovall, Robert -FS" <[rstovall@fs.fed.us](mailto:rstovall@fs.fed.us)>

Hi Mike,

Several of us here at FS are wondering if the meeting date has been set.

Thank you, Ed

Ed DeCleva

Heritage Program Manager & Tribal Relations Specialist

Chugach National Forest

[907-743-9522](tel:907-743-9522)



---

**From:** Cory Warnock  
**Sent:** Friday, March 08, 2013 12:21 PM  
**To:** Templin, Bill D (DFG)  
**Cc:** Emily Andersen  
**Subject:** RE: Grant Lake Hydro genetic study  
**Attachments:** Aquatic Resources Study Plan.pdf

Hi Bill,

Please find attached our Grant Lake Aquatics Study Plan. The genetic collection methods description is extremely limited by design and based upon formal discussion with resource agencies. I believe the appropriate approach would be for us to set up a time where my aquatics folks can speak with you and your co-workers to appropriately outline the collection methods and associated analysis needs that we see. That way we can make sure we secure all of the needed supplies for appropriate data collection and you can gain the appropriate amount of clarity related to the analysis that we will be needing at the back end of our 2013 studies.

So, after you have a chance to review and confer with your co-workers, let me know of a couple days/times that will work for you in the next couple week to chat and I'll get it scheduled with my folks. That sound like an ok approach?

Thanks,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
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Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

---

**From:** Templin, Bill D (DFG) [<mailto:bill.templin@alaska.gov>]  
**Sent:** Thursday, March 07, 2013 5:06 PM  
**To:** Cory Warnock  
**Subject:** Grant Lake Hydro genetic study

Cory,

You can send the study plan to me and I'll have it reviewed by my local experts. It might take a week since next week is spring break, but we can arrange a meeting or phone call to discuss sampling and analysis issues.

Regards,

Bill

William D. Templin  
Principal Geneticist  
Gene Conservation Laboratory  
Alaska Dept. of Fish & Game  
333 Raspberry Road  
Anchorage, Alaska 99518  
907.267.2234

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Grant Lake Project  
(FERC No. 13212)

# **Aquatic Resources**

## *Final Study Plan*

**Prepared for:**  
**Kenai Hydro, LLC**  
**3977 Lake Street**  
**Homer, AK 99603**

*November 2012*

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### **List of Abbreviations and Acronyms**

<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>AEIDC</b>	Arctic Environmental Information and Data Center (University of Alaska)
<b>AHRS</b>	Alaska Heritage Resources Survey
<b>APA</b>	Alaska Power Authority
<b>ARWG</b>	Aquatic Resources Work Group
<b>AWC</b>	Anadromous Waters Catalog
<b>BLM</b>	Bureau of Land Management
<b>°C</b>	Degrees Celsius
<b>cfs</b>	cubic feet per second
<b>cm</b>	centimeter
<b>CPUE</b>	catch per unit effort
<b>°F</b>	Degrees Fahrenheit
<b>DNR</b>	Alaska Department of Natural Resources
<b>EPA</b>	Environmental Protection Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FL</b>	Fork Length
<b>fps</b>	feet per second
<b>ft</b>	feet
<b>G&amp;A</b>	general and administrative
<b>GPS</b>	global positioning system
<b>GWh</b>	gigawatt hours
<b>HEP</b>	Hydroelectric Evaluation Program
<b>IFIM</b>	instream flow incremental methodology
<b>in</b>	inch
<b>KHI</b>	Kenai Hydro Inc.
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>kWh</b>	kilowatt hours
<b>LLC</b>	Limited liability company
<b>mg/L</b>	milligrams per liter
<b>mi</b>	mile

<b>MIF</b>	minimum instream flow
<b>mm</b>	millimeter
<b>MSL</b>	Mean sea level
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NWI</b>	National Wetlands Inventory
<b>O&amp;M</b>	Operations & maintenance
<b>RM</b>	river miles
<b>RVDs</b>	Recreation visitor days
<b>TL</b>	total length
<b>TWG</b>	technical working group
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	U.S. Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>YOY</b>	Young of the year

# **Aquatic Resources Study Plan Grant Lake Hydroelectric Project (FERC No. 13211/13212)**

## **1 Introduction**

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD), along with a Notice of Intent to file an application for an original license, for a combined Grant Lake/Falls Creek Project (FERC No. 13211/13212 ["Project" or "Grant Lake Project"]) under Part I of the Federal Power Act. On September 15, 2009, FERC approved the use of the Traditional Licensing Process for development of the license application and supporting materials. As described in more detail below, the proposed Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake.

The Project will be located near the community of Moose Pass, Alaska in the Kenai Peninsula Borough, approximately 25 miles north of Seward, Alaska and just east of the Seward Highway (State Route 9).

This Aquatic Resources study plan is designed to address information needs identified in the PAD, during the Traditional Licensing Process public comment process, and through early scoping conducted by FERC. A study report will be produced that presents existing information relative to the scope and context of potential effects of the Project. This information will be used to analyze Project impacts and propose protection, mitigation, and enhancement measures in the draft and final license applications for the Project.

## **Proposed Project Description**

The PAD Project proposal included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

The proposed Project would be composed of a diversion dam at the outlet to Grant Lake, an intake structure in Grant Lake, a tunnel, a surge tank, a penstock, a powerhouse, a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, an overhead or underground transmission line, and a pole-mounted disconnect switch where it ties into the existing City of Seward distribution line or Chugach Electric's transmission line. The powerhouse would contain two Francis turbine generating units with a combined rated capacity of 5.0 MW with a total design flow of 385 cfs.

Two modes of operation are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at a specific output level. Level control, or balancing of outflow to inflow, will likely only occur during periods of low natural inflow to Grant Lake when the reservoir is at or near minimum pool elevation. Due to the small size of the Project in relation to the size of the interconnected system, the Project is not likely to be used to load follow.



Prior to reinitiating planning efforts for natural resource studies, KHL was evaluating two potential access road routes. The Falls Creek route would be approximately 3 miles long beginning at the south end of Lower Trail Lake, and the Trail Lake Narrows route would be about one mile long beginning at the Seward Highway. In early 2012, KHL determined that the Trail Lake narrows route was the most feasible and has eliminated the Falls Creek route from consideration. The Trail Lake Narrows route has not been fully assessed from a natural resource perspective and will be comprehensively evaluated in 2013 as part of this study effort.

## **2 Overall Goals Identified during Project Scoping**

Together with existing information, the goals of the study efforts described in this plan are to provide baseline information, and where applicable, information on alternative flow regimes, which will allow an assessment of potential Project impacts on aquatic resources in the study report. These impact assessments will identify potential protection, mitigation, and enhancement measures to be presented in the draft and final license applications.

The goals of this suite of studies are to provide supporting information on the potential resource impacts of the proposed Project that were identified during development of the PAD, public comment, and FERC scoping for the License Application, as follows:

- Impact of Project operation on sediment transport (relative to the availability of spawning gravels) due to changes in flow in Grant Creek.
- Impact of Project operation (fluctuating lake levels in Grant Lake, changes in seasonal flow in Grant Creek, reduced flows between the dam and powerhouse on Grant Creek) on fish abundance and distribution.
- Impact of Project construction and operation on biological productivity and abundance of fish food organisms in Grant Creek and Grant Lake.
- Impact of Project intake structure operation on fish populations.
- Impact of Project construction on fish habitat in Grant Creek.
- Impact of Project facilities (increased access) on fish populations due to potential increased recreational fishing.
- Impact of Project construction and operation on commercial, sport, and subsistence fisheries supported by the Kenai River watershed.

Specific objectives and quantitative objectives are presented below for each individual study component.

## **3 Existing Information**

Information relating to aquatic resources has been collected during previous investigations into the potential development of hydroelectric generation at Grant Creek as well as during pre-licensing studies conducted by KHL in 2009 and early 2010.

### 3.1 Pre-2009 Studies

Previous FERC licensing efforts in the 1960s and 1980s for a proposed hydroelectric project at Grant Lake included studies of fish resources in Grant Lake and Grant Creek. Arctic Environmental Information and Data Center (AEIDC 1983) conducted fish sampling from 1981 to 1982 as part of a comprehensive environmental baseline study effort and the USFWS (1961) conducted limited sampling from 1959 to 1960. An instream flow study was completed in 1987 as part of a preliminary FERC license application prepared by Kenai Hydro, Inc. (not related to the current Kenai Hydro, LLC; Envirosphere 1987, KHI 1987a, and KHI 1987b).

**Grant Creek Fish Resources** - Both anadromous and resident fish are present in Grant Creek, including salmon, trout, and other species. Spawning Chinook (*Oncorhynchus tshawytscha*), Sockeye (*Oncorhynchus nerka*), and Coho (*Oncorhynchus kisutch*) salmon, as well as Rainbow trout (*Oncorhynchus mykiss*) and Dolly Varden (*Salvelinus malma*) are found in the lower reaches of Grant Creek (APA 1984; Johnson and Klein 2009; Figure 1). Rearing Chinook, Coho and Rainbow trout are also present (APA 1984, Johnson and Klein 2009). Round whitefish (*Prosopium cylindraceum*) and Arctic grayling (*Thymallus arcticus*) were caught during angling surveys but are not assumed to spawn in Grant Creek (APA 1984).

Upper Grant Creek is impassable to salmon 0.5 mile (APA 1984) to 1 mile (Johnson and Klein 2009) upstream of the mouth; fish habitat is most likely concentrated within the lower portion of stream. Habitat for juvenile fish exists mainly in stream margins, eddies, deep pools, and side channels offering reduced velocities (APA 1984). Substrate material is coarse throughout the entire length of the creek due to high water velocity that tends to wash away smaller gravels (APA 1984). Isolated areas of suitable spawning gravels occur in the lower half of the stream (APA 1984).

Periodic minnow trapping on Grant Creek from July 1959 through January 1961 captured juvenile Chinook salmon, Coho salmon, Dolly Varden char, and sculpin (extent of sampling area unknown; USFWS 1961). Minnow trapping and electrofishing in the lower reaches of Grant Creek for week-long periods in October 1981 and March, May, June, and August 1982 yielded higher catches of trout, salmon, and Dolly Varden in the fall and summer than in winter and spring (AEIDC 1983). Catches of Dolly Varden were generally most abundant in the minnow traps, followed by juvenile Chinook, juvenile Rainbow trout, and juvenile Coho. Juvenile Chinook were the most commonly caught fish during electrofishing surveys (APA 1984).

APA (1984) estimated that Grant Creek supported 250 Chinook spawners and 1,650 Sockeye spawners. The stream was also estimated to support 209 8-inch “trout” (including Dolly Varden and Rainbow trout) (APA 1984). Spawning Coho were not observed (APA 1984) but have been recorded as being present at unknown levels in the stream by the AWC (Johnson and Klein 2009). Maximum counts from intermittent stream surveys by ADFG were 76 Chinook (1963) and 324 (1952) Sockeye salmon.<sup>1</sup>

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<sup>1</sup>Anadromous Waters Catalog Stream Nomination #08-153,  
<http://www.sf.adfg.state.ak.us/SARR/FishDistrib/Nomination/FDDNomHome.cfm>

**Grant Lake Fish Resources** - Sampling during 1981-1982 found no fish in any of the tributaries to Grant Lake (AEIDC 1983). Sculpin and Threespine stickleback were the only fish found to inhabit Grant Lake. A series of impassable falls<sup>2</sup> near Grant Lake's outlet prevents colonization of the lake by salmonids via Grant Creek (APA 1984). Density of Threespine stickleback was ten times higher in the lower basin than the upper basin of Grant Lake (AEIDC 1983).

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<sup>2</sup> 2007 ADFG Stream survey referenced in Anadromous Waters Catalog Stream Nomination #08-153, <http://www.sf.adfg.state.ak.us/SARR/FishDistrib/Nomination/FDDNomHome.cfm>



**Figure 1. Fish and aquatic resources study area.**

Because of the impassable falls below Grant Lake's outlet, no anadromous fish species occur in Grant Lake and its tributaries (USFWS 1961, AEIDC 1983, APA 1984), and Grant Lake is not included in the Anadromous Waters Catalog (AWC) published by ADF&G (Johnson and Daigneault 2008). Grant Lake appears to support only resident populations of sculpin—including Slimy sculpin (*Cottus cognatus*) and Coast Range sculpin (*Cottus aleuticus*)—and Threespine stickleback (*Gasterosteus aculeatus*) (AEIDC 1983, USFWS 1961, Johnson and Klein 2009). Although Sisson (1984) reported that Dolly Varden and a few Rainbow trout occupied Grant Lake, subsequent investigations (USFWS 1961, AEIDC 1983, Marcuson 1989) have documented only sculpin and stickleback. From 1983-1986, coho salmon fry were stocked in Grant Lake by ADF&G, with limited success, though some enhanced returns to Grant Creek were recorded (Marcuson 1989).

**Instream Flow** - Environmental analyses that emphasized the relationship between stream flow and aquatic habitats (instream flow studies) were conducted on Grant Creek in the 1980s by Kenai Hydro, Inc. (KHI; unrelated to Kenai Hydro, LLC). These documents were compiled in support of a license application for hydropower development on Grant Creek. The documents include reports and written communications between KHI and state and federal agencies in 1986 and 1987 relative to a FERC license application for the proposed Grant Lake Hydroelectric Project (FERC No. 7633-002). Included were draft and final reports of a limited but complete Instream Flow Incremental Methodology (IFIM) investigation and negotiated minimum instream flows and ramping rates (Envirosphere 1987, KHI 1987a, and KHI 1987b). A technical memorandum was drafted and shared with the Instream Flow Technical Working Group (TWG) participants in 2009 detailing the results of the previous instream flow study efforts (HDR 2009b).

### 3.2 2009 and 2010 Aquatic Resources Studies

The 2009 aquatic resources study program was intended to begin the process of acquiring resource information needed for FERC licensing and other regulatory requirements. Emphasis was on updating existing information, acquiring more complete information required for specific issue analysis, and providing background information needed to develop more focused studies after initiation of the formal FERC licensing process. The studies were continued in 2010 but the program was discontinued in July, 2010 to revise the study plans as a result of comments received during the FERC scoping process. Most of the studies planned for 2010 were not completed.

**Fish** - The 2009 fisheries study (HDR 2009a) focused on the following objectives:

- Determine the relative abundance and distribution of juvenile fish in Grant Creek.
- Determine the relative abundance and distribution of resident Dolly Varden and Rainbow trout in Grant Creek.
- Estimate abundance and run timing of spawning salmon.
- Estimate abundance and run timing of spawning adult resident fish.
- Determine fish presence and distribution in Grant Lake.

Consistent with studies conducted by AEIDC (1983), Grant Creek was divided into study Reaches 1 through 6. Reaches 1 through 4 were roughly 0.25 mi each in length and Reaches 5 and 6 were established based on geomorphologic characteristics (HDR 2009a; Figure 2).



Kenai Hydro Environmental Baseline Studies

Figure 2

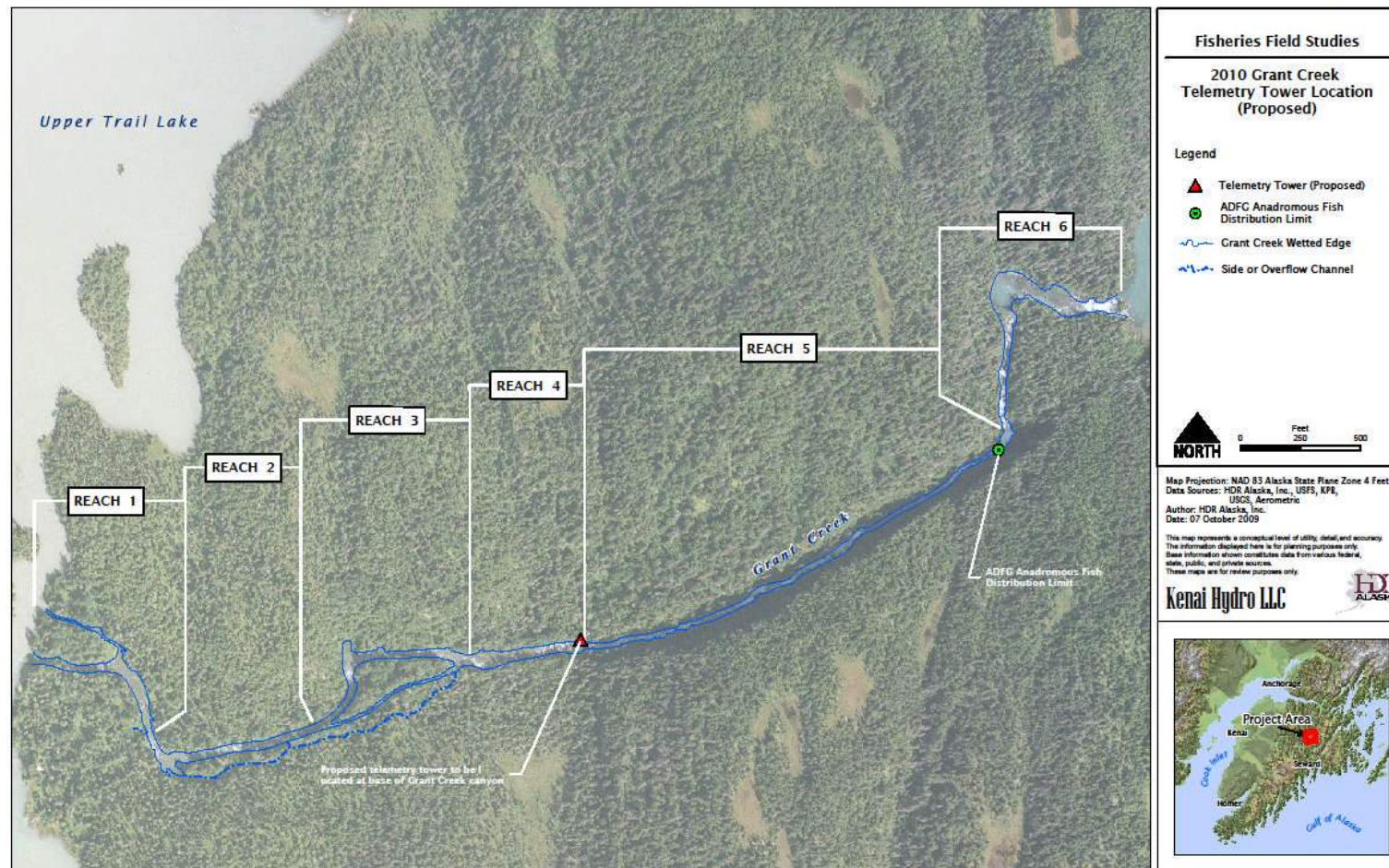


Figure 2. Study reaches designated on Grant Creek and proposed telemetry tower location.

Relative abundance and distribution of juvenile fish were determined by minnow trapping and calculating the catch-per-unit-effort (CPUE) for each reach. Reaches 1 through 4 were sampled relatively evenly, with nine to 13 minnow traps per reach. Terrain was difficult to access in Reaches 5 and 6, so these reaches were sampled less frequently and with only three and five sites, respectively. A total of 50 baited minnow traps were placed throughout the creek in Reaches 1 through 6; mesh size was 0.25 inch. The creek was sampled monthly, with the exception of Reach 6, which was sampled in June and August only. Dolly Varden were found to be the most abundant species in Grant Creek and distributed throughout Grant Creek Reaches 1 through 5, although they had a greater relative abundance in Reaches 4 and 5. Coho salmon was the next most abundant species and individuals were distributed throughout Reaches 1 through 5. However, coho appeared to have the greatest relative abundance in Reach 1. Chinook salmon was the next most abundant species. There was a noticeable decrease in Chinook abundance in upstream reaches, and they were not caught above Reach 4. Other fish present in small numbers were Sockeye salmon, Rainbow trout, sculpin, and threespine stickleback. Most salmon captured were young-of-the-year with few larger juveniles present (HDR 2009a).

Relative abundance of larger size resident salmonids (i.e., Rainbow trout and Dolly Varden) was determined by calculation of angling CPUE (HDR 2009a). A total of 18 angling sites were established along the creek, and each site was fished for 30 minutes approximately every 10 days, from early June through late September. Rainbow trout ( $n = 68$ ) were found to be more abundant than Dolly Varden ( $n = 9$ ) and were caught throughout the creek, although their relative abundance was higher in Reaches 3 through 5 than in Reaches 1 and 2. Dolly Varden were captured in Reaches 1, 2, and 3; their relative abundance was highest in Reach 1. This study was also aimed at determining the timing of spawning of adult resident fish; however, it appeared that spawning, if present, occurred before or after the 2009 study period, since little evidence of spawning fish was seen (HDR 2009a). Rainbow trout angling studies were continued in the spring and early summer of 2010 to confirm the presence of spawning and determine fish numbers. The progression of reproductive condition and the presence of adult rainbow trout in spawning condition confirmed that spawning did occur in Grant Creek in 2010. Capture success was too low to allow population estimates. Adult rainbow trout were observed in the upper portions of the canyon reach.

Abundance and run timing of spawning anadromous fish was estimated through data collected during foot surveys (HDR 2009a). Foot surveys occurred approximately every 10 days beginning in mid-June and ending in late September. Both Sockeye and Chinook salmon were seen in the lower five reaches. Chinook salmon reached Grant Creek first around the beginning of August. Sockeye salmon did not arrive until the end of August. Escapement of Chinook salmon was estimated to be 231 fish, and escapement of Sockeye salmon was estimated at 6,293.

Fish distribution and presence in Grant Lake and its tributaries were assessed using minnow traps, electrofishing, and gill nets (HDR 2009a). Sampling occurred at nine gill netting sites, 18 electrofishing sites, and 28 minnow trapping sites. Threespine stickleback was the dominant species in the lake followed by sculpin. No other species of fish was captured (HDR 2009a).

**Instream Flow** - The collaborative process for a study of “instream flow” effects in Grant Creek was initiated in 2009 (HDR 2009a). The primary goal of the 2009 instream flow study program was to establish a Technical Work Group (TWG) consisting of state and federal resource agency staff, KHL staff, and interested members of the local community. Once established, the TWG

met three times during the 2009 study season to review the results of the 2009 aquatic baseline study efforts, discuss and agree upon an acceptable instream flow evaluation method, and request additional information to support the selection of an instream flow method (HDR 2009a).

As part of the instream flow study, and at the request of the TWG, a sampling event was conducted from 23 to 25 June 2009 on Grant Creek to characterize the types of aquatic habitats used by resident fish and rearing fish (HDR 2009a). Aquatic habitat was described at each sample site by recording macro-, meso-, and micro- habitat characteristics. During the June sampling event, snorkeling was the primary method used to document fish presence. Electrofishing was used primarily to confirm species identification and calibrate fish length estimates (HDR 2009a).

Collaboratively, the TWG and KHL decided to select an instream flow study methodology based on the knowledge obtained from the summer 2009 aquatic resources and hydrology studies (HDR 2009a). Data and analyses from these studies were shared with the TWG in July and September. Based on the knowledge gained of Grant Creek's fish and hydrologic resources, KHL presented a proposed instream flow approach to the TWG on 23 September (HDR 2009a). Physical stream data required for instream flow modeling per the proposed approach were collected at 18 transects during low- and mid-flow conditions in 2010.

**Macroinvertebrates, Plankton, and Periphyton** - Benthic macroinvertebrate and periphyton samples were collected in Grant Creek in August, 2009 (HDR 2009a). Macroinvertebrate population density and taxa diversity can be used to assess stream water and habitat health and macroinvertebrates are an important source of food for fish. Periphyton (algae attached to large rocky substrate) is used to assess chlorophyll *a* content, an indicator of primary productivity. The sampling event was scheduled to occur during the time of year that typically displays the peak of diversity and population densities.

Sampling in 2009 was postponed due to a large rain event (HDR 2009a). This rain event may have scoured Grant Creek, dislodging many larger genera of macroinvertebrates and washing them out of the system. The macroinvertebrates that were found were typically smaller genera, although taxa diversity was at levels expected for south central Alaska streams. Periphyton is not affected as easily by high flow.

Zooplankton and phytoplankton were collected in Grant Lake in August (HDR 2009a). Phytoplankton samples were analyzed for chlorophyll *a* concentrations similar to periphyton in the creek. Concentrations in the lake were lower than that found in the creek.

### **3.3 Need for additional information**

Early study programs and the 2009-2010 baseline study program conducted by KHL have provided a significant amount of background information regarding aquatic resources in the Project area. Following analysis of the 2009 and 2010 study results, information gaps were identified for further study to support the FERC licensing process and accompanying permit requirements. Proposed additional field studies are intended to provide information on the following general topics. Specific objectives for study components will be described below for each component.

- Juvenile fish use of winter habitats.



- Better definition of fish use of microhabitats and overall species composition and relative abundances in Reaches 1 through 4.
- Extent of Rainbow trout spawning in Grant Creek.
- Use of Reach 5 by juvenile and adult fish, with additional emphasis on spawning Chinook salmon use of Reach 5.
- Delineation of aquatic habitats available in Grant Creek; identify key habitats for fish and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.
- Estimation of salmon spawning escapement in Grant Creek.
- Examination of how important individual habitat units may be affected by changes in flow due to the operation of the proposed Project using instream flow assessment methods.
- Baseline diversity and abundance characteristics of benthic macroinvertebrates in Grant Creek.
- Baseline primary productivity of Grant Creek as measured by chlorophyll *a* concentration in phytoplankton samples.
- Fish resources and habitat use of the Trail Lake Narrows at the proposed bridge site.

## **4 Methods**

Aquatic resources of Grant Creek will be studied through an integrated study program with three main disciplines: fish biology, instream flow, and an aquatic ecology element that includes macroinvertebrates and periphyton. Specific methods for aquatic resources are described below.

### **4.1 Study Area**

Water bodies to be investigated as part of the Aquatic Resources Study Plan include Grant Lake and Grant Creek, located near the community of Moose Pass, Alaska, approximately 25 miles north of Seward, Alaska, and just east of the Seward Highway (State Route 9). The proposed Project location is in the Kenai Peninsula Borough. The study area is shown in Figure 1.

### **4.2 Field Study Components**

Field studies will include the following principal components, each designed to address one or more specific concerns:

1. Grant Creek salmon spawning distribution and abundance:
  - Use of a counting weir to inventory upstream migrating salmon.
  - Supplemental foot surveys of Grant Creek to determine distribution and abundance of spawning salmon.

- Telemetry study of Chinook and Sockeye salmon spawning distribution, with emphasis on the inaccessible canyon section of Grant Creek (Reach 5).
2. Grant Creek resident and rearing fish distribution and abundance:
    - Use of a counting weir to inventory the movements and abundance of adult resident species.
    - Telemetry study of Rainbow trout to determine the distribution of spawning and feeding areas in Grant Creek.
    - Surveys to determine fish presence in suspected overwintering habitats.
    - Surveys of Grant Creek to estimate distribution and abundance of juvenile fish by habitat type, with emphasis on areas not surveyed in 2009 including Reach 5.
    - Juvenile fish outmigration monitoring in spring and fall.
  3. Grant Creek aquatic habitat mapping:
    - Synthesis of fish use and aquatic habitat data for Grant Creek.
    - Delineation of aquatic habitats in Reaches 1 through 5 of Grant Creek.
    - Surveys to ground-truth office-based habitat delineation, fill spatial data gaps, and verify fish use of aquatic habitats.
    - Identification of key habitats based on observed fish use.
    - Analysis of habitat factors that distinguish key habitats from other habitats available in Grant Creek.
  4. Grant Creek Instream Flow Study, including the following components:
    - Habitat availability analysis using measurements of stream geometry at the 18 previously selected transect sites.
    - Fish use of meso- and microhabitats.
    - Integration of flow and temperature monitoring.
    - Analysis and modeling to predict habitat response to changes in flow regime.
  5. Benthic macroinvertebrates in Grant Creek:
    - Sampling using pseudo-replication Surber sampling methods to estimate population density in riffle/run habitats.
    - Macroinvertebrate identification to genus level (when possible) identification for use in calculating population metrics.
  6. Periphyton in Grant Creek:
    - Collecting periphyton samples from riffle areas at two locations within Grant Creek.
    - Analyzing chlorophyll a concentration in individual samples.
  7. Trail Lake Narrows Aquatic Resource and Habitat Use
    - Seasonal fish abundance and distribution in the vicinity of the proposed bridge

- crossing site
- Assessment of the aquatic habitats at the bridge crossing – Fish habitat use and distribution

### **4.3 Grant Creek Fish Weir**

A weir is being proposed as a principal means of fish capture and inventory for several of the study components. Because of its application to multiple studies, weir methodology is being described in this separate section. Its specific applicability to each of the study components will be described in the appropriate sections below.

Grant Creek is a high gradient stream with substantial flow variation over the course of the open water study season. Consequently, a weir on Grant Creek will need to be designed to accommodate the difficult stream conditions. Many different weir designs have been used in fisheries research that could potentially be adapted to Grant Creek conditions. Resistance board, floating picket weir has been used successfully in fast streams in Alaska and other western states (Stewart, 2002). Such designs use a resistance board and floating pickets to allow debris and high water to pass over the top of the weir. This design minimizes the amount of maintenance required during weir operation and reduces the chance that high water will damage the weir. Regardless of the weir design selected, the spaces between pickets must be small enough to intercept adult sized Rainbow trout. A Grant Creek weir could be custom constructed, borrowed from fish research agencies, or purchased from one of several vendors. Resistance board weirs generally consist of the following components: a trap box to hold fish diverted by the weir, floating panels hinged to the stream bottom, a rail system to attach the panels to the stream bottom, and rigid picket modules at each bank. Other designs consist of rigid pickets extending across the stream. Potential configurations are highly variable depending on the stream characteristics and project needs. The primary intent of the weir is to catch upstream migrating fish. Some designs will also allow downstream passage.

Ideally, the spacing of the weir pickets should be such that it will capture fish of a size range from adult Rainbow trout to adult salmon. However, it is recognized that there are limitations to how closely spaced the pickets can be and still be practical in a high gradient stream. Consequently, a maximum 3 inch spacing is specified to assure capture of all salmon species. Closer spacing would be desirable so that some larger resident species would also be captured.

It may be desirable for the weir to be opened to allow unobstructed passage of fish during part of the open water season when few fish are moving within the stream or when high water makes weir monitoring impractical. When the weir is in place, it will be monitored at least twice per day and trapped fish will be released upstream of the weir. All fish caught in the weir will be identified to species and enumerated. Captured fish will also be measured if time allows and fish quantity is not too large to allow safe handling. Additional processing of fish is described below for the individual study components.

The Grant Creek weir will be installed at a suitable location as close to the stream mouth as possible during low flow in late April - early May of 2013 prior to breakup. It will be left in place until freeze-up at which time all components will be removed from the stream.

## 4.4 Grant Creek Salmon Spawning Distribution and Abundance

The purpose of this study component is to characterize spawning salmon distribution, run timing, and relative abundance in Grant Creek. This study effort will consist of two principal components and several subcomponents:

- Use of a counting weir to obtain a direct count of all salmon entering Grant Creek during the open water season.
  - Weir counts will be compared to counts from foot surveys similar to those conducted during 2009 to calibrate earlier surveys and obtain an estimate of observer error when viewing fish from the stream bank.
- A radio telemetry study to further assess the spawning distribution of Chinook and Sockeye salmon, with emphasis on Reach 5 (Canyon Reach). Coho salmon may be included in the study if conditions allow.

### 4.4.1 Salmon Escapement to Grant Creek – Relative Species Abundance

#### Project-Related Objectives

- Assessment of numbers and species of salmon in Grant Creek as a whole.
- Identification of key species and critical time periods as required for environmental assessment.
- Identification of key species and critical time periods as may be applied to design of Project mitigation measures.
- Calibration of escapement estimates from foot surveys conducted in 2009.

#### Quantitative Objectives

- The primary objective is to obtain a nearly complete count of salmon of each species entering Grant Creek. It is recognized that some fish will likely escape the weir and that extreme flow events can interrupt complete counts. Such events, if they occur, will be documented. Use of the complete count methodology requires no specific statistical analysis.

During 2009 foot surveys, salmon counts were conducted approximately every 10 days from mid-June through September resulting in escapement estimates for Chinook and Sockeye salmon using an area-under-the-curve method based on a trapezoidal approximation using linear interpolation to estimate the number of fish present in the stream for the days not surveyed (Neilson and Geen, 1981; English et al., 1992; Bue et al. 1998). Survey life (the number of days a fish is alive in the survey area) and observer efficiency (the proportion of fish actually seen by the observers) were estimated based on professional judgment. Because of marginal visibility and untested estimates of stream life and observer efficiency (both required for area under the curve estimates), the accuracy of the 2009 estimates was questionable. It was decided that the use of a counting weir, while difficult in Grant Creek, was a preferable method for relative abundance estimation. Use of a weir will have several additional benefits as follows:

- It will provide exact timing of stream entry.
- It will allow capture of fish for age and length measurements.

- It will allow capture of fish for radio tag implantation (see below).
- It will allow monitoring of larger resident species as well as salmon.
- It will make possible a calibration of the 2009 foot surveys by comparing known fish numbers with visual estimates.

A weir, as described in Section 4.3 above, will be established near the mouth of Grant Creek prior to the start of the Chinook salmon run (mid-July) and will continue to be monitored until freeze-up. The time period will encompass the full run of Chinook and Sockeye salmon and most of the coho salmon run, if possible. The intent will be to keep the weir in place until the coho salmon run is completed; however, icing conditions might require premature removal of the weir. Information regarding the abundance and timing of coho salmon is currently scarce; consequently, the success of a weir at capturing cohos is unknown. If coho salmon are continuing to move upstream after the weir is removed, the run will continue to be monitored using foot surveys, at least through November. All salmon passing through the weir will be counted and representative samples will be sexed, measured, and tagged with Floy spaghetti tags. Scale samples will be taken from selected fish for aging. To determine the uniqueness of Grant Creek salmon, limited tissue samples for genetic analysis will be collected from selected fish, provided that a cooperative agreement can be arranged with ADF&G to conduct the appropriate analyses.

During times when the weir is being operated in capture mode, salmon will be directly counted by examining all fish in the capture box and releasing them upstream. During salmon runs, personnel will monitor the weir and empty the catch box at least twice per day, more often if necessary.

Foot surveys of lower Grant Creek (Reaches 1-4) will be conducted at least once a week during the Chinook and Sockeye salmon runs using procedures similar to those used in 2009. Numbers of fish visually observed will be compared to numbers of fish known to be present based on weir counts. Locations of fish will be documented using GPS coordinates and paper maps. Floy tags and radio tags will be recorded at the weir if carcasses are encountered.

Personnel on site will document as much incidental information as time allows. For example, carcasses floating downstream into the weir can be counted and tag numbers recorded to provide insight into the duration of stream life (date originally tagged vs. date the carcass was found).

#### ***4.4.2 Distribution of Spawning Salmon in Grant Creek***

##### **Project-Related Objectives**

- Identification of critical spawning habitats as required for general assessment of Project impacts.
- Identification of habitat areas appropriate for use in instream flow analysis.
- Provide input for Project mitigation needs by identifying sensitive stream segments.

##### **Quantitative Objectives**

- Numbers of radio tagged fish must be adequate to provide an acceptable representation of the spawning populations of each species. Hypothesis: distribution of tagged fish is identical to the distribution of the entire population.

During the 2009 preliminary investigations, the crew was unable to access Reach 5 (Figure 2), except for the first 100 meters beyond the reach-break between Reaches 4 and 5. Reach 5 was also not accessed in the 1980s by previous investigators (AEIDC 1983). High-velocity flows and cascades prevented safe wading of the stream, and precipitous terrain prevented walking along the edge of the stream. As a result, the upstream extent of salmon spawning activity in Grant Creek has not been adequately characterized. Turbid water due to glacial runoff in Grant Creek also lowered observer efficiencies and added to uncertainty of escapement estimates and spawning distribution in the remainder of the stream. A radio telemetry study is proposed to overcome the above shortcomings with emphasis on delineating spawning distribution within Reach 5 (Canyon Reach).

A representative number of Chinook, Sockeye, and possibly coho salmon will be captured near the mouth of Grant Creek in the weir described in Section 4.3 above. The number of Chinook and Sockeye salmon to be tagged will be based on the total escapement numbers estimated in 2009. Chinook salmon will be radio tagged starting in early August, with the goal of distributing the tags proportionately throughout the run, which is expected to last from mid to late August. Sockeye salmon will be radio tagged from August 20 to about September 10. The timing of the coho salmon run is currently unknown, so professional judgment and pertinent literature will be used to assess run timing for Coho. There will be 65 tags allocated for Chinook, 65 tags for Sockeye, and 20 tags for Coho.

Once fish are captured, coded transmitters will be inserted into their stomachs. Tags will be lubricated with glycerin and pushed down the esophagus into the stomach using a PVC tube. All radio-tagged fish will also be tagged with Floy spaghetti tags. Radio tags will be programmed to have a 60-day battery life and will include a feature that codes for the death of the fish. A fixed radio telemetry receiver will be installed at the reach-break between Reaches 4 and 5 (Figure 2) to detect when fish enter or exit Reach 5. Tracking surveys using a hand-held mobile receiver will be conducted at least weekly during the period when tagged fish are present in the stream. Frequent telemetry surveys will provide valuable information on stream life (s) and position information of tagged fish as part of area-under-the-curve estimation and spawning locations, respectively. A trail has been established along a safe route on the canyon rim paralleling Reach 5. Once a fish is detected, the crew will use triangulation techniques to identify the tagged fish's position. Locations of the tagged fish will be recorded using GPS coordinates as well as marked on hand-held maps.

Installation of a fixed-telemetry site near the confluence of Grant Creek will likely be pursued, which will provide information regarding Rainbow trout exodus from Grant Creek. If deployed, the system will consist of either underwater or aerial antennas monitoring each channel, and be combined so that they are monitored as a single antenna. Our approach will be based on the configuration of each channel, potential ambient electrical noise, and the challenges associated with each type of system.

Movements of all radio tagged fish will be mapped and analyzed. Information will be combined with the results of foot surveys as described in Section 4.4.1 to delineate likely spawning locations for each species and probable proportions of salmon that spawn in various stream reaches. Dates of fish death as indicated by the radio tags will be combined with carcass information and tagging dates to estimate stream life duration.

## **4.5 Grant Creek Resident and Rearing Fish Abundance and Distribution**

The purpose of this study component is to characterize distribution and abundance of all species of resident and rearing fish and run timing of Rainbow trout in Grant Creek. This study effort will consist of the following components:

- Weir inventory and telemetry study to assess run timing, relative abundance, and spawning habitat location for Rainbow trout.
- Investigation of juvenile fish presence in Reach 5 of Grant Creek using minnow traps and other sampling techniques.
- Minnow trap and video sampling in late winter/early spring at likely overwintering habitats to determine salmonid overwintering presence in Grant Creek.
- Snorkel sampling to determine fish use of mesohabitats in Grant Creek.

### **4.5.1 Adult Rainbow Trout Abundance, Distribution, and Spawning in Grant Creek**

#### **Project-Related Objectives**

- Assessment of relative numbers of Rainbow trout in Grant Creek as a whole.
- Identification of sensitive time periods as required for environmental assessment.
- Identification of important spawning and feeding habitats as required for general assessment of Project impacts.
- Provide input for Project mitigation needs by identifying sensitive stream segments.

#### **Quantitative Objectives**

- Obtain a count of adult Rainbow trout entering Grant Creek during the open water season. It is understood that some trout will likely escape the weir or be too small to be captured.
- Determine distribution of trout by tracking radio-tagged fish. Ideally, the numbers of radio-tagged fish should be adequate to provide a acceptable representation of the total Grant Creek population.

Angling surveys in 2009 and 2010 documented that modest numbers of adult and subadult Rainbow trout were widely distributed in Grant Creek during the open water season and confirmed that some spawning occurs in the creek. Catch-and-recapture numbers in 2010 were too small to allow mark-and-recapture population estimates, and spawning locations remain largely unknown. To obtain more complete information on abundance, distribution, and timing of movements, it is proposed that additional study occur in 2013 that combines angling with possible weir capture of larger fish.

**Weir and Angling Study** - The weir will be installed prior to break-up during low-flow conditions; consequently, it will be in place prior to spring spawning migrations, which typically occur as water temperature approaches 4 °C. The final weir design is unknown and picket spacing may be such that most Rainbow trout will be able to bypass the weir. If the weir is effective at catching larger size trout then the weir will be operated in capture mode during the spawning period, and all trout will be measured and sexed and their reproductive condition will be assessed if possible. Depending on the effectiveness of the weir at catching trout, additional fish may be captured by angling during the spring and early summer period. During the remainder of the open water season, trout caught in the weir will be counted and representative numbers will be measured. Two-way passage will be the preferred mode of weir operation in the fall when trout are likely to be moving out of Grant Creek.

**Radio Telemetry Study** - A representative number of mature Rainbow trout will be captured during the early weeks of the spawning migration for surgical implantation of radio transmitters into the abdominal cavity. Capture method will be by weir capture, angling, or a combination of both. Surgical methods will generally follow those described by Summerfelt and Smith (1990). Fish within the dominant size range of mature Rainbow trout (500 - 700 mm) will likely weigh 1,800-6,000 grams (Russell, 1977). It is advised that radio tags should not exceed 2 percent of body weight, thus a tag weighing less than about 35 grams would be suitable. The tags will be individually coded allowing identification of specific fish and will incorporate motion sensing capability that allows remote sensing of motion history, providing information on whether a tagged fish is dead or alive. Forty radio tags will be secured for the Rainbow trout telemetry study.

A fixed radio telemetry receiver will be installed at the reach-break between Reaches 4 and 5 (Figure 2) to detect when fish enter or exit Reach 5. A second fixed-telemetry site will likely be located downstream of the weir near the Grant Creek confluence (as discussed above). Tracking surveys using a hand-held mobile receiver will be conducted at least weekly, and more frequently when possible during the spawning period. A trail has been established along a safe route on the canyon rim paralleling Reach 5. Once a fish is detected, the crew will use triangulation techniques to identify the fish's position. Locations of the tagged fish will be recorded using GPS coordinates as well as marked on hand-held maps.

Movements of radio-tagged fish will be mapped and analyzed to determine the locations of probable spawning and feeding habitats.

#### ***4.5.2 Resident and Rearing Fish Use of Study Reach 5***

##### **Project-Related Objectives**

- Assessment of rearing fish use of habitats within the high gradient Canyon Reach as required for impact assessment within the portion of Grant Creek that will be most altered by the Project.
- Assessment of the juvenile fish productivity of Reach 5 relative to the remainder of Grant Creek.
- Assessment of the need for mitigation measures within Reach 5.

##### **Quantitative Objectives**



- Because of the difficulty in safely accessing much of Reach 5 and the dominant turbulent flow, habitat areas sampled were selected purely on the basis of accessibility and feasibility of sampling. These reconnaissance level investigations are non-quantitative in nature. They provide presence/absence information and relative species abundance data for the sample sites. Statistical analyses are not appropriate under these circumstances.
- Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, trap efficiency can be calibrated by releasing marked samples of fish, and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field.

On-site Sampling - During 2009 minnow trap sampling, crews were unable to access Reach 5, except for the first 100 m beyond the reach-break between Reaches 4 and 5 (Figure 2). Most of Reach 5 was also not accessed in the 1980s by previous investigators (AEIDC 1983). High-velocity flows and cascades prevented safe wading of the stream, and steep terrain prevented safe upland access without climbing gear. To assess the presence of juvenile fish in Reach 5, juvenile fish sampling will be expanded to areas not reached in 2009.

An initial reconnaissance of Reach 5 was conducted in late winter 2010 when the creek was frozen and could be accessed on foot at the bottom of the gorge; information was gathered regarding potential summer access points, likely fish habitat, and potential sample sites.

Juvenile fish use of Reach 5 was assessed using the same minnow trapping methods that were employed during 2009, except that special equipment was used to access the creek in Reach 5 in a safe manner. Routine access of Reach 5 during high-flow conditions was accomplished by using roped protection. Sample site locations were based on the ability to safely access this reach from the canyon rim, influenced by the following criteria:

- Safe access via rappel/belay techniques.
- Proximity to safe anchor sites.
- Proximity to likely fish habitats.

Two sampling events were conducted in 2010, May and July. The initially planned September sampling event was not completed. A crew of two set minnow traps in as many locations as possible with 3 to 4 traps each within likely fish habitats, such as plunge pools and eddies. The three sites trapped in 2009 in the lower 300 meters of Reach 5 were also re-sampled, for a total of five sites in Reach 5. Target species were Chinook and coho salmon, Dolly Varden, Rainbow trout, and sculpin. CPUE was defined as the catch per trap-hour.

All sampling sites were marked by a GPS, staked, and flagged for future identification. Habitat characteristics were recorded. Fish captured were identified to species, measured, and released near the point of capture. Salmonid length measurements were based on fork length (tip of the snout to the fork in the tail), and other fish length measurements were based on total length (tip of snout to end of tail).

The procedures described above for the 2010 sampling will be repeated in September to complete the originally planned sampling schedule. Additional sampling techniques including electrofishing, seining, and underwater video may also be employed where feasible. Special effort will be dedicated to determining whether adult Dolly Varden use portions of Reach 5 for

spawning. Weir operation, as described in Section 4.3, may provide information on the timing of upstream movements of adult Dolly Varden. If sufficient numbers of spawning condition Dolly Varden are observed, mobile surveys of radio tagged fish will be utilized to identify their final desitnation. Given the historical data associated with Dolly Varden numbers in Grant Creek, HEA believes 10 radio tags will be sufficient for this analysis.

Outmigrant Monitoring - In addition to the sampling described above, outmigration of juvenile fish from Reach 5 will be monitored in the spring using a small inclined plane trap. The trap will be anchored near the boundary between Reaches 4 and 5, immediately downstream from the proposed Project powerhouse and tailrace outfall. The intent will be to determine the outmigrant contribution of the Canyon Reach (Reach 5) relative to the remainder of Grant Creek. Species of primary interest will be juvenile Chinook, coho, and Sockeye salmon and young-of-the-year Rainbow trout. Sockeye salmon fry are known to move out of Grant Creek within a few weeks of emergence; consequently, the outmigrant trap will need to be installed in early spring at the same time as the counting weir. Young fish entering the trap will be held in a fine mesh live box, which will be monitored at least once per day, more often if large numbers of fish are entrapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total outmigrant production from Reach 5. Resident and Rearing Fish Use of Winter Habitats

### **Project-Related Objectives**

- Determine the extent of fish and habitat use of Grant Creek during winter conditions as required for Project environmental assessment.
- Determine the need for winter mitigation measures, especially as related to storage pond release rates.
- Contribute habitat use information for application to instream flow studies.

### **Quantitative Objectives**

- Winter sampling of selected potential habitat use areas will be essentially reconnaissance level efforts and are non-quantitative in nature. They provide presence/absence information and relative species abundance specific to each sample site. In most cases statistical analyses will not be appropriate under these circumstances. Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, then trap efficiency can be calibrated by releasing marked samples of fish and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field
- Winter Sampling - The results of the 2009 snorkel and minnow trapping surveys provided evidence that very few juvenile salmon observed were older than young-of-the-year fish (YOY; i.e., hatched in spring). Based on these results, there is some question as to whether Grant Creek provides favorable overwinter habitat for juvenile salmon and

other species. This study component will assess juvenile salmonid presence in likely overwintering habitats such as open water, springs and seeps, deep pools, and backwater areas.

Likely overwintering habitats will be identified based on existing habitat mapping, knowledge of study area, and 2009 data. Additional areas will be identified based on winter reconnaissance. In addition to likely areas of winter refuge, sampling will also be conducted, where possible, at the locations of the instream flow transects to allow instream flow modeling to include the winter period. Areas of unfrozen water will be sampled using both minnow traps and backpack electrofisher. In frozen areas where substantial unfrozen water is suspected under the ice, an ice auger will be used to gain access to water under the ice, if necessary. A baited minnow trap or bait container will be lowered into the water along with an underwater video camera. Under-ice conditions will be observed on a monitor. If fish are seen on the monitor, then video will be recorded for later review. Footage will then be analyzed in the office to determine species and age class of any fish attracted to the bait. This one-time sampling event will occur in late winter, before breakup occurs in Grant Creek. The study will likely need to be conducted before break-up in Trail Lake to ensure safe access to Grant Creek.

Spring Outmigration Monitoring - In addition to onsite winter investigations, the outmigration of juvenile fish from Grant Creek will be monitored in the spring to help determine the extent to which juvenile salmon and Rainbow trout overwinter in Grant Creek. Emphasis will be on Chinook and coho salmon smolts. Recently emerged Sockeye salmon fry will likely also be captured in the trap. An inclined plane or small rotary screw trap will be installed near the mouth of Grant Creek to intercept juvenile fish moving downstream. The trap will be installed during the low-flow period that immediately precedes spring break-up at the same time that the outmigrant trap is installed below the Canyon Reach. Young fish entering the trap will be held in a fine mesh live box that will be monitored at least once per day, more often if large numbers of fish are trapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total outmigrant production from Reach 5. Calibration of the downstream trap may be coordinated with calibration of the upstream trap, using fish trapped upstream and released for downstream capture. Estimated Chinook and coho smolt outmigration numbers based on the trap catch will provide a direct indication of the contribution of Grant Creek overwinter rearing to the Kenai River system and will be compared to catches in the upstream trap to determine the relative contributions of upstream and downstream areas to Chinook and coho production. Numbers of Sockeye salmon fry will provide an indication of hatching success and can also be compared to catches in the upstream trap to determine the relative contributions of upstream and downstream areas to Sockeye production.

#### ***4.5.3 Resident and Rearing Fish Use of Open Water Habitats in Lower Grant Creek***

##### **Project-Related Objectives**

- Assessment of rearing fish use of habitats within lower Grant Creek as required for Project impact assessment.

- Assessment of the juvenile fish productivity of Reaches 1-4 relative to the remainder of Grant Creek.
- Assessment of the need for mitigation measures within Lower Grant Creek.
- Selection of high fish use areas for incorporation in the instream flow study.

### **Quantitative Objectives**

- Sampling of selected potential habitat use areas will be essentially reconnaissance level efforts and are non-quantitative in nature. They provide presence/absence information and relative species abundance specific to each sample site. In most cases statistical analyses will not be appropriate under these circumstances.
- Obtain a count of adult Rainbow trout, Dolly Varden, and other resident species entering Grant Creek during the open water season. Use of the complete count methodology requires no specific statistical analysis.
- Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, trap efficiency can be calibrated by releasing marked samples of fish and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field.

Field Sampling - Investigations in spring, summer, and fall of 2009 and in spring of 2010 sampled a variety of slow-water habitats using minnow trapping and snorkeling techniques, identified habitat types most heavily used by rearing fish, and provided significant information regarding relative species abundance. This task continues those investigations with the intent of filling data gaps and sampling a wider variety of habitat types so that the information can be integrated with the habitat mapping information.

In Study Reaches 1-4, sample sites in which catch of juvenile salmon in minnow traps was poor or sample sites in habitats that were underrepresented by sampling in 2009 and 2010 (e.g., low-velocity habitats, backwaters, undercut banks) will be identified in the office and in the field. Each selected habitat area will be sampled using the method most appropriate to the conditions. Methods may include baited minnow traps, snorkeling, electrofishing, and seining. Sampling methods for this subcomponent will be similar to those used in Reach 5, with the exception of the method of site determination, which will be based on habitat units. Where possible, minnow trapping sites will also be electrofished or snorkeled to attempt to correct for gear bias of the minnow traps (i.e., document species that may not be captured in the minnow traps). This kind of sampling results in a variety of outputs with varying quantitative value.

Electrofishing will not be employed when spawning fish are present within 10 meters of the study site. Instream work will be minimized in the vicinity of spawning fish. Any activity that causes displacement of spawners from spawning areas will be avoided.

Weir Data - The counting weir described in Section 4.3 will be in place throughout the open water season and may allow monitoring of the upstream and possibly downstream movements of larger resident fish throughout the season. The final design of the weir is currently unknown and it may not be effective at catching resident species. The weir may be useful for monitoring the upstream migration of Rainbow trout that occurs coincident with the salmon migration and for observing possible upstream movements of Dolly Varden spawners in the fall. All resident fish

passing the weir will be recorded. When the weir is in capture mode, the lengths of all fish will be measured if possible without harming fish or requiring extra effort. As described above, the presence of an obvious pulse of large Dolly Varden will trigger a need for foot surveys to identify spawning locations.

**Outmigrant Monitoring** - Some rearing fish move out of small streams in the fall into winter rearing areas. Others may remain in the stream through the winter. To better understand the life history of resident and anadromous species in Grant Creek, an inclined plane or rotary screw trap will be employed near the mouth of Grant Creek in the fall to intercept juvenile fish moving downstream. The trap will be installed in mid-September and will continue to operate until about mid-October, depending on fish movements. Young fish entering the trap will be held in a fine mesh live box that will be monitored at least once per day, more often if large numbers of fish are trapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total number of fall outmigrants contributed by Grant Creek. Combining the results of the spring and fall outmigration monitoring will provide an indication of the total annual productivity of the creek.

## **4.6 Grant Creek Aquatic Habitat Mapping**

### **Project-Related Objectives**

- Prepare an image of Grant Creek upon which aquatic habitat and fish use information can be superimposed.
- Develop a map of aquatic habitats that will provide a basis for describing the distribution of key habitat types.
- Identify important factors that influence fish use of key habitats for input to the instream flow analysis.

### **Quantitative Objectives**

- Habitat should be identified and mapped with sufficient resolution so that the GIS system can be used to accurately calculate surface areas.

The purpose of this study is to fully delineate and map the aquatic habitats available in Grant Creek, identify important habitats for fish (i.e., rearing and resident fish; spawning salmon), and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

It should be noted that much of the work described below has been completed including the basic structure of the GIS system and substantial information regarding fish use of various habitat types. The focus of the 2013 work will be to complete the habitat mapping, integrate all of the field data into the georeferenced database, identify data gaps, and conduct limited fieldwork to fill the gaps.

The approach of this study involves three primary phases. During the first phase, the team will spatially synthesize existing aquatic habitat and fish use data generated during various field efforts throughout the 2009 and 2010 field seasons. This exercise will be completed primarily to identify spatial data gaps. In the second phase, the team will then ground-truth habitat data in the field, collect additional habitat and fish use data in Reaches 1 through 5<sup>3</sup>, and incorporate other suitable habitat and fish use data collected in 2010 (e.g., instream flow study, Section 4.7). Finally, the team will analyze the suite of habitats and fish use data to identify important factors affecting the distribution of fish. The primary tasks associated with this approach will be:

- Prepare an office-based aquatic habitat map (i.e., based on habitat observations assembled throughout the 2009 and 2010 field seasons).
- Conduct field surveys to ground-truth the office-based mapping effort and fill spatial data gaps relative to aquatic habitat and fish use in Reaches 1 through 4. Actual collection of fish habitat use information will be accomplished by the resident and rearing tasks and the instream flow task.
- Incorporate aquatic habitat fish use data to identify key rearing, spawning, and feeding habitats for salmon and resident fish and potential overwintering habitats.
- Analyze and identify the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

The office-based mapping exercise will incorporate existing habitat data overlain by fish use data into a spatial format, using ArcMap® geographic information system (GIS) software. The initial dataset will include habitat units mapped during a microhabitat fish use reconnaissance study completed in June 2009<sup>4</sup>. The team will also plot locations of salmon spawning activity recorded during 2009 foot surveys and high-use spawning areas identified by historical data (APA 1984). The team will use the preliminary spatial fish habitat information to catalog and identify gaps in coverage.

The team will conduct surveys to ground-truth the preliminary aquatic habitat delineation (i.e., generated through the office-based exercise), redraw mapping boundaries where appropriate and confirm the location of habitat areas that are in need of additional study. The team will delineate aquatic habitats at the mesohabitat category and subcategory scale, consistent with the approach developed for the 2009 habitat reconnaissance study. Mesohabitat subcategories identified in 2009 included fastwater pools and fastwater riffles, margins with undercut bank, margins without undercut bank, large woody debris dams, margin shelves associated with large wood debris, backwater pools, sloughs, and pockets. Additional subcategory characterizations will be added if deemed necessary. Habitats identified as needing additional study will be investigated further under Task 4.5.4.

The team will identify key fish habitats in Grant Creek, based on observed fish use. This will be accomplished by analyzing the microhabitat fish use data collected in support of this study, data

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<sup>3</sup> Due to physical access limitations, the field team may be unable to ground-truth aquatic habitats delineated in portions of Reach 5.

<sup>4</sup> The 2009 fish microhabitat use reconnaissance study was initiated to gain insight into the types of habitats that fish occupy in Grant Creek. The team identified discrete microhabitat types and sampled for fish presence at 16 sites in Grant Creek.

collected in support of the instream flow study (see Section 4.7), and data collected in 2009 during the reconnaissance study (HDR 2009a). These data will be incorporated into the spatial dataset. Other fish use habitat datasets (e.g., foot surveys, telemetry surveys, electrofishing) will be considered when developing key habitat designations. Surface areas of habitat types will be calculated as needed using the capability of the GIS software.

## **4.7 Grant Creek Instream Flow Study**

### **Project-Related Objectives**

- Assist impact analysis by modeling changes in key types of fish habitat relative to potential changes in stream flow.
- Provide a basis for planning Project instream flow mitigation measures.
- Provide a starting point for stream flow discussion.

### **Quantitative Objectives**

- Provide supportable predictions of fish habitat availability in lower Grant Creek under various stream flow scenarios for key species and life history stages.

The Grant Creek instream flow study approach to be applied to lower Grant Creek Reaches 1-4 was collaboratively developed based on input from the Instream Flow Technical Working Group (TWG). Public meetings of the TWG were held in April and September 2009, and a conference call was held in May 2009; input and suggestions were solicited during these meetings and also through email and phone communications with the TWG and TWG members.

The selected instream flow study approach emphasizes a detailed study of utilized habitat types and addresses the desire of the TWG to examine how important individual habitat units may be affected by changes in flow due to the operation of the Project. Rather than applying a typical habitat study that generalizes mesohabitat units in a study reach, this approach uses several techniques to tie physical microhabitat to flow and timing, and applies *in situ* knowledge of fish habitat use in Grant Creek as tools to determine potential effects of the Project.

For an instream flow study in Grant Creek, an integrated effort provides a cost-effective way of obtaining information that most directly answers the questions the TWG members have regarding the effects of the Project on fish habitat in Grant Creek. The approach includes:

1. A series of single transect analyses, with each transect going through a known fish use area such as high-use spawning or rearing areas.
2. Fish studies that help identify microhabitat factors that affect fish use within each key habitat type.
3. Monitoring temperature and flows at multiple locations on Grant Creek in conjunction with the Water Resources study program to establish baseline stream flow and temperature changes.

These three components will be integrated and analyzed to determine effects of different flow regimes on several factors that are important in the life stages of Grant Creek resident and anadromous fish.

It is important to understand that a significant portion of the work described below has been completed. Specific study sites within high-use habitat types were selected, and transects were established at 18 locations including survey data and complete measurements of transect geometry. Depth, velocity, water surface elevation, discharge, substrate, and cover were measured at the transects during low and medium flow conditions. Incomplete data regarding microhabitat habitat suitability have been collected at various locations.

#### **4.7.1 Habitat Availability**

The purpose of the habitat availability component of the instream flow study is to measure available habitat at proposed mesohabitat sites as a function of discharge (Table 1). Available habitat will be correlated to results of the Habitat Utilization Study described below (Section 4.7.2). This information will be cross-referenced with historic hydrographs, recent hydrologic data, and potential flow scenarios in Grant Creek to determine discrete time periods when the habitat unit may be available for its designated use.

Cross section geometry, substrate, cover, and hydraulic data will be measured at each transect using techniques developed for the Physical Habitat Simulation (PHABSIM) method.

Application of PHABSIM techniques on Grant Creek is different from most other studies because transects are selected on important habitat units with known fish use, as opposed to a standard PHABSIM that attempts to represent all habitat units regardless of unique importance or known fish use. Collected data will enable several analyses including:

- A graphical plot of wetted perimeter and depth versus discharge, on which the range of flows at which habitat area is unavailable can be determined visually.
- Changes in the availability of microhabitat (depth, velocity, substrate, and cover) across a transect or at specific cells or groups of cells along the transect as a function of discharge.
- Lateral connectivity of main channel flow with side-channel, off-channel, or undercut bank habitats as a function of flow.
- Egg incubation effective habitat analysis.

Transects will be oriented across the selected habitat unit to best capture the average condition of interest in that unit, such as spawning or rearing potential. Headpins, tailpins, and a temporary benchmark will be set at each transect. Survey instrument and photo points will be established and marked. Each transect site will be fixed using a handheld GPS. Habitat unit cross sectional profiles will be surveyed using standard differential survey techniques. Cross section survey points will divide the profile into 1 - 3 foot cells. Dominant and subdominant substrate and cover will be recorded within each cell.

Water surface elevations at each transect will be measured using a survey instrument at 3 - 4 discharges ranging from a low flow of approximately 50 cfs to a high flow of approximately 200 - 300 cfs. Mean column velocities will be measured within each cell at a high flow of 170 - 200 cfs, or the highest possible flow within practical and safety limitations. If feasible and safe to do so, an additional water surface elevation will be taken above the high flow in order to extend the range of flows for the model. Numerous photos from established photopoints will be taken at each of the 3 - 4 flow levels.

Proposed cross sections (Table 1) were located during a site visit 24 September 2009. The locations were set based on presence of physical microhabitat (i.e., undercut bank, overhead



cover, bedrock outcrops, and pocket water) and observations of fish during the site visit and during snorkeling studies. The site locations will be refined and measured during spring, summer, and early fall.

**Table 1. Proposed mesohabitat assessment sites.**

Transect #	Channel Type	Fish Habitat Site	Notes
1 100	Rearing Distributary	R1FH11	Linear transect, slow water
2 110	Rearing Distributary	R1FH12	Linear transect, slow water, LWD
3 120	Spawning Main	-	Spawning riffle
4 130	Rearing Main	R1FH05	Main channel fast water, Side chnnl, small mid channel bar, vegetated, LWD upstream
5 140	Rearing Main	R1FH05	Main channel fast water, Side chnnl, small mid channel bar, vegetated, LWD upstream
6 150	Rearing Main	R1FH13	Woody debris LB LUS, fast water main channel
7 160	Rearing Main	R1FH13	Woody debris LB LUS, fast water main channel
8 200	Rearing Main	R1FH06	Backwater lobe
9 210	Rearing Main	R2FH10	Small tertiary channel Main channel, Fast water, undercut bank on
10 220	Rearing Main	R2FH10	RB
11 230	Rearing Main	R2FH10	Main channel, Fast water, undercut bank on RB, surveyed across island to backwater pool
12 300	Rearing Main	-	Backwater lobe
13 310	Spawning Main	R3FH14	Backwater, low vels, main channel fast deep
14 320	Rearing Secondary	R3FH09	LWD, Secondary channel and spawning
15 330	Rearing Secondary and Tertiary	R3FH09	LWD, Secondary channel, spawning and Tertiary channel.
16 400	Rearing Main	R3FH10	Small side channel, cobble/gravel bar - no veg, very deep undercut bank
17 410	Rearing Main	R3FH16	Small side channel, cobble/gravel bar - no veg
18 430	Spawning Main	R5FH15	Pool, deep fast, LWD upstream, shallow slow margin shelf

Channel Type	Count	Percent
Rearing Distributary	2	11.1%
Rearing Secondary or Tertiary	2	11.1%
Spawning Main	3	16.7%
Rearing Main	11	61.1%
Total	18	

#### 4.7.2 Habitat Utilization

The purpose of the habitat utilization component is to learn what meso- and microhabitat factors the fish in Grant Creek occupy to assess whether the Project would have an effect on instream habitat. To maximize the knowledge of habitat selection factors for fish in Grant Creek, observations will be made at the locations of the transects as described in the previous section.

Fish spawning and rearing microhabitat values will be recorded at programmatically-selected sites in Reaches 1 through 4. Measured microhabitat use parameters will vary by habitat units. During the TWG meeting on September 23, the following table (Table 2) was developed with input from TWG members.

**Table 2. Parameters used in the habitat utilization study.**

<b>Habitat use function by life history</b>	<b>Habitat use parameters to measure</b>
Salmon rearing	Depth, velocity, cover, wetted perimeter, habitat connectivity
Salmon spawning	Substrate, depth, velocity, temperature
Rainbow trout spawning	Substrate, depth, velocity, temperature
Incubation	Depth, wetted perimeter, temperature
Resident rearing and spawning	Salmon rearing will be used as a surrogate

Information relating to site-specific habitat suitability criteria (HSC) will be developed from these data and used in combination with HSC available in the existing literature and professional judgment to determine final HSC to be used in modeling. Development of final HSC will occur as a collaborative effort with the Instream Flow TWG. HSC will be combined with the transect measurements and mesohabitat characterizations to model changes in habitat as a function of discharge.

Habitat use data collection will be similar to the sampling approach developed in 2009, as described in the 2009 baseline study report (HDR 2009) and existing data files furnished by KHL. However, the field effort may be expanded to include multiple sampling events at varying flow regimes, as discussed below. The primary tasks associated with this approach are to:

- Identify and describe discrete mesohabitat sample areas within each sample site, based on habitat factors observed.
- Record fish species presence (or absence) within each mesohabitat sample area.

The field team established 16 sample sites in Grant Creek in June 2009. The sample sites comprise habitats expected to contain high densities of juvenile fish (i.e., backwater areas; along stream margins) as well as those not necessarily expected to contain high numbers of rearing fish (i.e., fast water near the thalweg). As a result, the team identified a number of key habitats for rearing and resident fish. The instream flow team considered the key habitats identified through the June 2009 effort and in September 2009 established cross-sections at these locations (as discussed above). The field team will sample mesohabitats associated with the selected transects. Most transects are co-located with at least one mesohabitat unit sampled in June 2009. Additional sample sites will be established if deemed necessary.

Sites will be divided into discrete mesohabitat sample areas based on habitat characteristics observed within the stream segment sampled. In 2009, the field team identified the following mesohabitat sample areas: fast water pool, fast water riffle, margin with undercut bank, margin without undercut bank, large woody debris dam, and margin shelf associated with large wood debris, backwater pools, pockets, and sloughs, and “other” channels (i.e., distributary, secondary, tertiary). One sample site may be composed of multiple mesohabitat categories. Additional mesohabitat categories will be added if encountered. Mesohabitat factors taken into consideration will include:

- Location relative to the main channel (i.e., stream margin; mid-channel; backwater slough; backwater pocket).
- Depth and flow regimes (i.e., shallow fast, shallow slow, deep fast, deep slow).

- Presence of cover (i.e., no cover; velocity; instream cover).
- Type of instream cover when present (i.e., undercut bank; woody debris; overhanging vegetation; submerged vegetation; substrate).

The field team will record fish presence (or absence) within discrete mesohabitat sample areas, so that fish presence (or fish absence) can be correlated with the microhabitat characteristics present (or absent) at each location sampled.

The team will rely on snorkeling as the primary method to document fish presence (or absence) within each mesohabitat sample area. Electrofishing will be used primarily to confirm species identification and calibrate fish length estimates. Electrofishing will be used in lieu of snorkeling, if conditions preclude the effective use of snorkeling (i.e., shallow conditions). Each fish observed during snorkeling will be identified to species and its fork length will be estimated using 20 mm size intervals.

Within rearing habitats and near stream margins, the field team will record dominant and subdominant types of cover for each separate observed group of fish. Stream depth will be recorded using a wading rod at locations of observed fish use, and fish nose depth will be estimated by the snorkeler. Mean column velocities and velocity at the fish location will be recorded using a Price-AA or Swoffer current meter attached to a USGS top-setting or standard wading rod. Water temperature will be recorded at each station, ideally mid-column and at or near the location of observed fish.

In areas of observed spawning use, high stream depth and velocity may preclude field staff from measuring all microhabitat parameters. When possible, depth and velocity will be recorded as described above. Dominant and subdominant types of substrate size will be recorded by visual estimate using categories as described in Table 3. When direct measurements are not possible, depth at the spawning habitat will be visually estimated, and a GPS point will be taken and the habitat area described. The field team will revisit spawning habitat areas in the fall when flows allow wading, and will record dominant and subdominant types of substrate types immediately outside the redd perimeter for each observed redd. In all cases, surface water temperature will be measured near mid-column in a well-mixed area near the location of the observed redd.

**Table 3. Substrate size classes used on Grant Creek instream flow study.**

Substrate Type	Size (inches)
Organics, vegetation	--
Clay, silt (fines)	<0.002
Sand (coarse)	0.002 - 0.07
Small gravel	0.07- 0.30
Medium gravel	0.30 – 1.25
Large gravel	1.25 – 2.5
Small cobble	2.5 – 5.0
Large cobble	5.0 – 10.0
Boulder	>10.0
Bedrock	--

### 4.7.3 Integration with Flow and Temperature Monitoring

Grant Creek flow and temperature studies for 2010 are described in the Water Resources Study Plan (HDR 2009c). Specifically, continuous flow and temperature monitoring stations that were set in 2009 will be continued and/or reestablished. The instream flow study relies on integration of the collected data, described in the previous sections, with the data collected per the Water Resources Study Plan. The data loggers will be downloaded at regular intervals to contribute to analysis during the field season.

### 4.7.4 Analysis Methods

Field data collected as described above will permit both empirical analysis and habitat modeling as a function of flow.

A number of different graphs can be provided and may include the “wetted perimeter versus flow” relationship, a static cross section of the channel showing substrate distribution and water surface at any flow, and/or a dynamic Excel graphic. A static example of the dynamic graphic is shown below in Figure 3. Changing the value in the “Discharge Window” will adjust the water level up or down corresponding to the stage/discharge formula imbedded in the worksheet. Wetted perimeter and average depth values in the lower right also change with the assigned discharge. Values such as percent of change in wetted perimeter can be easily added to the graphic. This type of dynamic graphic can be provided for any transect, as appropriate.

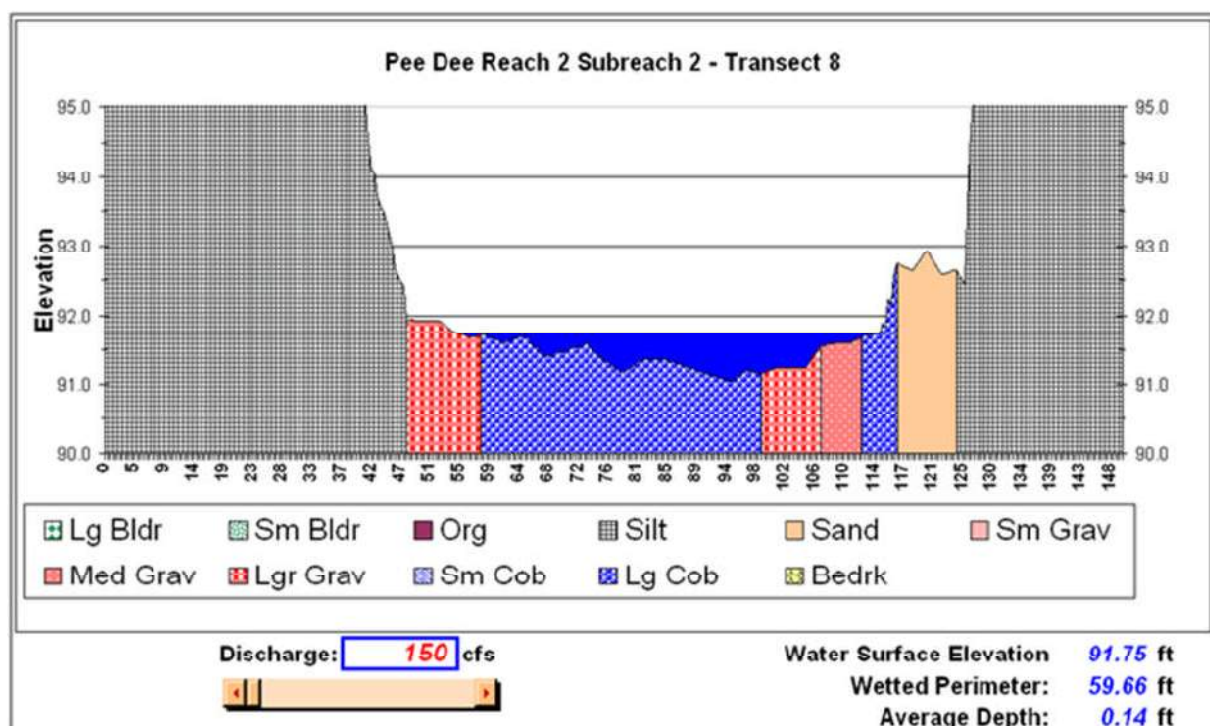


Figure 3. Example of a Channel/Flow Response cross sectional profile.

Collected data will also permit the application of the PHABSIM model for evaluation of changes in suitable habitat at select transects as a function of flow (Bovee et al. 1998). Site-specific habitat suitability will be developed from observations of microhabitat use by fish. A commercial version of PHABSIM, known as Riverine Habitat Simulation (RHABSIM), will be used.

#### **4.7.5 Reach 5 (Canyon Reach) Analysis**

The proposed Grant Lake Hydroelectric Project would necessitate a major reduction in the flow of the portion of Grant Creek upstream from the proposed powerhouse (Reach 5). Because of the extreme flow reduction and the very high gradient of the creek in this reach, standard instream flow analysis methods are not applicable or appropriate. It is expected that available post-Project habitats will be limited to pools that contain sufficient water to support fish.

A simplified modeling effort will be employed to obtain insight into the effects that small changes in flow might have on pool depth, pool connectivity, and fish passage availability. Physical measurements will be conducted at selected step pools including basic cross section, surface area, and depth of downstream control (to determine minimum pool depth at very low flow).

Connectivity of the various pools and channels will be measured and assessed using the Oregon Method (Thompson 1972). After 10 years of research on depth and velocity in streams in Oregon, Thompson concluded that the depth over “the shallow bars most critical of adult passage” was the feature that determined the likelihood of successful migration. Thompson recommends a minimum depth of 0.6 feet for large trout and 0.8 feet for Chinook salmon to achieve successful passage. The “Oregon Method” as it is now commonly called, concludes that the passage flow is adequate when the depth criteria is met on at least 25% of the transect width and on at least a 10% continuous portion. Transect data will be collected to determine where connectivity meets this criteria and where it does not based on the three flows described above.

Connectivity will be assessed concurrently with the instream flow study being conducted downstream in Reaches 1 – 4, at the same flows, provided data can be collected safely. Photo documentation will be included in the connectivity analyses. Documentation will include transect measurements delineating each pool that is measured at each of the flow levels evaluated.

#### **4.7.6 Instream Flow Modeling**

Input from the instream flow analyses will be used to model the effects on fish habitat under various flow regimes and will examine the habitat and energy trade-offs associated with a range of scenarios.

## **4.8 Baseline Studies of Benthic Macroinvertebrates in Grant Creek**

### **Project-Related Objectives**

- Provide a reliable measure of baseline stream productivity that can be compared from year to year and with other stream systems.
- Provide some indication of the relative “health” of the Grant Creek ecosystem by employing standard measures that are readily comparable to other Alaska stream systems.

### **Quantitative Objectives**

- Standard methods will be used that require replicate samples within uniform riffle habitat areas to minimize the effect of between sample variability. Five replicates are generally recommended for initial sampling. An analysis of variance will be employed to determine adequacy for baseline use.

Benthic macroinvertebrates inhabit every wetted habitat within a stream system. The various genera of aquatic macroinvertebrates feed on multiple trophic levels ranging from primary consumers to predators. They are the primary food source for many fish species, so the abundance of macroinvertebrates can directly affect fish populations. Benthic macroinvertebrates also serve a role in understanding long-term water quality trends within a stream system. Many benthic macroinvertebrate genera have been assigned “biotic index” values that rate their relative tolerance for environmental stress (e.g., organic pollution or sedimentation). Assigned biotic index values can be used to calculate an average score for a stream system.

Benthic macroinvertebrate samples will be collected at two stations on Grant Creek (GC 100 and GC 300) in August using the Surber sampling method. This technique is used to accurately characterize population density and taxa richness in a single habitat within a stream system and allows comparison between seasons and/or years.

Five replicate samples will be collected at each station. Each sample is collected from within the same riffle/run area of the stream. A specialized net is placed in the riffle/run, which defines a 1 ft<sup>2</sup> area that is then thoroughly examined for invertebrates by kicking, scrubbing, and moving substrate and allowing the invertebrates to wash downstream into the net. The contents of the net will be emptied into a sample jar and preserved with 70 percent ethyl alcohol.

Macroinvertebrates will be sorted from substrate material in the laboratory, identified to genus (except for Chironomidae), and counted. Data analyses will include a variety of standard metrics including taxa abundance, taxa diversity, percent dominance, and percent EPT (Ephemeroptera, Plecoptera, Trichoptera).

## **4.9 Baseline Studies of Periphyton in Grant Creek**

### **Project-Related Objectives**

- Provide a reliable measure of baseline stream productivity that can be compared from year to year and with other stream systems.
- Provide some indication of the relative “health” of the Grant Creek ecosystem by employing standard measures that are readily comparable to other Alaska stream systems.

### **Quantitative Objectives**

- Standard methods will be used that require replicate samples to minimize the effect of between-sample variability. Ten replicates are recommended for initial sampling. An analysis of variance will be employed to determine adequacy for baseline use.

Periphyton are single-celled algae that typically grow on rocky substrates in streams and rivers. Periphyton will be collected to assess chlorophyll *a* concentration, representing primary productivity, in Grant Creek. Many genera of benthic macroinvertebrates and some fishes depend on periphyton as their primary food source. Chlorophyll *a* concentration also can provide an indication of stream condition.

Periphyton will be collected by isolating a space of known area on a rock and collecting the algae from the space. This material is then sent to a laboratory to be analyzed for chlorophyll *a* content. Collection procedures will be as follows:

- Periphyton samples will be collected in August at two stream locations within Grant Creek (GC 100 and GC 300).
- Ten periphyton samples will be removed from a defined area on large gravel or cobble collected from the stream substrate.
- The material scrubbed from the rocks will be rinsed and then filtered onto glass fiber filters, preserved, and then frozen.
- The filters will be sent to a laboratory to assess chlorophyll *a* content.

## **4.10 Trail Lake Narrows Fish and Aquatic Habitats**

### **Project Related Objectives**

- Determine the extent of fish use in the vicinity of the proposed access road bridge crossing of Trail Lake Narrows in order to minimize impact to aquatic resources potentially resulting from bridge design, construction timing, and construction methodology.
- Determine habitat use to optimize bridge location and design.

### **Quantitative Objectives**

- The study will primarily be descriptive with some semi-quantitative fish sampling using catch per unit effort or standardized observations. Statistical analysis will not generally be applicable but catch methods will employ standard techniques allowing comparison with other bodies of water.

Field investigations will be conducted in the late July – early August period in the Trail Lake Narrows with emphasis placed on the vicinity of the proposed bridge site. Methods to be employed will include minnow trapping, beach seining, and snorkeling. Water clarity may be too poor for snorkeling to be effective. Use of stream bank habitats by juvenile Chinook and coho salmon will be a primary focus. It is expected that minnow trapping will be the most effective technique for juvenile captures..

Fish habitats within a cross section of the narrows will be subjectively described and will include a discussion of fish and habitat use.

## **5 Agency Resource Management Goals**

Aquatic resources including fish and their habitats are generally protected by a variety of state and federal mandates. In addition, various land management agencies, local jurisdictions, and non-governmental interest groups have specific goals related to their land management responsibilities or special interests. These goals are expressed in various statutes, plans, and directives:

- Alaska Statute 41.14.170 provides the authority for state regulations to protect the spawning, rearing, or migration of anadromous fish. Alaska Statute 41.14.840 regulates the construction of fishways and dams. State regulations relating to fish resources are generally administered by ADF&G. In addition to the state statutes, the following resource management plans and directives provide guidance and direction for protection of fish resources and aquatic habitats on lands within or adjacent to the Project area:
- Magnuson-Stevens Fishery Conservation and Management Act (PL 104-267) provides federal protection to “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” NOAA’s National Marine Fishery Service (NOAA Fisheries) is responsible for designating Essential Fish Habitat (EFH). In the case of anadromous fish streams (principally salmon), NOAA Fisheries has designated the AWC prepared by ADF&G (Johnson and Klein 2009) as the definition of EFH within freshwater habitats.
- Aquatic Resources Implementation Plan for Alaska’s Comprehensive Wildlife Conservation Strategy, September 2006. Prepared by Alaska Dept. of Fish and Game, Div. of Sport Fish.
- Our Wealth Maintained: A Strategy for Conserving Alaska’s Diverse Wildlife and Fish Resources. Prepared by Alaska Department of Fish and Game, Juneau, Alaska. xviii+824 pp.
- Kenai River Comprehensive Management Plan. Prepared by Alaska Department of Natural Resources, Division of Land and Division of Parks and Outdoor Recreation; in conjunction with Alaska Department of Fish and Game, Habitat and Restoration Division; Kenai Peninsula Borough.
- Kenai Peninsula Borough Comprehensive Plan. Prepared by KPB Planning Department. In 2005. Soldotna, Alaska.
- Kenai Peninsula Borough Coastal Zone Management Plan. Prepared by the Kenai Peninsula Borough Coastal Management Program and LaRoche and Associates. 2008. Kenai Peninsula Borough. Soldotna, Alaska.
- Kenai River Special Management Area (KRSMA), ADNR.
- Final Environmental Impact Statement and the Revised Land and Resource Management Plan for the Chugach National Forest, Chapter 3 Environment and Effects. Prepared by the U.S. Forest Service, 2002.



## **6 Project Nexus**

The proposed Project may have a number of potential impacts on aquatic resources within Grant Creek and Grant Lake. The studies described above are intended to provide sufficient information regarding the nature of the existing aquatic resources such that these potential impacts can be adequately assessed. Each study component is specifically designed to help evaluate potential impacts in the study report. The impact assessments will be presented in the study report, and will be used to inform the development of protection, mitigation, and enhancement measures to be proposed in the draft and final license applications. Some of the direct and indirect Project effects that could impact aquatic resources are itemized below:

- Alteration of the streamflow and temperature regime (depending on the depth of water withdrawal in Grant Lake) in Grant Creek as the result of potential Project operation could affect spawning and rearing habitat for anadromous fish species and habitat for all life stages of resident fish species, depending on the timing and magnitude of flow alteration.
- Changes in water surface elevations in Grant Lake would likely affect aquatic biota in littoral areas, including fish, macroinvertebrates, and macrophytes; the timing and magnitude of lake level changes would dictate the level of effects (the proposed lake level changes would range from 2 feet above to 11 feet below the natural lake elevation of approximately 698 feet). Areas of shoreline wetlands could also be affected.
- Any dredging of Grant Lake in the vicinity of the proposed intake structure could result in short-term impacts on benthic macroinvertebrate populations in the area.
- Water temperatures in Grant Lake could be influenced by operation of the proposed Project, depending on the depth of water withdrawal.

## **7 Consistency with Generally Accepted Practices**

Sampling methodology for Grant Creek and Grant Lake was designed in consultation with the public, resource agency scientists, and members of the Instream Flow TWG. Quality control of all study plans is maintained by using established methods used elsewhere to assess similar potential resource impacts and are reviewed by outside expert scientific reviewers. Methods proposed herein (use of foot surveys, minnow trapping, angling, block and removal techniques, and radio telemetry) are generally-accepted practices for assessing fish resources.

The instream flow approach, as a whole, is custom-designed for Grant Creek and its unique hydrology, geomorphology, and fish resources. However, each component of the study is a well-known and accepted technique for study application in the field. The integration of these components is accomplished through post-processing and analysis of results.

Macroinvertebrates will be collected using the sampling method described by Eaton et al. (1998). Surber sampling is a preferred method of the USGS and ADF&G. Periphyton will be collected using methods from Eaton et al. (1998).

## **8 Schedule for Conducting the Study**

- May-October 2012 – Re-engage stakeholders and conduct any tasks deemed beneficial in 2012.
- October 2012 - Apply for winter sampling permits.
- February-March 2013 – Conduct winter fish sampling.
- January 2013 (or earlier if any work to be done in 2012) – Apply for fish resources sampling permits, secure field equipment, telemetry tags, telemetry tower, traps etc., exploration of Reach 5, instream flow transect measurements.
- May 2013 – Begin Rainbow trout survey, juvenile fish habitat use sampling, instream flow habitat suitability measurements.
- June 2013 – Complete Rainbow trout survey, data entry and QC for field data, habitat map GIS work.
- July 2013 – Juvenile fish habitat use sampling, instream flow habitat suitability measurements, instream flow water surface elevation measurements, data entry and QC for field data.
- August 2013 – Begin foot surveys for spawning salmon, capture and radio tag Chinook salmon, habitat use snorkel surveys, data entry and QC for field data.
- September 2013 – Continue foot surveys for spawning salmon, tracking radio tagged Chinook salmon, juvenile fish habitat use sampling, instream flow habitat suitability measurements, instream flow water surface measurements, data entry and QC for field data.
- October 2013 – Continue foot surveys for spawning salmon, continue tracking radio tagged salmon, complete field work and demobilize field equipment, data entry and QC for field data.
- November 2013 – Continue foot surveys for spawning salmon, complete data entry and QC for field data, begin development of draft baseline study reports.
- January 2014 – Complete instream flow modeling.
- January 2014 – Complete draft study report for internal review.

## **9 Provisions for Technical Review**

KHL will provide updates and study products for review by the Aquatic Resources Work Group during the licensing process.

- December 2012: Issue final study plan to Work Group
- April through June 2013: Start of Study Season [varies by study area].
- Fall 2013: Work Group update on field activities.
- April 2014: Distribute draft study report.

- April 2014: Work Group meeting call to discuss comments on draft study report.
- May 2014: Distribute final study report.
- September 2014: File Draft License Application.
- January 2015: File Final License Application.

## 10 References

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----- Forwarded message -----

From: **Michael R Yarborough** <[mry@crcalaska.com](mailto:mry@crcalaska.com)>

Date: Fri, Mar 8, 2013 at 7:11 AM

Subject: Re: Area of Potential Effect (APE) for the Grant Lake Hydroelectric Project (FERC No. 13212)

To: "DeCleva, Ed -FS" <[edecleva@fs.fed.us](mailto:edecleva@fs.fed.us)>

Ed

We were hoping to have the meeting next Monday, but I had to travel to Dallas earlier this week for a death in my family. Corry and I will work on rescheduling once I get back to Anchorage.

Mike

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**From:** Cory Warnock  
**Sent:** Monday, March 11, 2013 10:54 AM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

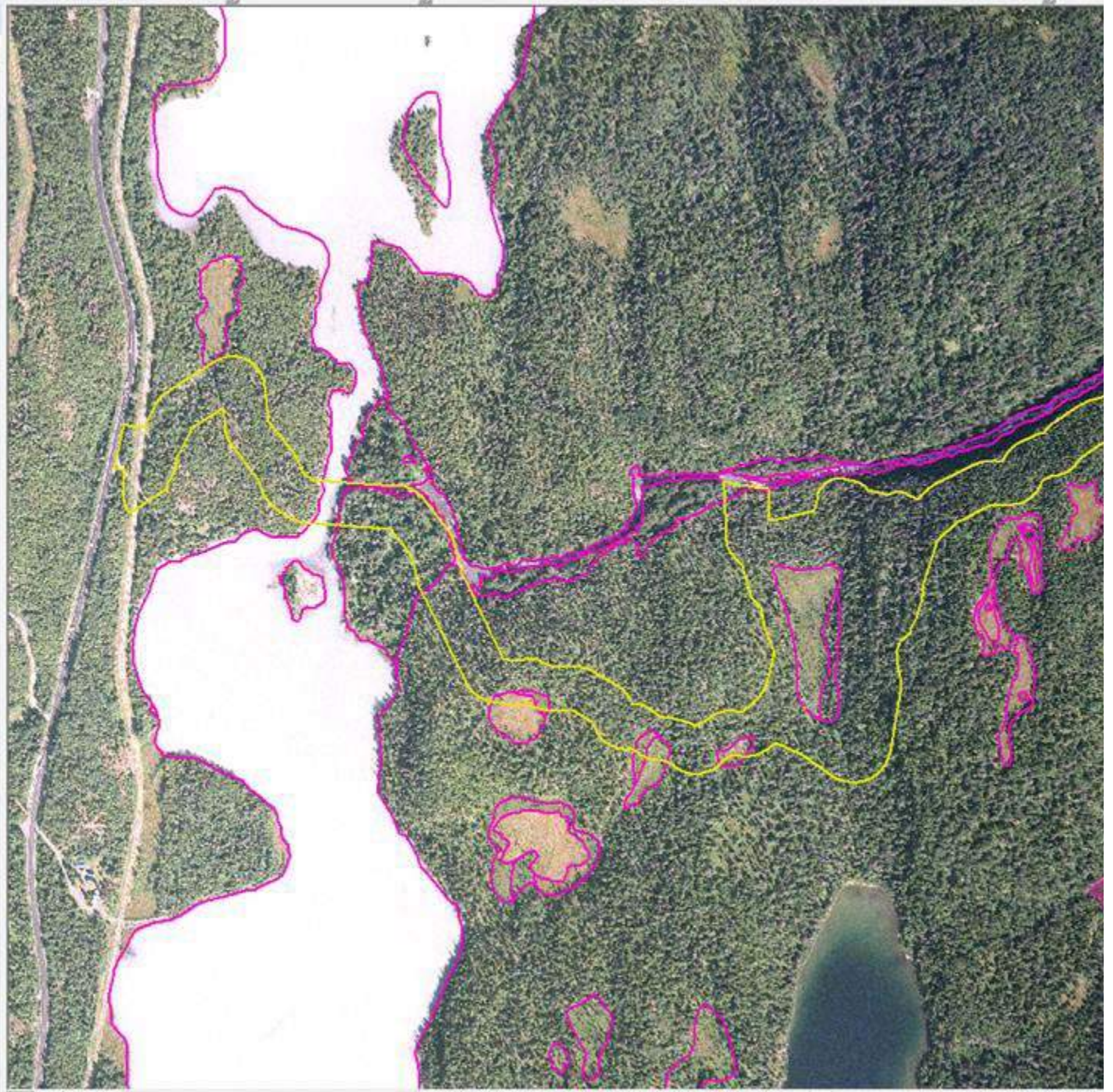
Hi Kathy,

In an effort to answer your questions, I broke them down below and provided answers (in red). In addition, I've provided a map of the area where some of the soil pits will be dug. Please let me know if you need anything else and/or what I can do to help with the amendment process. As always, more than willing to answer any questions.

1. Do we have a map of the vicinity where these pits will be dug? **We have a partial map. We will place ~2-4 soil pits around the boundary areas of each of the polygons but won't know exactly where until we're in the field. The "vicinity" is within the wetland assessment area (100 ft buffer either side of transmission corridor centerline, w/in 100 ft of all project facilities, head of Grant Lk, and any TBD assessment that occurs within the inundation area around Grant Lk, and along the Grant Cr corridor). Of these areas, we have a map with preliminary wetland polygons mapped between Grant Lk and Trail Lk. We don't have a map with potential wetland polygons in the other assessment areas (e.g. head of Grant Lk). We are lacking quality aerial imagery in the area which has prevented us from doing any desktop mapping in the area.**
2. How many pits will be dug? **Estimated 40-60 soil pits**
3. Specifics related to the pits (depth, diameter, how long after they are dug will they be filled in?). **Depth: 18-24" depending on depth to refusal; diameter: ~8-12"; the pit will only be open for ~1 hr during the wetland determination, then the soil plugs will be replaced.**

The screenshot below shows the assessment areas between the lakes outlined in yellow. Preliminary mapped wetland polygons are outlined in pink. Wherever a wetland polygon falls entirely or partially w/in the yellow assessment area is where we'll place wetland determination points (2-4 soil pits per polygon assessed). The head of Grant Lk will also be assessed. The shore of Grant Lk (e.g. 2 ft vertical from water level), and the Grant Cr corridor, may also be assessed.





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**From:** Van Massenhove, Katherine B -FS [mailto:kvanmassenhove@fs.fed.us]  
**Sent:** Friday, March 08, 2013 1:05 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Thanks Cory,  
I'm glad you checked too. We will need information on where these pits will be dug (super important for heritage), the number of pits to be dug and other specific information regarding the pits (depth, filling after, etc.). You can email a request, you do not need to submit a full application. A map of the areas you want to dig the pits will be most helpful for specialists review.

Kathy Van Massenhove



Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Friday, March 08, 2013 12:01 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

To be clear, the work done in 2009/2010 was not work we were conducting. It was a previous contractor. We are obviously willing to file the amendment. Can you clarify a bit for me that process or what you need from me to get that going?

Thanks and I'm glad I checked,

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, March 08, 2013 12:57 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Cory,

No, the existing permit does not allow for any ground disturbance, including the digging of holes even when they are to be refilled. You will need to request an amendment to the permit, which will take time to process, if you want to have the ability to do ground disturbing work. This work should not have been occurring in the previous seasons, I'm not sure Karen O'Leary was aware that you were doing so or she would have required the permit to be amended.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Friday, March 08, 2013 10:08 AM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Levia Shoutis; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Katherine,

I was having a talk with our terrestrial folks today and in the interest of being comprehensive, I wanted to verify something. The wetlands work we will be doing involves temporarily digging small core samples approximately 18 inches deep. Once the on-site analysis is conducted, the holes are immediately filled back in. This is consistent with work that was already done under the existing Special Use Permit in 2009/2010 and I'm sure is fine but again, in the

interest of being overly certain, I wanted to verify that this method was acceptable per the existing Special Use Permit that has been in place and the associated amendment.

Thanks,

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, February 08, 2013 3:14 PM  
**To:** Cory Warnock  
**Subject:** Executed Amendment for access by snowmobile and helicopter

Hi Cory,

Attached is the signed and fully executed amendment to the permit for the investigative studies on Grant Lake. You are now authorized access by the same means available to the general public, which include helicopter and snow mobile access.

Please let me know if you have any questions,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Sagner, Helen -FS  
**Sent:** Thursday, February 07, 2013 9:54 AM  
**To:** Van Massenhove, Katherine B -FS; Pence, Sitka -FS  
**Cc:** Stovall, Robert -FS  
**Subject:**

Per Robert; I have scanned and attached the required documents for you.

Thanks in advance.

Helen

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Version: 2013.0.2899 / Virus Database: 2641/6138 - Release Date: 02/28/13

Internal Virus Database is out of date.

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**From:** Cory Warnock  
**Sent:** Tuesday, March 12, 2013 3:37 PM  
**To:** Ayers, Scott D (DFG); Salzetti, Mikel  
**Cc:** Emily Andersen; Begich, Robert N (DFG)  
**Subject:** RE: Grant Lake Permitting

Sounds good. Thanks, Scott.

Expect to hear back from me late this week.

Cory

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Tuesday, March 12, 2013 3:36 PM  
**To:** Cory Warnock; Salzetti, Mikel  
**Cc:** Emily Andersen; Begich, Robert N (DFG)  
**Subject:** RE: Grant Lake Permitting

Hello Cory,

I believe that a write up of responses would work just fine. We're mainly looking for clarification of some points and slight alteration of others.

I appreciate the quick reply.

Cheers,

-Scott

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Tuesday, March 12, 2013 2:30 PM  
**To:** Ayers, Scott D (DFG); Salzetti, Mikel  
**Cc:** Emily Andersen  
**Subject:** RE: Grant Lake Permitting

Hi Scott,

As I mentioned in a previous email, I have a call set up with our aquatics lead later this week and will be getting back to you related to the issues you list below.

In the interim, I had a question and perhaps a clarifying point for you. To give you a bit of background, we have finalized our study plans based upon an agency meeting that we had in December of 2012 during which we welcomed a final round of informal agency comments. Upon receiving those comments, we revised the study plans commensurate with HEA's approach and subsequently finalized them. To that end, to reopen them and revise would be a large undertaking and one that isn't supported by the FERC process given the specific licensing process we are using and the associated phase we are currently in. To that end and as opposed to revising the study plan, what I'm hoping we can do is essentially write up detailed responses to your items below and provide them to you either in a word document or simply, an email. This has been an accepted course of action with other agencies that we have recently acquired permits from for this project. Would this be acceptable to you?

Let me know. I'd be more than happy to discuss further. Again, I appreciate your receptivity to being as expedient as possible with our application,

Cory

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Tuesday, March 12, 2013 11:54 AM  
**To:** Salzetti, Mikel  
**Cc:** Cory Warnock; Begich, Robert N (DFG)  
**Subject:** RE: Grant Lake Permitting

Hello Mike,

After the initial review of your project we have come up with some more questions that we would like answered to complete the permitting process. I do realize that this is time sensitive and I am trying to get this done as quickly as possible so that you are able to get your crews in the field and work started.

Please update the project study plan to:

- 1) indicate which type of weir design you plan to use this summer, and indicate how it is that you plan to allow for downstream passage of all fish species;
- 2) note that all radio-tagged rainbow trout will be externally marked with a secondary tag such as a FLOY type T-tag;
- 3) indicate that genetic samples (tip of axillary process near the pelvic fin) will be collected for ADF&G from fish handled at the weir for ASL sampling (genetic sampling equipment will be supplied by ADF&G);
- 4) indicate approximate dates that smolt traps will be in the water;
- 5) remove electrofishing from the methods.

Please do get back to us at your earliest convenience with this updated study plan so that we can move forward with the process.

Wishing you well.

Cheers,  
-Scott

---

**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
**Sent:** Wednesday, February 20, 2013 5:22 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** RE: Grant Lake Permitting

Scott:

Attached is a completed Fish Resource Permit Application which also includes a copy of the Aquatic Resources Study Plan and a satellite image noting key aquatic resource study sites. Please let me know if you have any question or need any further information.

I would also appreciate it if you could give me an indication as to when you would anticipate granting a permit if everything on our application is in order. I noted your backlog and I am concerned about getting the permit in time to start some late winter study work that we have scheduled to start during the last part of March.

Best Regards,

**Mike Salzetti**  
Fuel Supply & Generation Engineering Manager  
(907) 283-2375 work

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Thursday, February 14, 2013 8:48 AM  
**To:** Salzetti, Mikel  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
**Subject:** RE: Grant Lake Permitting

Mike:

Thank you for your quick reply. Having started this position in mid-January, I am still in the process of learning the ins and outs of the permitting world. While I do not know what permit applications are included in the Multi-Agency Permit Packet, I do know that a Fish Habitat Permit was issued for your work that disturbs the ground underlying the stream bed. I received a copy of your Fish Habitat Permit, realized that your project would also require a Fish Resource Permit, noted that I did not yet have one from your group, and sent the application your way. I do not know if there are any further permits outside of the Multi-Agency Permitting process that you will need to obtain.

Wishing you well.  
Cheers,  
-Scott

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**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
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**To:** Ayers, Scott D (DFG)  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
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Scott:

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Once you receive the permit application, please do hesitate to give me a call if you should have any questions.

Best Regards,

**Mike Salzetti**  
Fuel Supply & Generation Engineering Manager  
(907) 283-2375 *work*  
(907) 398-5073 *Mobile*

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Wednesday, February 13, 2013 1:59 PM  
**To:** Salzetti, Mikel  
**Subject:** FW: Grant Lake Permitting

Hello Mr. Salzetti,

I am writing to you to inform you that you will be required to submit a Fish Resource Permit to complete the work that is outlined on the Fish Habitat Permit for the Grant Creek Hydro project. There is a copy of the application attached to this message. I had attempted to pass this message to Cory Warnock of McMillen LLC who had been in touch with me earlier this year concerning permitting, but it appears that he is out of his office until February 20. Please let me know if I can be of any further assistance.

Cheers,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

---

**From:** Ayers, Scott D (DFG)  
**Sent:** Wednesday, February 13, 2013 11:20 AM  
**To:** 'Cory Warnock'  
**Cc:** 'Emily Andersen'  
**Subject:** RE: Grant Lake Permitting

Hello Cory,

A Title 16 Fish Habitat Permit crossed my desk this morning for the Grant Creek Hydro project, under Mike Salzetti of Kenai Hydro, LLC. After reviewing the permit I wanted to get in touch with Kenai Hydro to remind them that a Fish Resource Permit was also required for them to handle any fish in the process of their work. As you reached out to me earlier this year about permitting for this project I thought I'd try contacting you first. I've attached the permit application to this message and will also require a study plan of the proposed fisheries work that is intended. I currently have 90 applications on my desk, so the sooner this can be submitted the better. Please let me know if this message needs to be directed to someone else.

Wishing you all the best.

Cheers,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Friday, January 11, 2013 1:20 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Permitting

Hi Scott,

Monte Miller gave me your number as it appears today is Bob's last day. Sounds like you'll be taking over for him as it relates to permitting. I'm currently working with Homer Electric Association on their licensing process for the Grant Lake Project on the Kenai Peninsula. We are currently going through the Multi-Agency permitting process and I was hoping to touch base with you about a couple specific issues related to the permits we are looking to secure so that when you see your portion of the Multi-Agency Permit from the Kenai River Center, everything is understood. If you could give me a time in the not so distant future that would work to have a brief phone call, I'd appreciate it.

Thanks and I'll look forward to hearing from you,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264



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**From:** Cory Warnock  
**Sent:** Wednesday, March 13, 2013 5:28 PM  
**To:** Barclay, Andy W (DFG)  
**Cc:** Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net)); Emily Andersen; Mike Salzetti; Habicht, Chris (DFG); Templin, Bill D (DFG)  
**Subject:** RE: DNA Analysis Call (Grant Lake)

**Categories:**

Hi Andy,

I'll send you a call invite soon with the appropriate call in number and PIN.

Thanks,

Cory

---

**From:** Barclay, Andy W (DFG) [<mailto:andy.barclay@alaska.gov>]  
**Sent:** Wednesday, March 13, 2013 3:42 PM  
**To:** Cory Warnock  
**Cc:** Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net)); Emily Andersen; Mike Salzetti; Habicht, Chris (DFG); Templin, Bill D (DFG)  
**Subject:** RE: DNA Analysis Call (Grant Lake)

Hi Cory,

That time will work for me. Bill said he won't be able to make that time, but I should be able to answer any questions you have. Just let me know what number to call and I'll call in at 9am Alaska time. At the bottom of this email I've inserted links to the latest reports on Cook Inlet Chinook and sockeye baseline analyses. These will give you an idea of the sorts of analyses we will conduct with the samples you collect. We are in the beginning phase of a coho salmon baseline project so there are no reports to show you for that species, I'll fill you in more tomorrow.

Thanks,  
Andy

<http://www.adfg.alaska.gov/FedAidPDFs/FMS12-02.pdf>  
<http://www.adfg.alaska.gov/FedAidPDFs/FMS12-06.pdf>

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Wednesday, March 13, 2013 1:12 PM  
**To:** Templin, Bill D (DFG)  
**Cc:** Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net)); Emily Andersen; Mike Salzetti; Barclay, Andy W (DFG); Habicht, Chris (DFG)  
**Subject:** Re: DNA Analysis Call (Grant Lake)

Hi Bill,

Can we set up a call at 9 your time tomorrow? That would alleviate a couple conflicts we have. I'll set up a conference number for all of us if that time works since Mark and myself will be calling in separately.

Let me know and thanks,

Cory

On Mar 13, 2013, at 12:18 PM, "Templin, Bill D (DFG)" <[bill.templin@alaska.gov](mailto:bill.templin@alaska.gov)> wrote:

Cory,

We've received the study plan and it looks like this analysis should be fairly simple to set up. However, the project leader for these types of studies will be out of the office on Friday. Can we set a call for tomorrow morning (Thursday 3/14 at 10:30 am Alaska Time)? You can call us at 907.267.2475.

Regards,  
Bill

William D. Templin  
Principal Geneticist  
Gene Conservation Laboratory  
Alaska Dept. of Fish & Game  
333 Raspberry Road  
Anchorage, Alaska 99518  
907.267.2234

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Wednesday, March 13, 2013 10:21 AM  
**To:** Templin, Bill D (DFG)  
**Cc:** 'Mark Miller' ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net)); Emily Andersen; Mike Salzetti  
**Subject:** DNA Analysis Call (Grant Lake)

Hi Bill,

Per discussions with my aquatics lead, I'd like to set up a call with you to discuss our equipment needs and subsequent analysis assistance that ADF&G might be able to provide. Will this Friday at 2pm PST (1pm AK) work? If not, let me know of an alternate time that will work for you.

Thanks and I'll look forward to hearing from you soon,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
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5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

---

**From:** Ayers, Scott D (DFG) <scott.ayers@alaska.gov>  
**Sent:** Wednesday, March 13, 2013 12:10 PM  
**To:** Cory Warnock; Salzetti, Mikel  
**Cc:** Begich, Robert N (DFG); 'Mark Miller (mark.miller@bioanalysts.net)'; John Stevenson; Emily Andersen  
**Subject:** RE: Grant Lake Permitting

**Categories:**

Hello Cory,

Thank you for the updates/clarifications/comments. I will be back in touch as soon as I have more information to pass along.

Cheers,

-Scott

---

**From:** Cory Warnock [mailto:cory.warnock@mcmillen-llc.net]  
**Sent:** Wednesday, March 13, 2013 9:52 AM  
**To:** Ayers, Scott D (DFG); Salzetti, Mikel  
**Cc:** Cory Warnock; Begich, Robert N (DFG); 'Mark Miller (mark.miller@bioanalysts.net)'; John Stevenson; Emily Andersen  
**Subject:** RE: Grant Lake Permitting

Hi Scott,

The answers to your questions are provided below (in red).

Don't hesitate to let me know if you have any additional questions and I'll be in touch soon to check on progress. Again, thanks for your efforts to expedite the process.

Cory

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Tuesday, March 12, 2013 11:54 AM  
**To:** Salzetti, Mikel  
**Cc:** Cory Warnock; Begich, Robert N (DFG)  
**Subject:** RE: Grant Lake Permitting

Hello Mike,

After the initial review of your project we have come up with some more questions that we would like answered to complete the permitting process. I do realize that this is time sensitive and I am trying to get this done as quickly as possible so that you are able to get your crews in the field and work started.

Please update the project study plan to:

- 1) indicate which type of weir design you plan to use this summer, and indicate how it is that you plan to allow for downstream passage of all fish species – The weir we will be using is a standard picket design (example photo attached). It will be constructed of 1.9 cm galvanized pipe and 7.6 cm aluminum channel. The galvanized pipe will be picketed through 1.9 cm holes in the aluminum channel spaced 2.54 cm apart. The weir will be placed across the channel at an angle to stream flow. Fish migrating upstream will follow the weir to its most upstream location where we will remove several pickets to pass and enumerate upstream migrants. A

live box will be constructed on the upstream side to hold fish for sampling (Length, weight, age, tagging, etc.) Fish migrating downstream will follow the weir to its most downstream location where we will remove several pickets to pass and enumerate downstream migrants. CIAA will also inspect the weir regularly and pass fish downstream wherever they are. Passing live and dead fish downstream will be a significant part of weir management, particularly post spawning. Small fish – fry and fingerlings – will be able to pass through the weir unimpeded.

- 2) note that all radio-tagged rainbow trout will be externally marked with a secondary tag such as a FLOY type T-tag – An approximate 9 inch braided cable antennae will be visible, exterior of the fish very clearly establishing that these fish have been tagged. We typically don't like to use a supplemental floy tag with this as our experience has shown us that it can significantly increase the potential for predation of the rainbows.
- 3) indicate that genetic samples (tip of axillary process near the pelvic fin) will be collected for ADF&G from fish handled at the weir for ASL sampling (genetic sampling equipment will be supplied by ADF&G) – This is acceptable to us and will be the method we use.
- 4) indicate approximate dates that smolt traps will be in the water – The smolt traps will be in place from April 5, 2013 up until a latest date of November 7, 2013. There is flexibility built into the end of that time frame. If no fish are being captured later in the season, we may remove the smolt traps earlier but we'd like the ability to utilize them as long as possible in case captures occur into November.
- 5) remove electrofishing from the methods. – While we believe that we can accomplish our goals without the use of electrofishing, if possible, we would like to have it as a last option if certain circumstance dictate its use. We will not need it for any of the Trail Lakes Narrows work but there may be certain situations in Grant Creek where it could be useful. This isn't a deal breaker and again, we can likely accomplish all of our goals without it. But, if we could have it as a last resort type option, that would be preferable. Perhaps some sort of provision to that end could be incorporated into the permit? More than happy to discuss further.

Please do get back to us at your earliest convenience with this updated study plan so that we can move forward with the process.

Wishing you well.

Cheers,  
-Scott

---

**From:** Salzetti, Mikel [<mailto:MSalzetti@HomerElectric.com>]  
**Sent:** Wednesday, February 20, 2013 5:22 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Cory Warnock ([cory.warnock@mcmillen-llc.com](mailto:cory.warnock@mcmillen-llc.com))  
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I would also appreciate it if you could give me an indication as to when you would anticipate granting a permit if everything on our application is in order. I noted your backlog and I am concerned about getting the permit in time to start some late winter study work that we have scheduled to start during the last part of March.

Best Regards,

**Mike Salzetti**

Fuel Supply & Generation Engineering Manager

(907) 283-2375 *work*

(907) 398-5073 *Mobile*

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**To:** Salzetti, Mikel

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(907) 267-2517 – phone (907) 267-2464 – fax  
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**Cc:** 'Emily Andersen'  
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Anchorage, AK 99518  
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**Sent:** Friday, January 11, 2013 1:20 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Permitting

Hi Scott,

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Thanks and I'll look forward to hearing from you,

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Ferndale, Wa. 98248  
O – 360-384-2662  
C – 360-739-0187  
F – 360-542-2264

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No virus found in this message.  
Checked by AVG - [www.avg.com](http://www.avg.com)  
Version: 2013.0.2904 / Virus Database: 2641/6163 - Release Date: 03/10/13





# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

---

*Contact Name:* Andy Barclay

*Agency/Organization:* ADF&G

*Phone No./E-mail Address:* 907-267-2475, [andy.barclay@alaska.gov](mailto:andy.barclay@alaska.gov)

---

*Date:* 3/14/13

*Time:* 10 :00 PST

---

*Grant Lake Licensing Team Contact:* Cory Warnock

---

#### *Summary of Conversation and/or E-mail Exchange:*

Mr. Warnock and Mark Miller (BioAnalysts) had a call with Mr. Barclay to discuss the potential of having ADF&G provide the DNA collection materials and potentially do the resulting analysis for the samples collected on Grant Creek.

Mr. Barclay noted that ADF&G had done some work with anadromous species on Grant Creek and any additional data that we could collect to assist in their analysis would be greatly appreciated. Mr. Warnock informed Mr. Barclay that the three species they would be collecting data for were Chinook, sockeye and coho with Chinook and sockeye being more of a certainty and coho being somewhat opportunistic given their low numbers (historically) in the creek.

Issues such as bulk vs. individual sampling and collection methods were discussed. After some discussion, it was agreed that HEA would attempt to get a minimum of 45 Chinook samples and 100 sockeye samples with coho being opportunistic. Mr. Barclay indicated that it would cost approximately \$10,000 for ADF&G to conduct the analysis and provide a memo to HEA documenting genetic uniqueness of the species. The collection supplies would be provided for free.

Mr. Warnock stated that he would talk with HEA to get final approval on everything discussed but his current feeling was that HEA will collect the samples and have ADF&G hold them until it is determined that the analysis is needed for the licensing process. If that is determined then HEA will work with ADF&G to develop some sort of cooperative agreement/cost sharing for the

analysis. If the analysis is not needed for HEA's licensing purposes, ADF&G can retain the samples and analyze at their discretion.

It was agreed that a follow-up conversation would take place once Mr. Warnock spoke with HEA about this approach.

Call Duration: 30 minutes.

---

**Attachments:** SF2013-105d-permit.pdf; FRP data submission form 5.3.xls

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Monday, March 18, 2013 12:05 PM  
**To:** [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)  
**Cc:** Cory Warnock; Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG)  
**Subject:** PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Dear Mr. Salzetti:

Please find enclosed your ADF&G Fish Resource Permit (SF2013-105). You need to read this permit carefully not only to understand what you are authorized and required to do but also to check for mistakes that must be corrected immediately by contacting us. If your plans are modified later on (e.g. personnel changes, larger than expected collections, different sampling locations, etc.), contact us as soon as you know so that an amendment to your permit can be prepared and issued in time to avert disruptions to planned field work. Failure to abide by permit requirements or to amend your permit when conditions change are permit violations that can result in a citation and/or loss of your permit.

Please be sure that you and all authorized personnel carry a copy of the permit while conducting collecting activities.

A report detailing all collections for this permit is due on or before December 31, 2013. Please use the ADF&G data submissions form for this task. If you do not have the opportunity to utilize your permit, please submit a letter or email stating that the permit was not used. A telephone message is not sufficient.

**Please use the subject line in all future correspondence regarding this permit--thanks**

Wishing you success with your project,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

---



STATE OF ALASKA  
DEPARTMENT OF FISH AND GAME

333 Raspberry Rd.  
ANCHORAGE, ALASKA 99518

Permit #: **SF2013-105**

Expires: **11/30/2013**

Collections Report Due: **12/31/2013**

FISH RESOURCE PERMIT  
(For Scientific/Educational Purposes)

This permit authorizes Mike Salzetti (whose signature is required on page 2 for permit validation)  
person

of Homer Electric Association at 280 Airport Way, Kenai, Alaska 99611  
agency or organization address

to conduct the following activities from March 25, 2013 to November 30, 2013 in accordance with AS 16.05.930:

**Purpose:** Create baseline of fisheries resource for Grant Creek HEA hydroelectric project.

**Location:** Grant Creek between Grant Lake and Lower Trail Lake, and Trail Lake Narrows

**Species Collected:** All local species

**Method of Capture:** Beach seine, dip nets, hook and line, inclined plane/smolt and minnow traps, weir

**Department Sample Requirements:** The Department requires samples suitable for genetic analysis from salmon handled at the weir during ASL sampling under this permit (See **Stipulations # 17 & 18** for details).

**Final Disposition:** Unlimited numbers of all species may be passed through the weir, located near the mouth of Grant Creek to spawning areas.  
≤65 King salmon, ≤65 sockeye salmon, and ≤20 coho salmon adults may be marked with esophageal radio tags and spaghetti tags, and released alive.  
≤40 rainbow trout >500 mm may be marked with surgically implanted radio tags, and released alive during the early portion of their spawning migration (March 25 – June 30). These fish must also be tagged with an external tag.  
Any number of juvenile salmon may be captured, measured, and released at each smolt trap site (**Stipulations # 4 & 5**).  
Every 7-10 days, ≤500 king and ≤500 sockeye smolt may be marked with Bismarck Brown stain and released as a means to estimate smolt trap catch efficiency.  
All unintended mortalities must be recorded and returned to capture site waters.

-Continued on Back-

**COLLECTIONS REPORT DUE December 31, 2013.** The report, (using a data submission form furnished by ADF&G), shall include **ALL** species, numbers, dates, and locations of collection (datum/GPS coordinates in the decimal degrees format (dd.ddddd)) and disposition, and if applicable, sex, age, and breeding condition, and lengths and weights of fish handled. It must also include the date/time the local biologist was contacted for final authorization to carry out collecting activities. A completion report (abstract, background, methods, data, analysis), if not submitted with the collection report described above, must be submitted to the FRP program coordinator by: **MAY/2014.** Data from such reports are considered public information. The report shall also include other information as may be required under the permit stipulations section.

**GENERAL CONDITIONS, EXCEPTIONS AND RESTRICTIONS**

1. This permit must be carried by person(s) specified during approved activities who shall show it on request to persons authorized to enforce Alaska's fish and game laws. This permit is nontransferable and will be revoked or renewal denied by the Commissioner of Fish and Game if the permittee violates any of its conditions, exceptions or restrictions. No redelegation of authority may be allowed under this permit unless specifically noted.
2. No specimens taken under authority hereof may be sold or bartered. All specimens must be deposited in a public museum or a public scientific or educational institution unless otherwise stated herein. Subpermittees shall not retain possession of live animals or other specimens.
3. The permittee shall keep records of all activities conducted under authority of this permit, available for inspection at all reasonable hours upon request of any authorized state enforcement officer.
4. Permits will not be renewed until the department has received detailed reports, as specified above.
5. **UNLESS SPECIFICALLY STATED HEREIN, THIS PERMIT DOES NOT AUTHORIZE** the exportation of specimens or the taking of specimens in areas otherwise closed to hunting and fishing; without appropriate licenses required by state regulations; during closed seasons; or in any manner, by any means, at any time not permitted by those regulations.

Scott D. Ayres  
Fish Resource Permit Coordinator  
Division of Sport Fish

Sam Boyle  
for Director  
Division of Sport Fish

3-18-13  
Date

## **SF2013-105 continued (page 2 of 3)**

**Authorized Personnel:** The following persons may perform collecting activities under terms of this permit:

John Blum, Gary Fandrei, Mark Miller, Tim Riley, Charles Sauvageau, Denny Snyder, John Stevenson, Keith Watson

*Employees and volunteers under the direct supervision of, and in the presence of, one of the authorized personnel listed above may participate in collecting activities under terms of this permit.*

### **Permit Stipulations:**

- 1) The local Area Management Biologist (AMB), **Robert Begich** (260-2920 or 398-0138; [robert.begich@alaska.gov](mailto:robert.begich@alaska.gov)) Soldotna; and/or the assistant AMB, **Jason Pawluk** (262-9368; [jason.pawluk@alaska.gov](mailto:jason.pawluk@alaska.gov)) Soldotna; must be contacted for final authorization **prior** to you engaging in any collecting activities. The time/date of this contact must be included in your collections report (using the "data submission form" furnished by ADF&G). This AMB has the right to specify methods for collecting, as well as limiting or altering the collections of any species by number, time and location.
- 2) A valid Alaska sport-fishing license must be in the possession of any individual using hook-and-line gear.
- 3) An instance of >10% unintended collecting mortality requires sampling at a site to cease and the AMB contacted.
- 4) Smolt traps can result in high mortality if not checked regularly, especially during rising spring water levels that carry much watershed generated organic debris. As such, the authorized trap shall be: 1) checked twice daily during routine operations; 2) checked more than twice daily if relatively large numbers of fish are being caught and/or water levels are rising to the point of turbulence in the trap and/or water levels are causing heavy debris loading. This is to ensure that the trap is operating in a fashion that would avoid mortality to captured or entrained fish. If data is collected that shows this schedule is more stringent than necessary, the permittee may request a modification.
- 5) Smolt traps may be run from April 5 through November 7 to sufficiently detect or identify anadromous pacific salmon outmigrations that may occur at Grant Creek. If significant numbers (greater than 5% of the total captured number) are occurring after July 1 but before November 7, the AMB or assistant AMB must be contacted **prior** to discontinuing smolt trapping.
- 6) Weirs must allow downstream passage for steelhead, trout and char.
- 7) **At least one cage, (designed so that fish readily find/enter and are contained in it) must be installed and approved by the AMB. Further requirements include:** 1) the cage must be checked at least every 4 hours w/ all fish passed upstream; 2) If fish do not enter the cage within 48 hours of arrival at the weir then the weir must be partially opened to allow their passage; 3) If neither requirement 1 or 2 pass fish after five days, an entire section of pickets must be removed until the delayed fish pass; 4) the AMB must receive detailed reports weekly on weir operations including fish passage.
- 8) Any changes in marking or tagging of anadromous salmonids **MUST** be approved by the Alaska Department of Fish and Game Tag Lab. Contact **Dion Oxman** at 465-3499 for approval. No adipose fin clips may be used on anadromous salmonids unless fish are coded-wire tagged.
- 9) All sampling tools (punches, clippers etc) that are inserted into or cut animals must be placed in an iodophor bath with a 1:100 concentration between fish
- 10) Any fish that has the potential to be captured by anglers and consumed within 21 days after being anesthetized must be anesthetized by use of a Food and Drug Administration (FDA) approved anesthetic other than MS-222.
- 11) Because the use of Aqui-S as a fish sedative is specifically prohibited by the FDA and MS-222 is prohibited from being used on any fish that may be eaten by humans for 21 days after treatment, the Division of Sport Fish position is that food grade clove oil, for sale at grocery stores, is the most logical choice with the least concern for liability as a fish anesthesia in fisheries studies.
- 12) Each piece of unattended sampling gear must be; 1) labeled with the permittee's name, telephone number, and permit number, 2) securely tied to substrate, 3) placed in a location where they will not be easily noticed (e.g. under cut banks, in pools away from roads or trails), 4) allowed to soak no more than twenty-four hours at a time, 5) located with GPS coordinates, and 6) accounted for/ removed at the conclusion of sampling.
- 13) Radiotelemetry may be used in the Federal Communications Commission (FCC) assigned frequency band range approved for use by your agency/organization. If you desire to operate in the frequency band approved for other agency use, you are required to coordinate with that agency at the appropriate level.
- 14) Salmon eggs used as bait in traps must either be; sterilized commercial eggs or, if raw, be disinfected prior to use. A 10-minute soak in 1/100 Betadyne solution or some other iodophor disinfectant is adequate. Commercial eggs must be placed into a container that does not allow the fish to consume them (e.g., film canister with holes punched in it, plastic bag with slits cut in it).
- 15) Gloves, boots, and collecting gear should be disinfected between streams to reduce the potential of pathogen transmission. A wash/rinse in 1/100 Betadyne solution is adequate. **Felt or absorbent soles on waders and wading boots are prohibited.**

**SF2013-105 continued (page 3 of 3)**

- 16) If anadromous fish species new to permitted streams and rivers are found, the permit holder will work closely with ADF&G to see that information is included in the database for the *Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes*. Anadromous fish include *Oncorhynchus spp.*, Arctic char, Dolly Varden, sheefish, smelts, lamprey, whitefish, and sturgeon. Please direct questions to J. Johnson, 267-2337 or [j.johnson@alaska.gov](mailto:j.johnson@alaska.gov)
- 17) Please contact Judy Berger (907-267-2175, [judy.berger@alaska.gov](mailto:judy.berger@alaska.gov)) to obtain sampling instructions and sampling supplies prior to the start of the sampling period. She requests a one-week notice prior to field deployment for scheduling time to assemble sampling supplies. Samples are required to be delivered to the Department by the sample due date listed in the heading of this permit.
- 18) **The Department requests the following genetic samples:**
  - ≤145 King salmon;
  - ≤200 sockeye salmon;
  - ≤200 coho salmon.
- 19) Electroshocking is currently discouraged, but not prohibited. Electroshockers may not be used in anadromous waters in the presence of adult salmonids including trout or char. In areas where other means of capture are not feasible, only one pass is allowed. All electroshocked fish should be monitored before release with mortalities or injuries reported on the data submission form. Crew Leaders must have proof of attending formal class/field training along and ten days of electroshocking experience while crew members should have formal training.
- 20) **Atlantic salmon and other non-native invasive aquatic species** that you encounter during your sampling should be killed. In such an event please contact the nearest AMB (**Stipulation #1**) ASAP with species identification or description, capture location or location of sighting if capture is not possible, number captured, size, and sex. Preserve and turn in the whole specimen to the nearest ADF&G office.
- 21) *A Title 16 Fish Habitat Permit is required from the Division of Habitat, Alaska Department of Fish and Game, to place structures (weir, etc.) in fish-bearing streams.*
- 22) *A copy of this permit, including any amendments, must be made available at all field collection sites and project sites for inspection upon request by a representative of the department or a law enforcement officer.*
- 23) Issuance of this permit does not absolve the permittee from compliance with any and all other applicable federal, state, or local laws, regulations, ordinances including securing permissions to trespass on controlled lands.
- 24) A report of collecting activities, referenced to this fish resource permit number, must be submitted to the Alaska Department of Fish and Game, Division of Sport Fish HQ, 333 Raspberry Rd, Anchorage, AK 99518, Attention: Scott Ayers (267-2517; [scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)), and to the AMB (**Stipulation #1**) within 30 days after the expiration of this permit. This report must summarize the number of fish captured by date, by location (provide GPS coordinates and datum), and by species, and the fate of those fish. Fish length, weight, sex, and age data should be included if collected. A completion report (abstract/background/methods /data/analysis), if not submitted with the collection report described above, must be submitted to the department within six months of the expiration of the permit. Data from such reports are considered public information. A report is required whether or not collecting activities were undertaken.

**PERMIT VALIDATION requires permittee's signature agreeing to abide by permit conditions before beginning collecting activities:**

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**Signature of Permittee**

cc: Robert Begich, Division of Sport Fish, Soldotna  
Jason Pawluk, Division of Sport Fish, Soldotna  
Bert Lewis, Division of Commercial Fisheries, Anchorage  
Ginny Litchfield, Division of Habitat, Soldotna  
Mike Daigneault, Division of Habitat, Anchorage  
Fish and Wildlife Protection, Soldotna

ADF&G permit no. SF201X-XXX (FILL IN)																						
Summary report of fish collection activity.																						
The area biologist was contacted on: TIME/DATE																						
Location ID (optional)	Latitude	Longitude	Datum	Coordinate determination method	Name of water body	Date	Observer name (first name, middle initial, last name)	Fish collection method	Species	Life stage	Length (mm) No estimates/ranges	Length method	Weight (g)	Sex	Age	Age method	ADF&G GCL	Additional count (1)	Disposition (1)	Additional count (2)	Disposition (2)	Comments

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**From:** Cory Warnock  
**Sent:** Monday, March 18, 2013 9:43 AM  
**To:** Leclair, Claire H (DNR)  
**Cc:** Mike Salzetti; Emily Andersen  
**Subject:** RE: Grant Lake Permit

Hi Claire,

Just checking in to see how things are developing with the Grant Lake permit. As you know, we are planning to be on site next Monday with hopes of getting started with our late winter work later in the week. As always, if you have any questions, don't hesitate to let me know.

Thanks,

Cory

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**From:** Leclair, Claire H (DNR) [<mailto:claire.leclair@alaska.gov>]  
**Sent:** Thursday, March 07, 2013 1:17 PM  
**To:** Cory Warnock  
**Subject:** RE: Grant Lake Permit

Yes, thanks!

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Thursday, March 07, 2013 12:10 PM  
**To:** Leclair, Claire H (DNR)  
**Subject:** RE: Grant Lake Permit

Per the current plan, the only structure that will remain in place longer than this calendar year is the stream gauge. Our hope is that the 2013 season combined with our prior efforts will satisfy the natural resource concerns. Given that this is a licensing process, there is potential for evolution in the process that could require additional study next year but I'd assume that if that is the case, the permit could be amended to facilitate that or worst case, we'd secure another permit. Either way, the only planned structure to remain in place is the stream gauge.

Does that help?

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**From:** Leclair, Claire H (DNR) [<mailto:claire.leclair@alaska.gov>]  
**Sent:** Thursday, March 07, 2013 12:42 PM  
**To:** Cory Warnock  
**Subject:** RE: Grant Lake Permit

Thanks Cory. Off the top, which structures would you like to leave in place for longer than this calendar year?

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Thursday, March 07, 2013 11:02 AM  
**To:** Leclair, Claire H (DNR)  
**Cc:** Emily Andersen  
**Subject:** Grant Lake Permit

Hi Claire,



In talking with my aquatics lead yesterday, he noted the potential need for us to have the weir in place into early November given the uncertainty on an annual basis associated with coho returns. You and I discussed mid-October on Tuesday and I just wanted to write you and modify that as soon as possible as I know that you will be working on the evaluation/permit soon.

Thanks for the call on Tuesday. I appreciate your willingness to expedite the process. It will help our study season greatly. As I mentioned, if you have any additional questions, please don't hesitate to give me a call.

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

McMillen, LLC

[www.mcmillen-llc.com](http://www.mcmillen-llc.com)

5771 Applegrove Ln.

Ferndale, Wa. 98248

O – 360-384-2662

C – 360-739-0187

F – 360-542-2264

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No virus found in this message.

Checked by AVG - [www.avg.com](http://www.avg.com)

Version: 2013.0.2899 / Virus Database: 2641/6150 - Release Date: 03/05/13

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No virus found in this message.

Checked by AVG - [www.avg.com](http://www.avg.com)

Version: 2013.0.2899 / Virus Database: 2641/6150 - Release Date: 03/05/13

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Thanks, Scott.

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**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Tuesday, March 19, 2013 3:48 PM  
**To:** Cory Warnock; [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)  
**Cc:** Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen; Boyle, Larry R (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Cory,  
It was just brought to my attention that in my response to your first point I said 140 mm rather than 140 grams, which is what I had intended. I wanted to clarify that point.  
Cheers,  
-Scott

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Tuesday, March 19, 2013 2:43 PM  
**To:** Ayers, Scott D (DFG); [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)  
**Cc:** Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen; Boyle, Larry R (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hi Scott,

Thanks for you quick response. I will discuss with my aquatics folks and get back to you soon.

Cory

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**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Tuesday, March 19, 2013 3:34 PM  
**To:** Cory Warnock; [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)  
**Cc:** Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen; Boyle, Larry R (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hello Cory,

Thank you for your questions about the Fish Resource Permit SF2013-105. I'll answer the questions in the order that you asked.

1. 1. In the "Final Disposition" paragraph, it stipulates that  $\leq 40$  rainbow trout  $> 500$  mm (nearly 20") may be tagged. We are assuming that the state's requirement that the fish exceed 500 mm is due to concern that the tag will create an undue burden on the tagged fish. However, the transmitters that will be used on the rainbow only weigh 2.8 g in air; using the criteria developed by Winter (1983)<sup>1</sup>, which is generally the standard in radiotelemetry research, (the transmitter weighing up to 2% of the body weight of the fish in air), that allows the tagging of fish as small as 140 g. That equates to a fish much smaller than 500 mm. Would it be possible for the state to amend the permit, and base fish selection on fish weight ( $\geq 140$  g)? Our team has conducted a telemetry study on redband trout in the Klamath Basin using the same transmitter that will be used on Grant Creek, and tagged fish much smaller than 500 mm without any apparent ill effects. This combined with literature concluding that the types/size of tags we will be using would cause no harm to fish much smaller have led us to this request.

The size range for the rainbow trout ( $> 500$  mm) to be tagged came directly from the study plan that was provided to me for the permitting process (page 17, paragraph 2):

*Fish within the dominant size range of mature Rainbow trout (500 - 700 mm) will likely weigh 1,800-6,000 grams (Russell, 1977). It is advised that radio tags should not exceed 2 percent of body weight, thus a tag weighing less than about 35 grams would be suitable.*

I am amenable to altering the size range. The size of fish, however, must still fit within the objective that you are trying to answer with these tags, which I believe to be locating spawning locations within Grant Creek. I do not believe you are going to find rainbow trout as small as 140mm in spawning condition in Grant Creek. If you would like, please submit a lower end size range and I will consider an amendment to the permit.

2. In the same paragraph, it requires all rainbow trout to be marked with an external transmitter (I am assuming a floy tag). Per my communication with you on 3/13, we would prefer not to utilize an additional, external tag. As I mentioned, an approximate 9 inch braided cable antennae will be visible, exterior of the fish very clearly establishing that these fish have been tagged and essentially acting as an external tag. Additionally, during discussions with the floy tag representative, she acknowledged that some researchers have reported anecdotal information suggesting that fish marked with floy tags are more susceptible to predation relative to non-marked fish.

While I understand your concern about increasing the risk of predation upon fish that have an external tag (e.g., Floy tag), the addition of a secondary external marker is a stipulation required by the Area Management Biologist for all radio-tagged rainbow trout in this study. Tags now come in a large variety of colors and choosing a color that more closely matches the fish and/or is less flashy may decrease the risk of predation.

If you would like to discuss the secondary external mark further, I suggest you speak with the Area Management Biologist, Robert Begich (907) 260-2920. He is out of the office this week, but should be back on March 25<sup>th</sup>.

Wishing you well.

Cheers,

-Scott

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]

**Sent:** Tuesday, March 19, 2013 1:21 PM

**To:** Ayers, Scott D (DFG); [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)

**Cc:** Cory Warnock; Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG);

Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen

**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hi Scott,

On behalf of Mike Salzetti and HEA we have developed a couple of questions/clarifying points related to the Fish Resource Permit for Grant Creek. They are as follows:

1. In the "Final Disposition" paragraph, it stipulates that  $\leq 40$  rainbow trout  $> 500$  mm (nearly 20") may be tagged. We are assuming that the state's requirement that the fish exceed 500 mm is due to concern that the tag will create an undue burden on the tagged fish. However, the transmitters that will be used on the rainbow only weigh 2.8 g in air; using the criteria developed by Winter (1983)<sup>1</sup>, which is generally the standard in radiotelemetry research, (the transmitter weighing up to 2% of the body weight of the fish in air), that allows the tagging of fish as small as 140 g. That equates to a fish much smaller than 500 mm. Would it be possible for the state to amend the permit, and base fish selection on fish weight ( $\geq 140$  g)? Our team has conducted a telemetry study on redband trout in the Klamath Basin using the same transmitter that will be used on Grant Creek, and tagged fish much smaller than 500 mm without any apparent ill effects. This combined with literature concluding that the types/size of tags we will be using would cause no harm to fish much smaller have led us to this request.
2. In the same paragraph, it requires all rainbow trout to be marked with an external transmitter (I am assuming a floy tag). Per my communication with you on 3/13, we would prefer not to utilize an additional, external tag. As I mentioned, an approximate 9 inch braided cable antennae will be visible, exterior of the fish very clearly establishing that these fish have been tagged and essentially acting as an external tag. Additionally, during discussions with the floy tag representative, she acknowledged that some researchers have reported anecdotal information suggesting that fish marked with floy tags are more susceptible to predation relative to non-marked fish.

Thanks for your attention to these Scott and I'll look forward to hearing from you,

Cory

<sup>1</sup>Winter, J. D. 1983. Underwater biotelemetry. Pages 371-395 *In*: L. A. Nielsen and D. L. Johnson, editors. Fisheries techniques. American Fisheries Society, Bethesda, Maryland.

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**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]

**Sent:** Monday, March 18, 2013 12:05 PM

**To:** [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)

**Cc:** Cory Warnock; Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG)

**Subject:** PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Dear Mr. Salzetti:

Please find enclosed your ADF&G Fish Resource Permit (SF2013-105). You need to read this permit carefully not only to understand what you are authorized and required to do but also to check for mistakes that must be corrected immediately by contacting us. If your plans are modified later on (e.g. personnel changes, larger than expected collections, different sampling locations, etc.), contact us as soon as you know so that an amendment to your permit

can be prepared and issued in time to avert disruptions to planned field work. Failure to abide by permit requirements or to amend your permit when conditions change are permit violations that can result in a citation and/or loss of your permit.

Please be sure that you and all authorized personnel carry a copy of the permit while conducting collecting activities.

A report detailing all collections for this permit is due on or before December 31, 2013. Please use the ADF&G data submissions form for this task. If you do not have the opportunity to utilize your permit, please submit a letter or email stating that the permit was not used. A telephone message is not sufficient.

**Please use the subject line in all future correspondence regarding this permit--thanks**

Wishing you success with your project,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Ken Hogan

*Agency/Organization:* FERC

*Phone No./E-mail Address:* 202-502-7313, [kenneth.hogan@ferc.gov](mailto:kenneth.hogan@ferc.gov)

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*Date:* 3/19/13

*Time:* 3:00 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Mr. Hogan and Mr. Warnock had a brief conversation related to the current approach HEA was taking with finalizing natural resource study plans. Mr. Warnock reminded Mr. Hogan that HEA had accepted a final round of informal comments related to the plans and had amended them based upon HEA's determination of validity to the studies. Mr. Warnock stated that HEA's intention was to send an email to all the stakeholders making them aware that the plans were now final and all documentation (plans, informal comment matrix and meeting minutes) could be found on the Kenai Hydro website. Mr. Hogan thought that sounded like an acceptable approach.

Mr. Warnock then asked Mr. Hogan if, in his opinion, the study plans should be filed with FERC. He reminded Mr. Hogan that given HEA had already been through the formal scoping process/formal comment period in 2010, another round of comments wasn't necessary per the TLP requirements but HEA chose to do this given their desire to reestablish solid communication with the stakeholders after the time lapse. Mr. Hogan understood and stated that, in his opinion, the plans, informal matrix and meeting minutes should be filed so that they were on the record. Mr. Warnock agreed to file them and to keep Mr. Hogan apprised of developments during the 2013 study season.

Call Duration: 10 minutes.

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**From:** Cory Warnock  
**Sent:** Wednesday, March 20, 2013 7:27 PM  
**To:** Volk, Eric C (DFG)  
**Cc:** 'Mark Miller (mark.miller@bioanalysts.net)'; John Stevenson; Emily Andersen  
**Subject:** RE: Scale Sample Call (Grant Lake)

Hi Eric,

I'd like to discuss further. I understand and agree that there can be issues with sockeye but we will be dealing with Chinook as well and potentially a few coho so a discussion would be good.

Let me know what will work for you.

Thanks,

Cory

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**From:** Volk, Eric C (DFG) [<mailto:eric.volk@alaska.gov>]  
**Sent:** Wednesday, March 20, 2013 6:00 PM  
**To:** Cory Warnock  
**Cc:** 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; John Stevenson; Emily Andersen  
**Subject:** RE: Scale Sample Call (Grant Lake)

Hello Cory;

I will be involved in BOF meetings this week, but I did speak with Gary Fandrei who reminded me that we were mainly talking about spawning sockeye salmon in this work. You probably already know that dealing with spawning sockeye scales is very problematic and most investigators turn to otoliths for age determination. Perhaps we can hook up next week to discuss this further.

Eric

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Wednesday, March 20, 2013 3:30 PM  
**To:** Volk, Eric C (DFG)  
**Cc:** 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; John Stevenson; Emily Andersen  
**Subject:** Scale Sample Call (Grant Lake)

Hi Eric,

Just checking in to see if your schedule has become clearer and we can nail down a time (hopefully later this week) to discuss Grant Lake.

Let me know when you have a chance and thanks,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)

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**From:** Cory Warnock  
**Sent:** Wednesday, March 20, 2013 10:15 AM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Begich, Robert N (DFG); 'Mark Miller (mark.miller@bioanalysts.net)'; John Stevenson; Mike Salzetti; Emily Andersen  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Thanks again Scott for your prompt response.

I'll wait to hear back from you early next week,

Cory

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**From:** Ayers, Scott D (DFG) [mailto:scott.ayers@alaska.gov]  
**Sent:** Wednesday, March 20, 2013 10:06 AM  
**To:** Cory Warnock  
**Cc:** Begich, Robert N (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hello Cory,

I wanted to write and let you know that I have received your request. I do not believe it will be a problem to lower the size range for rainbow trout to be tagged. However, I do need to consult with Robert Begich, the local Area Management Biologist, prior to sending out the amendment. He is out of the office this week, but will be back next Monday. I will send a formal reply to you following that to answer all of your questions.

Wishing you well.

Cheers,  
-Scott

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**From:** Cory Warnock [mailto:cory.warnock@mcmillen-llc.net]  
**Sent:** Wednesday, March 20, 2013 8:48 AM  
**To:** Ayers, Scott D (DFG); [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)  
**Cc:** Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen; Boyle, Larry R (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hi Scott,

In response to your comments below, we are submitting a request to lower the size range for taggable rainbow trout in Grant Creek. For a bit of supplemental justification, I've attached some length-weight data from a Klamath River rainbow trout study some of our team members did (see table below). In looking back at the work done in 2009 on Grant Creek, most of the fish were centered in the 200-350 mm (8-14 inches). No fish were above the 500 mm class. Given this site specific data and the attached table for reference, we'd like to be able to tag rainbow as small as 300mm FL. We will certainly strive for larger fish >500 mm and may have that opportunity with the weir.

Additionally, one of our team members brought up a question last night associated with scale and/or otolith samples. We are currently discussion with Eric Volk (ADF&G) the potential of collecting scale and/or otolith samples



from anadromous species for aging purposes (per our study plan). I'm assuming that this won't be an issue given that scales (if the selected method) would be taken during the same time as the approved DNA collection and otoliths would only be taken on dead, presumably, post-spawn fish. I'd appreciate it if you could let me know if my assumption is correct.

Thanks Scott and let me know if the requested modification will work for you agency,

Cory

**Table 2. Summary information collected on rainbow trout radio-tagged in different reaches of the Klamath River.**

Reach	Tag ID	Tag Site (RM)	Date	Fork Length (mm)	Weight (g)
Lower Peaking	01	206.4	7-Feb-03	298	320
	02	206.4	7-Feb-03	348	510
	30	206.4	10-Feb-03	405	880
	31	206.9	9-Feb-03	367	540
	32	206.9	9-Feb-03	398	720
	34	205.3	9-Feb-03	376	700
	35	208.0	8-Feb-03	375	600
	36	205.3	9-Feb-03	378	630
	40	208.0	8-Feb-03	393	680
	41	208.9	8-Feb-03	347	460
	42	206.4	7-Feb-03	334	445
	43	206.4	7-Feb-03	321	380
	44	208.9	8-Feb-03	353	460
	45	206.4	7-Feb-03	429	860
			Min	298	320
			Max	429	880
			Mean	361	563
Upper Peaking	05	217.3	5-Feb-03	302	295
	06	220.1	5-Feb-03	313	380
	08	217.3	4-Feb-03	293	240
	09	217.3	4-Feb-03	291	270
	10	217.3	4-Feb-03	300	300
	11	217.3	4-Feb-03	328	330
	12	217.3	4-Feb-03	287	260
	13	217.3	4-Feb-03	283	255
	16	217.3	4-Feb-03	356	450
	17	217.3	4-Feb-03	342	435
	18	217.3	4-Feb-03	320	315
	23	220.1	3-Feb-03	277	250
	24	220.1	3-Feb-03	250	175
	29	215.7	20-Feb-03	276	225
			Min	250	175
			Max	356	450
			Mean	303	304
Boyle Bypass	03	220.9	6-Feb-03	263	200
	04	220.9	6-Feb-03	276	240
	14	221.3	18-Feb-03	265	240
	15	221.3	18-Feb-03	302	360
	19	224.3	4-Feb-03	271	226*
	20	221.4	19-Feb-03	265	205
	21	220.8	21-Feb-03	274	230
	22	224.3	4-Feb-03	307	327*
	26	223.4	13-Feb-03	303	300
	27	222.2	18-Feb-03	268	220
	28	221.1	19-Feb-03	254	200
	33	223.4	13-Feb-03	312	315
	37	223.4	13-Feb-03	287	280
	39	221.7	18-Feb-03	266	230
			Min	254	200
			Max	312	360
			Mean	281	254

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**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]  
**Sent:** Tuesday, March 19, 2013 3:34 PM  
**To:** Cory Warnock; [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)  
**Cc:** Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen; Boyle, Larry R (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hello Cory,

Thank you for your questions about the Fish Resource Permit SF2013-105. I'll answer the questions in the order that you asked.

1. In the "Final Disposition" paragraph, it stipulates that  $\leq 40$  rainbow trout  $> 500$  mm (nearly 20") may be tagged. We are assuming that the state's requirement that the fish exceed 500 mm is due to concern that the tag will create an undue burden on the tagged fish. However, the transmitters that will be used on the rainbow only weigh 2.8 g in air; using the criteria developed by Winter (1983)<sup>1</sup>, which is generally the standard in radiotelemetry research, (the transmitter weighing up to 2% of the body weight of the fish in air), that allows the tagging of fish as small as 140 g. That equates to a fish much smaller than 500 mm. Would it be possible for the state to amend the permit, and base fish selection on fish weight ( $\geq 140$  g)? Our team has conducted a telemetry study on redband trout in the Klamath Basin using the same transmitter that will be used on Grant Creek, and tagged fish much smaller than 500 mm without any apparent ill effects. This combined with literature concluding that the types/size of tags we will be using would cause no harm to fish much smaller have led us to this request.

The size range for the rainbow trout ( $> 500$  mm) to be tagged came directly from the study plan that was provided to me for the permitting process (page 17, paragraph 2):

*Fish within the dominant size range of mature Rainbow trout (500 - 700 mm) will likely weigh 1,800-6,000 grams (Russell, 1977). It is advised that radio tags should not exceed 2 percent of body weight, thus a tag weighing less than about 35 grams would be suitable.*

I am amenable to altering the size range. The size of fish, however, must still fit within the objective that you are trying to answer with these tags, which I believe to be locating spawning locations within Grant Creek. I do not believe you are going to find rainbow trout as small as 140mm in spawning condition in Grant Creek. If you would like, please submit a lower end size range and I will consider an amendment to the permit.

2. In the same paragraph, it requires all rainbow trout to be marked with an external transmitter (I am assuming a floy tag). Per my communication with you on 3/13, we would prefer not to utilize an additional, external tag. As I mentioned, an approximate 9 inch braided cable antennae will be visible, exterior of the fish very clearly establishing that these fish have been tagged and essentially acting as an external tag. Additionally, during discussions with the floy tag representative, she acknowledged that some researchers have reported anecdotal information suggesting that fish marked with floy tags are more susceptible to predation relative to non-marked fish.

While I understand your concern about increasing the risk of predation upon fish that have an external tag (e.g., Floy tag), the addition of a secondary external marker is a stipulation required by the Area Management Biologist for all radio-tagged rainbow trout in this study. Tags now come in a large variety of colors and choosing a color that more closely matches the fish and/or is less flashy may decrease the risk of predation.

If you would like to discuss the secondary external mark further, I suggest you speak with the Area Management Biologist, Robert Begich (907) 260-2920. He is out of the office this week, but should be back on March 25<sup>th</sup>.

Wishing you well.

Cheers,  
-Scott

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]

**Sent:** Tuesday, March 19, 2013 1:21 PM

**To:** Ayers, Scott D (DFG); [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)

**Cc:** Cory Warnock; Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen

**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hi Scott,

On behalf of Mike Salzetti and HEA we have developed a couple of questions/clarifying points related to the Fish Resource Permit for Grant Creek. They are as follows:

1. In the "Final Disposition" paragraph, it stipulates that  $\leq 40$  rainbow trout  $> 500$  mm (nearly 20") may be tagged. We are assuming that the state's requirement that the fish exceed 500 mm is due to concern that the tag will create an undue burden on the tagged fish. However, the transmitters that will be used on the rainbow only weigh 2.8 g in air; using the criteria developed by Winter (1983)<sup>1</sup>, which is generally the standard in radiotelemetry research, (the transmitter weighing up to 2% of the body weight of the fish in air), that allows the tagging of fish as small as 140 g. That equates to a fish much smaller than 500 mm. Would it be possible for the state to amend the permit, and base fish selection on fish weight ( $\geq 140$  g)? Our team has conducted a telemetry study on redband trout in the Klamath Basin using the same transmitter that will be used on Grant Creek, and tagged fish much smaller than 500 mm without any apparent ill effects. This combined with literature concluding that the types/size of tags we will be using would cause no harm to fish much smaller have led us to this request.
2. In the same paragraph, it requires all rainbow trout to be marked with an external transmitter (I am assuming a floy tag). Per my communication with you on 3/13, we would prefer not to utilize an additional, external tag. As I mentioned, an approximate 9 inch braided cable antennae will be visible, exterior of the fish very clearly establishing that these fish have been tagged and essentially acting as an external tag. Additionally, during discussions with the floy tag representative, she acknowledged that some researchers have reported anecdotal information suggesting that fish marked with floy tags are more susceptible to predation relative to non-marked fish.

Thanks for your attention to these Scott and I'll look forward to hearing from you,

Cory

<sup>1</sup>Winter, J. D. 1983. Underwater biotelemetry. Pages 371-395 In: L. A. Nielsen and D. L. Johnson, editors. Fisheries techniques. American Fisheries Society, Bethesda, Maryland.

---

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]

**Sent:** Monday, March 18, 2013 12:05 PM

To: [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)

Cc: Cory Warnock; Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG)

Subject: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Dear Mr. Salzetti:

Please find enclosed your ADF&G Fish Resource Permit (SF2013-105). You need to read this permit carefully not only to understand what you are authorized and required to do but also to check for mistakes that must be corrected immediately by contacting us. If your plans are modified later on (e.g. personnel changes, larger than expected collections, different sampling locations, etc.), contact us as soon as you know so that an amendment to your permit can be prepared and issued in time to avert disruptions to planned field work. Failure to abide by permit requirements or to amend your permit when conditions change are permit violations that can result in a citation and/or loss of your permit.

Please be sure that you and all authorized personnel carry a copy of the permit while conducting collecting activities.

A report detailing all collections for this permit is due on or before December 31, 2013. Please use the ADF&G data submissions form for this task. If you do not have the opportunity to utilize your permit, please submit a letter or email stating that the permit was not used. A telephone message is not sufficient.

**Please use the subject line in all future correspondence regarding this permit--thanks**

Wishing you success with your project,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

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Version: 2013.0.2904 / Virus Database: 2641/6187 - Release Date: 03/18/13

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Version: 2013.0.2904 / Virus Database: 2641/6187 - Release Date: 03/18/13

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**From:** Cory Warnock  
**Sent:** Wednesday, March 20, 2013 1:36 PM  
**To:** Leclair, Claire H (DNR)  
**Cc:** Blackwell, Jack D (DNR); Salzetti, Mikel; Emily Andersen; John Stevenson; 'Mark Miller (mark.miller@bioanalysts.net)'; Gary Fandrei  
**Subject:** RE: Field studies for Grant Lake Hydro project

Thanks for the note and the earlier discussion, Claire. I appreciate the clarification and your continued efforts to get us our permit from ADNR prior to our helicopter lift on April 3<sup>rd</sup>.

As always, if you have any questions, don't hesitate to call,

Cory

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**From:** Leclair, Claire H (DNR) [<mailto:claire.leclair@alaska.gov>]  
**Sent:** Wednesday, March 20, 2013 1:33 PM  
**To:** Cory Warnock  
**Cc:** Blackwell, Jack D (DNR); Salzetti, Mikel  
**Subject:** Field studies for Grant Lake Hydro project

Cory-

This email is to confirm for you that an authorization from the Division of Parks & Outdoor Recreation is not required for field crews to perform fish surveys by foot along Grant Creek and within lands managed as part of the Kenai River Special Management Area. I understand field crews will be on site for day trips starting March 25 and will access the area by power boat across Trail Lake and then on foot.

*Claire Holland LeClair*  
Deputy Director/Chief of Field Operations  
Division of Parks & Outdoor Recreation  
907-269-8702

*The Division of Parks & Outdoor Recreation provides outdoor recreation opportunities and conserves and interprets natural, cultural, and historic resources for the use, enjoyment and welfare of the people.*

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No virus found in this message.

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Version: 2013.0.2904 / Virus Database: 2641/6187 - Release Date: 03/18/13

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**From:** Cory Warnock  
**Sent:** Wednesday, March 20, 2013 1:47 PM  
**To:** Audrey Alstrom (aalstrom@aidea.org); Barbara Stanley (bstanley@fs.fed.us); Brenda Trefon (btrefon@kenaitze.org); Brent Goodrum (brent.goodrum@alaska.gov); Cassie Thomas (cassie\_thomas@nps.gov); David Griffin (david.griffin@alaska.gov); David Schade (david.w.schade@alaska.gov); Denise Koopman (denise.koopman@usace.army.mil); Doug Mutter (douglas\_mutter@ios.doi.gov); Doug Ott (dott@aidea.org); Doug Palmer (Doug.Palmer@fws.gov); Eric Rothwell (eric.rothwell@noaa.gov); Ginny Litchfield (ginny.litchfield@alaska.gov); Jan Konigsberg (jan@hydroreform.org); Jason Mouw (jason.mouw@alaska.gov); Jeffry Anderson (Jeffry\_Anderson@fws.gov); Jim Ferguson (jim.ferguson@alaska.gov); Joe Klein (joe.klein@alaska.gov); Judith Bittner (judy.bittner@alaska.gov); K.J. Muschovic (kjmushovic@blm.gov); Katherine McCafferty (katherine.a.mccafferty2@usace.army.mil); Ken Hogan (kenneth.hogan@ferc.gov); Kevin Laves (klaves@fs.fed.us); Kim Sager (kimberly.sager@alaska.gov); Krissy Plett (krissy.plett@alaska.gov); Lesli Schick (lesli.schick@alaska.gov); Lynnda Kahn (Lynnda\_Kahn@fws.gov); Michael Walton (michael.walton@alaska.gov); Mike Cooney (mcooney@arctic.net); Monte Miller (monte.miller@alaska.gov); Pamela Russell (pamela.russell@alaska.gov); Patricia Berkhahn (patricia.berkhahn@alaska.gov); Phil Brna (phil\_brna@fws.gov); Phil North (north.phil@epa.gov); Ricky Gease (ricky@kenairiversportfishing.com); Robert Stovall (rstovall@fs.fed.us); Robin Swinford (robin.swinford@alaska.gov); Shina Duvall (shina.duvall@alaska.gov); Sue Walker (susan.walker@noaa.gov); Ted Deats (ted.deats@alaska.gov); Tom Cappiello (tom.cappiello@alaska.gov); Travis Moseley (tmoseley@fs.fed.us); Valerie Conner (valerie@akcenter.org)  
**Cc:** Mike Salzetti; Emily Andersen; Charles Sauvageau; John Stevenson; Dwayne Adams; Michael Yarborough; John Blum; John Gangemi  
**Subject:** Grant Lake Final Natural Resource Study Plans  
**Attachments:** Informal Comment Response Table (Grant Lake).pdf; 12-12-12 Natural Resources Meeting Summary (Grant Lake).pdf

**Grant Lake Hydroelectric Project (FERC No. 13212) Natural Resources Study Stakeholder Group:**

Hello all,

Per our commitment, HEA has reviewed the informal study plan comments received by the stakeholders during and after the December 12<sup>th</sup> meeting. Accordingly, we have revised the Aquatics, Water and Recreation and Visual Resources Plans to incorporate many of the suggestions put forth in those comments and all study plans have been finalized and placed on the HEA website at [http://www.kenaihydro.com/work\\_groups/meetings\\_and\\_materials.php](http://www.kenaihydro.com/work_groups/meetings_and_materials.php). The one exception is the Cultural Resources Study Plan which, due to confidentiality reasons, will be distributed to the appropriate parties during the Section 106 meeting later this month or in early April. Attached you will find an informal comment response matrix (also available on the website), that refers to page numbers where additional text has been added and provides supplemental rationale for comments that were and were not incorporated into the plans after our review. Finally, the final meeting minutes from our December 12<sup>th</sup> meeting in Anchorage are provided for your files.

Over the course of the past three months and with many of your respective agencies' help, we have proactively prepared for the upcoming field season and are nearing completion of our permitting process and our logistical and mobilization planning. We are looking forward to a very informative and comprehensive 2013 field season. As I stated during our December meeting and the subsequent conversations that I've had with many of you since, it is our commitment to keep you apprised of developments and results during and after data collection.

As always, please don't hesitate to let me know if you have any questions,

Cory

**Cory Warnock**

*Senior Licensing and Regulatory Consultant*

McMillen, LLC

[www.mcmillen-llc.com](http://www.mcmillen-llc.com)

5771 Applegrove Ln.

Ferndale, Wa. 98248

O – 360-384-2662

C – 360-739-0187

F – 360-542-2264



**Grant Lake Hydroelectric Project (FERC No. 13212)**  
**Natural Resources Studies Meeting**  
**Residence Inn Midtown, 1025 35<sup>th</sup> Avenue, Anchorage, AK**  
**December 12, 2012, 8:00 am to 5:00 pm**

**In Attendance**

Dwayne Adams, USKH  
Amal Ajmi, ERM *[via phone]*  
Audrey Alstrom, Alaska Energy Authority (AEA)  
Emily Andersen, Long View Associates (LVA)  
Jeff Anderson, U.S. Fish and Wildlife Service (USFWS)  
Patti Berkahn, Alaska Department of Fish and Game (ADF&G) *[via phone]*  
John Blum, McMillen LLC (McMillen)  
Valerie Conner, Alaska Center for Environment  
Ted Deats, Alaska Department of Natural Resources (ADNR) *[via phone]*  
Shina Duvall, ADNR *[via phone]*  
Gary Fandrei, Cook Inlet Aquaculture Association (CIAA) *[via phone]*  
John Gangemi, ERM  
Ricky Gease, Kenai River Sportfishing Association (KRSFA) *[via phone]*  
David Griffin, ADNR (Alaska State Parks)  
Ken Hogan, Federal Energy Regulatory Commission (FERC) *[via phone]*  
Jan Konigsberg, Hydro Reform Coalition (HRC) *[via phone]*  
Denise Koopman, Army Corps of Engineers (ACOE)  
Ginny Litchfield, ADF&G *[via phone]*  
Katie McCafferty, ACOE *[via phone]*

Mark Miller, BioAnalysts (BA) *[via phone]*  
Monte Miller, ADF&G  
Sally Morsell, Northern Ecological Services (NES) *[via phone]*  
Travis Moseley, U.S. Forest Service (USFS) *[via phone]*  
Paul Pittman, Elemental Solutions (ES) *[via phone]*  
Krissy Plett, ADNR *[via phone]*  
Eric Rothwell, National Oceanic and Atmospheric Administration (NOAA Fisheries)  
Pam Russell, ADNR *[via phone]*  
Kim Sager, ADNR *[via phone]*  
Mike Salzetti, Kenai Hydro, LLC (KHL)  
Charles Sauvageau, McMillen  
Lesli Schick, ADNR  
Levia Shoutis, ERM  
John Stevenson, BA  
Ron Stanek, Cultural Resource Consultants, Inc. (CRC) *[via phone]*  
Robert Stovall, USFS  
Cassie Thomas, National Park Service (NPS) *[via phone]*  
Sue Walker, NOAA Fisheries  
Cory Warnock, LVA  
Mike Yarborough, Cultural Resource Consultants (CRC)

**Meeting Summary**

**Introductions and Agenda**

Cory Warnock (LVA) began the meeting with introductions and then reviewed the proposed meeting agenda (see [Attachment 1](#)):

- Project Overview and Update
- Licensing Path Forward
- Natural Resources Studies
  - Aquatic Resources
  - Water Resources
  - Terrestrial Resources
  - Cultural Resources
  - Recreation and Visual Resources
- Closing

## Project Overview and History

Mike Salzetti (KHL) presented an overview and history of the Grant Lake Hydroelectric Project (Project) (see PowerPoint included as Attachment 2). Mike S. gave a general description of the utility, Homer Electric Association (HEA), noting that Kenai Hydro, LLC (KHL), the applicant for the Project, is a wholly-owned subsidiary of HEA (*Slide 3<sup>1</sup>*). Mike S. indicated that the purpose for the Project is three-fold (*Slides 4-7*): 1) to meet the Board of Director's goal for an increase in its renewable energy portfolio; 2) to become a more independent utility by adding to its generation capacity, and 3) to create an alternate, reliable energy source in light of the anticipated impending shift to higher gas prices.

Mike S. briefly described the history of the proposed Project to date (*Slides 8-10*), explaining that feasibility studies were conducted for four potential sites (Grant Lake, Falls Creek, Ptarmigan Lake, and Crescent Lake), two of which (Grant Lake and Falls Creek) were carried forward and environmental baseline studies were conducted in 2009. The results of these studies were used in the development of the Pre-Application Document (PAD), filed with FERC August 2009, and in the development of the formal draft study plans.<sup>2</sup> The study program got underway in 2010, but was suspended by KHL later that year following FERC scoping, which led to significant stakeholder comments on the draft plans, in order to take the comments into consideration and revisit the draft study plans. Since that time, KHL has received a second preliminary permit (March 2012), hired McMillen as the Natural Resources Study consultant, and made significant updates to the study plans to address stakeholder comments.

Mike S. introduced the key parameters of the Project (*Slide 11*), noting that there are currently two proposals under consideration: one with a 2-foot dam, and the other without a dam. He reminded the group that the original proposal, as described in the PAD, was for a 10-foot dam. Mike reviewed a series of aerial views (*Slides 12-17*) showing the location of the proposed Project. The proposed Project is generally located to the west of the Moose Pass area (*Slide 12*). Mike S. noted that the original proposal included two potential transmission line access road options, but that one had since been eliminated ("Option 1" in *Slide 13*) to avoid its running parallel to the proposed path of the Iditarod National Historic Trail (INHT). Mike S. described the general layout of the proposed Project facilities (*Slide 14*). Mike S. pointed out that not all issues related to the INHT have been resolved – the proposed INHT route currently runs through the proposed site of the Project powerhouse – but KHL will be working with the relevant agencies and organizations to come up with a potential re-route of the INHT around the powerhouse area. Mike S. stated that due to a large waterfall on Grant Creek that creates a natural anadromous barrier, no salmonids can access the lake and there are no resident salmonids in the lake. The only known species to inhabit Grant Lake are stickleback and sculpin (*Slide 15*). Mike S. indicated that the need for the Project to have a dam is partially dependent on what is determined to be necessary for bypass flows, but noted that given the relatively steep topography of the lake and shoreline, the impact on resources in the lake due to lake level changes, are expected to be minimal (*Slides 16-17*).

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<sup>1</sup> For all PowerPoint presentations given during the meeting, slide numbers refer to the PDF page number.

<sup>2</sup> In May 2010, a revised Project description was filed with FERC, which indicated that the Falls Creek diversion had been removed from the Project proposal, and the associated impacts for which would no longer be studied.

Mike S. concluded his presentation with a summary of the key benefits for building the Project (*Slide 18*).

- *Comment:* Jeff Anderson (USFWS) asked if the current Project proposal is documented anywhere.  
*Response:* Cory Warnock (LVA) indicated that the revised study plans contain the current proposal. Mike S. added that the description in the PAD (August 2009) together with the FERC-filed updated Project descriptions (May and August 2010) (available on the Project website), also reflect the changes made to the current to the original proposal.
- *Comment:* David Griffin (ADNR) asked what from the feasibility analysis, led to the ultimate decision to move forward with Grant Lake.  
*Response:* Mike S. indicated that it was a combination of the expected environmental impacts and economical factors. Valerie Conner (Alaska Center for Environment) noted that the other options were viewed as more controversial, primarily due to recreational and visual resources issues.
- *Comment:* Travis Moseley (USFS) noted that, related to the INHT, KHL should anticipate needing to negotiate with ADNR related to rights-of-way and land ownership.  
*Response:* Mike S. agreed and said that he expected the interested parties to include the USFS, ADNR, and Kenai Borough, among others.
- *Comment:* Jan Konigsberg (HRC) asked if the cost of Project construction is yet known or what financing mechanisms may be used. Jan also asked whether the energy generated by the Project would be used for HEA customers or put on the wholesale market.  
*Response:* Mike S. replied that the Project cost will be determined by the yet-to-be hired engineering consultant (a request for proposal (RFP) for which will go out this winter), but shared that the preliminary estimate is approximately \$35 million. Mike S. indicated a portion of the funding may be covered by KHL and some was going to be sought via grants. As for the intended use of the power, Mike S. stated that the energy would primarily be used by their customers.
- *Comment:* Valerie Conner asked the reason why the expected rated generator output to be the same (5 megawatts [MW]) for the originally proposed 10-foot dam and for the currently proposed no dam and 2-foot dam options.  
*Response:* Mike S. clarified that the 5-MW is the maximum capacity for use during peaking periods, but that a Project will typically run at less than full capacity. He noted that a higher dam (10-foot versus 2-foot or no dam), allows for more storage capacity for use during high-use periods.

## Licensing Overview

Cory Warnock (LVA) presented an overview of the licensing process (see PowerPoint included by [Attachment 3](#)). Cory briefly reviewed the licensing process to date (*Slides 2-3*), reiterating many of the same points made by Mike S. earlier. Cory noted that when formal stakeholder

comments were filed in April-July 2010, KHL developed a matrix of the comments by resource area, and that since, KHL has updated the matrix with responses that include, as appropriate, cross-references to the relevant page/section of the respective study plan where a given comment is addressed (see Draft Study Plans Comment/Response Table included as [Attachment 4](#)).

- *Comment:* Eric Rothwell (NOAA Fisheries) asked the reason for selection of the Traditional Licensing Process (TLP).  
*Response:* Cory indicated that while the process decision preceded his involvement with the Project, it is his understanding that the decision was made in consultation with stakeholders at the time. Ken Hogan (FERC) added that because the Integrated Licensing Process (ILP) is the default process, an applicant has to file with FERC a request to use the TLP, which FERC then reviews and either denies or approves.

Cory reviewed the main objectives of the meeting (*Slide 4*), which are to: 1) identify and modify, as needed, current stakeholder contacts; 2) introduce the McMillen Natural Resources Studies team; 3) review proposed studies, by resource area, and 4) distribute the final study plans.

Cory explained that KHL's general plan is to move forward with the final study plans, which will be implemented in 2013/14, and noted that FERC has been consulted regarding KHL's general approach and has confirmed its consistency with the TLP requirements (*Slides 5-6*). To this end, Cory indicated that some team members (Mike S., John Blum, John Stevenson, Chuck Sauvageau, Gary Fandrei, and himself) were at the Project for an initial site visit the day before (December 11). Cory also laid out the steps and schedule for the 2<sup>nd</sup> stage consultation (*Slides 7-8*), noting that KHL is currently at the beginning of the stage, with the commencement of the study program, and that it would conclude with the filing of a Draft License Application (DLA) and meeting thereafter to discuss the study results, reports, and DLA (in summer 2014).

- *Comment:* Jeff Anderson asked whether there would be an opportunity to comment on the final study plans. Monte Miller (ADF&G) echoed the need for stakeholders to have an opportunity to submit written comments in light of the time that has lapsed since the draft study plans were discussed, and the significant changes that have since been made to them.  
*Response:* Cory noted that consistent with the TLP, the formal commenting on draft study plans was completed in 2010; that said, Cory added that questions and suggested clarifying edits to study plans would be accepted. Cory encouraged stakeholders to communicate any questions (via email or phone) directly with the appropriate resource area lead as specified in the team organizational chart (see *Slide 11* and [Attachment 5](#)). Ken Hogan emphasized that any suggested substantive edits to study plans should be focused on any proposed significant changes in the status of a particular resource area (RTE designation) since the initial study planning phase, or a significant change in the proposed Project infrastructure that necessitates a corresponding modification to a study plan. Mike Salzetti noted that no significant changes related to RTE species or Project infrastructure existed. Jan Konigsberg pointed out that there is additional opportunity to comment on studies and make additional study requests as part of commenting on the DLA, and Ken Hogan added, also again as part of commenting on the Final License Application (FLA). Monte Miller also noted that if there is a dispute regarding a study

request that FERC does not concur with, the agency or organization requesting the study has the discretion to conduct it at its own expense.

Cory summarized KHL's overarching commitments to making the licensing process a success (*Slide 9*), noted that the Project website will be the conduit for sharing of Project-related materials throughout the process (*Slide 10*), and reviewed once again the Natural Resources Studies Team organizational chart (*Slide 11*).

- *Comment:* Sue Walker (NOAA Fisheries) asked if the Project website includes the formal stakeholder and FERC draft study plan comment letters.  
*Response:* Cory concurred, and stated that the website is currently up to date with all relevant Project materials. Mike S. also noted that historic existing information about the Project is available on the website.
- *Comment:* Monte Miller asked if the Project website has a dedicated area for the public to post comments.  
*Response:* Cory indicated that it currently does not, but noted that it was a good idea, and something KHL would look into the possibility of adding to the website.

## **Fish and Aquatics**

John Blum (McMillen), the Aquatics Resources task lead, started the presentation for the Fisheries and Aquatics Study Plan (see [Attachment 6](#)), by introducing the other members of the Aquatics Resources team and the eight major components of the Aquatics Resources Study (*Slides 2-3*), which include: 1) Fish Weir Installation and Monitoring; 2) Resident and Rearing Fish Abundance and Distribution; 3) Salmon Spawning Distribution and Abundance; 4) Trail Lake Narrows Fish Study; 5) Aquatic Habitat Mapping; 6) Instream Flow Study; 7) Macroinvertebrate Studies, and 8) Periphyton Studies.

Gary Fandrei (CIAA) described the objectives, orientation of the crew, field camp setup, weir installation, monitoring and schedule for the Fish Weir Installation and Monitoring study component (*Slides 4-7*) – field work to occur May through mid-November and comprehensive Aquatics Resources Study report to be submitted January 2014 – and photos of a sample weir and typical field camps (*Slides 8-9*). Gary noted that the monitoring spans a relatively long period of time to try to capture all fish species. He also noted that in the event of a significant flood, the weir pickets would be pulled out.

- *Comment:* Jeff Anderson (USFWS) asked what locations are under consideration for setting up the field camp.  
*Response:* Gary responded that the current plan to set up as close to the weir as possible, probably somewhere in the lower 200 yards of Grant Creek, but not directly on the streambank.

John Stevenson (BA) introduced the Grant Creek Resident and Rearing Fish Abundance and Distribution study component, starting with a review of the available background information, USFWS (1961) and Arctic Environmental Information and Data Center (AEIDC; 1983)(*Slides*

10-13), and summarized the study details of the 2009/2010 KHL work (*Slides 14-23*). John S. noted that the field work in 2010 was suspended early, and therefore, the results for which were incomplete. John S. then outlined the proposed effort for 2013, noting that the intent is to continue the study where it had left off in 2010, conducting field work in the same 5 reaches, with the addition of winter habitat and fish monitoring and rainbow trout habitat use and spawning using radiotelemetry in response to stakeholder comments (*Slide 24*). John S. outlined the proposed data analysis (*Slides 25-27*) and field work and reporting schedule (*Slides 28-29*) – field work to occur February through March (winter work) and May through mid-October and comprehensive Aquatics Resources Study report to be submitted January 2014.

Mark Miller (BA) introduced the Grant Creek Salmon Spawning and Abundance study component, starting with a review of the available background information, ADF&G (1951/1981) and AEIDC (1983)(*Slide 30*). Mark summarized the study details of the 2009/2010 KHL work (*Slides 31-35*). Mark noted that most spawning ended within Reach 4, and also that escapement estimates for Chinook and sockeye in 2010 (231 and 6,293, respectively) were significantly higher than those from the earlier work (19 and 61, respectively).

- *Comment:* Sue Walker (NOAA Fisheries) asked for clarification regarding the data analysis used for the historical counts compared to that of the 2010 work.  
*Response:* Mark replied that the historical counts were characterized as single time, visual peak counts, whereas, the 2010 work used area-under-the-curve and visual counts collected over a study season.

Mark then outlined the proposed effort for 2013, describing the field work, data analysis, reporting and work schedule (*Slides 25-28*) – field work to occur late July through early November and a comprehensive Aquatics Resources Study report to be submitted January 2014. Mark also reviewed the stakeholder comments that were incorporated into the two fisheries study components (*Slides 39-41*).

Related to the Trail Lake Narrows Fish Study, Mark stated that no previous work has been conducted in Trail Lake Narrows in association with the potential bridge site location (*Slide 42*). Mark outlined the proposed 2013 effort, including the field work, data analysis, reporting, and work schedule (*Slides 43-45*) – field work to occur late July through early August and a comprehensive Aquatics Resources Study report to be submitted January 2014.

John B. introduced the Grant Creek Aquatic Habitat Mapping study component, starting with a review of the study details, including stakeholder consultation during study planning, of the 2009/2010 KHL work (*Slides 46-48*). John B. then outlined the proposed 2013 effort, noting that the intent is to ground truth the 2010 work, and modifying as needed. John showed an aerial photo of the transect locations of key habitats, the work schedule, and reviewed the comments from the draft study plan that were incorporated into the current plan (*Slides 49-53*) – field work to occur April through May and a comprehensive Aquatics Resources Study report to be submitted January 2014.

- *Comment:* Jeff Anderson asked whether a winter survey would be considered in light of the potential change in flows due to Project operations.

*Response:* John B. indicated that they can utilize the data collected from the Resident and Rearing Fish Abundance and Distribution winter work to evaluate aquatic habitat.

John B. introduced the Grant Creek Instream Flow Study component, starting with a review of the 2009/2010 KHL work (*Slides 54-55*). John B. noted that no high flow water surface area (WSE) measurements were taken and that, as a result, data analysis was not completed. John B. then outlined the proposed 2013 effort, noting that the primary objective is to verify the information collected at the same 18 transects of the 2009-10 effort and determine what has changed since then. John B. described the field work, data analysis, reporting, and work schedule, and showed photos of flows in select reach locations (*Slides 56-62*) – field work to occur April through November and study report to be submitted January 2014. John B. explained that he had discussed the Project with Thomas Payne, to develop an appropriate suite of models for Grant Creek. Also, for Reach 5, they would be utilizing Thompson (1972) to assess connectivity for upstream passage into representative pools (*Slide 58*). John B. pointed out that the study report would be detailed, to include calibration and habitat suitability index (HSI) data, the Instream Flow Incremental Methodology (IFIM) information, and Reach 5 calibration data (*Slide 59*). John B. also reviewed the stakeholder comments on the draft study plan that were incorporated into the current plan (*Slide 63*).

- *Comment:* Eric Rothwell (NOAA Fisheries) noted that he was not familiar with Thompson (1972), and asked 1) without having existing velocity measurements, whether there was a way to verify the use of the Thompson method in Grant Creek; and 2) whether any stream in the Thompson paper was similar to Grant Creek.

*Response:* John B. indicated that velocity measurements would be taken as part of the 2013 field effort, which could be used to verify the use of Thompson in Grant Creek, and noted that he would locate the paper and forward it to Eric.

- *Comment:* Valerie Conner (Alaska Center for Environment) asked what the threshold is for a “reasonable” impact of a hydropower facility on the surrounding environment and who makes that decision.

*Response:* Cory Warnock explained that the studies are designed to determine the existing environment and that the study information coupled with the engineering information should allow for the determination of the Project impact. Ken Hogan added that the “threshold” decision is ultimately FERC’s.

Sally Morsell (NES) introduced the Grant Creek Macroinvertebrate Study and Periphyton Study components, starting with a review of the work completed by KHL in 2009 (*Slides 64-67 and Slides 69-70, respectively*) and then outlined the proposed 2013 efforts. The primary objective of these studies is to replicate the 2009 effort and to combine the two sets of results to further establish the baseline condition. Sally described the field work, sample processing and identification, and data analysis and reporting for both efforts (*Slides 68 and 71, respectively*), the work schedule, and the stakeholder comment that were incorporated into the study plan (*Slides 72-73*) – field work to occur mid-August and a comprehensive Aquatics Resources Study report to be submitted January 2014.

- *Comment:* Monte Miller (ADF&G) asked whether a single sampling in August is a sufficient representation of the stream's productivity, or if potential early season development is not being captured.  
*Response:* Sally replied that because the study is not intended to be a benthic macroinvertebrate ecological study, the single-sample being collected in two different years accomplishes the objective to characterize the macroinvertebrate and periphyton populations.

John B. briefly reviewed the stakeholder consultation that occurred during the development of the draft aquatics study plans in 2009 and 2010 (*Slides 74-77*) and then reviewed the permits anticipated for the various components of the Aquatics Resources Study (*Slides 78-79*) – for weir installation/monitoring and fisheries investigations, ADF&G Fisheries Resource Permit and Fish Habitat Permit, USFS Special Use Permit (SUP), and KPB Floodplain Permit – and asked that if any permits appear to be missing from the list, to inform KHL and/or McMillen.

- *Comment:* Pam Russell (ADNR) stated that she does not see ADNR identified in the presentation, and recommended submittal of a Multi-Agency Permit Application. Jenny Litchfield (ADF&G) added that a permit may be required for the macroinvertebrate study, which does not appear to be included on the current permit lists.  
*Response:* Cory Warnock replied that the plan is to submit a Multi-Agency Permit Application, which is identified in a summary table of 2013 study permitting requirements, available as a meeting handout and on the Project website (see [Attachment 7](#)). Cory added that KHL appreciates any input folks have regarding necessary permits.

## Water Resources

Chuck Sauvageau (McMillen), the Water Resources task lead, started the presentation for the Water Resources Study Plan (see [Attachment 8](#)) by introducing the other members of the Water Resources team and the three major components of the Water Resources Study (*Slides 2-5*), which include: 1) Water Quality (WQ) and Temperature Study; 2) Hydrology Study, and 3) Geomorphology Study. Chuck showed a map depicting the location of thermistors, gages, and the natural outlet sampling point for the WQ and hydrology studies (*Slide 6*).

Chuck introduced the Water Quality and Temperature Study component, starting with a review of existing information for Grant Lake, USGS (1950's), AEIDC (1981-1982), and 2009/2010 KHL work (*Slide 7*), and for Grant Creek, USGS (1950-1958), AEIDC (1982), and 2009/2010 KHL work (*Slide 9*). Chuck then outlined the proposed 2013 effort (*Slides 8, 10 and 13*), noting that the September 2013 water quality sampling is intended to complete the data collection efforts that occurred in June/August of 2009 and 2010. Related to collection of water quality and temperature data in Trail Creek Narrows, Chuck pointed out that there is no historical information for that specific area; as such, the 2013 effort would include three water chemistry sampling efforts in spring, summer, and fall (*Slide 12*).

Chuck introduced the Hydrology Study component, starting with a review of the historical work completed (*Slide 14*). He then outlined the proposed 2013 effort (*Slides 15-16*).



- Comment:* Eric Rothwell (NOAA Fisheries) asked whether winter flows would be collected as part of the Hydrology Study.

*Response:* Chuck indicated that winter flows could be collected provided there are personnel available to do so. Chuck noted that one concern is that the relatively short battery life of the loggers (3-4 weeks) requires regular replacement, which could pose a potential safety concern in light of the inclement weather conditions. Eric suggested point measurements rather than continuous ones, to which, Chuck indicated this would be a possibility.
- Comment:* Eric Rothwell stated that between the Aquatics Resources Study, habitat information is being collected, and Hydrology Study, where discharge measurements are being taken for the development of a stage-discharge rating curve, the studies do not seem to propose a step for conducting an impacts analysis, which might include the development of a routing model and that perhaps it would be worthwhile to consider expanding the 2013 data collection effort, to ensure all necessary data are available for development of such a model, should the need arise.

*Response:* Chuck replied that the intent of the Water Resources Study is to collect existing information, the initial building blocks of a routing-type model. Cory Warnock pointed out that since operation scenarios have yet to be developed; it might be a challenge to identify all necessary data parameters before the 2013 study effort gets underway.
- Comment:* Sue Walker (NOAA Fisheries) asked if there is an overview of the proposed Project operations that could be shared.

*Response:* Referring back to the Overview and History presentation for the key Project parameters (Slide 11), Mike Salzetti explained that the proposal has not changed significantly since the revised Project description was filed in August 2010, with the exception of the proposed access route/transmission line alignment.

Paul Pittman (ES) introduced the Geomorphology Study component, noting that minimal work has been conducted to date for both Grant Lake shoreline erosion or Grant Creek sediment transport (*Slides 17-18*). Paul then outlined the proposed efforts for 2013 (*Slides 17-18*).

- Comment:* Eric Rothwell asked how the impact of Project operations on the existing geomorphic environment would be assessed (e.g., would there be a shear stress analysis to assess shoreline erosion impacts in Grant Lake).

*Response:* Paul acknowledged that changes to lake elevation could change the littoral zone, and similarly, a change in creek flows could impact the transport processes. Paul indicated that the Shields equation would likely be used to quantify the sediment transport impacts. Eric suggested detailing the equations and impacts analysis in the study plan. Paul and Eric agreed to have a follow up discussion regarding this topic.

Chuck reviewed the permitting needs (Multi-Agency Permit Application for WQ/temperature and geomorphology and a Fish Habitat Permit for hydrology) and work schedule for each of the three Water Resources Study components (*Slides 19-20*) – field work for WQ/temperature to occur September (Grant Lake and Grant Creek) and April through September (Trail Creek

Narrows), for hydrology April through mid-November, and for geomorphology mid-April through mid-June, with a comprehensive Water Resources Study report to be submitted January 2014.

- *Comment:* Katie McCafferty (ACOE) noted that ACOE's oversees permitting related to fill of wetlands, and based on the discussion, it does not appear that such a permit would be applicable to the Water Resources Study. She will, however, plan to review the Multi-Agency Permit Application to confirm.

*Response:* Cory thanked Katie for the comment.

- *Comment:* Sue Walker asked if temperature monitoring will be done within salmon redds, and if not, whether it could be. Sue added that defining the operational proposal now would be beneficial to allow for study of the potential impact of Project operations on temperature as it relates to redds, noting that spawning is a key resource value, and thus, it is important to assess the Project impacts on upwelling and/or downwelling within spawning redds.

*Response:* Mike S. stated that it is a challenge to refine the operational proposal before completion of the environmental analysis, specifically before knowing the minimum flows needed in the bypass reach. John Stevenson (BA) commented that monitoring within the redds is not currently planned. He noted concern with potentially disrupting redds, in particular when needing to regularly replace batteries in the sensors, and wondered if it would be acceptable to sacrifice a few redds in order to take the desired measurements. Eric Rothwell reiterated earlier concerns about the need to evaluate the Project impacts. Sue Walker stated that once the initial data are in, the Water Resources Study would possibly need to be expanded to assess egg survival.

- *Comment:* Jeff Anderson (USFWS) noted that the high flow measurement currently planned is for 200 cfs, and asked whether, after initial measurements are taken, the high flow value will be modified, as needed. Jeff also asked if un-manned measurement collection was considered.

*Response:* John Blum responded yes, the high flow could change, but noted that instream flow can be modeled 2.5 times the high flow value. Chuck indicated that the field crew may utilize an existing cable system and un-manned ADCP to collect high flow discharge data.

<<LUNCH BREAK>>

## Terrestrial Resources

John Gangemi (ERM), the Terrestrial Resources task lead, started the presentation for the Terrestrial Resources Study Plan (see [Attachment 9](#)) by introducing the other members of the Terrestrial Resources team and the seven major components of the Terrestrial Resources Study and the study work schedule (*Slides 2-5*), which include: 1) Vegetation-type Mapping; 2) Sensitive Plant and Invasive Plant Survey; 3) Mapping of Wetlands and Other Waters of the

U.S.; 4) Raptor Nesting Surveys; 5) Breeding Landbird and Shorebirds Surveys; 6) Waterbird Surveys, and 7) Terrestrial Mammal Surveys. Field work for the three botanical components to occur July 2013, for raptors June-July 2013 and 2014, for landbirds/shorebirds May-June 2013, waterbirds and terrestrial mammals, November-December 2013 and February-March 2014, and a comprehensive Terrestrial Resources Study report to be submitted January 2014.

In the absence of the study lead, Katy Beck (Beck Botanical Services), John G. introduced the Vegetation-type Mapping and Sensitive and Invasive Plant Survey components, explaining that vegetation type mapping exists for the general Project area (USFS 2007), but that no work has been done to date related to sensitive and invasive plants (*Slide 8*). John G. outlined the proposed 2013 effort, including the goals, study area, pre-field steps, field sampling, data analysis, reporting, intended communications with stakeholders, and work schedule (*Slides 6-7 and 9-12*), pointing out that a Biological Evaluation (BE) would be developed related to the sensitive plants survey and would be submitted as part of a comprehensive Terrestrial Resources Study report in January 2014, then finalized in May 2014 based on USFS' feedback.

Levia Shoutis (ERM) introduced the Mapping of Wetlands and Waters of the U.S. component, starting with a description of the goals and assessment area of the mapping exercise (*Slides 15-16*), and then a review of the 2009/2010 KHL work (*Slides 17-19*). Levia then outlined the proposed 2013 effort, including pre-field tasks, field sampling, data quality control, reporting, communication with stakeholders, and work schedule (*Slides 20-24*).

Amal Ajmi (ERM) introduced the four terrestrial wildlife study components, describing the objectives, the 2009/2010 KHL work, and proposed 2013 effort for each (*Slides 25-37*). Cory Warnock noted that due to the summer 2014 goshawk nesting survey work, and the winter 2013-2014 waterbird and terrestrial mammal surveys, the data for these components would be submitted as an addendum to the already completed Terrestrial Resource Report (January 2014).

## **Cultural Resources**

Mike Yarborough (CRC), the Cultural Resources task lead, started the presentation for the Cultural Resources Study Plan (see [Attachment 10](#)) by introducing the other members of the Cultural Resources team and the two major components of the Cultural Resources Study (*Slide 2*), which include: 1) Cultural Resources, and 2) Subsistence Use.

Mike Y. reviewed the cultural resources work conducted in the Project area to date USFS, CH2M Hill (1980), AEDIC (1983), and EBASCO (1984), and most recently, the work that commenced in 2010, but was suspended after initiation of Section 106 consultation (*Slides 3-4*). Mike Y. then outlined the proposed 2013 effort, which will start with a re-initiation of the Section 106 consultation, to define the Area of Potential Effect (APE)(*Slides 5-6*). Mike Y. pointed out that related to historic trails, there are two pieces to assess relative to cultural resources: the commemorative INHT, as well as other trails that may run through the Project area.

Mike Y. showed a map of the study area and reviewed the work schedule (*Slides 7-9*) – literature review and Section 106 consultation to occur early 2013, field work summer 2013, draft Historic

Properties Management Plan (HPMP) in winter 2013/2014, and a comprehensive Cultural Resources Study report January 2014. Mike Y. explained that the USFS' probability model (developed through a Programmatic Agreement with the State Historic Preservation Office [SHPO]) would be utilized for the historic and archaeological field study. Mike Y. noted that field work would commence once the ground was thawed and there was no snow, typically before vegetation begins to fill in.

Mike Y. reviewed the stakeholder comments received on the draft study plan and KHL's responses as well as the permitting requirements (USFS and ADNR)(*Slides 10-12*).

In the absence of the study lead, Ronald Stanek (CRC), Mike Y. introduced the Subsistence Use Study component, starting with a general definition of subsistence and noting that from a regulatory perspective, it is defined under both federal and state laws, the Kenai Peninsula being mostly a "non-subsistence area" by state law, and a "rural area" by federal law (*Slides 13-14*). Mike Y. stated that there had been no previous work done on subsistence use relative to the Project area, but that there is some relevant work that has been done on the Kenai Peninsula (Reed, Seitz et al. 1994, and Fall et al. 2000) and near the Project area (Davis, Fall, and Jennings 2003, and Fall et al. 2004) (*Slide 16*). Mike showed a data table and maps of the type of information that is collected for a subsistence use study (*Slides 17-19*). Mike then outlined the proposed 2013 effort, including the literature review, stakeholder comments received on the draft study plan, and work schedule, noting that no permits are required for the study (*Slides 20-23*) – literature review/field work to occur 2013 and a comprehensive Cultural Resources Study report to be submitted January 2014.

- *Comment:* Valerie Conner (Alaska Center for Environment) asked whether the Kenai River will be included as part of the study area and whether the APE to be defined as part of the Cultural Resources component, will be applied across all resource areas.  
*Response:* Mike Y. replied that the Kenai River will be taken into consideration as part of the information gathering effort of the Subsistence Use Study component. Regarding the APE, Mike Y. stated that the APE is specific to cultural resources, which are focused on historic resources, whereas, other resources are of the present, and therefore, the study areas for each study will be defined as such. (*Ron Stanek joined via phone*) Ron added that as part of the information gathering, he will follow up with all communities that qualify as subsistence areas, either by federal or state law.
- *Comment:* Travis Moseley (USFS) noted that as a cooperating agency related to tribal consultation, maybe there should be a call with the USFS to discuss the study area relative to subsistence use.  
*Response:* Mike Y. noted that as part of the Section 106 consultation, KHL will be already be talking with all interested tribes, native organizations, and village corporations at which point, subsistence use can also be discussed.

## **Recreational and Visual Resources**

Dwayne Adams (USKH), the Recreational and Visual Resources task lead, started the presentation for the Recreational and Visual Resources Study Plan (see [Attachment 11](#)) by

introducing the other members of the Recreational and Visual Resources team and the two major components of the Recreational and Visual Resources Study (*Slide 2*), which include: 1) Recreational Use Study, and 2) Visual Resources Study.

Dwayne described the general study area for both study components, noting that it will likely be more expansive than the area being assessed in the other studies, and that it will be informed by a scenic viewing analysis (*Slide 3*). Dwayne also reviewed the work conducted in the area to date, most of which was done in association with the INHT (*Slide 4*). Dwayne then outlined the proposed 2013 effort (*Slides 5-9*), noting that the effort will be a continuation of the work started but then suspended in 2010 as well as focus on the Trail Lakes Narrows access route.

- *Comment:* Monte Miller (ADF&G) asked if there would be field cameras deployed on the trails.

*Response:* Dwayne responded that the plan is for the field crew to be on the trails at opportune times to determine use at high use periods and to interview some users; therefore, there is no need for cameras.

Dwayne explained that one of the stakeholder comments received on the draft study plan was to include the INHT for access and routing for effects on users, and that KHL planned to study that as a separate effort, the steps of which, Dwayne outlined (*Slides 11-14*).

Dwayne reviewed the balance of draft study plan comments received and KHL's corresponding responses and anticipated permit needs (i.e., a Special Use Permit [SUP] from the USFS) (*Slide 15*).

- *Comment:* Cassie Thomas (NPS) asked if an assessment of the natural soundscapes would be part of the Recreational Use Study and if so, what would be the methodology used to determine baseline conditions, similar to the use of key observation points (KOP) in visual impacts assessments.  
*Response:* Dwayne indicated that noise would be part of the Recreational Use Study, specifically the impact of Project construction and operation on quality of life characteristics; however, taking baseline noise readings in the field was not currently planned, though it would not be significantly more effort to do so. Dwayne noted that the assessment could not be completed, however, until the Project operational scenario is better understood. Cassie suggested looking at the Visual Resources Study Plan proposed for the Susitna-Watana Hydroelectric Project (P-14241).
- *Comment:* David Griffin (ADNR) asked if KHL knows yet by what modes of transportation the Project area will be accessed by for the various studies.  
*Response:* Mike S. responded that a helicopter will be used to drop off equipment, a boat will be used on the lake, and a floatplane may be used to move equipment to and from the lake.
- *Comment:* David Griffin (ADNR) asked if geotechnical work is planned yet.

*Response:* Cory Warnock indicated that such an effort may be a component of the future engineering study. Mike S. added that some work has already been done by Jacobson during the 2009/2010 work.

## Closing

Cory Warnock stated that the draft notes from the meeting would be issued in approximately two weeks, at which time, KHL would request that stakeholders provide by January 20, 2013 comments on the meeting notes as well as comments/questions/points of clarification on the final study plans (ideally, as a single comprehensive response from each agency/organization), and suggested edits/additions to the Permitting Requirements table. Cory reiterated that all materials discussed during the meeting, including the final study plans, are available on the Project website.

- *Comment:* Monte Miller (ADF&G) asked when the next study plan meetings would be held.  
*Response:* Cory replied that if and when additional meetings are warranted, is dependent on the input provided by the stakeholders related to the final study plans.

## Action Items

- **KHL** to consider developing a section of the project website for the public to post comments regarding the project, licensing process, study program, etc.
- **John Blum (McMillen)** to locate Thompson (1972) and provide to Eric Rothwell (NOAA Fisheries).
- **Paul Pittman (ES) and Eric Rothwell (NOAA)** to have a follow up conversation about possible equations to include in the Water Resources study plan that might be used to estimate the potential change in sediment transport processes resulting from Grant Lake Project operations.
- **Cory Warnock (LVA)** to email stakeholders about providing by January 20: 1) comments on meeting notes; 2) comments/questions/requests for clarification on study plans; and 3) suggested modifications to the Permitting Requirements table.

## **Attachments**

Attachments are available on the Natural Resources Studies Meeting (December 12, 2012), Work Groups page at [www.kenaihydro.com](http://www.kenaihydro.com).

- Attachment 1: Meeting Agenda
- Attachment 2: Grant Lake Project Overview and History PowerPoint presentation
- Attachment 3: Licensing Overview PowerPoint presentation
- Attachment 4: Draft Study Plans Comment/Response Table (dated 12/1/12)
- Attachment 5: Grant Lake Team Organization and Contact Chart
- Attachment 6: Fisheries and Aquatics PowerPoint presentation
- Attachment 7: 2013 Study Permitting Requirements
- Attachment 8: Water Resources PowerPoint presentation
- Attachment 9: Terrestrial Resources PowerPoint presentation
- Attachment 10: Cultural Resources PowerPoint presentation
- Attachment 11: Recreational and Visual Resources PowerPoint presentation

**Grant Lake Hydroelectric Project (FERC No. 13212)**  
**Grant Lake Project Natural Resources Studies Meeting**  
**December 12, 2012**  
**Residence Inn Midtown, 1025 35<sup>th</sup> Ave., Anchorage, AK**  
**8:00 am to 5:00 pm**

**8:00am – 8:15am**

- **Introductions and Agenda (C. Warnock)**
  - Introductions
  - Meeting intent
  - Agenda

**8:15am – 9:00am**

- **Project Overview and Update (M. Salzetti)**
  - HEA Introduction
  - History
  - Project description/development

**9:00am – 9:30am**

- **Licensing Path Forward (C. Warnock)**
  - Where are we in the process?
  - Path forward
  - Anticipated Schedule
  - Study plans and matrix

**9:30am – 9:45am**

- **Break**

**9:45am – 10:15am**

- **Natural Resource Studies (C. Warnock)**
  - Introduction to McMillen Team
  - Point individuals

**10:15am – 11:45pm**

- **Aquatic Resources Presentation (J. Stevenson/J. Blum)**
  - Review of work done to date
  - Tasks remaining
  - Plan for 2013
  - Schedule
  - Stakeholder comments and how they were addressed
  - Permitting
  - Questions/Comments



**11:45pm – 12:45pm**

- **Lunch (on your own)**

\*Snacks to be provided during the day

**12:45pm – 1:45pm**

- **Water Resources Presentation (C. Sauvageau)**
  - Review of work done to date
  - Tasks remaining
  - Plan for 2013
  - Schedule
  - Stakeholder comments and how they were addressed
  - Permitting
  - Questions/Comments

**1:45pm – 2:45pm**

- **Terrestrial Resources Presentation (J. Gangemi)**
  - Review of work done to date
  - Tasks remaining
  - Plan for 2013
  - Schedule
  - Stakeholder comments and how they were addressed
  - Permitting
  - Questions/Comments

**2:45pm – 3:00pm**

- **Break**

**3:00pm – 3:45pm**

**Cultural Resources Presentation (M. Yarborough)**

- Review of work done to date
- Tasks remaining
- Plan for 2013
- Schedule
- Stakeholder comments and how they were addressed
- Permitting
- Questions/Comments

**3:45pm – 4:30pm**

- **Recreational and Visual Resources Presentation (D. Adams)**
  - Review of work done to date
  - Tasks remaining
  - Plan for 2013
  - Schedule
  - Stakeholder comments and how they were addressed
  - Permitting
  - Questions/Comments

**4:30pm-5:00pm**

- Next steps
- Website and SharePoint posting
- Global questions/comments

**5:00pm**

- Adjourn

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\*For those participating via webinar, the information below will allow you to see and hear the proceedings. Software install only takes a few seconds.

1. Please join my meeting.

<https://www3.gotomeeting.com/join/232775326>

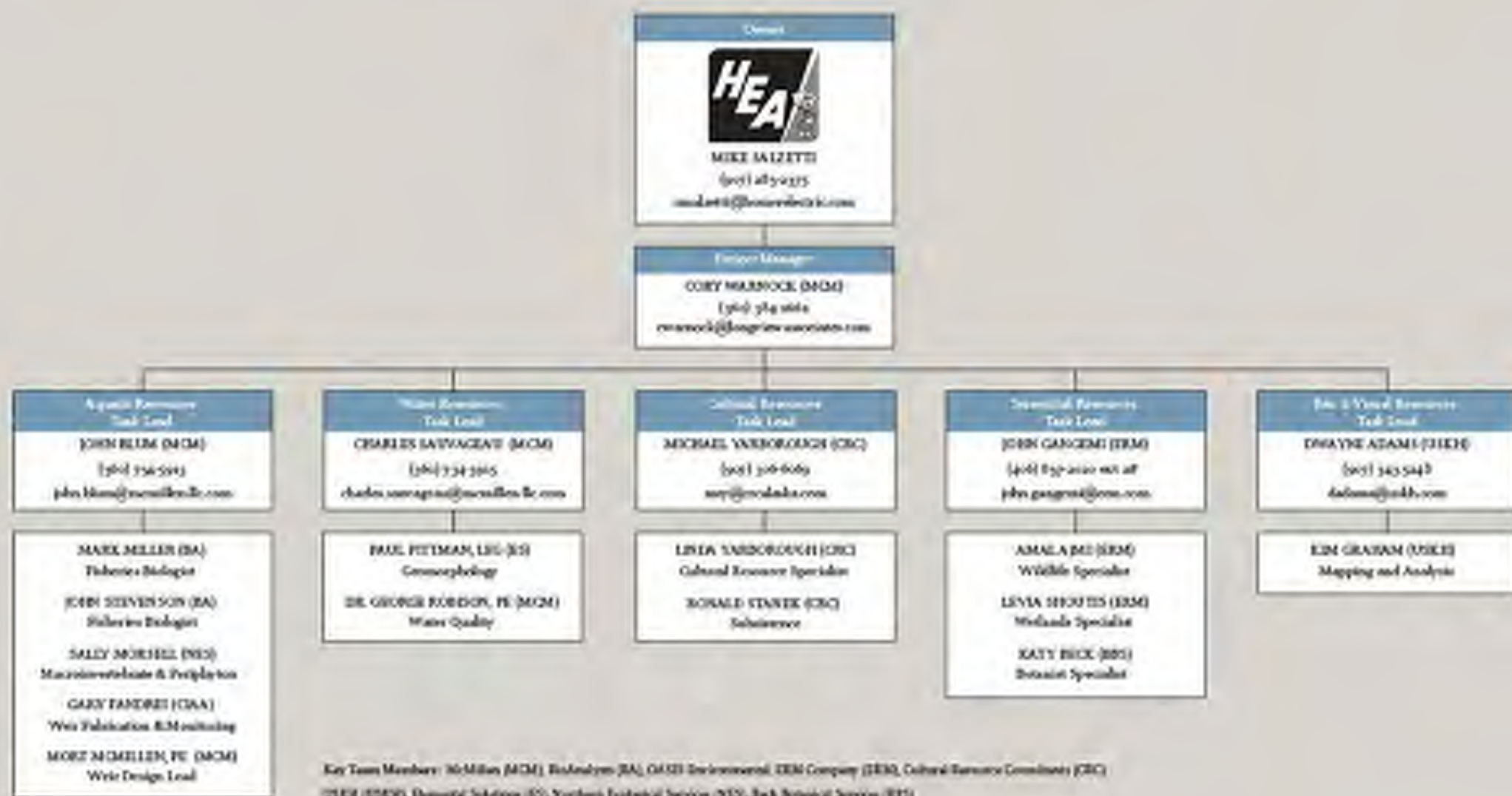
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## Permitting Requirements

Item No.	Firm*	Study Plan Area**	Permit Required	Agency	Process Time (Days / Months)	Notes / Comments
1	MCM	Grant Creek	Fish Habitat Permit	Alaska Department of Fish and Game	90 days (estimate)	For Task 2.2, Stream Gauge Installation
2	MCM	Grant Lake	Multi Agency Permit Application (Phase 1)	Multiple – Housed at Kenai River Center	30 days	For Task 2.1, Re-establish Thermistor String
3	ES	Grant Creek	Multi Agency Permit Application (Phase 1)	Multiple – Housed at Kenai River Center	30 days	For Task 2.3, Grain-size measurements (bulk sampling)
4	CIAA	Fish Weir	Fisheries Resource Permit	ADF&G	0.5 to 3 mos.	ADF&G will review permit applications starting in Jan. and review them in the order received. Process time depends on when application received. Can request the permits be expedited. (Note, CIAA has already submitted FRPs for other 2013 weir projects)
5	CIAA	Fish Weir	Habitat	ADF&G	0.5 to 3 mos.	See previous comment
6	CIAA	Fish Weir	Land Use	ADNR	0.5 to 1.5 mos.	
7	CIAA	Fish Weir	Flood Plain	Kenai Peninsula Borough	0.5 to 1.5 mos.	
8	BA	Grant Cr. Reaches 1-5; Trail River Narrows	Multi-Agency Permit	Multi-Agency	Typically 30 Days	The submission of the multi-Agency Permit is the first step in this



**Grant Lake Hydroelectric Project  
Natural Resource Study Plans**

						process. The Kenai River Center will then determine if and what additional permits may be required.
9	CRC	Cultural Resources	Alaska Cultural Resource Permit	Alaska Department of Natural Resources	2 to 3 weeks	Issued by the Office of History and Archaeology
10	CRC	Cultural Resources	Special Use Permit	USDA Forest Service	Approximately 1 month	Each Federal agency issues their own permit for archaeological investigations under the Archaeological Resources Protection Act of 1979.
11	USKH	Visual/Recreation	Special Use Permit	USFS	0.5 to 1 mos.	To address any interviews we may conduct.
12	ERM	Terrestrial Resources (all studies)	Special Use Permit	USFS	Est. 1 month (TBD)	Details TBD. Likely need permit for: aircraft, land use, camp.
13	ERM	Terrestrial Resources (all studies)	Land Use	ADNR	Est. 1 month (TBD)	Details TBD. Likely need permit for: land use, camp.

*\*Key: OASIS/ERM (ERM), McMillen (MCM), Elemental Solutions (ES), USKH, Cultural Resources Consultants (CRC), BioAnalysis (BA), Cook Inlet Aquaculture Association (CIAA)*

**Summary of comments on draft study plans for the Grant Lake Project (No. 13212) (List of Abbreviations and Acronyms attached)**

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
<b>General/Additional Study Requests</b>					
1	06-04-10	KWF	PAD	Thank you for the opportunity to comment on the PAD. Please provide a return receipt and if you could clarify how these comments will be incorporated into the process it would be appreciated. It is unclear who receives these comments, if they are transmitted to FERC.	This response to comment table will become a part of the project record submitted to FERC with the draft license application. The table is also posted on KHL's website (www.kenaihydro.com).
2	07-06-10	M. Cooney	PAD	In recognition of significant probable negative project impacts to the local and unique quality of life, individual businesses, and local economies, Socio-economic issues related to this project should not be evaluated peripherally or as a by-product of other studies as currently proposed by HEA. I again request HEA immediately establish an independent Technical Working Group to comprehensively identify and to investigate these issues. The Socio-Economic TWG membership should be significantly comprised of recognized Alaska professionals in the field, and residents from local project area communities, including local business owners. I look forward to participating and working with that Technical Working Group.	A comprehensive protection, mitigation, and enhancement proposal is necessary before socio-economic information can be fully considered. Socio-economic information consistent with FERC regulations, and commensurate with the scope of the project will be provided in the final license application Exhibit E (see 18 CFR §4.41), and will be available for review and comment by stakeholders.
3	07-06-10	ACE	PAD	Forest-related industries-how much income and investment is currently generated by forest-related industries including the non-consumptive values of the forest economy including: Direct use, human development, community benefits, scientific values, off-site benefits, ecosystem services, and passive uses and then assigning a dollar value to each.	See response to Comment 2.
4	07-06-10	ACE	PAD	Value of wild salmon watersheds-the PAD acknowledges (p61) that the Kenai River system is one of the most productive salmon rivers <i>in the world</i> . No mitigation is proposed as a result of the proposed projects because wild salmon are	A comprehensive protection, mitigation, and enhancement proposal will be presented in the final license application following completion of resources studies and consultation with resource agencies and stakeholders. In addition to resource effects analyses, a developmental analysis consistent with FERC regulations will be

<sup>1</sup> The full text of comments is included in this column, unless otherwise noted. Where the full text is not included, a reference for the full comment is included.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				impossible to replace. Is 4.5 MW (actually the reality is much less) of power worth sacrificing the viability of one of the most productive salmon streams in the world? It would be helpful to see a completed cost/benefit analysis that examines what will be lost and gained if this project was to move forward.	included in the final license application to address the effects of recommended environmental measures on project generation and economics and the effects of construction, operation, and maintenance on project economics.
5	07-06-10	ACE	na	Additionally, we recommend a separate and stand-alone working group to analyze the socioeconomic impacts.	See response to Comment 2.
6	07-06-10	ACE	PAD	Economic Impacts-who benefits and who pays?	See response to Comments 2 and 4.
7	07-06-10	ACE	PAD	Community Identity, Subsistence and Environmental Justice	The scope of the currently proposed Cultural Resources Study includes evaluation of subsistence use in coordination with the terrestrial and aquatic resource study efforts.
8	07-06-10	ACE	PAD	National Interests-the Chugach is a federally-owned forest known for its recreational values and surrounds the project area. The Black Mountain Research Natural Area is in close proximity to the project area and there should be some research completed about if the development could have impacts to the area.	FERC's Scoping Document 2 identifies the geographic scope of analysis as sufficiently broad to address potential impacts on the Kenai lake-Black Mountain Research Natural Area. Consultation with the USFS will continue throughout development of the project proposal to ensure consistency with the Chugach National Forest Plan.
9	07-06-10	ACE	PAD	Potential Conflicts with Goals or Objectives of Other Agencies and Landowners	The PAD and FERC's Scoping Document 2 identified comprehensive plans and planning documents that will be considered in evaluating the project proposal.
10	07-06-10	ACE	PAD	Irreversible and Irretrievable Commitment of Resources	The FERC licensing and NEPA process is designed to fully consider economic and environmental resource issues associated with project development.
<b>Terrestrial Resources Draft Study Plan</b>					
11	07-02-10	USFS	p.3, and all document Figures	The vicinity and facilities map is not the same one displayed in the scoping document (SD1), other draft study plans or at the public meeting on June 2, 2010. All study plans should display the same, updated maps.	KHL filed with FERC a revised project description and facilities figure on August 13, 2010. This description was also considered in FERC's Scoping Document 2. An updated facilities description and figure is included in all study plans.  <b>Pg. 3 Terrestrial Resources Study Plan</b>
12	07-02-10	USFS	Botanical Resources	The draft study plan for botanical resources was reviewed. We have no recommended changes at this time for sensitive and invasive plant survey or wetland mapping methodology.	KHL appreciates the USFS review of the proposed methodology.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
13	07-02-10	USFS	Botanical Resources	No mention is made of the timber resource. The timber resource (commercial or otherwise) needs to be quantified in the area influenced by the proposed lake level change. Vegetation clearing likely will need to occur around the lake perimeter and volume estimates will be required on National Forest System lands.	A timber resource inventory, which would evaluate timber resources in the area of potential inundation around Grant Lake, was added to the Terrestrial Resources Study Plan.  Pg. 15 Terrestrial Resources Study Plan
14	07-02-10	USFS	Wildlife Resources (p. 16, PP2)	Change to note that the Management Indicator Species (MIS) and Species of Special Interest (SSI) may occur IN or NEAR the project area.	The Terrestrial Resources Study Plan was revised to reflect the recommended change.  Pg. 17 Terrestrial Resources Study Plan
15	07-02-10	USFS	Wildlife Resources (p. 16, PP3)	What data supports the statement “the project vicinity provides only a small to moderate amount of wildlife habitat relative to other areas of the northern Kenai Peninsula?” If there are no data to support this statement, it should be removed.	The statement indicated was based on conclusions of authors of earlier studies (APA, 1984). The Terrestrial Resources Study Plan was revised to reflect the recommended deletion. Current habitat conditions will be discussed in the Terrestrial Resources Study Report and draft and final license applications.
16	07-02-10	USFS	Wildlife Resources (p. 17, PP1)	Trumpeter swan and bald eagle nest surveys are not conducted annually, only when budget permits.	The Terrestrial Resources Study Plan was revised to clarify nest survey frequency.  Pg. 18 Terrestrial Resources Study Plan
17	07-02-10	USFS	Wildlife Resources (p. 17, PP1)	A goshawk nest is suspected to occur in the project vicinity, but no nests have been located. Change references for (Benoit 2009) to (Benoit 2010).	The Terrestrial Resources Study Plan was revised to reflect the recommended changes.  Pg. 18 Terrestrial Resources Study Plan
18	07-02-10	USFS	Wildlife Resources (p. 17, PP6)	Check with the Alaska Department of Fish and Game (ADF&G) for data regarding moose counts for the Grant Lake area more specific than a general count for the whole GMU 7.	The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  Pg. 19 Terrestrial Resources Study Plan
19	07-02-10	USFS	Wildlife Resources (p. 18, PP2)	Cite the data to support that brown bears are sparsely distributed and the number of bears the area could support. The APA 1984 data is too old to represent current conditions. Consider asking Sean Farley from ADF&G for more recent information on dens, telemetry data, and habitat.	As stated in the study plan, one purpose of the studies and consultation is to update information collected in the area in the early 1980’s. The Terrestrial Resources Study Report will provide updated information based on observations and on consultation with appropriate agency personnel.  Pg. 19 Terrestrial Resources Study Plan
20	07-02-10	USFS	Wildlife Resources (p. 19, PP1)	An aerial survey is only sufficient to determine nesting habitat for bald eagles and trumpeter swans; it is insufficient to find northern goshawk nests. The Chugach Land and Resource Management Plan	The Terrestrial Resources Study Plan was revised to include goshawk nest surveys following USFS protocols. We appreciate the assistance of USFS personnel in planning the survey effort.



Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				(LMP) guidelines for raptor nest protection, including northern goshawks, are on page 3-31. The current protocol for goshawk nest surveys is a ground based method, rather than aerial. Forest Service protocols require two surveys per year for two years. We are happy to assist in identifying areas that need to be surveyed.	Pg. 22 Terrestrial Resources Study Plan
21	07-02-10	USFS	Wildlife Resources (p. 19, PP2)	Ospreys are unlikely to occur in the project area during the breeding season.	The Terrestrial Resources Study Plan was revised to include this clarification.  Pg. 21 Terrestrial Resources Study Plan
22	07-02-10	USFS	Wildlife Resources (p. 20, PP1)	<p>Flying at less than 150' Above Ground Level (AGL) looking for nesting birds is extremely disturbing to nesting birds and other wildlife. Forest Service aerial surveys do not allow flights below 500' AGL.</p> <p>The investigative studies special use authorization held by Kenai Hydro, LLC does not authorize the use of aircraft to conduct wildlife or other surveys. If you wish to conduct aerial surveys, please work with the Forest Service to amend your permit. The following mitigation is standard in Forest Service permits that use aircraft and these should be incorporated in your study plan:</p> <ul style="list-style-type: none"> <li>• Helicopters will maintain a minimum of 1,500 ft. AGL distance from all observed wildlife.</li> <li>• Helicopter flights will be avoided within ¼ mile horizontal or 1,500 ft. AGL separation distance of active bald eagle nests. If it is unknown whether a nest is active, helicopter flights will avoid the nest by a ¼ mile horizontal or 1,500 ft. AGL distance.</li> <li>• Helicopters will not hover, circle, or harass any species of wildlife in any way.</li> <li>• Aircraft will adhere to No-Fly Zones as identified by the district wildlife biologist, who identifies mountain goat and Dall sheep concentration areas to be avoided by helicopter flight paths. Zones are based</li> </ul>	<p>The Terrestrial Resources Study Plan was revised to reflect comments regarding use of aircraft. Observation from boats of cliffs around Grant Lake was included in the survey plans for cliff nesting raptors. We appreciate the data on bald eagle nests supplied by the USFS in 2010.</p> <p>Multiple modifications throughout the document including Appendix G</p>

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				<p>on a separation distance of 1,500 ft. from animal and habitat survey data.</p> <p>As stated previously, aerial surveys are not appropriate to locate northern goshawk nests. The Forest Service conducted bald eagle nest surveys in 2010 and has already provided the data to HDR, so further surveys are not needed. Trumpeter swan surveys have been conducted in the past and suitable nest habitat does not occur, so these surveys are not needed. To reduce disturbance to wildlife, we recommend scanning the project area from boats during shorebird surveys to determine the presence of cliff nesting raptors rather than using aircraft.</p>	
23	07-02-10	USFS	Wildlife Resources (p. 23, PP 4)	<p>The statement “There are no known concentrations of any water bird nesting or feeding areas near the Project (APA 1984; Benoit 2009)” should be re-worded to state that the Forest Service has not conducted surveys for water bird nesting or feeding areas at Grant Lake.</p> <p>Please remove the citation of Benoit 2009 from the statement “Although their current conservation status is unclear, they are listed in the Sea Duck Joint Venture Species Status Report and are of particular concern to resource agencies (Seaduck Joint Venture 2008; Benoit 2009)”. While they are a concern, Ms. Benoit did not state that they are of particular concern to the Forest Service. Also, Ms. Benoit did not state that “Common loons and yellow-billed loons have been observed on Grant Lake and nesting habitat for loons is present on Grant Lake (APA 1984; Benoit 2009).” They may be present, but Ms. Benoit does not recall seeing them and does not know if they have nesting habitat there.</p>	<p>The Terrestrial Resources Study Plan was revised to reflect the recommended changes.</p> <p><b>Pg. 26 Terrestrial Resources Study Plan</b></p>
24	07-02-10	USFS	Wildlife Resources (p. 26, PP2)	<p>Please change Kenai Peninsula to the Seward Ranger District in this statement “Open water habitat that supports waterbirds on the Kenai Peninsula is limited (Benoit 2009).”</p>	<p>The Terrestrial Resources Study Plan was revised to reflect the recommended change.</p> <p>See response to Comment 22 regarding aircraft.</p>

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				Again, the special use authorization for investigative studies currently does not authorize use of aircraft for surveys.	
25	07-02-10	USFS	Wildlife Resources (p. 26, PP4)	<p>Please contact ADF&amp;G and review more recent literature on brown bears to validate the statements listed in the following paragraph. The statements in boldface are not consistent with our knowledge of brown bear behavior.</p> <p><b>Bears.</b> Brown and black bears are found throughout the Project vicinity during the spring, summer, and fall. They may be found in a variety of habitat types, but <b>brown bears tend to prefer open habitats, particularly shrub and tundra communities at higher elevations</b>, while black bears tend to prefer forested habitats at lower elevations (APA 1984). <b>Forage resources and denning habitat as determined during 1982 surveys</b> are shown in Figure 6 (APA 1984). The distribution of both species of bears is affected strongly by food availability. Emerging grasses, forbs, and other herbaceous plants are critical foods in spring, whereas spawning salmon and berries are critical foods in late summer. Both species enter dens during October or November and remain there until <b>early to mid-May</b>, with maternal females entering dens before and emerging later than males (APA 1984).</p> <p>Brown bears are found in most habitat types and to our knowledge do not prefer shrub and tundra communities or high elevations in this area. Denning habitat information that is more current should be obtained from ADF&amp;G. Moose are also an important food source in the spring. Most brown bears emerge from their dens around mid-April.</p>	<p>The Terrestrial Resources Study Plan was revised to reflect the recommended change.</p> <p><b>Pg. 28 Terrestrial Resources Study Plan</b></p>
26	07-02-10	USFS	Wildlife Resources (p. 26, last PP)	If you plan to use the survey data the Forest Service collected on brown bear dens while doing bald eagle nest surveys on May 6, 2010, please note that a complete den survey was not conducted in the	The Terrestrial Resources Study Plan was revised to clarify the brown bear denning survey will include all areas potentially affected by the Project.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				project area. The survey only included habitat along Grant Creek and the hills adjacent to Grant Lake. The Forest Service survey protocol does not allow flights below 500' AGL as stated in the study plan. Again, the current special use authorization for investigative studies does not authorize the use of aircraft for wildlife surveys (see above).	<a href="#">Pg. 29 Terrestrial Resources Study Plan</a>  See response to Comment 22 regarding aircraft.
27	07-02-10	USFS	Wildlife Resources (p. 27, PP3)	Please document how the moose range and travel corridors identified in Figure 7 were determined. They do not match the ranges identified by ADF&G.	The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  <a href="#">Pg. 29 Terrestrial Resources Study Plan</a>
28	07-02-10	USFS	Wildlife Resources (p. 32)	<i>Raptor Nest Surveys</i> - Please note that goshawk surveys should be conducted in mid and late June.	The Terrestrial Resources Study Plan was revised to reflect the recommended change.  <a href="#">Pg. 24 Terrestrial Resources Study Plan</a>
29	07-02-10	USFS	Wildlife Resources (p. 32)	<i>Terrestrial Mammal Surveys</i> - Please note that an additional bear den emergence aerial survey should be conducted in mid-May 2011 if you want a complete survey of the project area. In addition, bats have been reported to roost in the historic cabin on the west end of Grant Lake. If the project could affect water levels to the extent that this cabin might be affected, a bat survey of the cabin must be conducted.	See response to Comment 26 regarding bear denning surveys.  A bat survey of the historic cabin has been completed and will be reported on in the Terrestrial Resources Study Report.
30	07-06-10	USFWS	Goals and Objectives	Because of the wide-ranging movement of fish, birds, and wildlife (in general) throughout this ecosystem, Kenai Hydro must put the potential effects to birds and wildlife in a landscape/watershed context. Grant Lake is part of the larger Kenai River watershed and the proposed studies are too limited in scope.	The draft and final license applications will analyze study results and provide information commensurate with the scope of the project. The license application will include analysis adequate to inform a cumulative effects analysis in FERC's EA.
31	07-06-10	USFWS	Goals and Objectives	Before we can effectively evaluate the potential effects of the proposed project on our trust resources, we must have well-defined, statistically valid, measurable, achievable/realistic, specific and quantifiable objectives for each study component with a clearly specified level of precision and accuracy such that the objectives are statistically sound. (See USFWS comment letter p. 9 for full	The Terrestrial Resources Study Plan was revised to clarify goals and objectives.  <a href="#">Multiple modifications throughout the document</a>

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				detail of comment.)	
32	07-06-10	USFWS	Botanical Resources (p. 5)	On pg. 5, reference is made to invasive plant species being present on the Chugach National Forest and adjacent State, Borough, and private lands. Construction and maintenance of facilities may disperse invasive plants throughout the area. A detailed plan will be necessary to effectively address this issue, with specific protocols mandated for contractors and others working in and around the project area. Proper implementation of measures to avoid the spread of invasives will be critical throughout the life of the project.	A plan, which will be included in construction BMPs, will be developed as necessary based on potential Project effects and will be detailed in the draft and final license applications.
33	07-06-10	USFWS	Wetland Mapping	For wetland mapping, we recommend using other sources [than NWI maps], such as the Kenai Peninsula Land Cover Classification. (See USFWS comment letter p. 10 for full detail of comment.)	The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel and the best current mapping and information.  <b>Pg. 15 Terrestrial Resources Study Plan</b>
34	07-06-10	USFWS	Wildlife Resources, Existing Information	Ground-truthing efforts to accurately map wetlands and other habitats in the watershed that may be affected by the proposed project will be necessary. We encourage Kenai Hydro to use Mike Graez's Wetland Mapping and Classification protocol. (See USFWS comment letter p. 10 for full detail of comment.)	Site-specific vegetation mapping and wetland delineations of the Project foot print was included in the Terrestrial Resources Study Plan.
35	07-06-10	USFWS	Wildlife Resources, Existing Information	Without the appropriate data to support the statement that "the Project vicinity provides only a small to moderate amount of habitat for wildlife resources relative to other areas of the northern Kenai Peninsula", we suggest you omit or revise such accordingly. (See USFWS comment letter p. 10 for full detail of comment.)	See response to Comment 15.
36	07-06-10	USFWS	Wildlife Resources, Existing Information	Again, on Pg. 16, reference is made to the eastern end of Grant Lake being preference habitat for snowshoe hare, lynx, beavers and moose, with the area likely also providing nesting habitat for some waterfowl and passerine species. However, there does not appear to be any mention of analyzing the potential effects to wildlife from displacement when the area [eastern end of Grant Lake] is inundated. Appropriate studies will be necessary to ascertain	The Terrestrial Resources Study Plan is designed to collect vegetation and wildlife data in potentially affected areas along the Grant Lake shoreline. If inundation will occur based on the final Project design proposal, potential effects of this inundation will be discussed in the Terrestrial Resources Study Report and presented in the draft and final license applications.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				the potential effects to all of the terrestrial resources utilizing the habitat around Grant Lake, especially those areas that will be flooded as a result of project operation.	
37	07-06-10	USFWS	Wildlife Resources, Existing Information (p.16)	We believe mountain goat surveys are a necessity and that these surveys should be conducted to ascertain potential effects from the proposed project. (See USFWS comment letter p. 11 for full detail of comment.)	The Terrestrial Resources Study Plan was revised to include observation of mountain goats during other wildlife surveys on Grant Lake.  <b>Pg. 36 Terrestrial Resources Study Plan</b>
38	07-06-10	USFWS	Wildlife Resources, Existing Information	On Pg. 17, the Draft TRSP again references out-dated studies to infer that Dall sheep will not be studies since they mainly occur on the higher ridges and slopes beyond the areas potentially affected by the project. Yet, it states that as with goats, sheep sometimes move to lower altitudes. While they are generally high country animals, Dall sheep sometimes occur in rocky gorges below timberline. We encourage Kenai Hydro to contact ADF&G for further information about sheep in and around the study area.	The Draft Terrestrial Resources Study Plan and PAD provide information available through 2009. The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.
39	07-06-10	USFWS	Wildlife Resources, Existing Information (p. 17)	The assumption is made that snow depth and a corresponding lack of winter forage limit moose numbers in the project vicinity... We therefore recommend this and similar assumptions be omitted, and that an appropriate level of study be initiated to support the findings. We encourage you to contact the appropriate ADF&G staff to obtain moose data for this area. (See USFWS comment letter p. 12 for full detail of comment.)	The Draft Terrestrial Resources Study Plan and PAD provide information available through 2009. The Terrestrial Resources Study Plan has been revised to clarify that the information is the result of earlier studies of the Project area. The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  <b>Pg. 19 Terrestrial Resources Study Plan</b>
40	07-06-10	USFWS	Wildlife Resources, Existing Information (p.18)	We reject claims [regarding sparse bear populations] and again recommend further, detailed analysis of brown and black bear movements and habitat in the project area to accurately assess the potential for impacts from the project. (See USFWS comment letter p. 12 for full detail of comment.)	See response to Comment 19.
41	07-06-10	USFWS	Wildlife Resources, Study Methods	[Low level flights] are not acceptable and we are hopeful that HDR utilized USFS aerial bald eagle nest data collected in May 2010. (See USFWS comment letter p. 12 for full detail of comment.)	See response to Comment 22.
42	07-06-	USFWS	Wildlife	Kenai Hydro must not only map eagle nests, but	The Terrestrial Resources Study Plan was revised to reflect an

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
	10		Resources, Study Methods	because of the new eagle “take” regulations, should also determine locations of breeding and feeding territories within and adjacent to the project area if the project poses a potential impact to eagles, their nesting, and their young. (See USFWS comment letter p. 12 for full detail of comment.)	emphasis on observing breeding and feeding behaviors of bald eagles in and near the study area.  Pg. 20 Terrestrial Resources Study Plan
43	07-06-10	USFWS	Wildlife Resources, Study Methods	Regarding northern goshawks and other raptors, HDR should use the USFS protocol for surveying as appropriate.	See response to Comment 20.
44	07-06-10	USFWS	Wildlife Resources, Study Methods	Breeding landbirds and shorebirds - Nesting along the lakeshore that is to be inundated is an issue with respect to “take” of waterfowl, gulls, and other shorebirds under the MBTA, as “take” will not be authorized. Please explain how “take” will be avoided in the above scenario. Also, please indicate what aspects of the project will impact migratory birds – lake level fluctuations; clearing for roads, powerhouse and transmission lines, etc. Studies commensurate with potential direct and cumulative effects are needed.	The Terrestrial Resources Study Plan, and subsequent analysis of potential effects to be presented in the draft and final license application, will include analysis to address the scope identified by FERC in Scoping Document 2.
45	07-06-10	USFWS	Wildlife Resources, Study Methods	Provide supporting documentation to verify this assertion [that natural lake levels fluctuate 9 ft.], and conduct proper studies to address how far lake levels could rise and expand outward from the current lake edge, and the extent of impacts to breeding landbirds and shorebirds. (See USFWS comment letter p. 13 for full detail of comment.)	Field data will be collected to verify natural, seasonal lake level fluctuations. If inundation will occur based on the final Project design proposal, potential effects of this inundation will be discussed in the Terrestrial Resources Study Report and presented in the draft and final license applications.
46	07-06-10	USFWS	Wildlife Resources, Study Methods (p.22)	On Pg. 22, HDR indicates that Grant Creek is not included in the study area for landbirds because it is virtually impossible to detect signing songbirds along a loud creek corridor. Please explain, in detail, how songbird data will be assessed and quantified for this area, and how relative abundance and density will be determined.	The Terrestrial Resources Study Plan was revised to clarify methods used to collect and analyze wildlife data, consistent with the scope and scale of the Project.  Pg. 25 Terrestrial Resources Study Report
47	07-06-10	USFWS	Wildlife Resources, Study Methods	Please explain the rationale to support the association of various species of birds to particular habitats when discussing the type and level of surveys to be conducted.	The Terrestrial Resources Study Plan was revised to clarify methods used to collect and analyze wildlife data.  Multiple modifications throughout the document

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48	07-06-10	USFWS	Wildlife Resources, Study Method	Regarding potential effects to migratory birds, there is no mention of how the clearing of the road and transmission line corridors will affect nesting and roosting habitat. An assessment will be needed to determine the extent of direct, indirect, and cumulative effects on migratory birds and their habitat in conjunction with these proposed corridors. The added foot and motorized traffic that will result once roads and other right-of-ways are cleared must be considered in this analysis.	The draft and final license applications will analyze potential Project effects on migratory birds (including corridor clearing and changes in use) commensurate with the scale of the Project.
49	07-06-10	USFWS	Terrestrial Mammal Surveys	We recommend contacting Mr. Sean Farley (ADF&G) and Mr. Jeff Selinger for more recent data on habitat, movement corridors, den locations, etc, for both brown and black bears. (See USFWS comment letter p. 13 for full detail of comment.)	Thank you for the recommendation. The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  Multiple modifications throughout the document based on consultation with aforementioned individuals.
50	07-06-10	USFWS	Terrestrial Mammal Surveys	Opening up access in conjunction with the project could have serious implications to brown and black bears and other wildlife in the area. Den disturbance through site development as well as that resulting from recreational access via snow machine along with newly found hunting opportunities, is likely. (See USFWS comment letter p. 13 for full detail of comment.)	Potential impacts to wildlife from increased access related to the Project will be assessed in the draft and final license applications.
51	07-06-10	USFWS	Terrestrial Mammal Surveys	Anadromous runs are important food resources for brown and black bears. With the potential for fisheries impacts, more information will be needed to ascertain what effects such would have on the brown bear which inhabit the study area. (See USFWS comment letter p. 14 for full detail of comment.)	The Aquatic Resources Study will collect information on fisheries that will be used in the draft and final license applications to address the effects impacts to fisheries might have on other wildlife species.
52	07-06-10	USFWS	Terrestrial Mammal Surveys	Appropriate studies will be needed to ascertain what, if any effects, the proposed lake level increases will have on all terrestrial resource habitats around Grant Lake. In addition, appropriate mapping to show the acreage to be inundated and extent of potential habitat impacts will be required. (See USFWS comment letter p. 14 for full detail of comment.)	See response to Comment 36.
53	07-06-	ADFG	Study	We support the delineation of the zone of inundation	See response to Comment 36.



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	10		Methods	potential along the entire shore of Grant Lake and recommend quantifying the distribution of each riparian/terrestrial habitat type and the relative abundance of aquatic and riparian species utilizing each habitat. We are primarily concerned with habitats selected by waterbirds (waterfowl, shorebirds, loons, gulls and terns) for breeding and those selected by moose for browse, cover and thermoregulation. To evaluate the proposal of increasing lake levels, a quantitative summary of the relative abundance of these species by specific habitat types is needed along with the extent to which these habitats will be inundated. Waterbird surveys should also be conducted for Grant Creek by noting habitat associations with the meso habitats identified in the Aquatic Resources Study and with particular riparian habitat types being mapped in the Terrestrial Resources study.	
54	07-06-10	NPS		<p>NPS's comments on this draft study plan are directed at terrestrial resources associated with recreational use, including watchable and huntable wildlife.</p> <p>KHL's terrestrial resources study should include an evaluation of the potential for land clearing activities associated with construction of the project access road to have ongoing impacts on vegetation due to windthrow and erosion. The evaluation should identify areas along the proposed road, penstock, and transmission line rights-of-way that could be vulnerable to such unplanned or uncontrolled changes because of steep slopes, soil type, and other factors. The effects of any resulting unplanned or uncontrolled loss of forest cover on recreational experience, wildlife distribution and abundance, and water quality should be assessed.</p> <p>Does the proposed study area, which is bounded by the Seward Highway to the west, encompass the full range of habitat utilized by wildlife in the project area? E.g., do Moose, Bear, etc. utilize habitat on both sides of the highway? Where will wildlife</p>	<p>The draft and final license applications will analyze results of the Terrestrial Resources Study, the geotechnical survey, and engineering and design efforts to evaluate and describe potential effects of the project.</p> <p>The Terrestrial Resources Study Report will provide updated information on wildlife use of the general Project vicinity based on consultation with appropriate agency personnel.</p>

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				displaced from the immediate project area during construction likely seek refuge? The study area should include all such habitat. For Dall sheep and mountain goat, this may include areas outside the Grant Lake watershed.	
55	07-06-10	NPS		Do Moose currently utilize the frozen surface of Grant Lake for winter travel? If so, what impact would there be on winter movement between wetland habitat at the eastern end of the lake, and areas west of the mouth of the lake, if the lake were open, or had inadequate ice, for longer periods? Given the animal's popularity for hunting, why are no Moose surveys proposed?	The Terrestrial Resources Study Plan was revised to include a winter survey of moose presence and use of the Grant Lake area.  <b>Pg. 32 Terrestrial Resources Study Plan</b>
56	07-06-10	NPS		Why are no goat or sheep surveys proposed? Goats in particular are known to be highly susceptible to disturbance, including helicopter use. How will KHL and FERC be able to evaluate the impact of project construction and operation, including improved access, on goat and sheep populations in the absence of baseline data?	The Terrestrial Resources Study Plan was revised to include observations of mountain goats and Dall sheep.  <b>Pg. 32 Terrestrial Resources Study Plan</b>
57	07-06-10	NPS		How would fluctuating lake levels, potentially dewatering wetland habitat in the Inlet Delta and causing changes in vegetation, have on the distribution and abundance of huntable or viewable wildlife species?	See response to Comment 54.
58	07-06-10	NPS		The study plan should include a survey of American Dipper nest sites and foraging areas within Grant Creek. Dippers are known to build nests on creekside cliffs and to feed in fast-flowing streams like Grant Creek.	The Terrestrial Resources Study Plan was revised to include dipper surveys.  <b>Pg. 19 Terrestrial Resources Study Plan</b>
59	07-06-10	NPS		A single winter waterbird survey, via helicopter or snowshoe, is unlikely to yield meaningful data about the project area's utilization by such species. Multiple surveys throughout the open water season would be necessary to determine whether the project area provides important winter habitat for waterfowl, and to establish baseline conditions.	The Terrestrial Resources Study Plan was revised to increase the number of winter surveys of Grant Lake wildlife use.  <b>Pg. 28 Terrestrial Resources Study Plan</b>
60	07-09-10	USACOE		The proposed study plan discusses wetlands delineation and states that the information will be collected as required by the 1987 wetland	Thank you for the review of the methods.

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				delineation manual and the 2007 Alaska Regional Supplement. This is appropriate.	
61	07-09-10	USACOE		The study plan states that representative boundaries of wetlands will be identified and then wetland boundaries will be drawn using GIS. The method described is appropriate for scoping purposes, however, more detailed wetland delineations information may be necessary to complete the alternatives analysis. For the purposes of determining the amount of direct impacts resulting from the final design, the wetland boundaries must be determined by filed delineations and recorded using GPS.	Comment noted. KHL will continue consultation with the USACOE during development of the Project proposal to ensure the appropriate level of wetland information is available for the final environmental document.
62	07-09-10	USACOE		The Wetland Field Data Form referenced in the study plan and included in Attachment E is incomplete. The second page is missing.	The Terrestrial Resources Study Plan was revised to include the full attachment. <b>Appendix E Terrestrial Resources Study Plan</b>
63	07-09-10	USACOE		The draft study plan refers only to the identification of wetlands. Because we regulate the discharge of dredged or fill material into waters of the U.S., we must know the location and size of all waters that would be impacted by the proposed project. Waters of the U.S. include channels with an ordinary high water mark (streams) and open waters with a mean high water mark (ponds or lakes) in addition to wetlands. Each stream, open water, and wetland that may be impacted by a proposed alternative must be identified, described, and mapped.	The Water Resources Study Plan was revised to acknowledge this information.
64	07-09-10	USACOE		Direct impacts to waters of the U.S. must be identified and quantified for all portions of the project that would involve the placement of fill in waters of the U.S.; this includes any waters crossed by the proposed road and utility corridor, any waters flooded by the raised waters in Grant Lake or wetlands flooded by increased flows in Grant Creek, and any waters that would be filled during the construction of the powerhouse, dam or other structure.	The assessment of Project impacts in the license application will include an assessment of potential effects to all waters of the U.S.
65	07-09-10	USACOE		Secondary impacts to waters of the U.S. must be identified and assessed for each water of the U.S.	The assessment of Project impacts in the license application will include an assessment of potential effects to all waters of the U.S.

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				(See USACOE comment letter p. 2 for full detail of comment.)	
66	07-09-10	USACOE		Cumulative impacts to waters of the U.S. must also be indentified and assessed. Cumulative impacts are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. The geographic extent may be different for each cumulative impact.	The draft and final license applications will analyze study results and provide information commensurate with the scope of the project. The license application will include analysis adequate to inform a cumulative effects analysis in FERC's environmental document.
67	07-09-10	USACOE		If compensatory mitigation is required, it will be necessary to complete a functional or condition assessment for each water of the U.S. that would be impacted by the proposed project. There are a variety of metrics or methods available. We recommend that you contact us to discuss your selected method, prior to its implementation, to ensure that it is appropriate.	KHL will consult with the USACOE as potential mitigation measures are developed commensurate with the scope of the Project and its effects.
68	07-09-10	USACOE		As we mentioned at the meeting, the Alaska District has written Regulatory Guidance Letter (RGL) 09-02, which provides guidance regarding the evaluation of compensatory mitigation plans to the Regulatory Project Management and the public. We have attached a copy of the RGL to our letter.	KHL thanks the ASACOE for the information.
69	07-06-10	ACE	p.22	In the Terrestrial Resources study plan, it states on p 22 that surveys will be done in June 2010 for landbirds along the road corridor, yet there is no firm plan regarding the placement of the road. Four species of landbirds are listed on the State of Alaska list of Species of Special Concern that likely live in the project area.	The project study schedule has been revised to allow for consultation with agencies regarding a revised Project facilities proposal. The species list for landbirds was reviewed to include State of Alaska Species of Special Concern.
70	07-06-10	ACE		The clearing of the road corridor and possibly a transmission line corridor, will impact the vegetation beyond the edges of the road. Trees along the corridor will have a greater risk of blow down, and invasive plants will have better access into the area. With this area already facing huge swaths of die off due to the spruce bark beetle, an assessment should be made of the standing forest and how taking additional trees will impact the forests recovery.	Results of the Terrestrial Resources Study will be analyzed in the draft and final license applications to evaluate and describe potential effects of the project. A plan to prevent the spread of invasive plants will be developed for Project construction and operation as necessary and commensurate with the Project scope.

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71	07-06-10	ACE	p.15	The plan states that the primary objective of wildlife surveys is to provide existing baseline distribution and abundance information on target species. The plan then refers to studies done in the early 80's. Much has changed in thirty years, and these references should be considered with that in mind. Dramatic changes to forest stocking levels and to understory vegetation and forest structure have changed dramatically over the last 20 years due to extremely high levels of spruce (Sitka, Lutz and White spruce) mortality resulting from a spruce bark beetle epidemic.	Comment noted. The Terrestrial Resources Study Report will provide updated information based on current studies and on consultation with appropriate agency personnel.
72	07-06-10	ACE	p 16	The plan states that no federally listed wildlife species occur in the project vicinity. While this may be true, if FERC considers the geographic scope to be the Kenai River basin (and we fully support this decision), then this statement is not true as the Cook Inlet beluga whale, which is listed as an endangered species, has been documented to occur in the project area. Impacts to their food source will need to be considered.	Scoping Document 2 has defined the geographic scope for cumulative effects as the Kenai River basin and concluded that "extending the geographic scope to include open ocean habitat utilized by beluga whales is not appropriate."
73	07-06-10	ACE		Interesting to note that even though moose have been identified as a management indicator species, that the project proponent has decided not to perform specific surveys. According to local residents, moose are seen quite often in the area, (hence the name Moose Pass), and use the browse on the east end of Grant Lake during winter time (which would be flooded if the dam is built). Again the study plan refers to a one year study performed 30 years ago. Critical moose winter range (willow flats) located on the east end of Grant Lake comprises one of only a very few good winter browse areas in a forested landscape largely devoid of good moose winter habitat.	See response to Comment 55.
74	07-06-10	ACE	p 16	The study admits that the inlet delta at the eastern end of Grant Lake is preferred habitat for snowshoe hares, lynx, beavers and <i>moose</i> . There is no indication that the proponents plan to study the effects of displacing these populations by flooding the area.	The Terrestrial Resources Study area includes the area of potential inundation.  See response to Comment 55.

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75	07-06-10	ACE	p.18	[Study plan] states that no more than one or two families of Kenai brown bear would den in the proposed area. Because the Kenai Brown bear is listed as a Species of Special Concern, we believe that the geographic scope of this study should extend beyond the boundaries of Grant Lake. If animals are going to be displaced by the development of the project the study area should be expanded.	Comment noted. Results of studies and agency consultation will be analyzed in the draft and final license applications to evaluate impacts to brown bears.
76	07-06-10	ACE	p.22	We wonder why only the outlet delta area of Grant Lake is included in the study for breeding landbirds.	Breeding habitat in other areas of the shoreline of Grant Lake is limited due to topography and vegetation type. However, incidental observations of all wildlife will be recorded during surveys of the shoreline for breeding waterbirds.
77	07-06-10	ACE	p.23	The draft study plan optimistically states that the intent of the bird surveys is to sample enough points to “ensure that all breeding landbirds in the area are documented”. Though this is a laudable goal, we feel it is a misleading and inaccurate statement that should be amended to reflect the realities of field work.	The Terrestrial Resources Study Plan was revised to clarify the data that will be collected, commensurate with the scope of the Project.  <b>Pg. 24 Terrestrial Resources Study Plan</b>
78	07-06-10	ACE	p. 23	The study states that there are no know[n] concentrations of any waterbird nesting or feeding in the project area, yet many have testified that they had seen trumpeter swans during the winter at the outlet of Grant Lake which provides a relatively rare, ice-free zone. We are glad that the proponents plan to visit the site in the wintertime to see if they can document this, however, we are skeptical if the use of a helicopter is an effective way to do wildlife studies and encourage a less intrusive method.	Comment noted. See response to Comment 22.
79	07-06-10	ACE	PAD	Identify denning and foraging habitat for the Kenai Brown Bear in and adjacent to the project area. Recognize that this is a species of special concern and that reducing the number of fish available is going to impact the species. More access to the area will open it up for more disturbances and the possibility of out-migration of bears to other areas of higher densities of both people and bear which always lead to a higher mortality rate for the bears. The number of kills in defense of life and property always goes up along roadsides, so we can easily	The Terrestrial Resources Study Plan was designed to collect data regarding Kenai brown bear in the Project area. Potential effects of the Project on the brown bear will be evaluated in the draft and final license applications.

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				predict that bears will be impacted. The natural and existing wildlife travel corridors need to be identified, and every effort made to avoid contributing to the decline of this species. There needs to be a scientific study to determine more about this species, and not rely on anecdotal evidence or information 50 years out of date.	
80	07-06-10	ACE	PAD	Grant Lake shoreline, outlet and the head of Grant Lake are all significant habitat for birds and further studies need to be done to identify specific species and numbers of birds who are using the lake to feed and nest.	See Terrestrial Resources Study Plan.
<b>Recreation and Visual Resources Draft Study Plan</b>					
81	07-02-10	USFS		<p>There are numerous references to the “proposed Iditarod Trail” throughout the document. The Iditarod National Historic Trail (INHT) is more than proposed. It was designated by Act of Congress in 1968 as part of the National Trails System. It is managed under the guidance the 1986 Comprehensive Management Plan for The Iditarod National Historic Trail: Seward to Nome Route, with the Secretary of the Interior designated as the federal Trail Administrator.</p> <p>The Forest Service is constructing and reconstructing the INHT through the Chugach NF to provide recreation opportunities, including within this project area (on easements across State lands). Depending on location, the INHT is “existing,” “under construction,” or “planned for construction.”</p>	<p>The Recreation and Visual Resources Study Plan was revised to consider the current and future status of the INHT within the study area.</p> <p><b>Multiple modifications throughout the document.</b></p>
82	07-02-10	USFS	p. 2	Under Goals and Objectives, the first bullet should also include the Iditarod National Historic Trail (INHT) in the list.	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><b>Pg. 4 Recreation and Visual Resources Study Plan</b></p>
83	07-02-10	USFS	p. 2	Under Goals and Objectives the fourth bullet, last line should read "from existing and planned recreational trails and use areas."	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><b>Pg. 4 Recreation and Visual Resources Study Plan</b></p>
84	07-02-10	USFS	p. 2	Under Goals and Objectives the seventh bullet, last line should read "...changed access to, and character	The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.

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				of, remote area...."	<a href="#">Pg. 4 Recreation and Visual Resources Study Plan</a>
85	07-02-10	USFS	p. 3, PP 1	<p>The statement that there is "no developed trailhead and minimal signing" should also state that a primary INHT trailhead is currently planned for construction near the outlet of Lower Trail Lake.</p> <p>The same paragraph describes uses as "light," "very light," and "some." These qualifiers are not based on data. The study plan should include a determination of the amount of use the area receives throughout the year. It appears that field studies are to be conducted only during July and August. This will not provide an accurate assessment of use patterns and numbers. Winter recreation use should be quantified. The possible effects to recreation users by fluctuating water levels and lake ice changes should also be studied.</p>	<p>See response to Comment 81.</p> <p>Comment noted. A winter site visit was added to the Recreation and Visual Resources Study Plan. Information gathered on winter recreation use of the area will be evaluated in the draft and final license applications.</p>
86	07-02-10	USFS	p. 3, PP2	The Forest Service will be constructing the INHT from Ptarmigan Creek to Vagt Lake in 2010 and 2011. The INHT alignment will be cleared of brush and logs from Vagt Lake north to Trail Creek in 2010. This construction project includes upgrades to the existing Vagt Lake Trail to its start near the mouth of Trail Lake. (The Vagt Lake Trail is part of the INHT.)	Comment noted. KHL looks forward to continued coordination with the Forest Service and ADNR regarding the INHT.
87	07-02-10	USFS	p.4, PP1	It should be noted that access to Grant Lake will be available via the planned INHT.	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><a href="#">Pg. 5 Recreation and Visual Resources Study Plan</a></p>
88	07-02-10	USFS	p. 4	In the section titled "Need for Additional Information," in the first bullet, sightseeing should be added to the list of activities.	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><a href="#">Pg. 6 Recreation and Visual Resources Study Plan</a></p>
89	07-02-10	USFS	p. 4	In the section titled "Need for Additional Information," it should be stated that there is a need to assess the effects on the user experience of those traveling the planned INHT.	<p>Comment noted. KHL looks forward to continued coordination with the Forest Service and ADNR regarding the INHT.</p> <p><a href="#">Pg. 6 Recreation and Visual Resources Study Plan</a></p>
90	07-02-10	USFS	p. 6	In the section titled "Field Study Design" in the first bullet, it should read "existing and planned trails and	The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.



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				access points" and "potential effects of fluctuating lake level or creek flow and project construction and operation."	<a href="#">Pg. 6 Recreation and Visual Resources Study Plan</a>
91	07-02-10	USFS	p. 6	In the section titled "Field Study Design" in the third bullet, it should read "walking on existing and planned trails, and other travel ways such as the frozen lake surface."	The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.  <a href="#">Pg. 7 Recreation and Visual Resources Study Plan</a>
92	07-02-10	USFS	p. 6	The visual assessment should also include views from the air due to the occurrence of private and commercial scenic flights in the area.	The Recreation and Visual Resources Study Plan was revised to include aerial views.  <a href="#">Multiple modifications throughout the document.</a>
93	07-02-10	USFS	p. 7	The section titled "Study Component #2" in the second paragraph states that visual simulation from up to four viewpoints will be provided. This number seems inadequate due to the size of the area and the variety of use areas and recreation activities identified. The number of viewpoints should be identified during the field study of recreation use of the area. Examples of viewpoints should also include those found in the eastern portion of the study area, and should include both winter and summer seasons.	The number of visual simulations is based on the extent of Project facilities, the scope and scale of the Project, and the potential views of the facilities from areas most likely frequented by potential viewers (e.g. Moose Pass, the Seward Highway, and the planned alignment of the INHT). Study Component #2 has been revised to include aerial views.  <a href="#">Pg. 8 Recreation and Visual Resources Study Plan</a>
94	07-06-10	NPS		As a general comment, both of these study plans [Recreation and Visual Resources and Terrestrial Resources] would benefit from clarification of the geographic boundary of the proposed study area(s). While KHL is still refining the design and location of project facilities such as roads and transmission lines, it is nonetheless possible to outline study areas for known project features. For example, project operations would result in fluctuating elevations in Grant Lake, causing impacts to the entire shoreline of the lake, including the eastern end of the lake. Therefore all plans, including the terrestrial resources study plan, should include surveys of existing conditions in this area. Likewise, the visual resources study plan should include the viewshed that could be affected by the project; generally, the area bounded by the height of land surrounding Grant Lake, to include locations south, west, and north of Moose Pass wherever new structures, roads,	The Terrestrial Resources Study Plan and the Recreation and Visual Resources Study Plan are designed to collect data regarding the potentially affected resources. Potential effects of the Project will be presented in the draft and final license applications.

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				powerlines, or the altered lake shoreline would be visible. The vicinity map provided in the draft plans lacks such details.	
95	07-06-10	NPS	p.9	<p>The schedule provided on p. 9 of the RVRDSP for completion of the study reports is wholly unreasonable. To NPS's knowledge, the Human Environment Work Group has not yet formed. KHL's deadline for written comments on the RVRDSP is today, 7/6/2010, and it will likely take the applicant and its consultants several days to analyze the comments. KHL's study designs are still quite vague, amounting to little more than a literature search with limited field reconnaissance. It is not clear if or how recreational users will be counted or interviewed, or how these subjects – including visitors from outside the area, and participants in fall, winter, or spring activities – will be chosen. Yet KHL proposes to have its study reports completed by November, just four months away. NPS does not believe this approach will provide the necessary level of detail or scientific rigor to allow FERC to make an informed decision about the likely impact of the proposed original project license on public interests, including recreational and aesthetic resources.</p> <p>For all known and potential recreational resources in the project area, including those identified below, KHL should develop specific study plans. Such plans should include sample locations, methods, timing, frequency, data analysis, and review process. NPS encourages KHL to form a "Human Environment" technical working group as soon as possible to help guide this effort, and would be an active participant. Based on the vague description of this group's formation, role and function on p.6 of the RVRDSP, it is not clear whether the work group has already been established, nor whether KHL intends to involve the group in helping develop sound recreational use study design.</p>	<p>The schedule for consultation and development of the study report has been revised. KHL will consult with agencies regarding the most efficient means of consultation during ongoing study work.</p> <p><b>Pg. 10 Recreation and Visual Resources Study Plan</b></p>
96	07-06-	NPS		Where available, KHL should use the land	The Recreation and Visual Resources Study Plan was developed

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	10			managing agencies' goals for recreational experience in the area to help inform study objectives. If such goals have not been established, KHL needs to evaluate existing <b>recreational opportunities</b> – not just recreational use <i>per se</i> -- and then determine, through use of ROS or similar methodology, what affect the project would have on the recreational setting. Interviews with recreational users should also be conducted in advance of developing use-specific study plans to help determine what specific experiences these users are seeking.	commensurate with the scope and scale of the Project.
97	07-06-10	NPS		The type and amount of recreational use in Alaska is highly dependent on ease of access. Easier access does not, however, make for “better” recreation. It merely alters the kind of use an area receives, and, in many cases, the kind of user attracted to the area. If the Grant Lake project is built, existing users may be displaced because the project area no longer meets their needs and preferences. When interviewing current and potential recreationists, KHL should include questions about whether the users would continue to visit the area once the access road and powerline were built, and if Grant Lake no longer supported activities like skating or skiing due to lake level fluctuations. Where would these users go instead and what impact would this displacement have on other areas?	Comment noted. KHL appreciates the recommendations for study considerations.
98	07-06-10	NPS		Likewise, depending on KHL's proposed access policies (which should be described in the study report), new users may be attracted to the area for fishing, car-top boating, hunting, ATVing, and snow-machining. How will KHL accommodate these users? Would parking, including space for trailers, be needed?	Kenai Hydro will rely upon the relevant land management agency direction to determine recreational access to the area, and will work with agencies to develop proposed access management policies, as appropriate, for the license application.
99	07-06-10	NPS		Will any parts of the proposed project be off-limits to recreationists due to security or safety considerations? If so, how will this affect recreational opportunities and experiences? What method does KHL intend to use to implement any access limits?	The final license application and facilities proposal will describe access consistent with appropriate land management agency objectives, and any potential safety issues that are identified with the facilities proposal.

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100	07-06-10	NPS		The timing and duration of each study should be based on relevant factors. In some cases, a single season or year of data collection may not be adequate to determine existing levels of recreational use due to variability in snow cover, ice formation, salmon returns, tourism levels, barriers to access such as avalanches or major road and bridge work on the Seward Highway, etc. KHL's study plans and schedules should take this reality into consideration.	Comment noted. Relevant conditions that occur during the study will be discussed in the Recreation and Visual Resources Study Report and as part of the analysis in the draft and final license applications.
101	07-06-10	NPS		<p>NPS is aware of the following recreational resources in the project area; however, additional types of use, including potential new uses over the term of any FERC license, doubtless exist:</p> <ul style="list-style-type: none"> <li>• Hiking, including backpacking</li> <li>• Camping</li> <li>• Day use</li> <li>• Nordic Skiing</li> <li>• Backcountry (metal-edge) Skiing</li> <li>• Skating</li> <li>• Mushing</li> <li>• Snow machining</li> <li>• ATVing</li> <li>• Hunting (Moose, goat, sheep, etc.)</li> <li>• Fishing (both for resident species and for salmon)</li> <li>• Berrying</li> <li>• Bird-watching</li> <li>• Wildlife-viewing</li> <li>• Boating</li> <li>• Sight-seeing</li> </ul>	Thank you for the comment.
102	07-06-10	NPS		Project facilities will affect the Iditarod National Historic Trail. Studies to assess these impacts are needed. What recreational experiences do existing and future users of this important trail resources seek? What types of recreation occur, or are likely to occur over the next 50+ years, along the trail? How would the project's facilities (road, powerline, power house, fences, gates, and security lighting) and operations (access across the INHT) affect	See response to Comment 81.

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				users' experience along this historic route?	
103	07-06-10	NPS		The project may also affect conceptual plans for the area as developed by the KPB Trails Commission, the State of Alaska, and the U.S. Forest Service. KHL should evaluate the impact of the project on these plans, which include development of local and regional trails, including a hut-to-hut route.	Consistency with existing plans will be addressed in the final license application.
104	07-06-10	NPS		NPS suggests that the visual resources section of the overall study plan be expanded to include other aesthetic impacts, such as potential changes in the natural soundscape resulting from project construction and operation. For example, there will be noise from motorized vehicles used to access project construction and operation sites, and the altered flow regime downstream of the Grant Lake weir may affect the natural sounds of the creek. The magnitude and duration of such project-related noise and changes in natural sounds should be estimated and evaluated.	Estimation and evaluation of the effects of Project construction and operation on area noise and natural sounds will be included in the draft and final license applications.
105	07-06-10	NPS		As mentioned above, the recreational resources studies need to have clear geographical boundaries. Key observation points for recreational users should help inform the geographical scope of the aesthetics study. Flight-seers should be included as recreational users. The visual effect of the "bathtub ring" around Grant Lake should be included in the impact analysis, as should any likely changes in the extent or duration of ice formation on the lake.	See response to Comments 92 and 94.
106	07-06-10	NPS		How will KHL determine which four viewpoints should be used in developing visual simulations of the project? Why four? Does KHL have criteria with which to rank the relative importance of project viewpoints? What methods (e.g. an online visual preference rating survey, focus group, interviews with existing project area users, evaluations by potential visitors) will KHL use to assess the impact of the simulated project? How will KHL capture the opinions of tourists?	The Recreation and Visual Resources Study Plan was revised to clarify the methods.  Multiple modifications throughout the document.
107	07-06-10	NPS		The effect of any security lighting associated with the project on night skies should also be evaluated.	The license application will state whether any lighting is necessary with the final facilities proposal, and will consider the potential

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					effects of lighting, if any is proposed.
108	07-06-10	NPS		The project, if licensed, will affect recreation and visual resources for 30-50 years. How does KHL intend to estimate future recreational demand in the area? What methods will KHL use to assess the cumulative impact of this project and other developments on the affected area's visual and recreational resources?	The Recreation and Visual Resources Study Report and draft and final license applications will present information on recreation trends in the Project area. FERC has identified recreation resources as an area that will be included in the cumulative effects assessment in the Project EA.
109	07-06-10	NPS		Are new facilities (e.g. boat launches, parking areas, or improved trails) needed or desirable to accommodate changing recreational use in the area?	The need for new facilities will be evaluated in consultation with agencies and stakeholders based on the study results and assessment of Project effects in the draft and final license applications.
110	07-06-10	ACE	p.4	The road is of particular interest to many local residents as they know from experience the impacts roads can have on an area. On p 4 of the draft plan, are four identified areas that need further study. We would also like to see an analysis of potential impacts that could result from increased access into the area and adjacent backcountry.	See response to Comment 98, regarding agency coordination to formulate a management plan for public use of the Project access road. The impacts to resources from construction and use of the Project access road will be analyzed in the draft and final license applications.
111	07-06-10	ACE		Many of the local residents are concerned about whether the lake will be safe to ski on in the winter months as the level of the water is drawn down over the course of the winter.	Impacts to winter recreational use of Grant Lake will be discussed in the Recreation and Visual Resources Study Report and analyzed in the draft and final license applications.
112	07-06-10	ACE		Mentioned in the draft study plans is a plan to organize a Human Environment Working Group, and we encourage the proponents to follow through with their schedule as proposed.	Comment noted. KHL will consult with agencies regarding the most efficient means of consultation during ongoing study work.
113	07-06-10	ACE	PAD	Recreation-one of the region's top sectors of employment and economic development this topic needs to be evaluated in more depth by a qualified consultant who has an understanding of the intrinsic and off-site benefits of recreation. The PAD claims (p108) no adverse impacts have been identified on recreation resources, illustrating that this is an area that needs further study.	Comment noted. The Recreation and Visual Resources Study will be collecting data on recreation use in the Project area. The Recreation and Visual Resources Study Report and the draft and final license applications will evaluate Project related impacts to recreation resources.
114	07-06-10	ACE	PAD	Motorized vs. non-motorized – what happens to the value of recreational lands when access by motorized vehicles is introduced? What additional maintenance and enforcement will be needed with the introduction of new roads? What precautions will be taken to minimize poaching, litter, fire,	Access management needs will be evaluated in consultation with agencies and stakeholders based on the resource goals of the land management agencies.

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				illegal camping, invasive species, erosion? Current levels of law-enforcement by the Forest Service is insufficient to prevent degradation of wetlands, forested areas, and even alpine habitats (sheep and mountain goat habitat in the Falls Creek drainage, as one example) on the Chugach National Forest due to unauthorized ATV use.	
115	07-06-10	ACE	PAD	Carrying capacity-how many more people, and what type of uses will occur in the area if access is improved?	Access management needs will be evaluated in consultation with agencies and stakeholders based on the resource goals of the land management agencies.
116	07-06-10	ACE	PAD	Tourism- what do people who visit the area do now? What draws them here? How might this change with increased development in the area? The PAD implies that activities such as scuba diving occur in the area. Obviously the information needs some refinement and updating.	See response to Comment 113.
117	07-06-10	ACE	PAD	Community Quality of Life Values-what do people most appreciate about living/working/playing in the area?	See response to Comment 113.
<b>Cultural Resources Draft Study Plan</b>					
118	07-02-10	USFS		The methodology and consultation process for cultural resources defined in the draft study plan is acceptable. However, the figure displayed on page 11 should reflect the current, updated map. The Area of Potential Effect (APE) needs to be adjusted to accurately encompass the proposed project facilities and access roads. The cultural resources and surveys listed in the tables on Pages 4 and 5 may also need to be modified.	Comment noted. The Cultural Resources Study Plan will be revised to include updated information and maps of Project facilities. The APE will be adjusted as necessary.
119	07-01-10	RBCA	p.7	RBCA believes the APE as proposed is too narrowly defined...  We believe that the vertical measurement is appropriate but the horizontal measurement should be increased to 100 feet. Additionally, all structures, turnarounds, transmission corridors, pipelines corridors, dam sites, surge tank, power plant, staging areas, fill areas, pullouts, appurtenant facilities and road alignments should be specified and located. All known site areas including current and formerly	Consultation for Section 106, including the appropriate extent of the APE will continue. Recommendations of the consulting parties will be incorporated into a revised APE. The schedule for consultation and completing the resource studies was revised.

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				used trails should be included in the APE and the 100 foot measurement extended beyond those site area boundaries. The APE should include all the small alluvial fans that drain into Grant Lake. These areas may have offered usable space to earlier inhabitants.	
120	07-01-10	RBCA		KHL has not committed to a road corridor nor transmission line type (which would affect corridor width). Three route alignments have been proposed. Defining an APE without a KHL commitment to infrastructure locations creates inefficiency and introduces the possibility of error. Until an APE is defined, KHL should consider surveying a larger study area that would include the area north of Falls Creek to Grant Creek.	KHL filed with FERC a revised project description and facilities figure on August 13, 2010. This description was also considered in FERC's Scoping Document 2. KHL will continue consultation with appropriate agencies regarding the road alignment and facilities location. An updated facilities description and figure will be included in all study plans.
121	07-01-10	RBCA		The reported (Ebasco study page 4-8) trail between site SEW-285 (Solars Sawmill) should be relocated and surveyed.	Potential Project mitigation activities will be assessed relative to the final proposed Project presented in the draft and final license application.
122	07-01-10	RBCA	Methodology	Typically, all artifacts uncovered in shovel tests or test units are collected and curated. We think that should occur with this study as well.	Comment noted. Study methods will comply with current standards and practice. The Cultural Resources Study Plan will be revised to clarify methodology.
123	07-01-10	RBCA	Methodology	Because the vegetation along the shoreline is dense and choked with beetle-killed fallen spruce, walking is difficult but not impossible. We think than in addition to a pedestrian reconnaissance of the shoreline within the APE, the entire shore should be surveyed by boat.	See response to Comment 122.
124	07-01-10	RBCA	Methodology	Should construction of the Grant Lake dam occur and the lake level reduced, KHL should inventory newly exposed shoreline for cultural artifacts and features, especially, but not limited to, near known historic sites. Water bodies provide an attractive place to dispose of trash historically and currently.	See response to Comment 122. The Historic Properties Management Plan required for the Project will provide guidance for handling exposure of cultural artifacts during Project construction and operation.
125	07-01-10	RBCA		We'd like to reiterate comments made by Judy Bittner, Alaska State Historic Preservation Officer at the HDR-sponsored cultural meeting in Anchorage on June 24, 2010. She emphasized that the Iditarod National Historic Trail is of <i>national</i> importance, not just important locally or regionally. She also mentioned the need to consider the Iditarod trail in	Comment noted.



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				the context of a recreational resource and as a cultural resource.	
126	07-01-10	RBCA		Do not rely on existing cultural resource inventories. The USFS studies focused on selected areas in conjunction with proposed prescribed burning. The EBASCO study didn't address the shoreline of Grant Lake. Plus in the 26 years since the EBASCO study was conducted, sites have deteriorated. For example, the cabin standing at SEL-285 in 1984 has collapsed.	Comment noted.
127	07-01-10	RBCA		Because the rising lake levels will have an adverse effect on cultural resources, KHL should begin planning immediately on how to address the impact.	If inundation will occur based on the final Project proposal, potential effects of this inundation, and any proposed mitigation, will be presented in the draft and final license applications.
128	07-01-10	RBCA		<p><b>Excavation</b> RBCA suggests KHL assess the threat to the stability of the log cabin at SEL-659 by higher water levels and if necessary develop a mitigation program.</p> <p>Intact subsurface deposits exist within the 10 foot level at SEL-659. Because the site area is large (approximately an acre) and located at the shoreline, it is reasonable to expect that this deposit is extensive horizontally, potentially as much as 200 feet. Intact subsurface deposits exist at SEL-285 though they appear to be much less extensive than at SEL-659. KHL should be aware of the cost and complexity of site excavation in its study plans and budgeting for the proposals. We suggest planning on a 100% excavation (see RBCA comments on the KHL Pre-Application Document) of the portions of the site directly impacted by rising water levels (Grant Lake elevation plus 10 feet vertical).</p> <p>Increased access to Grant Lake and other known and not yet discovered sites within the APE will subject them to the threat of vandalism. KHL should assess the threat of vandalism and develop a plan for mitigation.</p>	If inundation will occur based on the final Project proposal, potential effects of this inundation, and any proposed mitigation, will be presented in the draft and final license applications.
129	07-01-	RBCA	Table 2, page	Solars Sawmill is misidentified as SEW-00258. It's	Comment noted. The Cultural Resources Study Plan was revised as

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	10		5	actually SEW-00285. The site has not been determined not eligible as indicated.	necessary.
130	07-01-10	RBCA	Page 5	We noticed that SEW-155 (Brosius cabin) was not included in the tables.	Comment noted. The Cultural Resources Study Plan was revised as necessary.
131	07-01-10	RBCA		Other sites nears Falls Creek should be included in the study plan.	Comment noted.
132	07-01-10	RBCA	Page 5	The Carter Lake trail is misidentified as being within one mile of the proposed APE.	Comment noted. The Cultural Resources Study Plan was revised as necessary.  Pg. 6 Cultural Resources Study Plan
<b>Water Resources Draft Study Plan</b>					
133	7-9-10	USACOE	Erosion Study Component	This study plan indicates that an erosion study will be done on the shores of Grant Lake to determine how raising the elevation of the water would affect shore erosion and we support this analysis. However, no mention is made of studying the effects of the dam and altered flow on aspects of Grant Creek other than the potential effect to fishes. In order to fully address the effect of the potential fill, we must also know the anticipated effects of the project on Grant Creek. How would the change in current patterns and water circulation alter or erode the physical substrate, not just the suitable spawning habitat, of Grant Creek? In addition, how would the proposed project affect sediment transport and deposition in both the lake and the stream?	Comment noted. The qualitative erosion study initially proposed for Grant Creek will be replaced with a program that includes quantitative sediment sampling and modeling of sediment availability and transport. The license application will analyze potential effects on both Grant Creek and Grant Lake substrate commensurate with the scope of the Project.
134	07-02-10	USFS	p.3	A reference identified in the Aquatic Resources Draft Study Plan (Source: Grant Lake Morphology in Marcuson, P. 1989. Coho Salmon Fry Stocking in Grant Lake, Alaska, USDA Forest Service, Seward Ranger District, Chugach National Forest, February 1989) states: “An upper basin of Grant Lake has a maximum depth of 80 feet and a lower, outlet end exceeding 90 feet in depth. The two basins are separated by a narrow isthmus with an island and less than 10 feet of depth.” Lake depths in the area in question should be evaluated and this statement verified. If true, there	The maximum drawdown of the lake as currently designed will be to an elevation of 687 feet, whereas the elevation of the isthmus between the basins is at elevation 685 per the existing bathymetry. Consequently, there should be no disproportionate drawdown.  These depths will be confirmed during pre-licensing field work, and any potential effects will be discussed in the final license application.

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				could be a disproportionate drawdown of the lower basin and there may be a need to dredge between, or otherwise connect, deeper regions of the upper and lower portions of Grant Lake.	
135	07-02-10	USFS	Figure 1	Please note that the draft study plan should display the updated project map.	Comment noted.
136	07-06-10	USFWS		USFWS recommends developing SMART objectives with statistical criteria, sampling design, and methods that will provide quantitative estimates for the impact of Project construction and operation on water quality, hydrology, and ice conditions of Lower Trail Lake and Trail Creek. (See USFWS comment letter p. 8 for full detail of comment.)	The intent of the study plans is to provide information commensurate with the scope of the proposed Grant Lake Project. While KHL questions whether the SMART system of developing objectives is fully applicable to all the required studies for the Grant Lake Project, revised plans provide additional definition of objectives. The study plans were modified to include a hierarchical discussion of objectives that includes overall project objectives, specific study objectives, and statistical objectives with emphasis on hypothesis testing where applicable.
137	07-06-10	USFWS	Erosion Study	The Grant Lake shoreline erosion study and Grant Creek substrate recruitment studies would both benefit from SMART objectives. As currently proposed, both studies will result in qualitative assessments that will be open to interpretation.	See response to Comment 136.
138	07-06-10	USFWS		USFWS recommends targeting data collection to adequately describe coho salmon spawning habitat and suitability criteria. Coho salmon likely spawn in Grant Creek as late as November, which may coincide with increase stream flows during project operations in future years. Adequately describing adult coho salmon spawning habitat is necessary as baseline data to evaluate potential Project impacts and cumulative effects.	Determination of numbers, spawning locations, and suitability criteria was included in the Aquatic Resources Study Plan.
139	07-06-10	USFWS		USFWS recommends describing flow conditions at transects during winter months. (See USFWS comment letter p. 9 for full detail of comment.)	The winter study program was expanded to include Instream Flow transects.
140	07-06-10	ADFG	Goals and Objectives	As with the Aquatic Resources Draft Plan, we recommend that the objectives are revised to be more specific and repeatable. Objectives need to be specific in terms of what parameters are being estimated and when relevant, under what criteria for accuracy and precision. The overall goal is to	See response to Comment 136.

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				<p>estimate how proposed operation scenarios will alter hydrologic, thermal and chemical regimes and how these alterations will influence the maintenance of fish habitat.</p> <p>Flowing water has been referred to as the “master” variable that drives the creation and maintenance of aquatic and riparian habitats. Reductions in flow and flow variability have predictable, albeit general, consequences. Reductions in flow reduce the availability of aquatic habitat and reductions in flow variability impair a streams competence to maintain habitat. Stabilization of the flow regime typically results in coarser substrates, channel incision and reduced lateral hydrologic connectivity. Since the lateral margins and off-channel areas of streams are important for spawning and rearing, reductions in lateral hydrologic connectivity can result in substantial reductions in biological productivity.</p>	<p>Comment noted. See Instream Flow Study Component of the Aquatic Resources Study Plan.</p>
141	07-06-10	ADFG	4.2.1	<p>We support the general approach for the collection of water quality and continuous temperature data. We recommend, however, the installation of an additional continuous temperature data logger in the off-channel environment. In addition, and as stated above, we also recommend the collection of instantaneous field measurements throughout the full range of meso habitats identified in the Aquatic Resources study.</p>	<p>Continuous temperature data loggers will be added at selected off-channel locations. Instantaneous temperature measurements have been and will continue to be collected at meso habitat locations. See Instream Flow Study Component of the Aquatic Resources Study Plan.</p>
142	07-06-10	ADFG	4.2.2	<p>One stream gage is proposed near the historic USGS gage location. This should be sufficient provided that additional field measurements of discharge are made at various locations along Grant Creek. We recommend periodically taking synoptic discharge measurements at the outlet of Grant Lake, near the outlet of the canyon, and downstream of the gage to assess accretion due to tributaries and/or interactions between ground and surface water. Accretion in the canyon reach, if present, will be important to consider when evaluating instream flow needs in the proposed bypass reach. Accretion below the proposed powerhouse location will be important</p>	<p>Meaningful accretion estimates will be very difficult to measure in Grant Creek because small differences will be masked by measurement errors. Nevertheless, an accretion study at low flow using either salt dilution or direct measurement techniques has been added to the study program.</p>

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				<p>when evaluating proposed releases from the powerhouse.</p> <p>In support of the development of hydrologic records at the proposed stream gage, we recommend conducting more than three discharge measurements. A sound stage-discharge rating typically requires more than three measurements. We also recommend conducting measurements in early April to measure base flow conditions and throughout the summer and fall. The data from the stream gage should also be frequently downloaded to ensure that it is still working properly and replaced if necessary.</p>	Comment noted. Combined discharge measurements between the hydrology and instream flow study programs will provide an adequate number of measurements at a variety of flows.
143	07-06-10	ADFG	4.2.3	<p>More specificity is needed for these studies. Procedures used to evaluate sediment transport and erosion should be described. We also recommend using the hydrologic record to estimate the magnitude, timing and duration of flows needed to transport sediments and maintain downstream fish habitat. High flows are also needed to maintain off-channel habitat and provide seasonal access to these habitats.</p>	<p>The qualitative study initially proposed for Grant Creek was replaced with a program that includes quantitative sediment sampling and modeling of sediment availability and transport. Methods to be used in the Grant Lake Shoreline Erosion Study have been clarified.</p> <p><b>Pg. 14 Water Resources Study Plan</b></p>
144	06-04-10	KWF	PAD	<p>The PAD for water resources and aquatic resources are insufficient to provide meaningful comment.</p> <p>The premise of the proposed studies as described in the PAD are to gather baseline data, not to address impacts from potential hydro development scenarios. Gathering baseline data is not adequate in this context. It is unclear what the scope of the hydro-development project is. The range of publicly stated options by the applicant Kenai Hydro has been very wide, the scope must be narrowed to provide more meaningful comment on specific studies necessary.</p>	The intent of the PAD was to report existing information. Where information gaps exist, or more recent information is necessary for evaluation of Project effects, the water resources and aquatic resources study reports will provide additional information regarding existing resources in the Project area.
145	06-04-10	KWF	PAD	<p>Hydrologic Data Records</p> <p>The period of record for all aspects of hydrological data is both too historic and of insufficient duration to support any assumptions or predication that are flow dependent. Statistical measures of hydrology</p>	Very few Alaska projects are accompanied by a hydrological record that is sufficient for optimal statistical analysis. The combination of historic and current hydrological measurements will provide a reasonable framework for engineering and environmental analysis. Limitations of the data will be discussed in the study reports and in

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				play a key role in every aspect of modeling and predicting impacts from altering natural flow regimes. Statistically valid flow frequencies and temporal rates-of-change will not be available with the proposed studies, a longer and more modern record is required.	the license application documents. Ongoing hydrological monitoring including post-construction will extend the record and allow project adjustments if needed.
146	06-04-10	KWF	PAD	<p><b>Sediment Transport</b>  The relationship between flow regimes and sediment transport is a well-developed, complex science. A wide range of numerical models are available; however the PAD suggests studies related to sediment transport will be limited to a qualitative 2-day field observations and reported in the form of a “memo”. Given the relative importance of the role sediment has on economically important species this approach seems woefully inadequate.</p> <p>The ability to model 2-D varied unsteady flow with realistic and statically valid flow data, coupled with existing sediment transport models that have been calibrated to the existing conditions should be available for analysis. Any sediment transport model used should be calibrated to empirical data representative of the existing condition; with simulations under the full range of proposed modifications AND full range of uncertainties should be produced. The suggested modeling exercise should also include predictions of catastrophic impoundment failure.</p> <p>Recruitment of stream substrate, woody debris and other detritus are fundamental components of the physical environment and appear to be absent from either basic monitoring or study plans. Detailed bulk grain-size analysis of sufficient sample size to characterize the sediment distribution from both the active bed and sub-active layer are required to evaluate predicted changes to stream-bed over the engineered design life. Wolman pebble counts or similar methods are insufficient to characterize grain-size distributions.</p>	See response to Comment 143.

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				Sediment data derived from bulk samples should be collected in multiple reaches, as the stream is recognized to have segments that are in equilibrium with the available sediment, as well as reaches of erosion and deposition. It is not possible to offer valid predictions on how the substrate will respond without quantifying the existing substrate. This should include, but not be limited to the discharge required to maintain channel form in each segment; flooding frequencies and flows required to mobilize bed material should be available as well as the range of flow required to recruit and transport the full distribution of bed sediment. Each of these sediment concerns must be related to stream biota downstream of impoundment and delineated through the entire downstream zone of influence, including Trail Lake.	
147	06-04-10	KWF	PAD	Implication of altered thermal regimes: No information is planned to evaluate the altered temperatures in the context of the relationship to existing food at the time of organism emergence. While temperature concern is recognized in the studies, the implications of altering the emergence of aquatic life is not addressed. The relationship between aquatic life in Grant Creek and Trail Lake is not mentioned, and may be significant. That is, how are available food resources linked to emergence timing, are sufficient food resources available if emergence times are altered? Will there be increased competition for food resources?	The draft and final license applications will assess the impact of changes to temperature regimes (if any) on emergence timing and discuss potential impacts to fish.
148	07-06-10	ACE	PAD	Identify cumulative impacts to the watershed-there is currently no discussion of this in the PAD.	Scoping Document 2 identified resource issues that will be analyzed for cumulative effects in the final environmental documents.
149	07-06-10	ACE	PAD	Climate change-there should be some discussion about how water flows will change as a result of climate change. Bradley Lake is already suffering from a lack of water leading to diminished energy production. What will happen to Grant Lake in 30 or 50 years?	FERC noted in its Scoping Document 2 that predictions of future flow scenarios on any given stream would be too speculative given the state of the science [on climate change] at this time. However, we do suggest that when making flow recommendations and conditions, agencies consider whether different requirements for high and low water years are appropriate.
150	07-06-10	M. Cooney	PAD/Study Plan	As a show of good faith to project area residents and to demonstrate a strong commitment to environmental stewardship and protection, the	KHL will obtain all necessary state and federal permits to operate the Project. KHL does not control the policy of Alaska DEC regarding Clean Water Act Section 401 water quality certification.

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				applicant (HEA) should voluntarily seek formal water quality (Section 404, Clean Water Act) certification for the project though certification is not currently required by Alaska DEC for hydropower projects in Alaska.	
<b>Aquatic Resources Draft Study Plan</b>					
151	07-06-10	USFWS	Goals and Objectives	Specific objectives should be developed for each study component with a clearly specified level of precision and accuracy such that the objectives are statistically sound. USFWS recommends SMART objectives with statistical criteria, sampling design, and methods to provide quantitative estimates of potential project impacts identified for study. (See USFWS comment letter p. 3-4 for full detail of comment.)	See response to Comment 136.
152	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	A fish counting weir would provide better estimates. An objective was identified in the 2009 Draft Aquatic Biology Baseline Study Plan to conduct a feasibility study for siting and installation of a counting weir...Was this feasibility study completed? If so, what was the outcome? (See USFWS comment letter p. 4-5 for full detail of comment.)	Assessment of stream conditions in 2009 and 2010, in conjunction with evaluation of recently developed floating weir technology, suggest that a weir is feasible. The Aquatic Resources Study Plan was modified to include the use of a weir, possibly in combination with a video counting system, to enumerate salmon and rainbow trout, provide capture for telemetry studies, provide insight into stream life, and calibrate foot surveys.  Multiple modifications throughout the document. Primary weir discussion begins on Pg. 12
153	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	A SMART objective with statistical criteria could help guide sampling designs and methods to estimate abundance and spawning distribution of adult salmon in Grant Creek...a single estimate for observer efficiency for all counts is likely not appropriate because stream and observation conditions can be variable over the course of a spawning season. (See USFWS comment letter p. 5 for full detail of comment.)	See response to Comment 136.  Methods for refining observer efficiency estimates are described in the Final Aquatic Resources Study Plan  Multiple locations throughout the document
154	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	Regardless of the method selected, counts need to be continued through November to estimate numbers of adult coho salmon returning to Grant Creek. The only information for coho salmon collected to date in Grant Creek includes juvenile numbers and a small number of adults counted during the last	Comment noted. The existing study plan specifies that counts will continue through November.



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				walking survey in late September 2009. Coho salmon spawning abundance, distribution, and timing are key baseline population parameters that are necessary to evaluate potential Project impacts and cumulative effects.	
155	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	Develop SMART objectives with statistical criteria, sampling design, and methods to assess spawning distribution in Reach 5 for all salmon species, not just Chinook salmon. (See USFWS comment letter p. 6 for full detail of comment.)	See response to Comment 136.
156	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Minimize sampling effects on spawning fish during this critical and vulnerable time of their life history. Develop rigorous sampling protocol to address CPUE differences. (See USFWS comment letter p. 6 for full detail of comment.)	The Aquatic Resources Study Plan was modified to include sampling protocols in the vicinity of spawning fish.  Pg. 22 Aquatic Resources Study Plan
157	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Based on results of juvenile sampling in 2009, it appears that Dolly Varden are an important component of the fish assemblage in Grant Creek, yet little is known about their life history or habitat use in Grant Creek, particularly of adults. We therefore recommend investigations that describe the basic life history and habitat use of Dolly Varden in Grant Creek that includes estimates of spawning abundance and distribution and estimates of seasonal habitat use and migration patterns. (See USFWS comment letter p. 6 for full detail of comment.)	The Aquatic Resources Study Plan was modified to include expanded sampling during the late fall spawning period and during the winter to provide a more complete picture.  Multiple locations throughout the document.
158	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Develop SMART criteria to describe the migratory patterns of rainbow trout and Dolly Varden throughout the Kenai River watershed as baseline data. (See USFWS comment letter p. 6-7 for full detail of comment.)	See response to Comment 136.
159	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Round whitefish and Arctic grayling have been caught during angling surveys in Grant Creek and an assumption was made (page 5) that these species do not spawn in Grant Creek. We request additional information to justify this conclusion.	The suggestion of no spawning by grayling and whitefish was a conclusion drawn by earlier investigators. There is no assumption on the part of the current study team. However, ongoing and historical studies have indicated that these two species are so rare that targeted sampling would not be justified. Opportunistic observations of these species will continue to be made as part of general sampling programs and information updated as it becomes available.

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160	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Basic life history investigations should be completed to address a series of baseline data questions. (See USFWS comment letter p. 7-8 for full detail of comment.)	The Aquatic Resources Study Plan was revised to reflect more clearly data to be collected. The license application will use these data to evaluate potential Project effects.
161	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Develop SMART criteria to investigate overwinter survival and the availability of suitable overwinter habitat ... The information is necessary as baseline data to evaluate potential Project impacts and cumulative effects. [Additional methods such as PIT tags and mark-recapture are suggested.] (See USFWS comment letter p. 7 for full detail of comment.)	See response to Comment 136. A statistically supportable overwinter survival study would be difficult to conduct and is beyond the scope of the Grant Lake Project. However, the addition of a smolt outmigration study with spring sampling will provide direct evidence of juvenile fish production and overwinter stream use.
162	07-06-10	USFWS	Habitat Mapping and Critical Factors Analysis	USFWS 21: USFWS recommends that Habitat Availability and Habitat Utilization studies be conducted during winter so that results of the Instream Flow Analysis will also be applicable during winter.	The winter study program was expanded to include habitat utilization at the instream flow transects.  <b>Pg. 19 Aquatic Resources Study Plan</b>
163	07-06-10	USFWS	Habitat Mapping and Critical Factors Analysis	USFWS 22: We recommend presenting a table or other analysis using information available in the peer-reviewed literature that models emergence timing of Chinook salmon, coho salmon, sockeye salmon, rainbow trout, and Dolly Varden based on changes in water temperature from current incubation temperature regimes.	The environmental analysis included in the draft and final license applications will include such an analysis based on the integration of study results and available models.
164	07-06-10	USFWS	Habitat Mapping and Critical Factors Analysis	USFWS 23: We recommend adding temperature as a "Habitat use Parameter" for "rainbow trout spawning" in Table 2 on Page 23 because it is likely an environmental cue that influences the onset of spawning for rainbow trout in Grant Creek.	Temperature was added to Table 2.
165	07-06-10	ADFG	Goals and Objectives	In general, we recommend that the objectives are revised to be more specific and repeatable. Objectives need to be specific in terms of what parameters are being estimated and when relevant, under what criteria for accuracy and precision.	The general goals expressed at the beginnings of the study plans were intended to be consistent with those expressed in the PAD and to conform to the requirements of the FERC application process. The objectives of specific study elements are explained more fully and made more specific. See response to Comment 136.
166	07-06-10	ADFG	Goals and Objectives	Impact of project operation on sediment transport. Comment: such an assessment would require an estimate of the particle size distribution of the surface layer of the stream bed, an estimate of flows needed to mobilize this distribution and the flow	See response to Comment 165.

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				duration of these flows based on the historic period of record. We recommend restructuring this statement into an objective statement that specifically addresses the estimation of these physical parameters.	
167	07-06-10	ADFG	Goals and Objectives	<p>Impact of project operation (in terms of hydrologic regulation) on fish abundance and distribution. Comment: this statement requires more specificity and several prerequisite objectives. To assess impacts to the distributions of fish, the distributions of habitats utilized by fish must first be assessed, followed by quantitative assessments of fish habitat utilization. These should be two separate objectives. The relationships between utilized habitats and the natural flow regime must then be modeled to estimate instream flow needs to support existing fish habitat utilization patterns and comparison with alternative operation scenarios.</p> <p>We recommend framing a separate objective to estimate the impacts of hydrologic regulation on fish abundance and question whether or not estimations of abundance can be used to assess impacts associated with hydrologic alteration resulting from the proposed project. Specifically, we question whether or not adequate levels of accuracy and precision for population estimates can be met to attribute any changes in populations to hydrologic alteration associated with the proposed project. We agree that there is value in enumerating populations of fish and putting those populations in the context of the Kenai watershed, but we question whether these estimates with their associated variability and uncertainties, can be used to measure changes in fish populations with sufficient accuracy and precision. These estimates, when put in a watershed context, can be useful in a comparative analysis and possibly for future mitigation analysis, if needed. At this point, however, our focus will be on the avoidance of impacts to fish habitat.</p>	Comment noted. See response to Comment 165.

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168	07-06-10	ADFG	Goals and Objectives	Impact of project construction and operation on biological productivity and abundance of fish food organisms in Grant Creek. Comment: impacts resulting from project construction should be quantified in terms of the total amount of habitat lost or converted to project infrastructure. Objectives for estimating biological production and the abundance of fish food organisms need to be specific in terms of what parameters are being estimated.	Comment noted. See response to Comment 165.
169	07-06-10	ADFG	Goals and Objectives	Impact of project construction on fish habitat in Grant Creek. Comment: we recommend quantifying the total amount of fish habitat displaced or converted by project infrastructure.	Comment noted. See response to Comment 165.
170	07-06-10	ADFG	Need for Additional Information	2009 field studies provide a good foundation for this summer's studies but were more reconnaissance and qualitative in nature. Results of 2009 fisheries investigations are primarily reported by study reaches of the stream that are more for reference purposes. The results were also more qualitative in nature. In 2010, specific habitat attributes and fish habitat utilization patterns need to be quantified for each of these reaches so that instream flow needs can be assessed. The following list of information needs is listed in the 2010 aquatic resources draft study plan. We briefly provide our comments following each identified need and address each need in greater detail in the following respective sections. In general, we also recommend that specific and repeatable objectives are framed for each of the following data needs.	See responses to following Comments 171 through 179.  See response to Comment 127.
171	07-06-10	ADFG	Need for Additional Information	Determine juvenile fish use of winter habitats. Comment: we recommend that smolt trapping be conducted in addition to winter surveys. Although we are supportive of winter surveys, it is unknown whether or not they will be feasible. Smolt trapping in the fall and then again in spring is recommended to estimate the timing of outmigration and provide a better understanding of the rearing ecology of juvenile salmon in Grant Creek.	The Aquatic Resources Study Plan was modified to include smolt trapping in spring and fall.  <b>Pg. 19 Aquatic Resources Study Plan</b>
172	07-06-10	ADFG	Need for Additional	Better define fish use of microhabitats and overall species composition and relative abundances in	The Aquatic Resources Study Plan includes a habitat mapping component where all meso habitats will be identified. Within that

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			Information	reaches 1-4. Comment: we recommend a hierarchical approach to surveys and characterizations of aquatic habitat. The 2010 study plan switches between different spatial scales at which habitats are studied and referred to. We recommend a more thorough definition of meso habitats prior to definition of micro habitats. Similarly, we recommend greater detail and definitions for the habitat classification study. As with the 2009 studies, the USFS Tiered Habitat Survey 1 could be referred to for structuring the stratification and surveys of each stratum.	framework, important subcategories will be identified as appropriate for the conditions in Grant Creek. The Study Plan was clarified to include better definition of habitat types and classifications.
173	07-06-10	ADFG	Need for Additional Information	Determine the extent of rainbow trout spawning in Grant Creek. Comment: we assume this means the extent of the spatial distribution of rainbow trout spawning. If possible, we recommend telemetry for this purpose since access into the canyon reach (reach 5) is difficult and hook and line surveys may provide limited information, especially if rainbow trout are only using these upstream reaches for short periods of time.	The Aquatic Resources Study Plan was modified to include a telemetry component for rainbow trout.  Pg. 17 Aquatic Resources Study Plan
174	07-06-10	ADFG	Need for Additional Information	Determine use of reach 5 by juvenile and adult fish, with additional emphasis on spawning Chinook salmon use. Comment: We recommend the use of telemetry to assess the upstream distribution of sockeye as is proposed for Chinook. Sockeye are probably just as likely, if not more likely to utilize this reach for spawning.	The Aquatic Resources Study Plan was modified to include the use of telemetry to assess the distribution of sockeye salmon.  Pg. 15 Aquatic Resources Study Plan
175	07-06-10	ADFG	Need for Additional Information	Delineate aquatic habitats available in Grant Creek. Identify key habitats for fish and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek. Comment: This objective requires more specificity. We recommend characterizing meso habitats, as mentioned in #2 above, and then taking specific micro habitat measurements within the most heavily selected meso habitat units and within those that are relatively unselected. Appropriate statistical methods will be required to identify which micro habitat parameters are influential to site selection if	The Aquatic Resources Study Plan was modified to include greater specificity for this objective.  Multiple locations throughout the document

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				micro habitat parameters are to be used when modeling instream flow needs.	
176	07-06-10	ADFG	Need for Additional Information	Provide an estimate of salmon spawning escapement in Grant Creek. Comment: we recommend maintaining consistency with the 2009 methods and that assumptions used for the Area Under the Curve (AUC) method be tested with site specific observations of stream life and observer efficiency.	The Aquatic Resources Study Plan includes provisions for testing the assumptions used for the 2009 escapement estimates. See response to Comment 152.
177	07-06-10	ADFG	Need for Additional Information	Examine how important individual habitat units may be affected by changes in flow due to the operation of the proposed project using instream flow assessment methods. Comment: we recommend more specificity for this need/objective. We need quantitative estimates of how hydrologic connectivity with meso habitats and important micro habitat parameters change as a function of flow in Grant Creek.	The Aquatic Resources Study Plan specifically addresses this information need. Nevertheless, the greater specificity for this objective was provided in the study plan.  Multiple locations throughout Section 4.7
178	07-06-10	ADFG	Need for Additional Information	Collect benthic macroinvertebrates in Grant Creek to establish baseline diversity and abundance characteristics. Comment: this need/objective requires more specificity with respect to spatial scale how abundance will be quantified. We recommend estimating the relative density for each genus by habitat type. We also recommend providing these estimates for each meso habitat instead of leaving this unspecified.	The Water Resources Study Plan was modified to include greater specificity for this objective. The existing study plan is focused on providing a statistically valid baseline of relative productivity that can be compared from year to year. Duplicate sampling within uniform riffle habitats using approved methods is the commonly accepted methodology.
179	07-06-10	ADFG	Need for Additional Information	Collect periphyton samples in conjunction with macroinvertebrate samples in Grant Creek to establish baseline chlorophyll a availability. Comment: as with macroinvertebrates we recommend that these samples are stratified by meso habitats.	See response to Comment 178.
180	07-06-10	ADFG	Section 3.2.1	We support the continuation of ground surveys to assess the distribution and abundance of spawning salmon in Grant Creek but feel that telemetry or aerial surveys will most likely be needed to fully assess the distribution of spawning into the canyon reach (reach 5). We also recommend that surveys are performed frequently enough to account for stream life (the length of time fish are alive and	The Aquatic Resources Study Plan was revised to include a telemetry study of rainbow trout. See response to Comment 174 relative to sockeye telemetry.  Pg. 17 Aquatic Resources Study Plan  The frequency of ground surveys will be reviewed in light of existing data to determine whether more frequent observations

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				spawning in Grant Creek) of species being observed. As proposed, the frequency of surveys would be every 10 days. When conducting ground surveys and estimating populations using the AUC method, stream life and observer efficiency must be accurately estimated. If stream life is not greater than 10 days, population estimates will be underestimated. We support the use of telemetry to estimate the distribution of adult Chinook in Grant Creek and encourage the use of this method for adult sockeye and rainbow trout. Since fixed repeating stations are being installed to support the use of telemetry to estimate the distribution of Chinook it seems like a missed opportunity to not utilize this existing instrumentation to estimate the distributions of other species. For sockeye, we recommend spreading out the implantation of radio tags throughout the sockeye run to account for any life history differences that sockeye in the canyon reach may have. We recommend consultation with agencies on the number of radios that would be needed to assess adult sockeye distribution. This same recommendation applies to the objective of assessing the distribution of rainbow trout. It is important to know which species of fish are distributed within reach 5 since it is the proposed bypass reach and instream flow releases will depend upon the species that are present and the timing of their presence.	would be appropriate. Additionally, aerial surveys will be considered, and may be proposed to accompany at least some of the ground surveys with emphasis on Reach 5.  Comment noted.
181	07-06-10	ADFG	3.2.2.1	In 2009, the use of angling to estimate catch-per-unit-effort was not successfully used to obtain a sufficient number of recaptures to allow population estimates for rainbow trout. Instead of continuing this approach in the future, we recommend putting resources into a rainbow trout telemetry study so that the full spawning and rearing distribution of this species can be estimated. This will also prevent the need to conduct angling surveys in the canyon reach which will be restricted by access and implemented with unknown effectiveness.	The Aquatic Resources Study Plan was modified to include a telemetry program for rainbow trout.  <b>Pg. 17 Aquatic Resources Study Plan</b>
182	07-06-	ADFG	3.2.2.3	We support the proposed efforts to document rearing	See response to Comment 171.

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	10			of anadromous and resident fish in winter but are concerned that opportunistic minnow trapping and electro-fishing will not adequately document the winter ecology and life history of rearing fish. We support these efforts, but recommend trapping smolts in the fall and spring to estimate when fish emigrate from Grant Creek. If the majority of smolts are trapped in fall, rearing is likely limited in winter. This would certainly be supported by the presence of young of year fish and the lack of juvenile salmon in Grant Creek. Understanding the life history of rearing fish in Grant Creek is needed to assess instream flow needs for rearing on a seasonal basis.	
183	07-06-10	ADFG	3.2.2.4	In general, we support the procedures and gear types proposed to assess resident and rearing fish use of open-open water habitats. We recommend electro-fishing of young of year and juvenile fish, in compliance with collection permits, to allow more accurate identification of habitat associations and to quantify utilization, or the relative density of fish by specific meso habitats. We recognize that there are issues with deeper water and the presence of adult fish when using this gear type, but recommend its use in shallow off-channel habitats and habitats providing lateral refugia for young of year and young rearing fish. In many of these habitats, electro-fishing is the only viable method to sample fish and assess habitat utilization.	Comment is noted. Electrofishing will be employed as appropriate.
184	07-06-10	ADFG	3.2.3	Sampling and assessments of fish habitat utilization needs to be stratified by habitat. The delineation of meso habitats needs to be diversified. Several important meso habitats are not readily apparent in 2009 classification, which may result in their exclusion and unrepresentative flow-habitat relationships. In particular, sockeye salmon are commonly observed spawning along shallow shores or margins of the stream channel. It is not clear whether or not this would be included in the proposed “margins without undercut banks” meso habitat category. Units of the riffle-pool sequence are also not fully represented. This is important	<p>In order to be consistent with terminology used in the instream flow study, mesohabitats are defined as general habitat types. We recognize that specialized sub-categories of mesohabitats are particularly important in Grant Creek and agree that more sub-types need to be added to those identified in 2009 study reports.</p> <p>Regarding stratification and random sampling, because of the physical nature of Grant Creek (high gradient, dominance of riffles and cascades), the decision was made (and discussed with the Instream Flow Technical Work Group) to emphasize the identification and sampling of specialized high use habitats rather than attempt stratified random sampling. Quantitative sampling of 90% of the stream would be difficult or impossible. It is our</p>



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				because bed topography (Montgomery et al.; 19992) is an important driver of redd site selection. We realize that, due to its high gradient, Grant Creek is more like a continuous series of rapids. Still, this series is discontinuous and segmented by topographic highs and lows in the longitudinal stream profile. The tailouts of pools and channel bifurcations, although rare in this system, may be important spawning locations as they are in other stream systems. Off-channel habitats also need diversification. There are shallow –water habitats peripheral to both primary and secondary channels that should not be overlooked and there are shallow pond-like habitats present in several locations. These should be included in the mesohabitat classification and their relative distribution should be quantified as is proposed for the other meso habitats.	contention that the use of a statistically rigorous stratified random sampling approach to examine critical factors is not a viable technique under Grant Creek conditions. Targeting known fish use areas was seen as a more efficient and effective means of assessing potential impacts from hydrological changes. The 2009 study program identified high use fish areas that have highly specific characteristics that promote fish use. In most cases, fish observations combined with site specific physical measurements and professional judgment will be adequate to identify probable critical factors.  The Aquatic Resources Study Plan was modified to clarify these points.
185	07-06-10	ADFG	3.2.3	<p>Critical factors influential to habitat utilization patterns are difficult to identify and in some cases may not be possible to identify. The proposal is to record fish presence, and by default absence within discrete mesohabitat so that presence can be “correlated” with the specific habitat features (we assume micro habitat features) present at each location sampled. This will require a rigorous stratification of sampling of habitat and the presence and absence of spawning and rearing fish.</p> <p>This stratification will then require a statistical method to analyze the variance microhabitat parameters in mesohabitats utilized and those not. In cases where utilization of particular meso habitats is not consistent, it may be possible to attribute presence to a particular critical factor. In cases where utilization is high in a particular habitat that is rare, it may be difficult to attribute presence to any one particular critical factor. In such cases it will need to be assumed that such habitats are important to the production of fish in Grant Creek and that instream flow needs to support the continued use of these habitats will need to be assessed.</p>	See response to Comment 184.

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186	07-06-10	ADFG	3.2.3	An adequate suite of micro habitat features needs to be surveyed and quantified within occupied meso habitats to support assessments of instream flow needs. This suite of features includes water depth, cover of large wood debris and overhanging vegetation, distance to cover, distance from shore and site-specific water temperature. Water depth allows assessment of the range of depths that are suitable, and most importantly, what depths are needed to support specific life history stages of fish. Cover of living and dead wood provides refugia for young of year and juvenile fish, and distance to shore allows assessment of lateral hydrologic connectivity with undercut banks and shallow banks associated with the main channel. Temperature is a micro-habitat variable that is known to influence the distribution of fish on a seasonal basis and can be used to assess which habitats provide thermal refugia for young of year and juvenile fish.	Comment is noted. Our approach is specifically designed to examine the kinds of factors described in the comment. The Aquatic Resources Study Plan was modified to clarify that a full suite of factors will be considered.  Multiple locations in Sections 4.6 and 4.7
187	07-06-10	ADFG	3.2.4	An instream flow technical working group has been formed for this project and recently met in June, 2010 to discuss specific study plans for this proposed project. At these meetings, we learned of the proposal by the applicant to use a variety of instream flow assessment techniques and methodologies. The proposal discussed was to use a physical habitat simulation model (PHABSIM) and a wetted perimeter model.  ADF&G supports the meso and micro habitat analyses and their use in developing flow-habitat relationships. We also support the placement of transects at reaches most utilized by fish. We do not, however, support the use of these transects to assess habitat availability or assess habitat utilization. We recommend those procedures outlined in the preceding habitat mapping and critical habitat factors analysis section. As proposed, we have several concerns about the use of PHABSIM to model micro habitat parameters as a function of flow. The use of literature or “library” habitat suitability criteria and curves to model/simulate	See response to Comment 184.  We agree that any habitat suitability models taken from the literature for use in Grant Creek analysis will need to be selected carefully to match stream conditions as closely as possible.

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				<p>physical habitat as a function of flow is not expected to yield biologically meaningful estimates. For example, sockeye have been observed by project and agency biologists spawning in shallow, tranquil shoreline conditions, deep and hydraulically turbulent conditions, and within deep pools within the lower reaches of the canyon. It is not likely that literature curves can be used to represent this range of conditions. Furthermore, the curves for sockeye that are available from other Alaskan studies represent a different life history strategy exhibited by sockeye. Available curves for sockeye were developed within groundwater side sloughs of the Susitna River, which differ from Grant Creek in terms of hydrology, hydraulics and water quality. These curves do not appear to be transferrable to Grant Creek.</p> <p>Site-specific habitat suitability criteria (critical factors) could be identified and site-specific curves could be developed but these curves would only be meaningful if the criteria could be demonstrated to influence habitat selection. As stated in our comments on the identification of critical habitat factors, this would require comparative statistical analyses of sites heavily utilized and those with little to no utilization (Railsback; 1993). This would need to be done for each life stage and species whose habitat was being simulated with PHABSIM.</p>	As discussed in the response to Comment 184, a stratified random sampling approach to developing site-specific HS criteria is not considered viable in Grant Creek. Rather, habitat characteristics will be measured at transects placed within known high use fish areas. Habitat suitability models will be developed based on fish presence within these selected areas, supplemented by literature based models, and professional judgment including coordination with the Instream Flow Working Group. All HSI models to be employed in the Grant Creek analysis will be determined in consultation with the Instream Flow Working Group.
188	07-06-10	ADFG	3.2.4	<p>Another issue with the use of PHABSIM for this particular project involves the hydraulic environment of Grant Creek and hydraulic modeling. One dimensional hydraulic modeling with the PHABSIM methodology often leads to a scale mismatch between the scale at which fish are selecting habitat and the scale at which hydraulics are modeled (Kondolf et al.; 20004). In other words, fish may be selecting habitat at scales that cannot be modeled with a one-dimensional PHABSIM model. Although we do not feel this is always the case, the overall roughness, gradient, and resultant hydraulic turbulence of Grant Creek could lead to a PHABSIM model that provides poor predictions of</p>	There are trade-offs associated with 1-D and 2-D modeling. 1-D measurements were collected during the 2010 study period. This information will be presented and its use discussed at an Instream Flow Working Group meeting to be held prior to additional field study.

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				habitat area as a function of flow for this project. Two dimensional (2-D) modeling would allow for more accurate modeling of micro habitat parameters at the scale at which habitats are being selected. Still, if this approach were adopted, the issue with habitat suitability criteria remains. The use of library curves or those developed with professional judgment in conjunction with 2-D modeling can provide more accurate hydraulic modeling if designed, calibrated and developed appropriately, but may result in the inability to credibly attach biological relevance to modeled conditions. In order to identify which criteria influence habitat selection and develop curves that are representative, site-specific measure are needed. And, as described elsewhere in the Aquatic Resources Draft Study Plan, these measures must follow a strict stratification and include sites selected by each species and life stage under study, and those not. Only then can a statistical analysis of the variability in utilization be attributed to particular physical habitat parameters. Curves could then be developed for these criteria and, if used in conjunction with 2-D modeling would yield more realistic predictions of the area of important habitat based on how micro habitat conditions vary with flow.	See responses to Comments 184 and 187.
189	07-06-10	ADFG	3.2.4	Another approach identified in the Aquatic Resources Draft Plan is the use of a wetted perimeter model used to model wetted perimeter, depth and flow relationships. We recommend using these relationships to model the availability of meso habitats (e.g. shallow shorelines) utilized for spawning and rearing and important microhabitat features (e.g. cover) as a function of discharge. We also support the proposed use of these relationships to model thresholds of lateral hydrologic connectivity with lateral refugia and off-channel habitats utilized for spawning and rearing. This is necessary to assess instream flow needs to maintain hydrologic connectivity with habitats important to anadromous and resident fish species. This would allow estimation of how seasonal reductions in	Comment is noted. The Aquatic Resources Study Plan supports this approach.

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				flows would disconnect Grant Creek from important off-channel and channel margin habitat and when important main channel micro habitats, such as wood debris become inaccessible to spawning and rearing fish.	
190	07-06-10	NOAA – Fisheries		NMFS recommends studying the effects of powerhouse operations on instream flows and anadromous fish habitat. This study should include a comprehensive, scale-appropriate analysis of available habitat for spawning and rearing sockeye, Chinook and possible coho salmon in Grant Creek, to determine precisely where, when and to what extent spawning occurs, and an analysis of how that habitat is related to stream flow. (See NMFS comment letter p. 1-2 for full detail of comment.)	The Aquatic Resources Study Program is specifically designed to collect information regarding these potential effects. The environmental analysis in the license application will present effects analysis and any necessary protection, mitigation, and enhancement measures. See responses to comments regarding specific components of the program below.
191	07-06-10	NOAA – Fisheries		The primary life-history functions of Grant Creek by all anadromous fish species are not well understood. (See NMFS comment letter p. 2 for full detail of comment.)	The intent of the Aquatic Resources Study Program is to provide a better understanding of life history functions. See responses to comments regarding specific components of the program.
192	07-06-10	NOAA – Fisheries		For all proposed studies, study designs and sampling methods need to be refined to yield appropriate quantitative estimates of the impacts of project construction and operations on biological productivity and habitat parameters of all anadromous and resident fish species within the Kenai River watershed, as identified in the goals, objectives and impacts, but not addressed completely in the draft study plans.	See response to Comment 136.
193	07-06-10	NOAA – Fisheries		Ecological flow requirements below the dam and below the tailrace need to be designed to avoid or minimize adverse impacts to anadromous fish and their habitat. (See NMFS comment letter p. 2 for full detail of comment.)	The purpose of the Instream Flow Study is to allow prediction of flows that will optimize conditions within the constraints of project engineering requirements. The Aquatic Resources Study Plan was modified to include a quantitative instream flow evaluation of Reach 5 (low flow conditions only) in addition to lower reaches.
194	07-06-10	NOAA – Fisheries		We concur with the U.S. Fish and Wildlife Service's recommendations that objectives should be based on SMART objectives. (See NMFS comment letter p. 2-3 for full detail of comment.)	See response to Comment 136.
195	07-06-10	NOAA – Fisheries		Sediment transport models should be developed under current hydrologic conditions and compared to proposed operational conditions to estimate	See response to Comment 143.

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				project effects on this critical habitat function. (See NMFS comment letter p. 3 for full detail of comment.)	
196	07-06-10	NOAA – Fisheries		Consider 2-D modeling rather than PHABSIM. (See NMFS comment letter p. 3 for full detail of comment.)	See response to Comment 188.
197	07-06-10	NOAA – Fisheries	Need for Additional Information	Grant Creek below Reach 5 is only half mile long. This short reach should be thoroughly inventoried by habitat type and geomorphology. (See NMFS comment letter p. 3 for full detail of comment.)	We agree. The Aquatic Resources Study Program is designed to collect data on habitat type.
198	07-06-10	NOAA – Fisheries	Need for Additional Information	Limited fish sampling for adults and juveniles in the lowest section of Reach 5 indicates the habitat is used by anadromous fish for spawning and rearing, thus this reach will need to be studied to investigate the extent of fish use by all species and life stages, and how changes in flow would affect habitat availability, sediment recruitment, and water quality. (See NMFS comment letter p. 4 for full detail of comment.)	Comment noted. See responses to Comments 143, 173, 174, and 193.
199	07-06-10	NOAA – Fisheries		We recommend that outmigrant smolt trapping occur in addition to winter sampling given the difficulties and possible failure of sampling efforts under heavy snow and ice cover, and the limited types of habitats that can be sampled during the winter season. (See NMFS comment letter p. 4 for full detail of comment.)	See response to Comment 171.
200	07-06-10	NOAA – Fisheries		We recommend that assumptions inherent in using foot surveys and Area Under the Curve methodology to estimate escapement be discussed. (See NMFS comment letter p. 4 for full detail of comment.)	See response to Comment 176.
201	07-06-10	NOAA – Fisheries		We agree with the suggested Chinook spawning telemetry method to locate preferred spawning areas in Grant Creek, as well as the utility in determining if spawning occurs in Reach 5. In addition, we suggest conducting a sockeye telemetry study to determine preferred spawning locations (this should corroborate the visual observations) and to investigate the use by sockeye of Reach 5. (See NMFS comment letter p. 4 for full detail of	See response to Comment 174.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				comment.)	
202	07-06-10	NOAA – Fisheries		NMFS Comment 13: We suggest a collection method near the mouth of Grant Creek to estimate the production of outmigrating juvenile salmonids and to determine the timing of out-migrating juveniles relative to temperature and flow. Fyke-netting or more robust rotary screw trapping might be successful in such a dynamic setting, and such an outmigrant study should record the full extent of fall and spring juvenile outmigration in order to estimate the magnitude of production originating in Grant Creek, based upon an appropriately designed SMART objective.	See response to Comment 171.
203	07-06-10	NOAA – Fisheries		NMFS recommends that the results of the 2010 studies and 2011 winter sampling and spring outmigrant sampling be presented to agencies for collaborative review and use in determining any necessary additional data needs. (See NMFS comment letter p. 5 for full detail of comment.)	Data from 2010-2011 investigations will be provided for agency review.
204	06-01-10	KAFC	Goals and Objectives	The goals and objectives section does not relate the anticipated impacts and how the studies will address them. The idea that impacts of project operation and construction on fish populations will be answered without specifics is too broad.	See response to Comment 164.
205	06-01-10	KAFC	Goals and Objectives	This section states that construction and operation of the project on the biological productivity and abundance of fish food organisms in Grant Creek and Grant Lake will be addressed. However, there are no real studies of Grant Lake to provide data to deal with this broad objective.	See response to Comments 164 and 178. Zooplankton abundance and Chlorophyll <i>a</i> concentrations were measured in Grant Lake in 2009 to provide a measure of baseline productivity. Additionally, there is substantial historical information available for the limnological characteristics of Grant lake.
206	06-01-10	KAFC	Existing Information	The 2009 studies indicated 231 and 6293 Chinook and sockeye salmon in Grant Creek. Given the exploitation rate of the various fisheries in UCI it would be easy to calculate the production of these stocks. However, there does not appear to be any age composition data presented. Was it collected?	The 2009 study program did not involve the capture of any salmon, consequently age data were not collected. The planned Chinook salmon telemetry study for 2012 will require the capture of fish and allow scale sampling for age determination without additional effort. The Aquatic Resources Study Plan was modified to include the collection of scales for a sample of captured chinook and sockeye salmon.
207	06-01-10	KAFC	Section 2.2	There are several omissions in this section. These include the total lack of studies in Grant Lake, yet this lake will have significant changes in water level.	Zooplankton abundance, Chlorophyll <i>a</i> concentrations, and water chemistry were measured in Grant Lake in 2009 to provide baseline productivity which can be compared to future conditions.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				The impact of the project on the biological productivity of this system on the structure and function of the lake and surrounding waters is not addressed.	
208	06-01-10	KAFC	Section 2.2	Over 500 Chinook and probably 12-20 thousand sockeye salmon are produced from the Grant Lake/Creek system. There is an extensive data set for the Kenai River on the genetic makeup of the various sub-populations. There are in that data set indications of a number of systems that are very unique – Russian River and Hidden Lake. Are Grant Lake/Grant Creek salmon unique genetically? There are no sample protocols or plan to answer this question. It is an obvious omission.	The collection of tissue samples for genetic analysis would be a worthwhile addition to the study program that can be accomplished at no extra cost (assuming that genetic analysis would be contributed by the ADF&G genetic lab). After consultation with ADF&G, the Aquatic Resources Study Plan was modified to include tissue sampling protocols, if appropriate.  Pg. 14 Aquatic Resources Study Plan
209	06-01-10	KAFC	Section 2.2	There is no program to address stream macro-invertebrate drift. Organisms produced in Grant Lake may be important in these evaluations.	See responses to Comments 178 and 207. Additionally, the high gradient of Grant Creek would make the collection of statistically credible drift sampling very difficult.
210	06-01-10	KAFC	Section 3.2.11	The stream life is an important part of making a population estimate. It should be defined for this system by tagging and recovery of salmon. Professional judgment is not precise enough to make a reasonable estimate.	See response to Comment 176.
211	06-01-10	KAFC	Section 3.2.11 and 3.2.1.2	There does not appear to be any studies to age and sex salmon in Grant Creek. This is necessary if one wants to do run reconstruction to get a total production estimate for the Creek. There appears to be a sufficient abundance of salmon to get these data sets.	See response to Comment 206.
212	06-01-10	KAFC	Section 3.2.2.3	The use of a backpack electrofisher should not be used in winter. Delayed mortality has been associated with this method in the Kenai and the abundance of fish may be very concentrated in winter. Therefore, visual means is a better method and should be the only method used besides minnow traps.	This comment directly contradicts ADF&G Comment 183. KHL will follow ADF&G guidance. Electrofishing will be deployed very carefully using programmable shocking equipment and strict protocols to minimize harm. In any event, electrofishing opportunities in the winter will be minimal.
213	06-01-10	KAFC	Table 2	Salmon rearing will be used as a surrogate for resident species rearing and spawning. This is not defensible given the differences in life history and habitat use.	In the high gradient environment of Grant Creek where slow water habitats are scarce, it makes sense to consider small, juvenile fish as a single guild. Fish size and swimming ability are likely more important than species differences.
214	06-01-	KAFC	Section 3.2.5	There are no studies to deal with macroinvertebrate	See response to Comment 209.



Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
	10			drift and where those organisms are being produced. The role of Grant Lake should be evaluated.	
215	06-01-10	KAFC	Section 3.2.5	The focus of the studies on a number of study reaches and yet only two stations for macroinvertebrates is not acceptable. If the goals are to be realized then more baseline data is needed for each study reach.	See response to Comment 178.
216	07-06-10	ACE		Quantify, by species, the average annual production of juvenile Pacific salmon, rainbow trout and other species of fish that are spawned in Grant Creek and that out-migrate into the greater Kenai River Basin ecosystem, including reaches of the Kenai River located downstream of Kenai Lake.	The draft and final license applications will integrate all the study results and provide estimates of production as part of the required environmental analysis. Smolt outmigration studies, including spring and fall, was added to the study program to assist in this analysis.
217	07-06-10	ACE		Determine and map the locations, characteristics and extent of spawning gravels used by all 5 species of Pacific salmon and rainbow trout in Grant Creek, and to study and document the natural dynamic forces and processes in the Creek that have created and maintained these spawning gravels over time.	The combined efforts of the habitat mapping, instream flow, and geomorphology study components of the Aquatic Resources Study Plan are designed to accomplish this objective.
218	07-06-10	ACE		Determine the importance of fish habitat located in the “canyon section”, that is the reach of Grant Creek that will be de-watered, to spawning, rearing and resident fish species.	The canyon reach will not be de-watered but flow will be significantly reduced. The Aquatic Resources Study Plan was modified to include additional emphasis on the canyon reach. See responses to Comments 164, 165, and 184.
219	07-06-10	ACE		The genetic diversity of salmon species should be considered and maintained.	See response to Comment 208.
220	07-06-10	ACE	PAD	Commercial Fishing - how will these projects impact commercial fishing interests downstream?	See response to Comment 216. Environmental analyses in the draft and final license applications will discuss Grant Creek productivity in the context of regional fisheries.
221	07-06-10	ACE	PAD	Increased erosion from roads and cleared areas. What will the results be? Fish are very sensitive to increases in suspended solids and turbidity.	The draft and final license applications will include a discussion of potential sedimentation impacts related to disturbed areas.
222	07-06-10	M. Cooney	PAD/Study Plan	A study to quantify, by species, the average annual production of juvenile Pacific salmon, rainbow trout and other species of fish that are spawned in Grant Creek and that out-migrate into the greater Kenai River Basin ecosystem, including reaches of the Kenai River located downstream of Kenai Lake. Estimating annual production of juvenile salmon from Grant Creek should be based on actual field	See responses to Comments 216 and 220.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				sampling (catch and re-catch ratios as necessary) of fry and must not rely on estimates derived from adult spawning escapement combined with non-site specific various computer modeling methods. HEA's fisheries consultant, Northern Ecological Services, has agreed and stated that certain recommended studies (including the one referenced above) and study methodologies would provide more reliable fisheries data than will result from study plans currently proposed by HEA, but has also suggested the applicant (HEA) is unwilling to fund certain recommended studies or study methodologies.	
223	07-06-10	M. Cooney	PAD/Study Plan	A study to determine and map the locations, characteristics and extent of spawning gravels used by all 5 species of Pacific salmon and rainbow trout in Grant Creek, and to determine and document the natural dynamic forces and processes in the Creek that have created and maintained these spawning gravels over time.	See response to Comment 217.
224	07-06-10	M. Cooney	PAD/Study Plan	A study to determine the importance and use of fish habitat located in the "canyon section", (that is the reach 5 of Grant Creek that will be de-watered), to spawning, rearing and survival of anadromous and resident fish species.	See response to Comment 218.
<b>Comments Applicable to All Study Plans</b>					
225	07-09-10	USACOE	All Study Plans	The 404 (b) guidelines [40 CFR 230 404 (b) (1)] require that we assess the potential short-term or long-term effects of a proposed fill activity on the chemical, physical, and biological components of the aquatic environment. To that end, we must have sufficient information to be able to make factual determinations regarding the effects of the proposed discharge. We will utilize all available information in order to make these factual determinations.	Comment noted.
226	07-09-10	USACOE	All Study Plans	Our assessment of impacts to waters of the U.S. is not limited solely to Grant Lake and to Grant Creek. Our evaluation of the effects of the proposed discharge of fill material will encompass the direct effects to waters of the U.S., which includes	Comment noted. The study plans were reviewed as recommended.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				wetlands, streams, and open waters. In addition, we will also consider the secondary and cumulative effects of the proposed fill on waters of the U.S. The draft study plans should be reviewed to ensure that sufficient information is collected to fully assess the potential effects of the project on waters of the U.S. that may be impacted by the proposed road, utility corridors, or other appurtenant structures.	

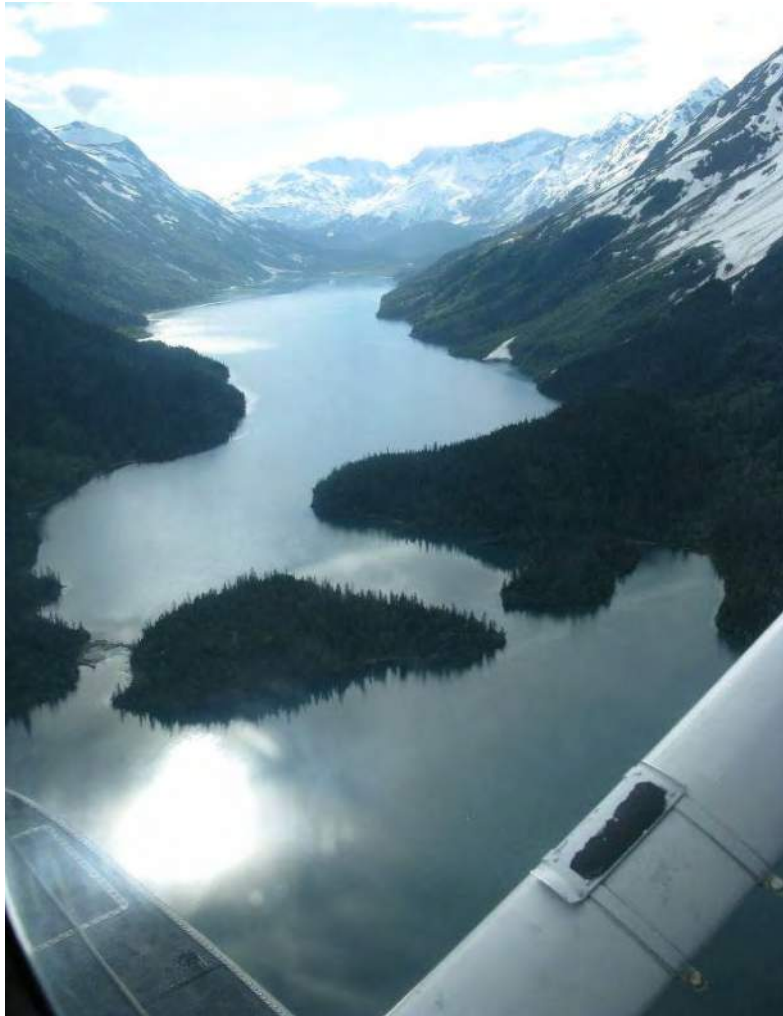
### **List of Abbreviations and Acronyms**

<b>ACE</b>	Alaska Center for the Environment
<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>ADFG</b>	Alaska Department of Fish and Game
<b>ADNR</b>	Alaska Department of Natural Resources
<b>AGL</b>	above ground level
<b>APA</b>	Alaska Power Authority
<b>APE</b>	Area of Potential Effect
<b>ATV</b>	all terrain vehicle
<b>AUC</b>	area under the curve
<b>CFR</b>	Code of Federal Regulations
<b>CPUE</b>	catch per unit effort
<b>-D</b>	dimensional
<b>DEC</b>	Alaska Department of Environmental Conservation
<b>DNR</b>	Alaska Department of Natural Resources
<b>FERC</b>	Federal Energy Regulatory Commission
<b>GIS</b>	geographic information system
<b>GMU</b>	Game Management Unit
<b>HEA</b>	Homer Electric Association
<b>HS</b>	habitat suitability
<b>HSI</b>	Habitat Suitability Index
<b>IFIM</b>	Instream Flow Incremental Methodology
<b>INHT</b>	Iditarod National Historic Trail
<b>KAFC</b>	Kenai Area Fisherman's Coalition
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>KWF</b>	Kenai Watershed Forum
<b>LLC</b>	limited liability company
<b>LMP</b>	Chugach Land and Resource Management Plan (USFS)
<b>MBTA</b>	Migratory Bird Treaty Act
<b>MIS</b>	Management Indicator Species (USFS)
<b>MSL</b>	mean sea level
<b>MW</b>	megawatt
<b>NEPA</b>	National Environmental Policy Act
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NPS</b>	National Park Service
<b>NWI</b>	National Wetlands Inventory
<b>PAD</b>	Pre-Application Document (FERC)
<b>PHABSIM</b>	Physical Habitat Simulation Model
<b>PIT</b>	Passive Integrated Transponder
<b>RBCA</b>	Resurrection Bay Conservation Alliance
<b>RGL</b>	Regulation Guidance Letter (USACOE)
<b>ROS</b>	Recreation Opportunity Spectrum
<b>RVRDSP</b>	Recreation and Visual Resources Draft Study Plan
<b>SD1 and SD2</b>	Scoping Document 1 and Scoping Document 2 (FERC)
<b>SMART</b>	Specific Measurable Attainable Relevant Time-bound

<b>SSI</b>	Species of Special Interest (USFS)
<b>TL</b>	total length
<b>TRSP</b>	Terrestrial Resources Study Plan
<b>TWG</b>	technical working group
<b>UCI</b>	Upper Cooke Inlet
<b>USACOE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	U.S. Department of Agriculture Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey



# GRANT LAKE PROJECT OVERVIEW & HISTORY



Kenai Hydro, LLC  
Natural Resources Studies Meeting  
December 12, 2012  
Mike Salzetti



Homer Electric  
Association, Inc.  
A Toxotone Energy Cooperative



# PRESENTATION OVERVIEW

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- Introduction to HEA
- Why we are doing this project?
- Project History
- Project Description/Development



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A Touchstone Energy® Cooperative



# INTRODUCTION TO HEA



- 150 Employees
- Member-Owned Cooperative
- 32,339 Meter
- 2,373 Mile of Energized Line
- 3,166 Sq. Mile of Service Territory
- Sales of 475 GWh/year
- Governed by an Elected Board of Directors
- Kenai Hydro is a wholly-owned subsidiary of HEA



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A Toolikse Energy Cooperative

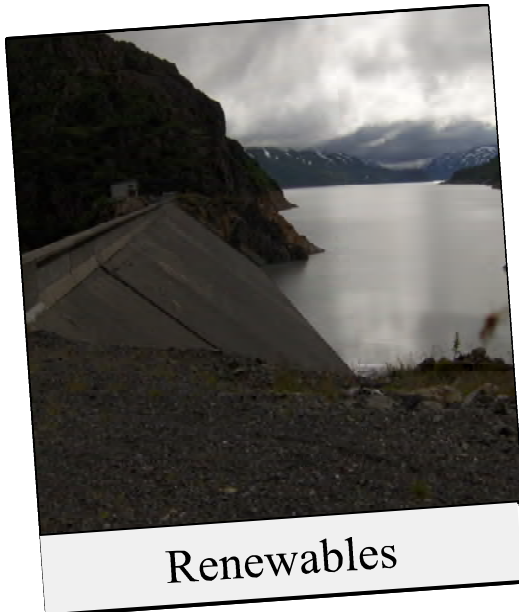




# WHY



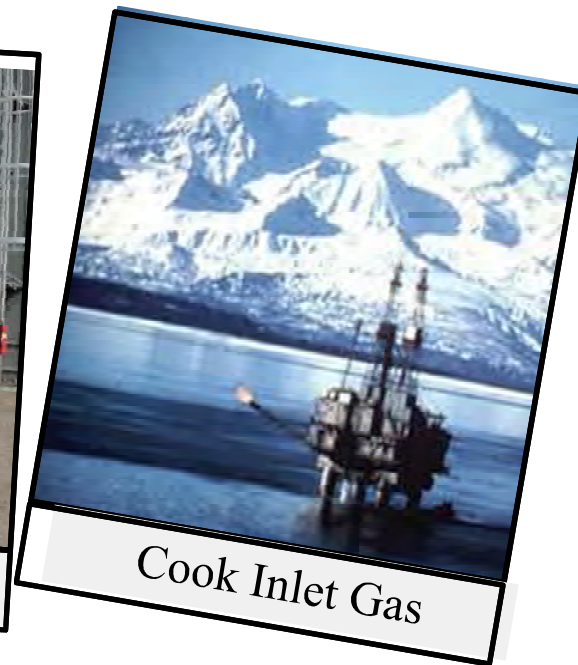
- Board of Directors Goal for Renewable Energy
- Independent Light
- Cook Inlet Gas Situation



Renewables



Independent Light



Cook Inlet Gas



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# RENEWABLE ENERGY



2011 HEA Demand 475,000 MWh

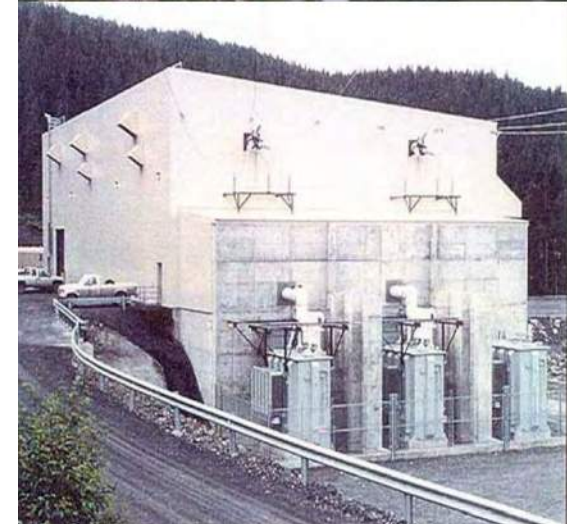
Grant Lake 19,700 MWh

$$\frac{19,700 \text{ MWh}}{475,000 \text{ MWh}} = 4.15\%$$

Bradley Lake

$$\frac{44,000 \text{ MWh}}{475,000 \text{ MWh}} = 9.26\%$$

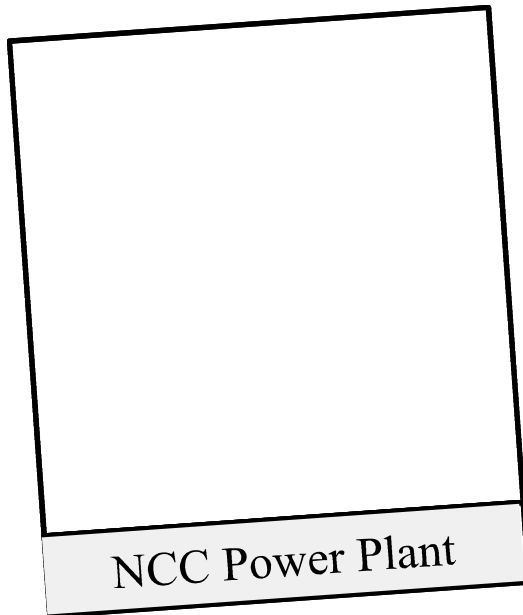
Renewable Energy Increase 45



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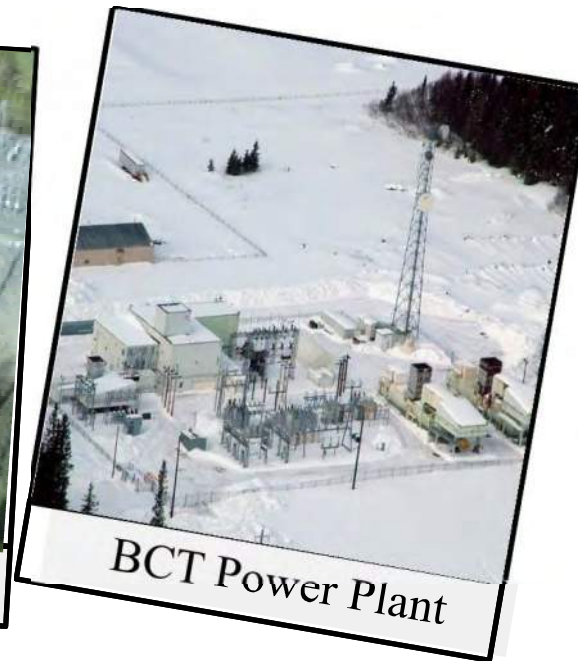
# INDEPENDENT LIGHT



NCC Power Plant



SCT Power Plant



BCT Power Plant



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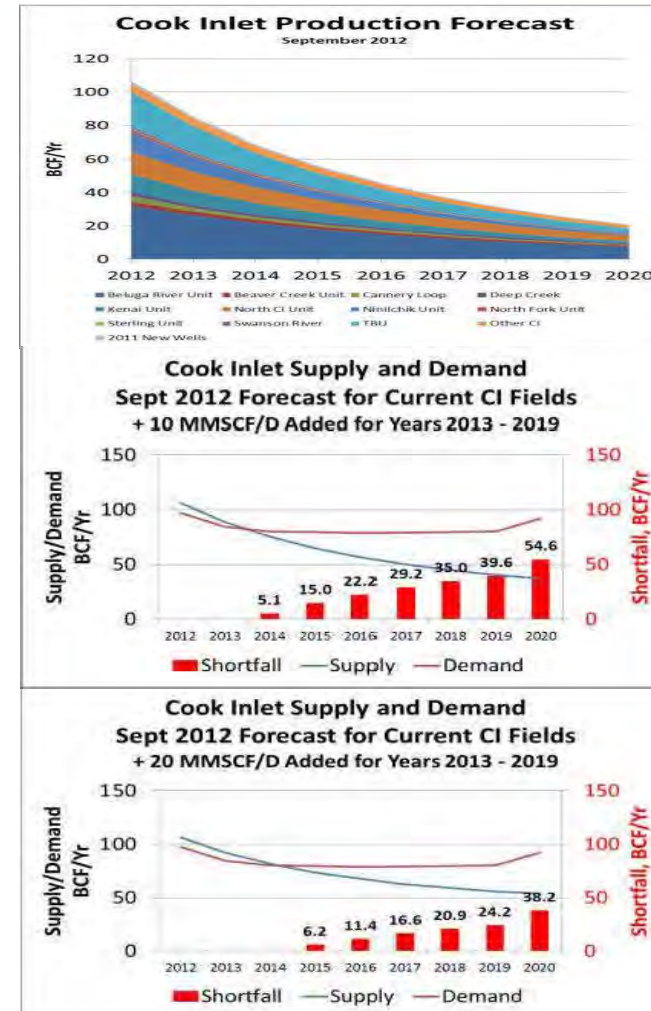
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# COOK INLET GAS



- Surplus gas since 1960s
- Demand expected to exceed supply 2014 / 2015
- Economic Consequences



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# HISTORY



## Feasibility Studies

- Grant Lake
- Falls Creek
- Ptarmigan Lake
- Crescent Lake



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# HISTORY

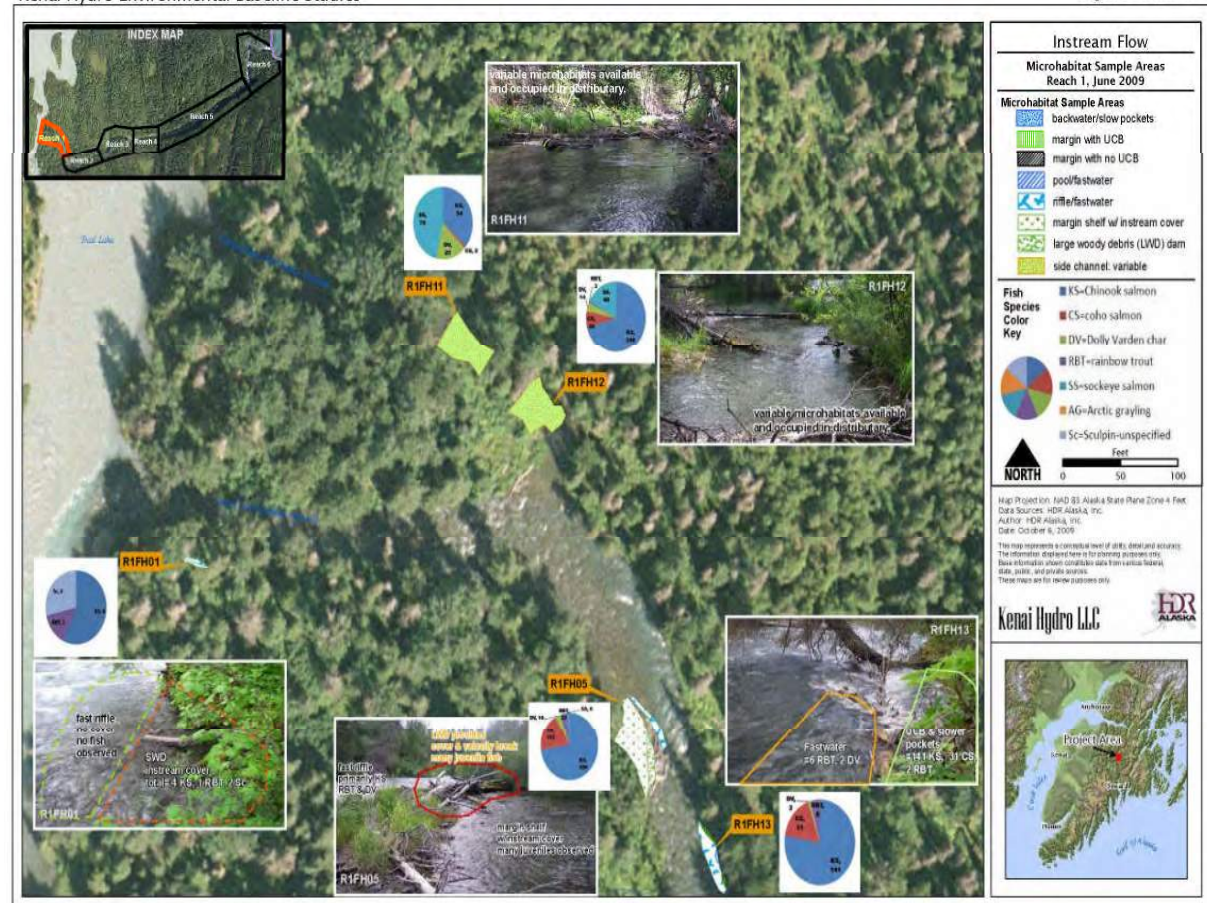


## 2009 Environmental Baseline Studies

- Examine Previous Studies
- Fill Data Gaps
- Develop Study Plans

Kenai Hydro Environmental Baseline Studies

Figure 3.4.3- 1



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A Touchstone Energy Cooperative



# HISTORY



- 2010 Study Season
- FERC Scoping Process
- Preliminary Permit Expiration (Oct 2011)
- 2<sup>nd</sup> Preliminary Permit (March 2012)
- RFP Process
- Securing McMillen as Natural Resources Study Consultant



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# KEY PROJECT PARAMETERS



Rated Generator Output Unit 1 – 1 MW Unit 2 – 4 MW	5 MW	
Average Annual Energy	19,700 MWh	20,500 MWh
Diversion	None	2 ft x 120 ft (H) (L)
Reservoir Max Elevation	698 fmsl* (natural)	700 fmsl*
Reservoir Min Elevation	687 (-11)	687 (-13)
Tunnel Length	3200 ft	
Access Road Length	4 miles	2 miles
Transmission Line	3.5 miles	1 mile
*fmsl – feet above mean sea level		



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# PROJECT OVERVIEW



Google Earth Pro

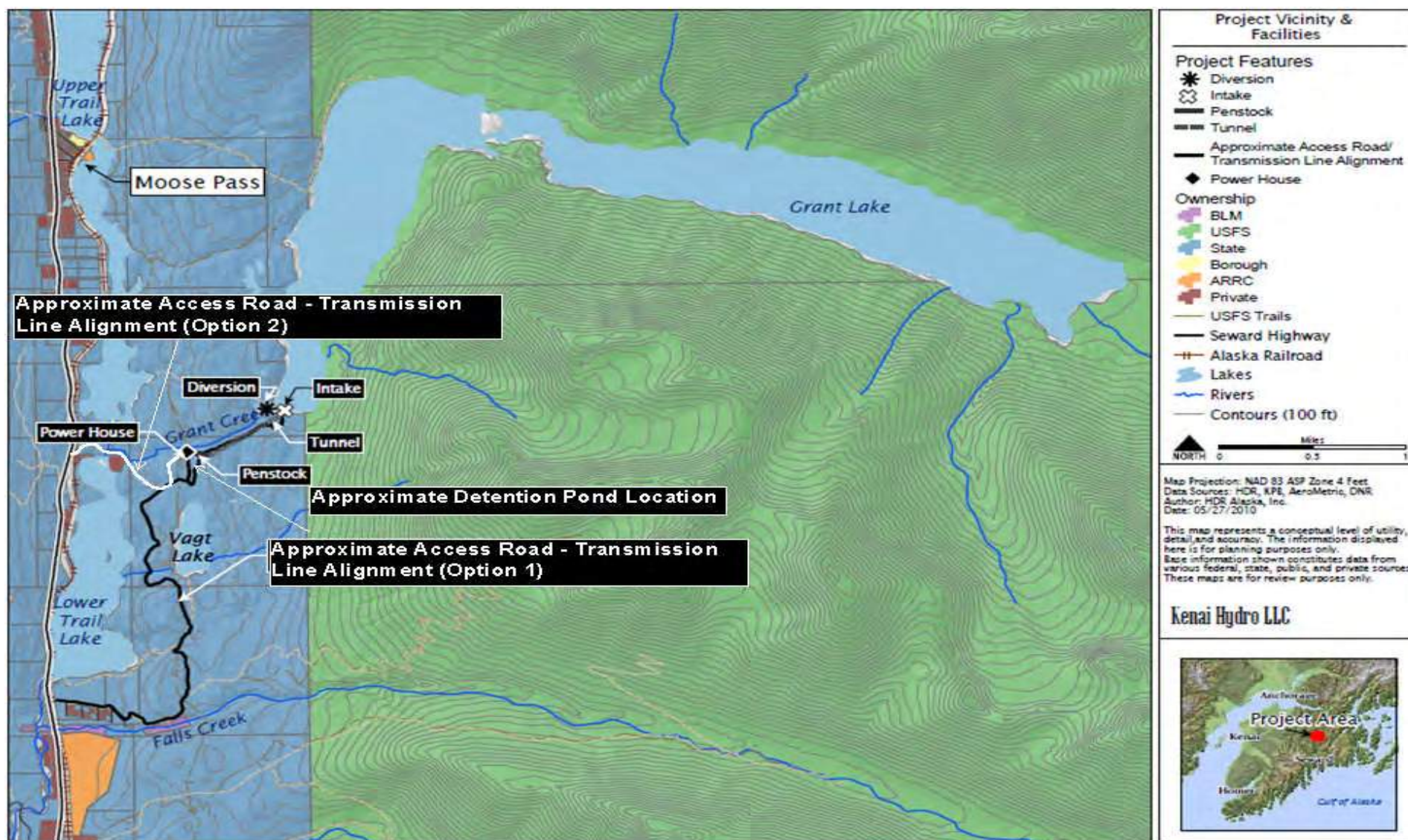
miles  
km







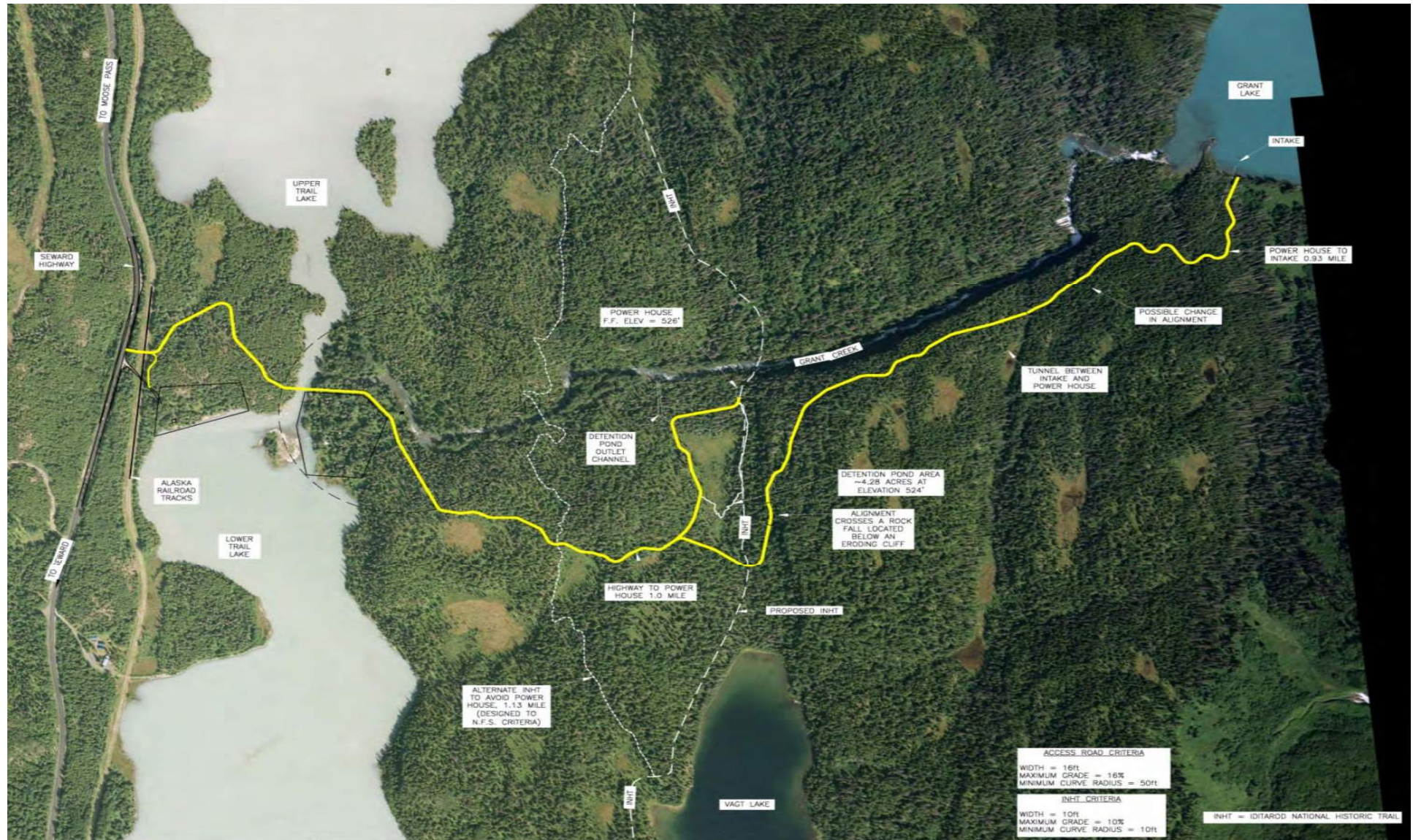
# PROJECT OVERVIEW







# PROJECT OVERVIEW







# PROJECT OVERVIEW

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## Natural Anadromous Barrier



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# PROJECT OVERVIEW

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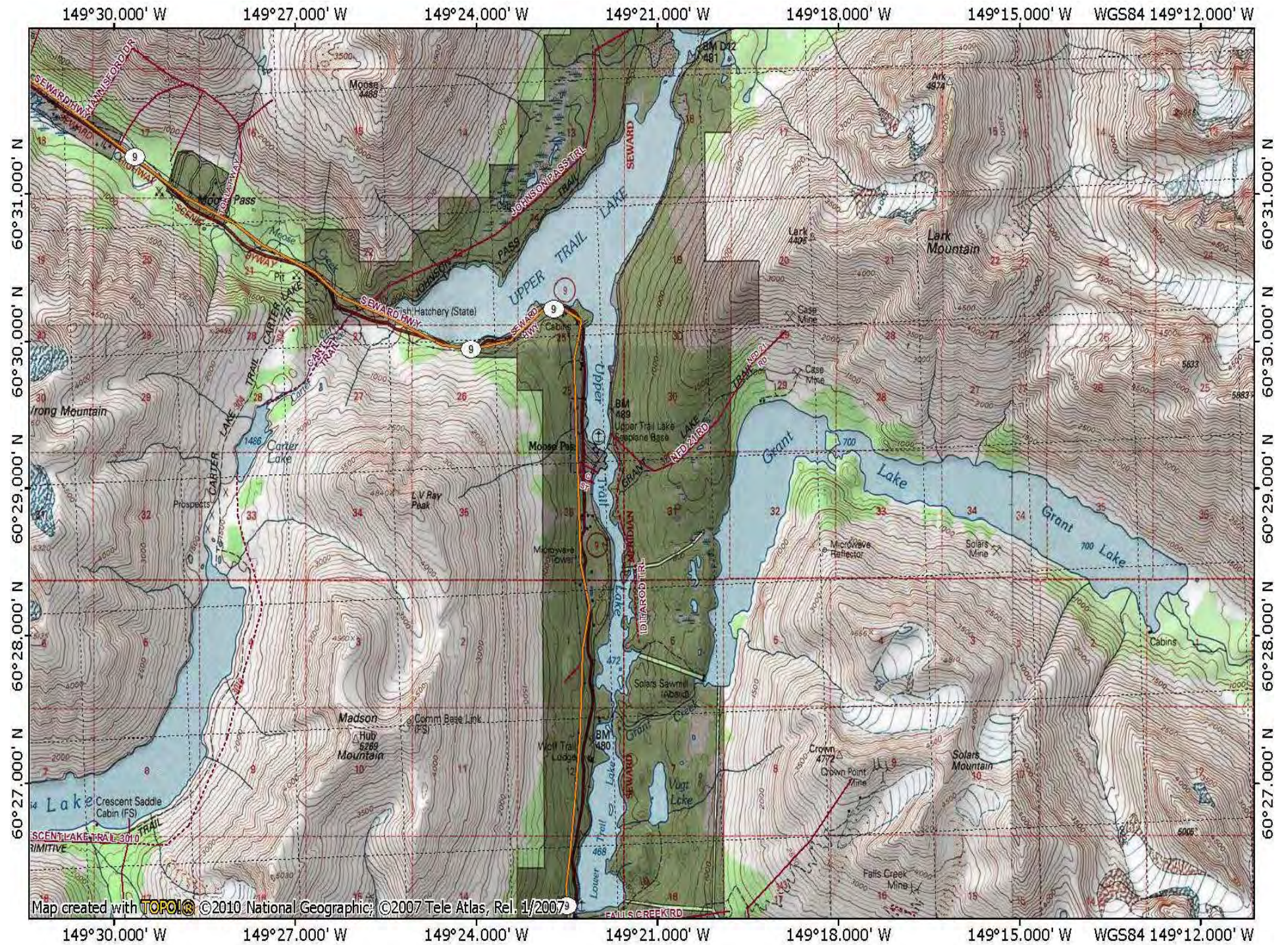


**Minimal Lake Effect  
with Lake Level Rise**



**Homer Electric  
Association, Inc.**  
A Toothrose Energy Cooperative









# SUMMARY



- Renewable Resource
- Low Cost
  - Bradley Lake ~ ¢4.4/KWh
  - Cooper Lake ~ ¢3/KWh
  - Eklutna < ¢3/KWh
- Long Life Expectancy
  - Alaska Electric Light & Power (Juneau)
    - Gold Creek 1914
    - Annex Creek 1915
    - Salmon Creek 1913
- Investment in the future



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# QUESTIONS





# Licensing Overview

**Grant Lake Hydroelectric Project (FERC No. 13212)  
Natural Resource Studies Meeting**

**December 12, 2012 – Anchorage, AK**



In Association with



# Background

- ✓ HEA begins licensing process – October, 2008 (1<sup>st</sup> PP)
- ✓ Environmental baseline studies conducted – 2009
- ✓ NOI/PAD Submitted to FERC – August, 2009
- ✓ FERC authorizes TLP & non-federal representative – September, 2009
- ✓ Joint meeting – November, 2009
- ✓ Environmental baseline study report distributed – March, 2010
- ✓ 2010 Study Plans distributed for stakeholder review – April/May, 2010

# Background

- ✓ HEA receives formal stakeholder comments on draft study plans – April-July, 2010
- ✓ FERC issues Scoping Document 1 – May, 2010
- ✓ FERC issues Scoping Document 2 – August, 2010
- ✓ Natural resource studies suspended – August, 2010
  - After 2009 baseline studies, HEA developed a set of study plans believed to be commensurate with the size/scale of the Project. After stakeholder review/FERC scoping, it was evident that additional study would be needed so HEA suspended the 2010 studies until additional revisions to the plans could be made.
- ✓ 1<sup>st</sup> Preliminary Permit expires – September, 2011
- ✓ FERC approves 2<sup>nd</sup> Preliminary Permit – March, 2012

# Meeting Intent

- ✓ Identify and change in Stakeholder contacts
- ✓ Introduce McMillen Team
  - Key individuals/contacts
- ✓ Natural resource centric
- ✓ Review studies, resource area by resource area:
  - What has been done to date
  - What is left to do
  - Associated schedules
  - Discussion of formal comments received by Stakeholders
  - How the comments were addressed
  - Permit needs
- ✓ Distribute final study plans

# Natural Resource Studies

- ✓ HEA plans on completing the natural resource studies in 2013/2014
- ✓ Per the TLP, the Draft Grant Lake Natural Resource Study Plans were formally commented on in 2010
- ✓ HEA has integrated these comments into the Final Study Plans
  - Matrix created to document the effort
- ✓ Ken Hogan (FERC) has been consulted regarding HEA's general approach and confirms its applicability per TLP requirements

# Natural Resource Studies

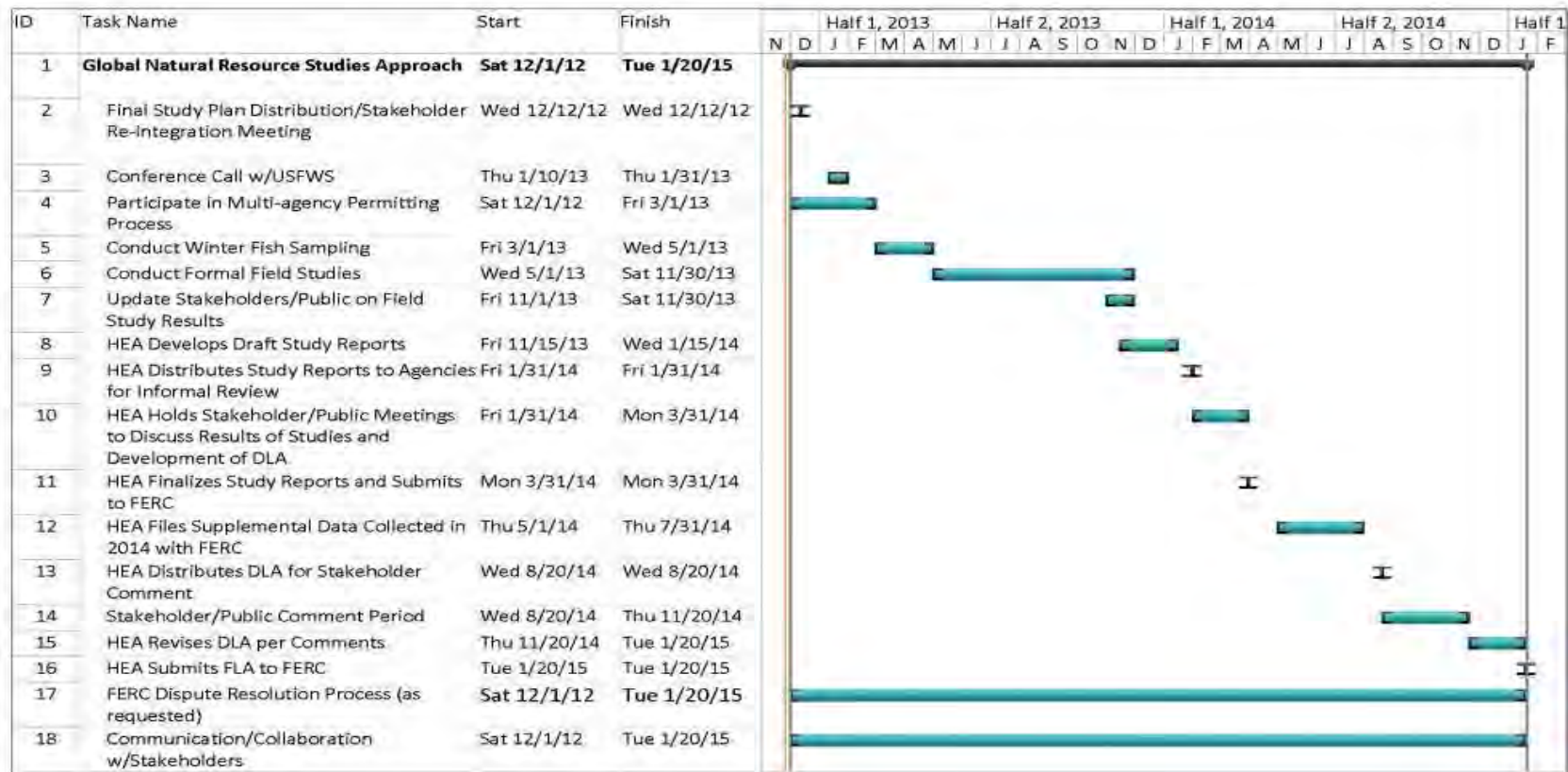
- ✓ Use this meeting as a mechanism to discuss how comments were incorporated to satisfy agency concerns
- ✓ Formal comments were clear and thorough
- ✓ HEA open to any clarifications Stakeholders may have

# TLP

## ✓ Where we are:

- Beginning of 2<sup>nd</sup> stage
  - Conduct studies
  - Update Stakeholders on progress and results as they're developed
  - Provide study reports for review
  - Develop Draft License Application (DLA)
  - Submit DLA to Stakeholders for review
  - Hold meetings to discuss results, reports and DLA (as appropriate)

# Natural Resource Studies Schedule





# HEA Commitments

- ✓ Proactive
- ✓ Effective communication and collaboration
- ✓ Consistent points of contact
- ✓ High quality, scientifically defensible studies

# Project Planning

## ✓ SharePoint Site:

- Kenai Hydro Website
- <http://www.kenaihydro.com/>
- Mechanism for review and information sharing

## ✓ In early 2013, HEA will be choosing an engineering consultant to conduct feasibility work in preparation for the License Application

Owner



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# Fisheries and Aquatics Study Plan

**Grant Lake Hydroelectric Project (FERC No. 13212)  
Natural Resource Studies Meeting**

**December 12, 2012 – Anchorage, AK**



In Association with



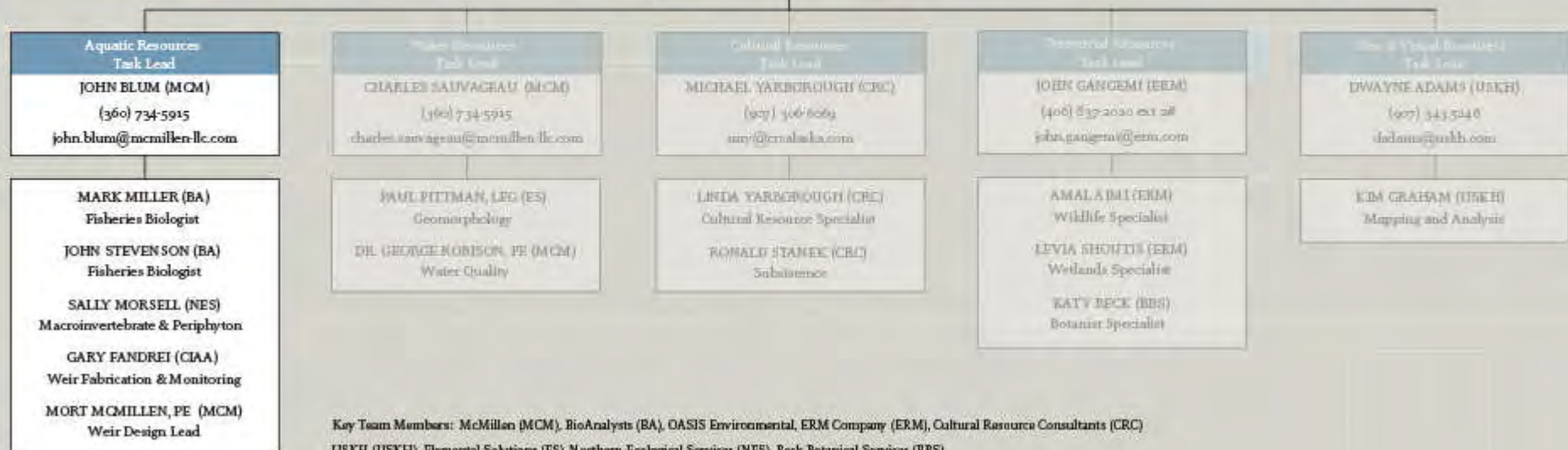
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# **Fisheries and Aquatics Studies**

## **Grant Creek Studies**

- Fish Weir Installation and Monitoring
- Resident and Rearing Fish Abundance and Distribution
- Salmon Spawning Distribution and Abundance
- Trail Lake Narrows Fish Study
- Aquatic Habitat Mapping
- Instream Flow Study
- Macroinvertebrate Studies
- Periphyton Studies

# **Grant Creek Weir Installation and Monitoring**

## **Objectives**

- Enumerate Pacific Salmon Immigration to Grant Creek
- Describe Pacific Salmon Returning to Grant Creek
  - Age
  - Sex
  - Length
- Identify Pacific Salmon Run Timing
- Support Genetic Sampling and Fish Tagging

# **Grant Creek Weir Installation and Monitoring – Remaining Tasks**

- Crew Orientation
  - Methods
  - Safety (Including Bear Safety)
- Setup Field Camp
  - 2 person field camp to provide continuous surveillance (24x7) of the weir
  - Temporary housing for other researchers
- Install Weir
  - Weir design: standard steel and aluminum picket weir
    - 1.9 cm steel pickets spaced 2.54 cm apart



# Grant Creek Weir Installation and Monitoring – Remaining Tasks

- Monitoring
  - Identify and enumerate all salmon species migrating through the weir – upstream and downstream
  - Temporarily collect a representative sample of returning salmon by species:
    - Identify sex
    - Remove scale for age determination
    - Measure length – mideye to fork of tail

# Grant Creek Weir Installation and Monitoring – Schedule

### Proposed Schedule for Grant Creek Weir Installation and Monitoring

	2012	2013										
	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov
Task												
Site Visit												
Agency Communication												
Camp Setup and Weir Installation												
Weir Monitoring												
Weir and Camp Removal												

# **Grant Creek Weir Installation and Monitoring – Aluminum and Steel Picket Weir**





# Grant Creek Weir Installation and Monitoring – Typical Field Camps



# **Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed**

- Recent Work Completed
  - HDR Alaska, Inc. 2010. Report
  - HDR Alaska, Inc. 2010. Additional Field Studies
- Background Information
  - Arctic Environmental Information and Data Center 1983.
  - United States Fish and Wildlife Service 1961.

# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

- Background Info:
- USFWS (1961)
  - The only fish species present in Grant Lake are coastrange sculpin and threespine stickleback.
  - The falls in Grant Creek preclude immigration of other fish species.
  - Monthly sampling by minnow traps in Grant Creek established the presence of juvenile Chinook, Coho, and Dolly Varden and sculpins.

Fish species collected by minnow traps by USFWS in Grant Creek, July 1959 to January 1961

Month	King Salmon	Coho Salmon	Dolly Varden	Sculpins
Jan	X			
Feb	X			
Mar				X
Apr	X		X	X
May	No Sampling			
Jun	X		X	X
Jul	X		X	X
Aug	X	X	X	X
Sep	X	X		
Oct	X	X		X
Nov	X	X		
Dec	No Sampling			

Source: USFWS (1961) as reported by AIEDC (1983).

# **Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed**

- Background Information
- AEIDC (1983)
  - To address objectives they conducted week long field investigations. Samples in October 1981, March, May, June, and August 1982
  - Objectives:
    - Document seasonal presence of resident and anadromous fish species in Grant Creek
    - Estimate their relative abundance
    - Document habitat use characteristics

# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

- AEIDC (1983) Minnow Trapping and Electrofishing

Grant Creek fish taken by minnow trapping and electrofishing, October 1981- August 1982

Location	October 1981				March 1982				May 1982				June 1982				August 1982			
	CH	CO	RB	DV	CH	CO	RB	DV	CH	CO	RB	DV	CH	CO	RB	DV	CH	CO	RB	DV
Minnow Trap Sample Area 1	3	0	12	10	5	4	3	0	1	0	0	3	0	2	2	15	21	5	4	21
Minnow Trap Sample Area 2	17	0	2	1	1	0	0	0	1	0	7	6	0	0	1	5	3	6	1	34
Minnow Trap Sample Area 3	37	2	6	9	0	0	0	0	0	0	3	0	0	0	1	1	8	0	2	26
Minnow Trap Sample Area 4	14	0	3	2	0	0	0	1	0	0	0	0	4	0	0	3	2	0	0	32
Total Fish	71 <sup>1</sup>	2	23 <sup>2</sup>	22	6	4	3	1	2	0	10	9	4	2	4	24	34	11	7 <sup>3</sup>	113 <sup>4</sup>
Total Trap Hours	80				306				162				108				126			
Catch per Hour	0.89	0.03	0.29	0.28	0.02	0.01	0.01	0.01	0.01	0.00	0.06	0.06	0.04	0.02	0.03	0.22	0.27	0.09	0.06	0.90
Electrofishing	21	8	15	3	6	0	1	1	79	11*	7*	22*	**	**	**	**	**	**	**	**

CH=Chinook; CO=Coho; RB=Rainbow Trout; DV=Dolly Varden

- Two additional juvenile Chinook (70 and 81 mm) were taken by angling
- A 27 cm rainbow was taken by angling at the mouth of Grant Creek
- Three additional rainbows (20 to 30 cm) were taken by angling in Grant Creek.
- Twenty additional Dolly Varden (20 to 30 cm) were taken by angling in Grant Creek.

\* All fish were fry or alevins taken while performing the block and removal methodology (Zippen 1958)

\*\* No electroshocker sampling conducted



# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

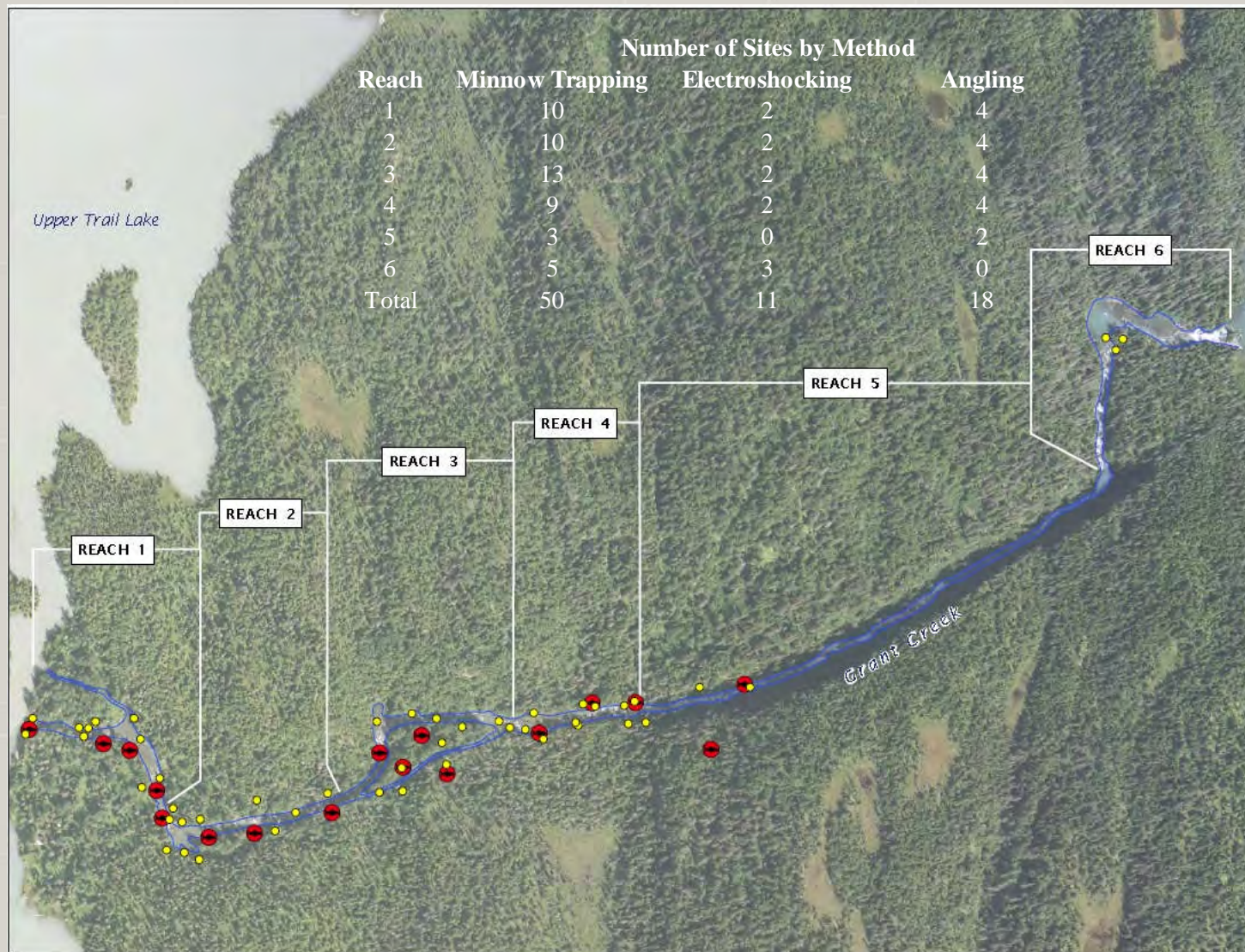
- HDR (2010) – 2009 Field Study

- Study Objectives

- ❖ Determine Relative Abundance and Distribution of Juvenile Fish in Grant Creek
    - ❖ Determine Relative Abundance and Distribution of adult Dolly Varden and Rainbow Trout in Grant Creek
    - ❖ Characterize Fish Use of Microhabitats

- Methods

- ❖ Adult Resident Fish
      - Foot Surveys – Conducted every 10 days from June through September
      - Angling – Approximately every 10 days with 30 minute sessions
    - ❖ Juvenile Salmon and Resident Fish
      - Minnow Trapping – Monthly with 24 hour sets from June through September
      - Electroshocking – After each minnow trapping session – for approximately 1 minute
      - Snorkel Surveys – Used to document fish use of micro-habitat
    - ❖ Used Same Reach Delineation as AEIDC (1983)



## Fisheries Field Studies

### 2009 Grant Creek Sampling Sites and Reaches

#### Legend

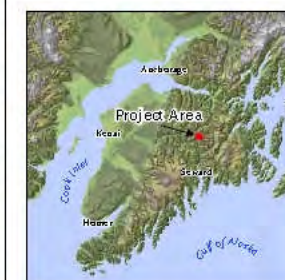
- Minnow Trap / Efish Site
- Angling Site
- ~ Grant Creek Wetted Edge



Map Projection: NAD 83 Alaska State Plane Zone 4 Feet  
 Data Sources: HDR Alaska, Inc., USFS, KPE,  
 USGS, Aeronautic  
 Author: HDR Alaska, Inc.  
 Date: 05 October 2009

This map represents a conceptual level of utility, detail, and accuracy.  
 The information displayed here is for planning purposes only.  
 Base information shown consists of data from various federal,  
 state, public, and private sources.  
 These maps are for review purposes only.

**Kenai Hydro LLC**



# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

## ➤ Analytical Methods/Metrics

### ❖ Adult Resident Fish

- Angling used to determine relative abundance and distribution of resident fish
- Upon capture, each fish was inspected for caudal fin clip – recapture noted
- Species, location of capture, fork length, sex, and spawning condition recorded
- Caudal fin was clipped to indicate capture, and fish was released near site of capture
- CPUE calculated by reach

# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

## ➤ Analytical Methods/Metrics - Continued

### ❖ Juvenile Fish

- Minnow traps and electrofishing used to collect juvenile fish
- All captured fish were enumerated by species, and subsample (n=20 for salmonids) was measured
- Electrofishing used to supplement collection of minnow traps – collect fish not susceptible to minnow traps (i.e., sockeye fry)
- CPUE calculated by reach
- Snorkel surveys were used to document fish presence in micro-habitat areas – Species I.D. and length estimated within 20 mm bins – Confirmed with electroshocking – Recorded dominant and subdominant substrate and cover



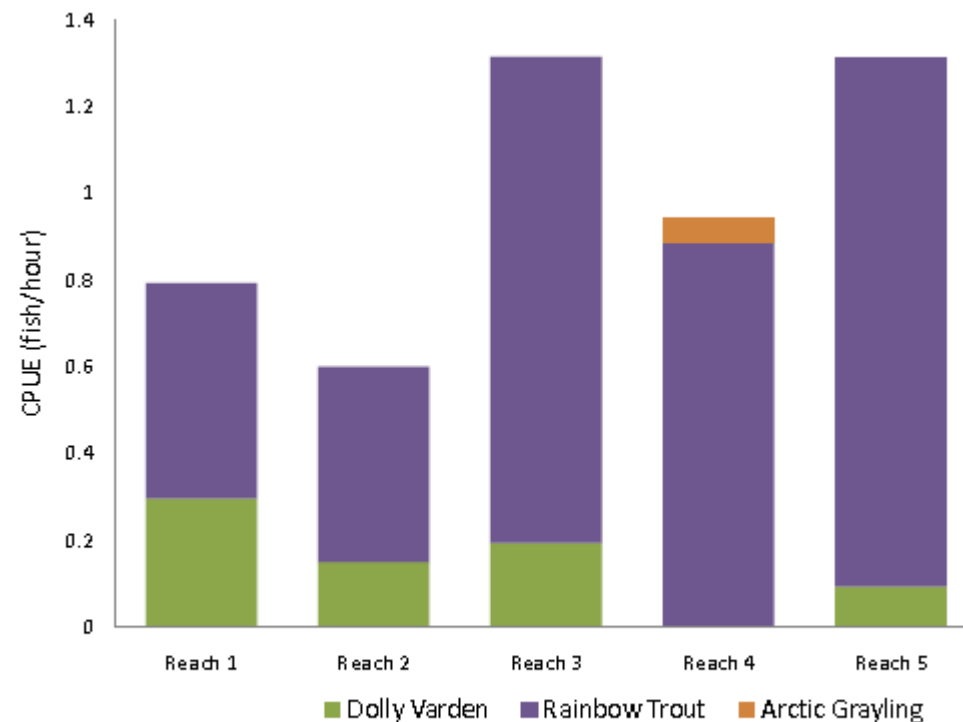
# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

## ➤ Study Results

### ❖ Adult Resident Fish

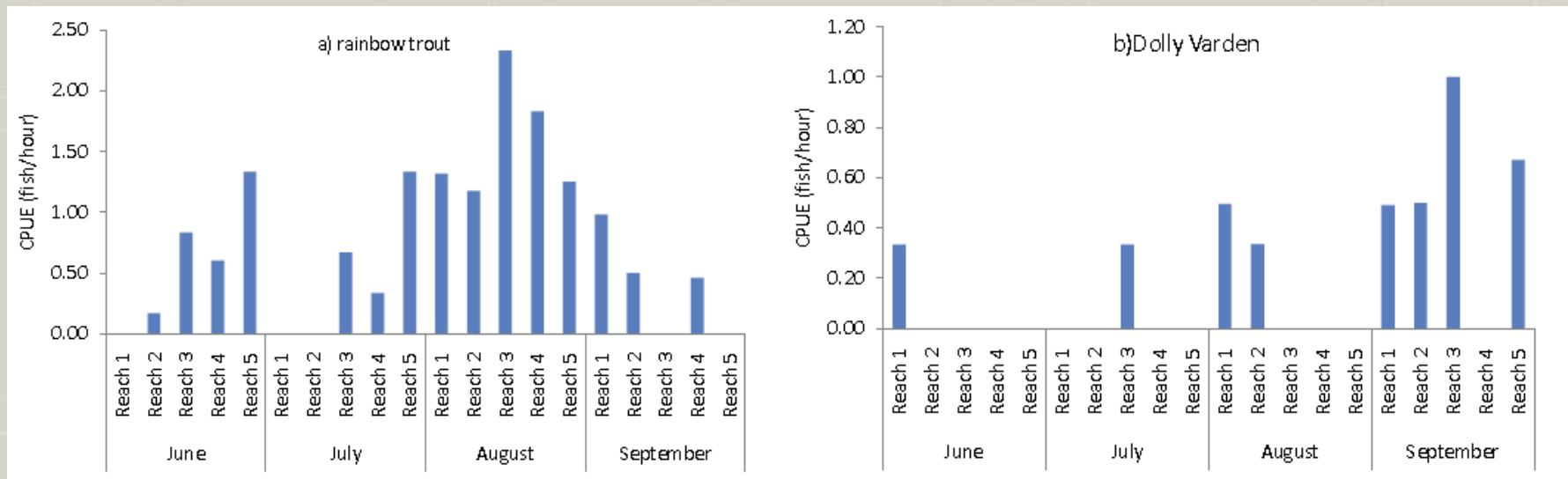
- Angling surveys used to describe relative abundance and distribution based on CPUE
- Resident fish present in Grant Creek include rainbow trout and Dolly Varden (single Arctic grayling was caught in Grant Creek)
- No direct evidence of resident fish spawning in Grant Creek
- However, angling surveys weren't initiated until June 2
- Presence of YOY rainbow indicates spawning may have occurred
- Studies to date have not investigated Dolly Varden spawning in Grant Creek

# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed



**Figure 3.5.2-14 CPUE by reach and species from angling surveys in Grant Creek, June – August, 2009**

# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed



**Figure 3.5.2-15 CPUE by month and reach for a) rainbow trout and b) Dolly Varden from angling surveys in Grant Creek, June – September, 2009**

# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

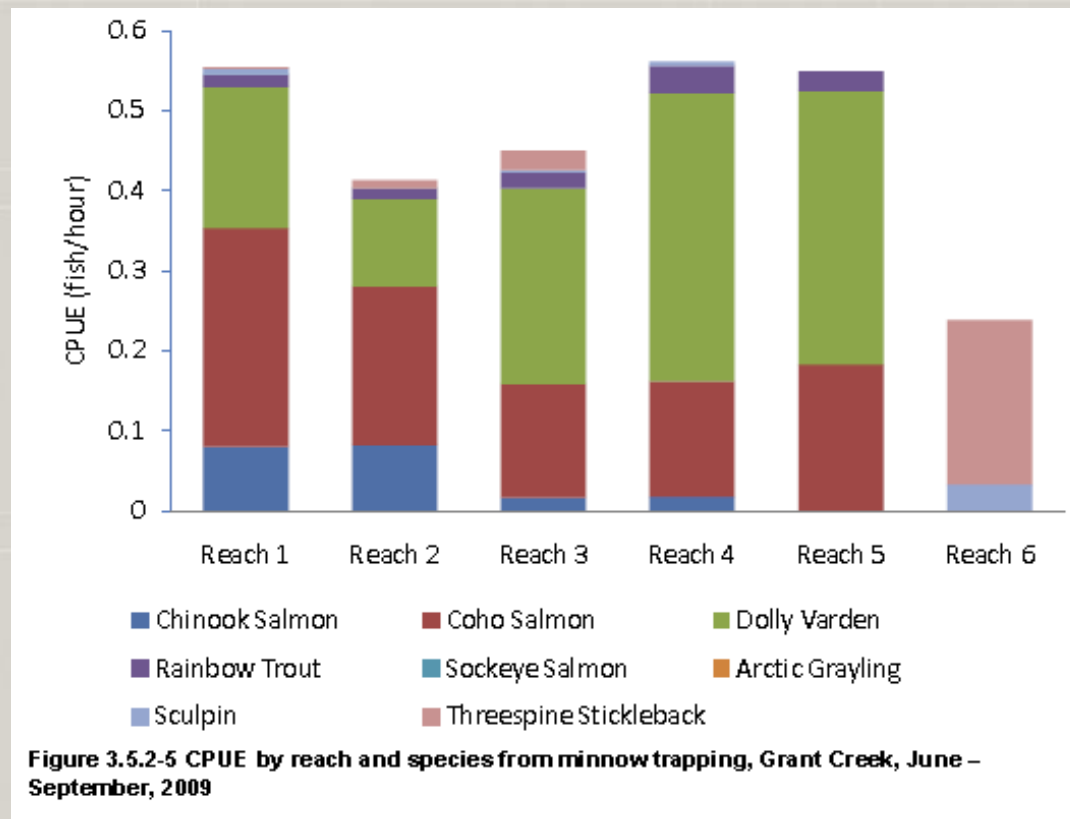
## ➤ Study Results

### ❖ Juvenile Fish

- Species present in Grant Creek include juvenile Chinook, coho, and sockeye salmon, rainbow trout, Dolly Varden, sculpin, and threespine stickleback
- Minnow trapping was the primary means of sampling in Reaches 1-6, with Dolly Varden being most abundant, followed by coho and then Chinook. Other species were captured to a lesser degree (i.e., threespine stickleback, RBT, sculpin, and juvenile sockeye)
- Reach 4 had the highest combined CPUE for all reaches across all months
- Juvenile Chinook abundance steadily decreased moving upstream into Reach 5, where no Chinook were captured
- Juvenile coho abundance also decreased moving upstream, however coho abundance in Reach 5 was relatively high
- No salmonids were captured in Reach 6 (above the falls)



# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed



# Grant Creek Resident and Rearing Fish Abundance and Distribution Work Completed

- HDR (2011)
  - 2010 Field Season was Terminated Early – As such, results were Incomplete
    - ❖ Resident and Rearing Fish Distribution and Abundance
      - Surveys conducted for Reach 5; and Reaches 1-4
      - Three surveys planned – Two were conducted (May 24-28; and July 21-26)
      - In Reach 5 – Surveyed 2009 sites (lower R-5) and established new upper sites in R-5
      - Set minnow traps, snorkeled, and used angling
        - ❑ Captured adult rainbow trout in upper Reach 5 in July
        - ❑ No juvenile salmon were observed in the upper Reach 5 sites (only D.V. and RBT)
        - ❑ Within lower Reach 5, mostly DV and RBT were observed, but so were juvenile Chinook, coho, and sockeye
      - In Reaches 1-4, surveyed 2009 sites, plus some new sites
        - ❑ Used minnow traps, snorkeling, seine and hand nets
        - ❑ Captured and/or observed juvenile Chinook, sockeye, coho, DV, and RBT
    - ❖ Significant Findings for 2010
      - The distribution and composition of fish in Reach 1-4 was similar to past years
      - Juvenile DV and RBT were present in upper reaches R-5 – Flows too high to migrate into the area – suggesting DV and RBT spawning in Reach 5
      - Some adult RBT captured in upper Reach 5 – also suggesting adult use of the area

# **Grant Creek Resident and Rearing Fish Abundance and Distribution – Remaining Tasks**

- Field Work (2013)
  - Juvenile incline plane traps will monitor Reach 1-4 and Reach 5
  - Reach 5 fish assessment using previous methods
  - Winter habitat and fish monitoring
  - Rainbow trout habitat use and spawning using radiotelemetry
- Data Analysis
  - Juvenile incline plane traps will provide abundance estimates for Reach 5 and reaches 1-5, as well as length, species diversity, and outmigration timing.

# **Grant Creek Resident and Rearing Fish Abundance and Distribution – Remaining Tasks**

- Data Analysis (con't)
  - Evaluate resident and juvenile fish use of Reach 5 (Sep)
    - Baited minnow traps, electrofishing, snorkel surveys, juvenile migrant trap for Reach 5 (Sep)
    - Metrics: presence/absence, abundance, CPUE, distribution, fish size, habitat-fish abundance relationships, outmigration timing; for adult RBT - passage at fixed station telemetry site and mobile telemetry surveys.
    - Coordination of habitat use with IFIM team

# **Grant Creek Resident and Rearing Fish Abundance and Distribution – Remaining Tasks**

- Data Analysis (con't)
  - Evaluate winter habitat use of Reach 5 in Grant Creek (Feb-Mar)
    - Baited minnow traps, electrofishing, underwater video, and snorkel surveys
    - Metrics: presence/absence, CPUE, distribution, fish size, habitat-fish abundance relationships
    - Coordination of habitat use with IFIM team

# **Grant Creek Resident and Rearing Fish Abundance and Distribution – Remaining Tasks**

- Data Analysis (con't)
  - Evaluate resident and rearing fish use of open water habitat in lower Grant Creek: (spring, summer and fall sample events)
    - Rainbow trout radiotelemetry study component, baited minnow traps, electrofishing, seine, and snorkel surveys.
    - Metrics: abundance, presence/absence, CPUE, fish size, distribution, and habitat-fish abundance relationships.
    - Coordination of habitat use with IFIM Team

# **Grant Creek Resident and Rearing Fish Abundance and Distribution – Remaining Tasks**

- Reporting
  - Submit report January, 2014

# Grant Creek Resident and Rearing Fish Abundance and Distribution -Work Schedule

[illegible]



# Grant Creek Salmon Spawning and Abundance Work Completed

- Background Info:
  - ADFG (1951/1981)
  - AEIDC (1983).

Peak salmon escapement counts for Grant Creek, 1952-1982

Year	King Salmon	Sockeye Salmon
	Number of Spawners	Number of Spawners
1952	0	250
1953	12	13
1954	6	45
1957	8	0
1959	28	0
1961	86 Total Salmon*	
1962	2	324
1963	33	41
1976	29	0
1977	0	4
1978	5	0
1979	42	29
1980	5	0
1981	45	19
1982	46**	135**
Average	19	61

\* Not included in averages

\*\* Source AEIDC 1982

Source: Alaska Department of Fish and Game 1952-1981

# **Grant Creek Salmon Spawning and Abundance Work Completed**

- **Field Work (2009 & 2010)**
  - Adult sockeye and Chinook escapement was estimated in 2009.
  - Recorded locations of adult fish (spawning aggregates)
- **Data Analysis**
  - Area under the curve (AUC) used with visual counts to estimate escapement
  - Plotted distribution of visual observations
- **Reporting**
  - Baseline study reported in 2010 (HDR 2010)

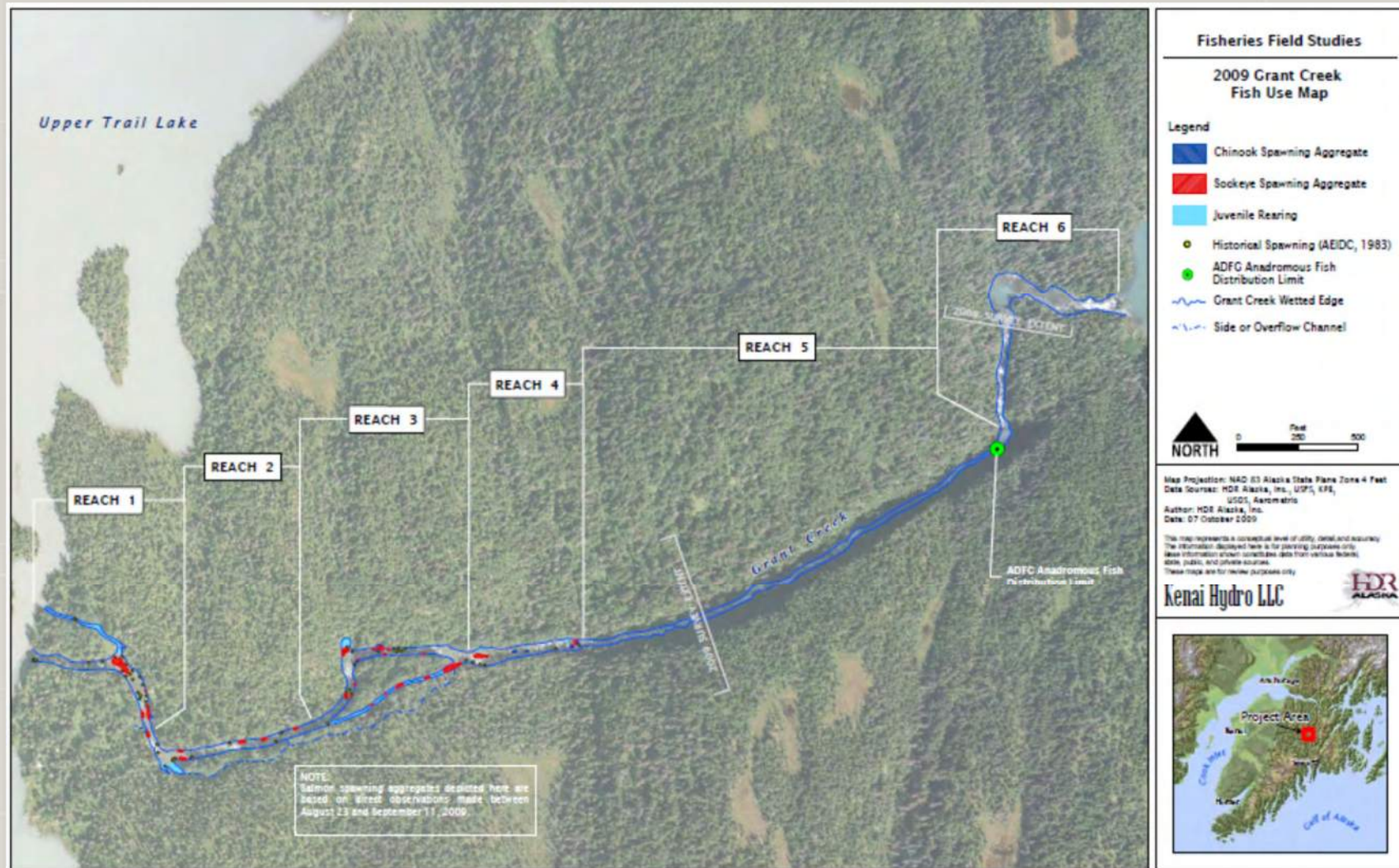
# **Grant Creek Salmon Spawning and Abundance Work Completed**

- Consultation
  - September 22, 2009: aquatic resources technical work group meeting with agencies and interested stakeholders. Site visit to Grant Creek.
  - October 22, 2009: Recommendation from the Moose Pass Advisory Planning Commission to hold a public meeting regarding the Grant Lake Project in Moose Pass.
  - March 4, 2010: The Aquatics Technical Work Group was notified that the 2009 environmental baseline study report was posted on the Kenai Hydro website.

# **Grant Creek Salmon Spawning and Abundance Work Completed**

- Consultation (cont'd)
  - May 4, 2010: All licensing contacts were notified that draft study plans for the Aquatic and Water Resources were posted on the Kenai Hydro website and that a review Project description was filed with FERC on May 3, 2010.

# Chinook and Sockeye Salmon Spawning Aggregates





# Adult Salmon Visual Counts

- Area under the curve estimated
  - Chinook escapement estimate 231- w/ survey life at 14 days & observer efficiency at 0.30
  - Sockeye escapement estimate 6,293- w/ survey life at 9 days & observer efficiency at 0.50.
  - No escapement estimate for Coho salmon.

Survey Date	Species		
	Chinook	Sockeye	Coho
8/1/2009	0	0	0
8/10/2009	4	2	0
8/13/2009	19	1	0
8/23/2009	62	6	0
8/30/2009	31	545	0
9/11/2009	0	1351	0
9/16/2009	0	1188	0
9/29/2009	0	78	6

# **Grant Creek Salmon Spawning and Abundance – Remaining Tasks**

- **Field Work (2013)**
  - Sockeye, Chinook, & Coho escapement est. 2013.
  - Document locations of adult fish (spawning aggregates)
  - Radio tag and monitor adult salmon and rainbow trout
  - Collect scale, genetic samples, carcass surveys
- **Data Analysis**
  - Develop area under the curve (AUC) escapement estimates from visual counts of salmon.
  - Develop survey life estimate for AUC estimate from radio tagged and Floy tagged adults salmon tagged at the weir.

# **Grant Creek Salmon Spawning and Abundance – Remaining Tasks**

- Data Analysis (cont'd)
  - Develop observer efficiency estimate for AUC based on ratio of visual counts to weir counts.
  - Plotted distribution of visual observations, redds and document habitat use.
  - Develop migration and spawning periodicity for salmon based on weir counts, radiotelemetry, and visual counts
  - Document age-at-return (scale analysis), egg voidance, gender, and length-at-age.
- Reporting
  - 2013 field studies reported in January of 2014.



# Grant Creek Salmon Spawning and Abundance Work Schedule

[illegible]

# Comments to Existing Fisheries Study Plans

- A majority of formal comments were incorporated into study plans
  - Use radiotelemetry to document rainbow trout and salmon movement, spawning, and habitat use.
  - Use radiotelemetry on adult salmon to:
    - Develop estimates of survey life for Chinook, sockeye, and coho
    - Track movements in Grant Creek and use of Reach 5
  - Install fixed station telemetry sites at confluence and Reach 4/5 boundary.

# Comments to Existing Fisheries Study Plans

- Use weir to obtain:
  - Abundance estimate for salmon and trout
  - Develop observer efficiency for AUC estimates
  - Sample, tag, and document information on salmon and trout migration periods.
- Conduct winter habitat use study
- Finish fall Reach 5 sampling to complement spring and summer information collected previously
- Conduct resident and rearing study to assess Reaches 1-4 fish habitat use with special attention to focal habitats.

# **Comments to Existing Fisheries Study Plans**

- Install juvenile migrant traps to assess Reach 5 and Grant Creek juvenile migrant abundance and timing

# **Trail Lake Narrows Fish and Aquatic Habitats Study-Work Completed**

- No previous fisheries work has been completed in Trail Lake Narrows in association with the potential bridge site location.

# **Trail Lake Narrows Fish and Aquatic Habitats Study-Remaining Tasks**

- **Field Work (2013)**
  - Assessment of fish use within the Trail Lake Narrows, particularly in the vicinity of the proposed Trail Lake Narrows Bridge.
  - Sampling techniques may include minnow traps, snorkeling, and seining with stream bank habitat the area of focus for Chinook and coho juveniles.
- **Data Analysis**
  - Document CPUE, number of fish sampled, size, species diversity and habitat type and location.

# **Trail Lake Narrows Fish and Aquatic Habitats Study – Remaining Tasks**

- Reporting
  - submit report in January of 2014

# Trail Lake Narrows Fish and Aquatic Habitats Study

[illegible]



# Grant Creek Aquatic Habitat Mapping – Work Completed

- Field Work
  - Lower Grant Creek (Reaches 1 – 4) mapped key habitats using the following mesohabitat categories
    - Backwater/slow pockets
    - Margin with Undercut Bank (UCB)
    - Margin with No UCB
    - Pool/fastwater
    - Riffle/fast water
    - Margin Shelf with instream cover
    - Large Wood Debris (LWD) dam
    - Side channel Variable (tributary, secondary, and tertiary)

# **Grant Creek Aquatic Habitat Mapping Work Completed**

- **Data Analysis**
  - Completed by 2010. Habitat data from 2009 synthesized and incorporated into GIS platform
  - Incorporated spatial fish data from 2009 and 2010
- **Reporting**
  - Baseline studies report issued in 2009
- **Consultation**
  - HEA consulted with Work Groups 11 times in 2009 on fisheries, habitat, and instream flow issues

# **Grant Creek Instream Flow Study Work Completed**

- Consultation:
  - 24 March 2009: TWG presentation in Moose Pass
  - 21 April 2009: TWG meeting in Kenai
  - 18 May, 2009: Study plans uploaded to Kenai Hydro web site
  - 19 May 2009: TWG conference call
  - 10 June 2009: TWG sent compilation of documents from ADF&G
  - 01 July 2009: Technical memo to TWG re: habitat use work in 2009

# **Grant Creek Aquatic Habitat Mapping Remaining Tasks**

- Field work:
  - Ground truth habitat mapping and modify if revisions required
- Data Analysis
  - Synthesize fish utilization data collected in 2013
  - Analyze and identify factors that influence fish use in key habitats

# **Grant Creek Aquatic Habitat Mapping Remaining Tasks**

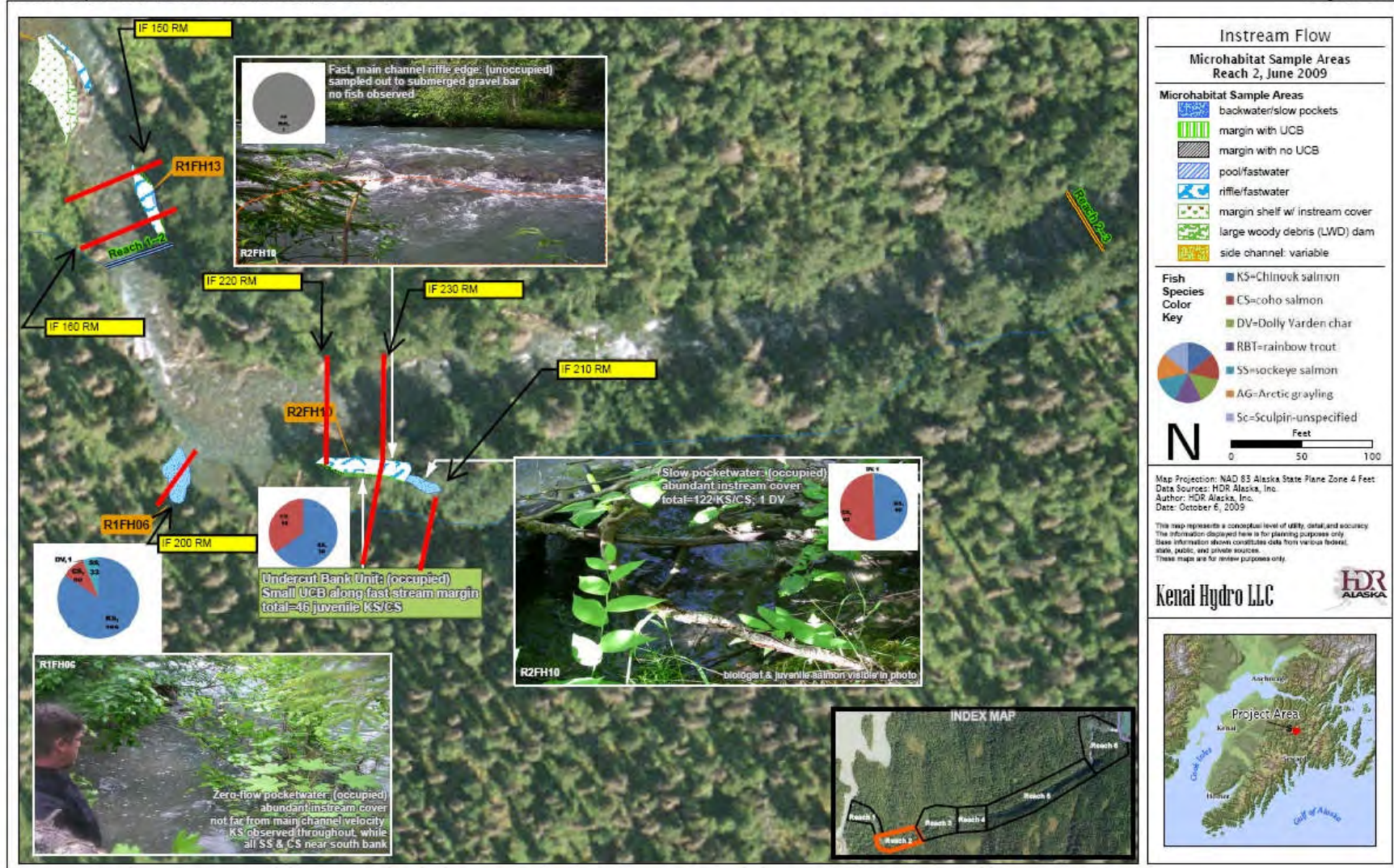
- Reporting
  - Revisions to existing maps will be incorporated at the end of the field season



# Reach 2 – Transect Locations on Key Habitats (from HDR)

Kenai Hydro Environmental Baseline Studies

Figure 3.7



# Aquatic Habitat Mapping Schedule

[illegible]

# **Comments to Habitat Mapping Study Plan**

- Project will collect depth, velocity, temperature, substrate and cover data for all fish utilization measurements
- Mesohabitat categories expanded



# **Grant Creek Instream Flow Study Work Completed**

- **Field Work**
  - 18 Transects approved by Instream Flow Work Group set up to model the most sensitive Lower Grant Creek areas with following measurements:
    - Middle Flow calibration measurement (175 – 184 cfs) with depth, velocity, water surface elevations (WSE)
    - Low flow WSE (92 – 169 cfs)
    - No High flow WSE
    - Substrate across all transects
    - Cover across all transects

# **Grant Creek Instream Flow Study Work Completed**

- **Data Analysis:**
  - None completed since all field measurements were not taken
- **Reporting**
  - Baseline studies report in 2009; no complete report, since all field measurements were not taken
- **Consultation**
  - HEA consulted with Work Groups 11 times in 2009 on instream flow, habitat and fisheries issues

# **Grant Creek Instream Flow Study**

## **Remaining Tasks**

- **Field Work**
  - Verify stability of the 18 existing transects (bed profile, stage of zero flow, substrate and cover)
    - If stable, use existing middle flow measurements taken in 2010 and use as high flow measurement
    - If not stable, redo those transects that have shifted (bed profiles, depth/velocities, WSE, substrate and/or cover)
  - Take low/middle flow WSEs and discharges
  - Collect higher WSE and discharge if necessary/safe
  - Collect data for site-specific Habitat Suitability Index (HSI) curves

# **Grant Creek Instream Flow Study**

## **Remaining Tasks**

- **Field Work**
  - Survey bed profiles and water surface elevations, residual depth of representative pools in Reach 5 at a range of flows, and assess connectivity
- **Data Analysis**
  - Use 3 WSEs and one velocity set (one flow model) to simulate the range of flows for Grant Creek:
    - WSE and discharges at low, middle, high and potentially higher calibration flow
    - Depths and Velocities from high flow (approximately 200 cfs)
    - Use One flow model for flows at and below the high flow measurement (~200 cfs)

# **Grant Creek Instream Flow Study**

## **Remaining Tasks**

- Use a combination of One Flow model and Depth Calibration model to simulated flows above the high flow measurement (~200 cfs)
- **HSI Curves: use site-specific data to develop curves for Grant Creek**
  - Supplement with literature curves that reflect conditions in Grant Creek
- **Weighted Usable Area**
  - Developed for target species and life stages
- **Reach 5 Analysis**
  - Use Thompson (1972) to assess connectivity for upstream passage into representative pools

# **Grant Creek Instream Flow Study**

## **Remaining Tasks**

- Reporting
  - Calibration, HSI data reports
  - Grant Creek IFIM Report
  - Reach 5 Calibration Report



## Downstream of Canyon, Upper Reach 4 (from HDR)





# ISF 120, Middle Flow (HDR)





# Grant Creek Instream Flow Schedule

	2012	2013											
Task	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Site Visit													
Agency Communication													
Habitat Utilization Studies													
Conduct Instream Flow Studies													
Data reduction/QA/QC													
Data Analysis/Report													

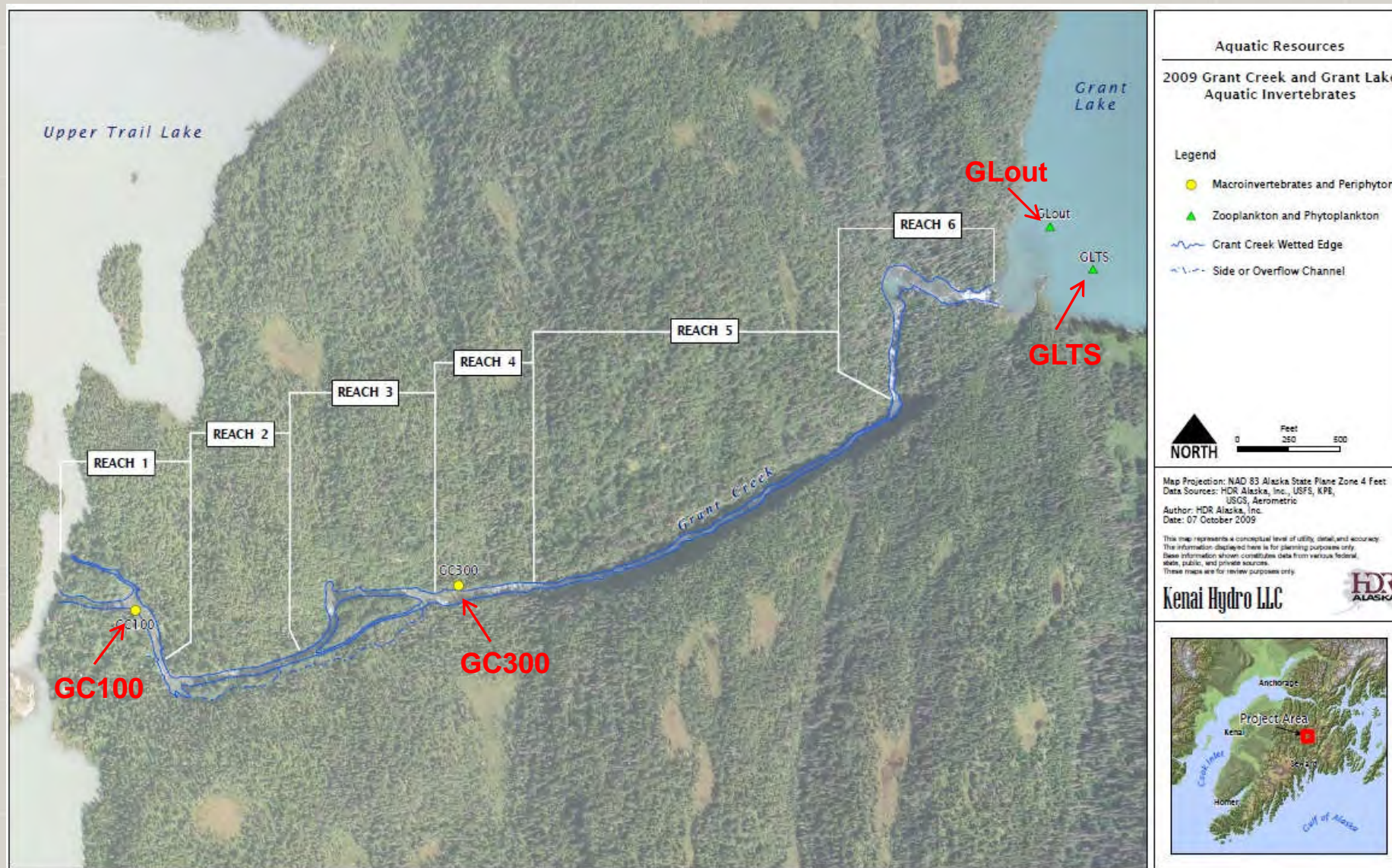
# Comments to Existing Study Plans

- A majority of the comments were incorporated into study plans
  - Development of site-specific HSI curves for synthesis with existing, pertinent curves
  - Continue to use the 18 transects agreed-upon by TWG
  - Due to the limited utilization of side channels on Reach 3, 2D modeling is not warranted.

# **Grant Creek Macroinvertebrate Study – Work Completed**

- Field Work: one sampling event in 2009
  - Samples collected on August 31, 2009, at sites GC100 and GC300
  - Used both Alaska Stream Condition Index (ASCI) methods and Surber samplers
  - ASCI methods sample all habitats proportionately within a study reach and provide an overview of population characteristics
  - Five Surber samples collected within a single habitat type (riffles) are pseudo-replicates that provide more quantitative data for monitoring purposes
  - Also, zooplankton and phytoplankton samples collected in Grant Lake at GLout and GLTS

# Grant Creek Macroinvertebrate Study





# **Grant Creek Macroinvertebrate Study – Work Completed**

- Sample Identification: all samples identified to genus or next practicable taxon
- Data Analysis:
  - Metrics calculated for populations collected using both methods:
    - Population Density
    - Percent Ephemeroptera, Plecoptera, and Trichoptera (EPT)
    - Taxa Diversity
    - Percent Dominant Taxa
    - HBI – Biotic Index Score
- Report of 2009 results

# Grant Creek Macroinvertebrate Study – Work Completed

- 2009 results
  - Trend in metrics different between GC100 and GC300
  - Percent EPT and percent dominant taxa indicate better habitat at GC300
  - Taxa diversity and population density were greater at GC100
  - Three taxa of zooplankton identified in Grant Lake at both sites, greatest density at Glout; highest chlorophyll *a* concentrations at GLTS

# **Grant Creek Macroinvertebrate Study – Remaining Tasks**

- **Field Work:**
  - One more sampling event in August 2013 at GC100 and GC300
  - Employing Surber samplers for quantitative results for use in future monitoring
- **Sample processing and identification:**
  - Identification to genus or next practicable taxon
- **Data analysis and reporting:**
  - Combine with earlier analysis to further establish baseline condition

# Grant Creek Periphyton Study

## Work Completed

- Field Work: one sampling event in 2009
  - Samples collected on August 31, 2009 at sites GC100 and GC300
  - Used a modified rapid bioassessment protocol
  - Ten samples collected within a single habitat type (riffles) are pseudo-replicates that provide more quantitative data for monitoring purposes
- Data Analysis: samples analyzed for concentration of chlorophyll *a*
- Report of 2009 results



# Grant Creek Periphyton Study Work Completed

- 2009 Results
  - Trend in chlorophyll *a* concentrations indicate difference between sites
  - Average concentrations higher at GC100 than GC300

# **Grant Creek Periphyton Study**

## **Remaining Tasks**

- **Field Work:**
  - One more sampling event in August 2013 at GC100 and GC300
  - Using same modified RBP methods
- **Analyze samples for chlorophyll *a* concentration**
- **Data analysis and reporting:**
  - Combine with earlier analysis to further establish baseline condition

# **Grant Creek Macroinvertebrate and Periphyton Studies– Schedule**

- Field Work:  
Mid-August 2013
- Sample processing and identification:  
September – October 2013
- Data Analysis and Reporting:  
November – December 2013

# **Grant Creek Macroinvertebrate and Periphyton Studies Comments /Response**

- Study has better defined its objectives to collect quantifiable data and is using repeatable methods – pseudo-replicates collected using a Surber sampler

# **Grant Creek Salmon Spawning and Abundance Consultation**

- September 22, 2009: aquatic resources technical work group meeting with agencies and interested stakeholders. Site visit to Grant Creek.
- October 22, 2009: Recommendation from the Moose Pass Advisory Planning Commission to hold a public meeting regarding the Grant Lake Project in Moose Pass.
- March 4, 2010: The Aquatics Technical Work Group was notified that the 2009 environmental baseline study report was posted on the Kenai Hydro website.

## **Grant Creek Salmon Spawning and Abundance Consultation, (cont'd)**

- May 4, 2010: All licensing contacts were notified that draft study plans for the Aquatic and Water Resources were posted on the Kenai Hydro website and that a Project description was filed with FERC on May 3, 2010.

# **Grant Creek Instream Flow and Habitat Mapping Consultation**

- 24 March 2009: TWG presentation in Moose Pass
- 21 April 2009: TWG meeting in Kenai
- 18 May, 2009: Study plans uploaded to Kenai Hydro web site
- 19 May 2009: TWG conference call
- 10 June 2009: TWG sent compilation of documents from ADF&G
- 01 July 2009: Technical memo to TWG re: habitat use work in 2009

## **Grant Creek Instream Flow and Habitat Mapping Consultation (cont'd)**

- 16 July 2009: TWG conference call
- 27 August 2009: Instream flow study report uploaded to Kenai Hydro web site
- 08 September 2009: TWG sent summary of 1984 instream flow study
- 22–24 September 2009: TWG meeting in Moose Pass
- 07 October 2009: TWG sent tech memo re: instream flow study plan



# **Anticipated Grant Creek Weir Installation and Monitoring/Fisheries Investigation Permits**

- ADF&G Fisheries Resource Permit
- ADF&G Fish Habitat Permit
- USFS Special Use Permit
- KPB Floodplain Permit

# **Anticipated Permits for other Aquatic Studies**

- **Habitat Mapping:**
  - No permits are anticipated to be required for collecting habitat mapping data
- **Instream Flow Study:**
  - No permits are anticipated to be required for collecting instream flow and HSI curve data
- **Macroinvertebrate and Periphyton Studies:**
  - No permits are anticipated to be required for collecting macroinvertebrate and periphyton data

**Grant Lake Hydroelectric Project (FERC No. 13212)**  
**Natural Resource Studies Meeting**  
**December 12, 2012 – Anchorage, AK**

**Water Resources Studies**

**Water Quality**

**Hydrology**

**Geomorphology**



In Association with



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# Resource Area Studies

- Water Quality and Temperature Studies
  - Grant Lake and Grant Creek Water Chemistry Sampling
  - Grant Lake and Grant Creek Water Temperature Data Collection
  - Trail Lakes Narrows Water Chemistry Sampling

Grant Lake and Grant Creek sampled once in late summer 2013

Trail Lakes Narrows sampled 3X, spring, summer, fall.

# Resource Area Studies

- Hydrology Studies

- Re-establish historical USGS gaging station to continuously monitor stage during ice-free periods.
- Take multiple discharge measurements throughout the season to develop a stage-discharge rating curve
- Conduct a low flow accretion study in Reach 5 (i.e., Canyon Reach) of Grant Creek

# Resource Area Studies

- Geomorphology Studies

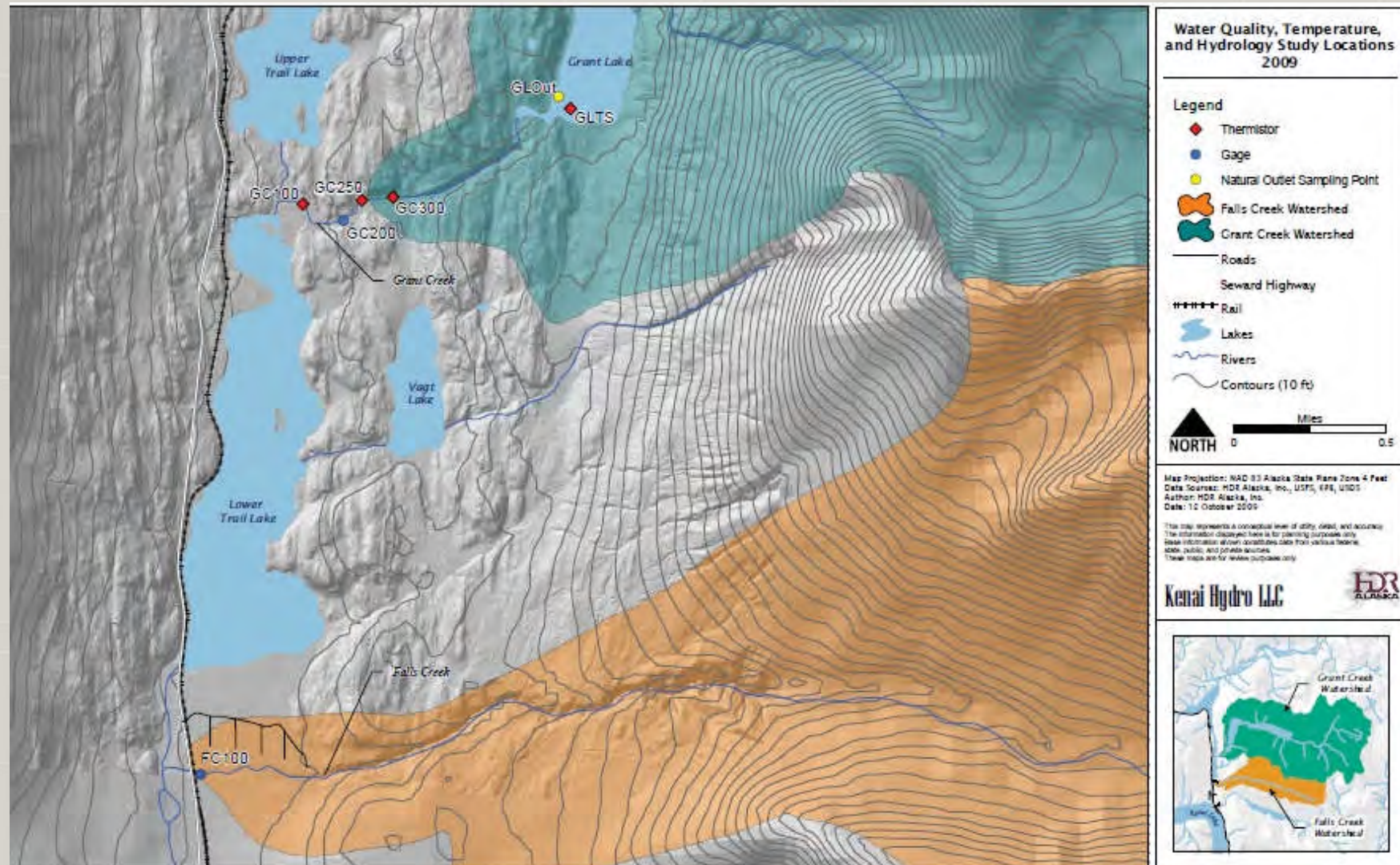
- Assess material transport within Grant Creek.
- Characterize shoreline erosion potential of Grant Lake and its tributaries

Sediment transport studies will emphasize gravel movement in relation to maintenance of habitat for spawning salmon.

Shoreline erosion studies to emphasize potential lake impoundment and drawdown scenarios.



# Water Quality and Hydrology Site Locations



**Source:** Grant Lake Hydroelectric Project Environmental Studies Baseline Report, 2009



# Water Quality and Temperature – Grant Lake

## Work Completed

- Water chemistry sampling in Grant Lake intermittently by the USGS in the 1950's; AEIDC in 1981-1982; and KHL in June and August 2009; June 2010
  - 2009/2010 water samples collected at proposed Project intake and Grant Lake outlet
- Temperature and dissolved oxygen profiles by USFWS in 1961; ADFG in 1981; and AEIDC from 1981-1982. KHL conducted reservoir profiles in 2009 as well as installing a thermistor string in June of 2009 and July 2010 at proposed Project intake.
  - Thermistor string (20m depth) collects temperature data at 10 discrete depth nodes
- Water Chemistry data analysis consists of tabular and graphical summaries (reservoir profiles and histograms) for each water quality analyte to determine baseline conditions and temporal trends.
- Water temperature data analysis consists of graphical summaries (reservoir profiles and line graphs) to depict continuous mean daily or instantaneous temperature trends.
- 2009 Study Reports submitted to FERC and stakeholders.
- Stakeholders reviewed 2009 report and submitted formal comments in summer of 2010 to shape 2012 study plans.

# Water Quality and Temperature – Grant Lake (continued)

- 2013 Study Efforts
  - Water chemistry sampling in Grant Lake: September 2013
    - Water samples collected at proposed Project intake (GLTS) and Grant Lake outlet (GLOut)
  - Re-establish relict GLTS thermistor string to commence data collection after ice breakup in 2013.
  - Water Chemistry data analysis consists of graphical summaries (reservoir profiles and histograms) for each water quality analyte to determine baseline conditions and temporal trends.
  - Water temperature data analysis consists of graphical summaries (reservoir profiles and line graphs) to depict continuous mean daily water temperature trends.
  - 2013 Study Reports will be submitted to stakeholders in January of 2014

# Water Quality and Temperature – Grant Creek

## Work Completed

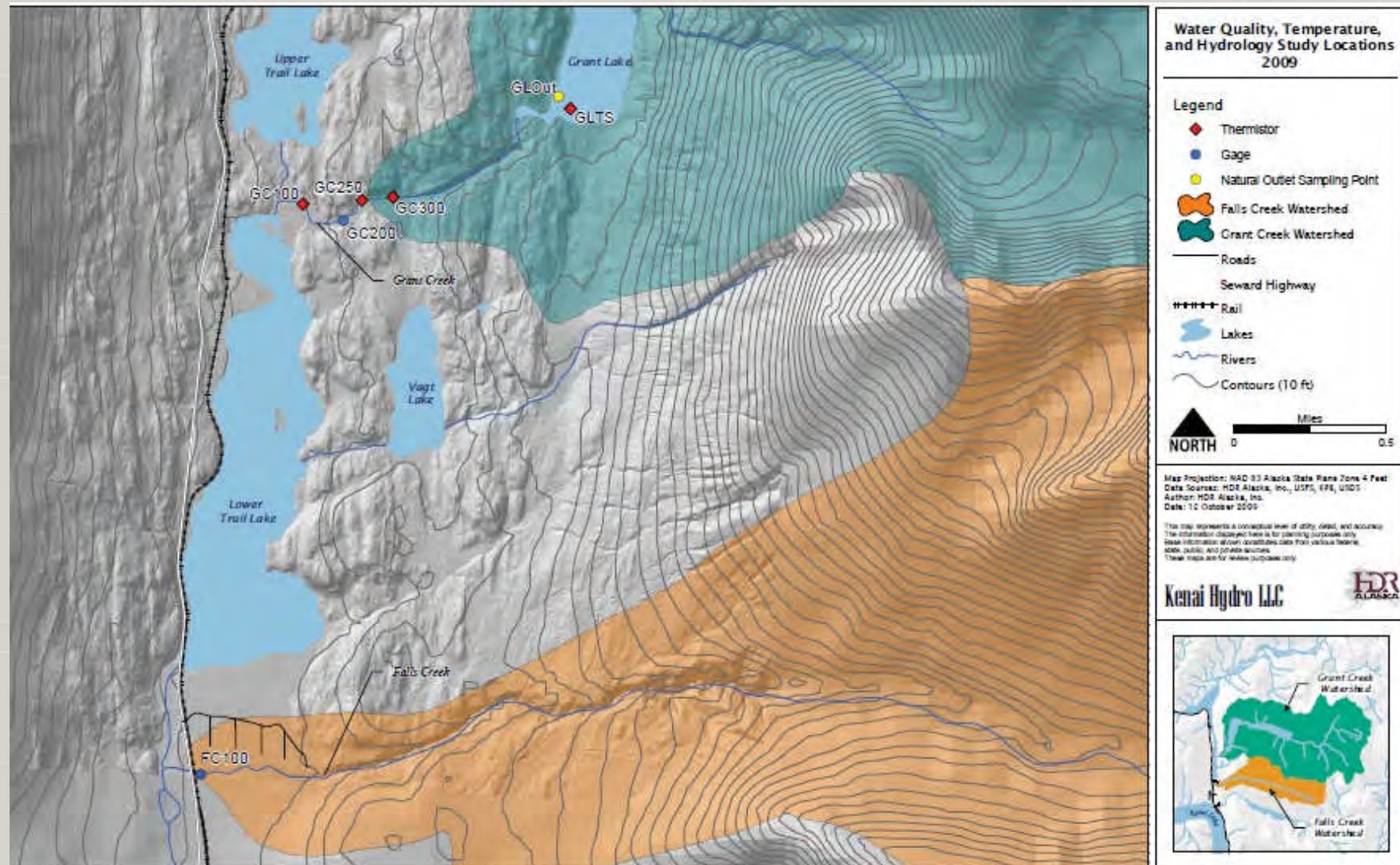
- Water chemistry sampling in the lower reaches of Grant Creek by the USGS from 1950-1958; AEIDC in 1982; KHL in June and August 2009; June 2010
  - 2009/2010 water samples collected at GC 100, GC 200, and GC 300.
- Thermistors deployed in August 1982 at GC 200; June of 2009 and July 2010 at GC 100, GC 200, GC 250, and GC 300.
- Water Chemistry data analysis consists of tabular and graphical summaries (histograms and line graphs) for each water quality analyte to determine baseline conditions and temporal trends.
- Water temperature data analysis consists of tabular and graphical summaries (line graphs) to depict mean daily water temperature trends.
- 2009 Study Reports submitted to FERC and stakeholders.
- Stakeholders reviewed 2009 report and submitted formal comments in summer of 2010 to shape 2012 study plans

# Water Quality and Temperature – Grant Creek (continued)

## – 2013 Study Efforts

- Water chemistry sampling in Grant Creek: September 2013
  - Water samples collected at GC 100, GC 200, and GC 300
- Install thermistors at GC 100, GC 200, GC 250, and GC 300 to commence data collection after ice breakup in 2013.
- Water Chemistry data analysis will add to graphical summaries (histograms) for each water quality analyte to round out seasonal baseline conditions and temporal trends.
- Water temperature data analysis consists of graphical summaries (line graphs) to depict seasonal mean daily water temperature trends in relation to streamflow.
- 2013 Study Reports will be submitted to stakeholders in January of 2014

# Water Quality and Hydrology Site Locations



**Source:** Grant Lake Hydroelectric Project Environmental Studies Baseline Report, 2009

# Water Quality – Trail Lake Narrows

- Historical Water Quality Data Not Available
- 2013 Study Efforts
  - Three water chemistry sampling events in Trail Lake Narrows: spring, summer, and fall 2013
    - Water samples to be collected downstream of proposed access road crossing.
    - All water quality analytes to match Grant Lake and Grant Creek samples, with the addition of hydrocarbons.
  - Water Chemistry data analysis will provide tabular and graphical summaries (histograms) for each water quality analyte to assess seasonal baseline conditions and temporal trends.
  - 2013 Study Reports will be submitted to stakeholders in January of 2014



# Grant Lake and Grant Creek Water Quality Analytes

Parameter	Units
Alkalinity (CaCO <sub>3</sub> )	mg/L
Total dissolved solids (TDS)	mg/L
Total suspended sediment (TSS)	mg/L
Kjeldahl Nitrogen	mg/L
Nitrate/Nitrite	mg/L
Orthophosphate	mg/L
Total phosphorous	mg/L
Lead	µg/L
Hardness	mg/L
Calcium	mg/L
Magnesium	mg/L
Sodium	mg/L
Potassium	mg/L
Low level mercury	ng/L
Fluoride	mg/L
Chloride	mg/L
Sulfate	mg/L
pH	STD
Temperature	°C
Dissolved oxygen (DO)	mg/L, %
Specific and Relative Conductivity	mS/cm, µS/cm
Oxygen Reduction Potential (ORP)	mV
Turbidity	NTU

# Hydrology – Grant Creek

## – Work Completed

- Historical USGS gaging site 15246000 (GC 200), operational for 11 years (1947 - 1958)
- Simulated discharge record from 1959-1980 with the HEC-4 monthly streamflow simulation model (Ebasco,1984)
- Continuous stage recording device installed in Grant Creek (GC 200) at historical USGS gaging location. Operational Periods: May 1982 - December 1983; June - October 2009; April 2010-June 2010.
- Hydrology data analysis consists line graph tracking mean daily stage values over time. Also instantaneous staff gage datum are overlaid with continuous data to track measurement error.
- 2009 Study Reports submitted to FERC and stakeholders.
- Stakeholders reviewed 2009 report and submitted formal comments in summer of 2010 to shape 2012 study plans

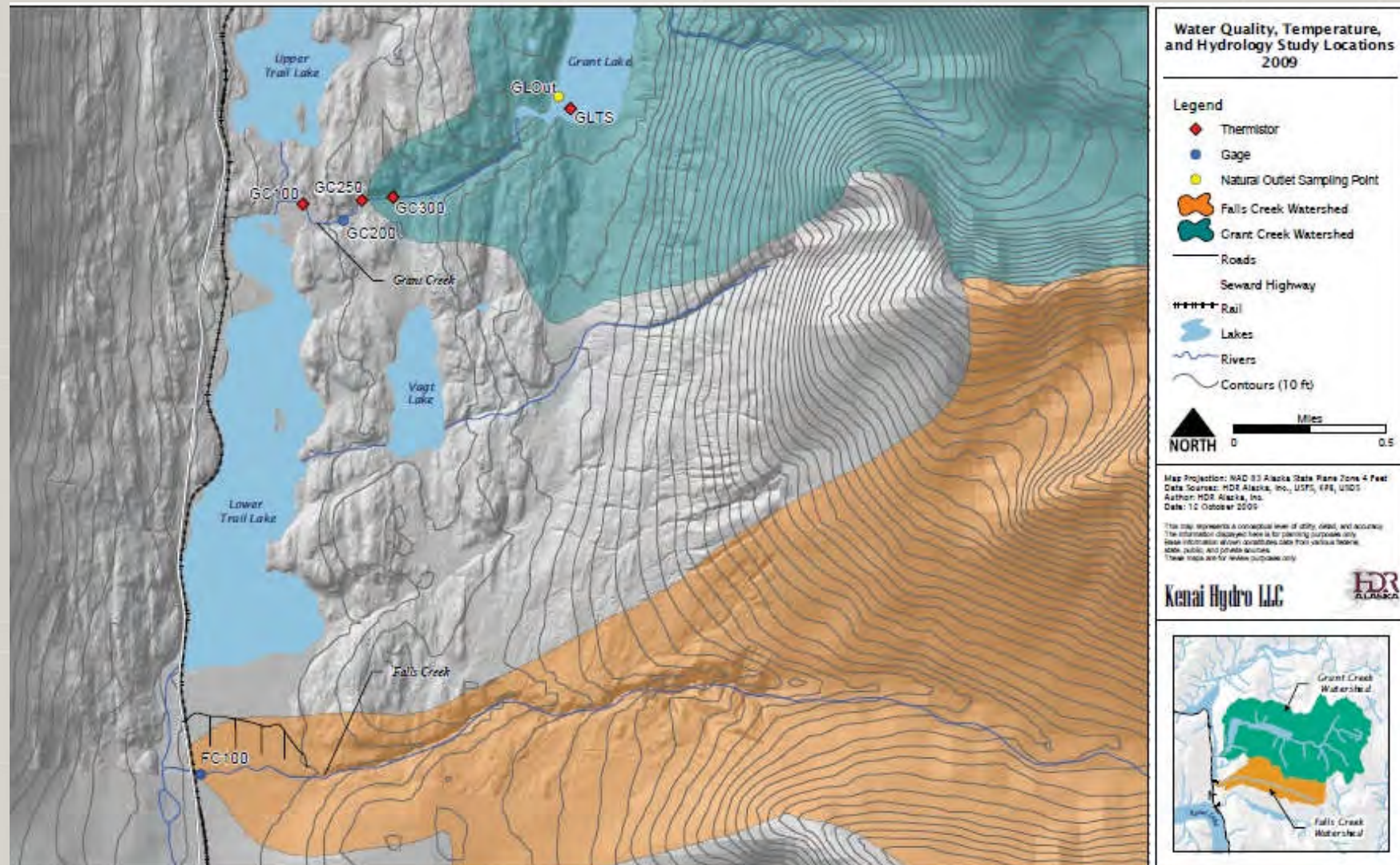


# Hydrology– Grant Creek (continued)

## – 2013 Study Efforts

- Install continuous stage recording device, take discharge measurement: Spring 2013
  - Stage recording device upgraded to USGS standards
- Service and calibrate stream gage on a 6-8 week schedule.
  - Gage to be disabled in late fall due to icing conditions
- Low flow accretion study in Reach 5 of Grant Creek (Fall 2013)
- Hydrology data analysis will consist of mean daily flow tables with streamflow and stage hydrographs depicting temporal trends in stage and flow conditions. Accretion data to indicate water gains/losses within Reach 5 of Grant Creek.
- 2013 Study Reports will be submitted to stakeholders in January of 2014

# Water Quality and Hydrology Site Locations



**Source:** Grant Lake Hydroelectric Project Environmental Studies Baseline Report, 2009

# Geomorphology – Grant Lake Shoreline Erosion

- Work Completed
  - Bathymetry (Ebasco, 1984)
  - Geologic mapping
  - LiDAR
  - Air photos
- 2013 Study Efforts
  - Desk-top GIS analysis
  - Existing shoreline condition inventory (boat-based field assessment, geo-referenced photos, field interpretation and GIS-based mapping product)
  - Prediction of potential geomorphic response to lake impoundment and drawdown scenarios

# Geomorphology – Grant Creek Sediment Transport

## – Work Completed

- Historic hydrology (Historical USGS gaging site (1947 - 1958), Simulated discharge record from 1959-1980 with the HEC-4 (Ebasco, 1984), Continuous stage recording device installed in Grant Creek at historical USGS gaging location (May 1982 - December 1983; June - October 2009; April 2010-June 2010).
- Historic geologic mapping, LiDAR and air photos

## – 2013 Study Efforts

- Desktop analysis (geomorphic mapping and characterization)
- Field sediment characterization (bulk samples, Wolman counts, ebeddedness, cross-section)
- Field geomorphic characterization (sediment inputs, channel form, transport/deposition)
- Prediction of potential geomorphic response to stream flow under management scenarios (integrate existing hydrology and field measurements to estimate incipient motion thresholds for a range of flows)

# Permitting— Water Resources

- Water Quality and Temperature

Multi-agency permit application to be submitted to Kenai River Center. Grant Lake thermistor string is the only monitoring device potentially in need of a permit.

- Hydrology

Installation of stream gage will require a Fish Habitat Permit

- Geomorphology

Multi-agency permit application to be submitted to Kenai River Center for the proposed bulk sampling in Grant Creek.



# Grant Lake Water Resources Study Schedule

[illegible]

# Water Resources – Questions and Comments?

# Terrestrial Resources Presentation For the Grant Lake Hydroelectric Project

**Grant Lake Hydroelectric Project (FERC No. 13212)**  
**Natural Resource Studies Meeting**  
**December 12, 2012 – Anchorage, AK**



In Association with





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# Botanical Resources Studies

- General vegetation type mapping (Beck Botanical Services)
- Sensitive plant and invasive plant survey (Beck Botanical Services)
- Mapping wetlands and other waters of the U.S. (OASIS ERM)

# Wildlife Resources Studies

- Raptor nesting surveys
- Breeding landbirds and shorebirds
- Waterbirds
- Terrestrial mammal surveys

OASIS ERM will be completing components of each of the wildlife studies

# Field Study Timeline

[illegible]

# Vegetation Type Mapping, Sensitive and Invasive Plant Surveys

## Goals:

- Vegetation Type Mapping
  - Update existing vegetation type map, produce a technical report with a description of Project vegetation
- Sensitive Plant Survey
  - Satisfy USFS requirements for a technical report and BE for Sensitive plants
- Invasive Plant Survey
  - Document invasive plants in areas affected by Project construction and operation, produce a technical report

# Study Area

- Sensitive Plant and Invasive Plant Surveys will occur:
  - 2 vertical feet around the perimeter of Grant Lake
  - 50 feet on either side of Road and Transmission Line
  - 100 foot margin around proposed Project facilities

# Work done to date (2010)

- Vegetation
  - A Vegetation Type Map exists for the general Project Area (USFS 2007a)
- Sensitive and Invasive Plants
  - No work has been done to date

# Remaining Tasks: Pre-field

- Complete the R10 2009 Pre-Field Review Worksheet for Sensitive plants
- USFS data request for Sensitive plants or Invasive plants in or near the Project area
- AKNHP data request for rare plants in or near the Project area



# Field Sampling 2013

- Conduct Sensitive Plant/Invasive Plant Surveys
  - Follow USFS procedures (Stensvold 2002)
  - Focus surveys in high potential habitats
  - Complete TES Plant Element Occurrence Forms
  - Complete the 2008 USFS Plant Survey Field Form
  - Document invasive plants with AKEPIC forms
  - Keep records of survey locations, vascular plants observed
  - Take GPS points, as necessary
- Ground truth the Vegetation Type Map

# Data Analysis

- Post-field GIS-based Sensitive Plants and Invasive Plants mapping
- Create map of areas surveyed
- Revise Vegetation Type map based on ground truthing during field work

# Reporting

- Sensitive Plant technical report and BE
  - Element occurrence forms (if Sensitive plants are located)
  - Assess potential Project impacts and PME's for Sensitive plants
- Invasive Species technical report
  - Document invasive plants with AKEPIC field forms
  - Assess potential Project impacts with regard to invasive plants
  - Develop plan for managing invasive plants for inclusion in the draft and final license applications and construction BMP's
- Vegetation Type Mapping technical report
  - Update existing vegetation type map
  - Produce technical report with a description of Project vegetation

# Communication

- Submit Sensitive plants, Invasive plants and Vegetation type technical reports and Sensitive plants BE to USFS, other agencies
- Communicate with agencies, as necessary

# Schedule for Remaining Tasks

- Winter 2012-2013/Spring 2013
  - Complete Pre-Field Review for Botanical Resources
  - Data requests for botanical information
- Summer 2013
  - Conduct Botanical Field Surveys (July)
- Fall 2013/Winter 2013-2014
  - Data management/quality control
  - Create GIS maps using field data
  - Prepare draft technical reports and BEs
- May 2014
  - Finalize technical reports and BEs

# Wetlands and Waters of the U.S. Studies

Goal: Fulfill data needs for Section 404 Permit Application in support of FERC License Application

- Wetlands mapping and classification
- Functional assessment

# Wetlands and Waters Assessment Area

- Access road / transmission corridor
- Facilities
- Grant Lake inlet area
- As needed/TBD
  - Dam (if included in Project Plan)
  - Grant Lake shore
  - Grant Creek margin

# Work done to date (2010)

- Pre-field
  - GIS-based wetland mapping using NWI mapping and aerial imagery
  - Identified 77 “field targets” within transmission corridor and lake shore
- Field
  - Sampled late June, 2010
  - Field sampled 43 plots within transmission corridor
- Post field
  - GIS feature class of 43 points

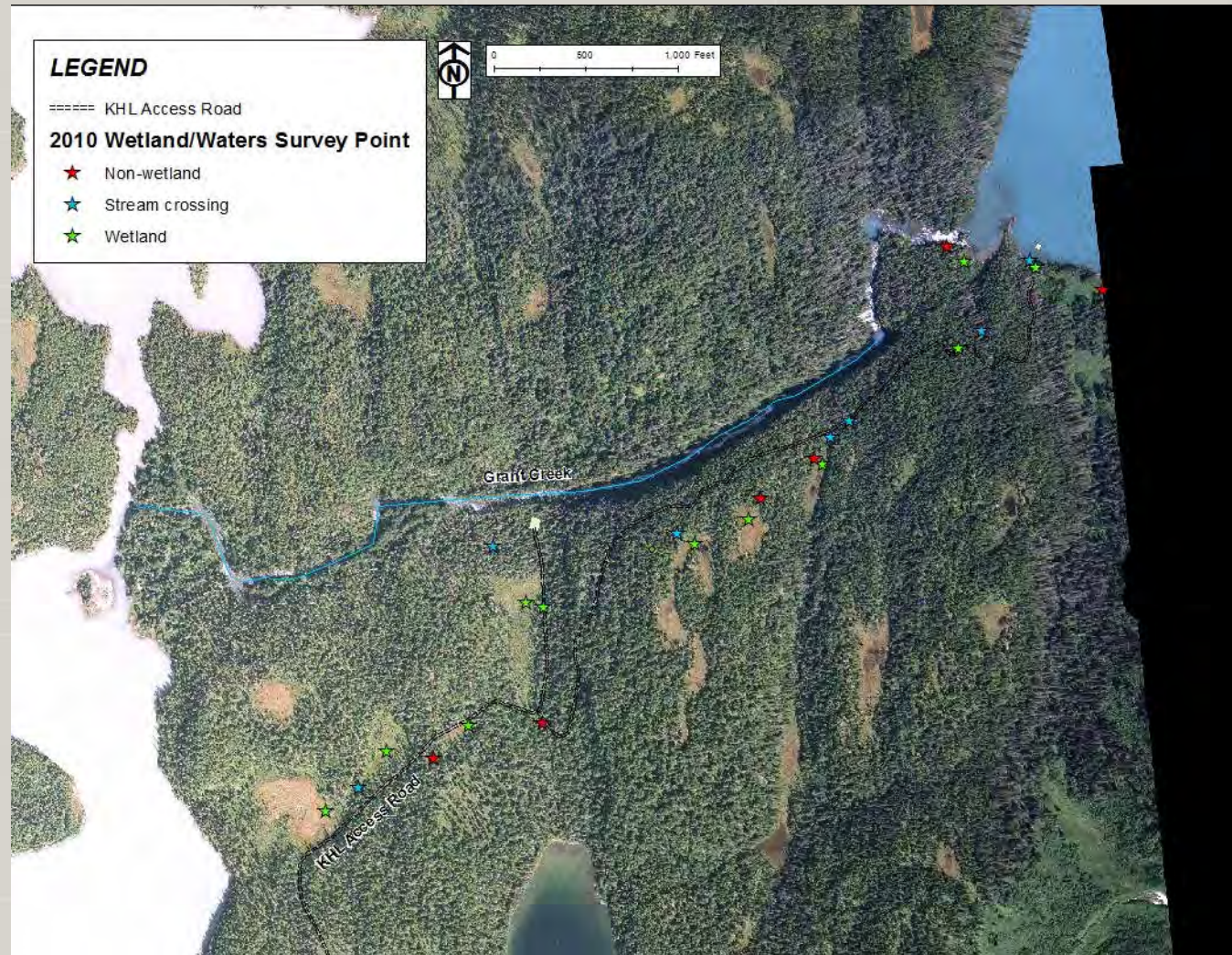


# Work done to date (2010)

## Continued

Plot Type	Number	NWI Classifications
Wetland determination	21	Wetlands (16): palustrine: emergent, scrub/shrub, forested; Non-wetland (7)
Representative wetland	8	Palustrine: emergent, scrub/shrub, forested
Representative upland	5	Non-wetland
Stream crossing	9	Riverine: upper perennial, intermittent
<b>Total</b>	<b>43</b>	

# Field work done to date (2010)



# Remaining Tasks: Pre-field

- Confirm functional assessment method with USACE
- Identify mapping gaps
- Pre-mapping in GIS using existing layers:
  - 2010 field plots
  - Aerial imagery
  - NWI mapping
  - Kenai Peninsula Land Cover mapping
  - National Hydrography data set
  - Chugach NF hydrography data set

# Field Sampling 2013

- Wetlands and waters mapping and classification
  - Wetland determination points using USACE 1987 Manual and AK Supplement
  - GPS points along all wetland boundaries
- Functional assessment of each wetland/waterbody

# Data QC and Summary

- Data quality control
- Post-field GIS-based wetland mapping
- Data Summary
  - Wetland status (wetland or non-wetland)
  - Classification (NWI and HGM classes)
- Functional assessment
  - Summarize wetland functions for each mapped wetland

# Reporting and Communication

- Reporting
  - Wetlands and Waters of the U.S. report including
    - Wetland maps
    - Wetland classification
    - Functional assessment
- Communication
  - USACE, USFWS, as necessary



# Schedule for Remaining Tasks

- Winter 2012-2013/Spring 2013
  - Acquire/review existing data
  - Develop preliminary wetland map in GIS
- Summer 2013
  - Conduct wetland/waters field sampling (July-August)
- Fall 2013/Winter 2013-2014
  - Data management/quality control
  - Revise wetland maps using field data in GIS; prepare final maps
  - Prepare wetland and waters report (including maps, wetland/waters classification, and functional assessment)

# Terrestrial Wildlife Studies

- *Study Component #1 – Raptor Nesting Surveys*
  - Raptor Nest Survey: Completed 2010
  - Goshawk Nest Ground-Based Survey: June & early-July, 2013 & 2014
- *Study Component #2 – Breeding Landbirds and Shorebirds*
  - Breeding Landbird and Shorebird Study: 20 Points Completed 2010
  - Breeding Landbird and Shorebird Study: Mid-May & June, 2013
- *Study Component #3 – Waterbirds*
  - Harlequin Duck Surveys: Completed 2010
  - Waterbird Brood-Rearing Survey: Completed 2010
  - Winter Waterbird Survey: November / December, 2013 & February / March, 2014
- *Study Component #4 – Terrestrial Mammals*
  - Bat Surveys: Complete 2010
  - Bear Dens: Complete 2010
  - Winter Moose Surveys: November / December, 2013 & February / March, 2014



# RAPTORS

- **Study Objectives:**

Locate, identify, and map tree and cliff-nesting raptor nest locations,

Compile a list of raptor species nesting in the Project vicinity, and

Assess potential Project effects and propose potential strategies to avoid and minimize impacts to raptors.

- **Field Work (2010):**

Bald eagle nest surveys were conducted by the USFS in 2010 and that information supplied to the Project.

At the request of the USFS, all observations for cliff and tree nesting raptors around Grant Lake were made by boat during the 2010 waterbird surveys.

Observations for tree nesting raptors near proposed Project facilities were made during the 2010 breeding bird survey of proposed Project facilities.

1.5 Northern Goshawk Broadcast Call Surveys, 32 Survey Stations (15,16,19 & 28 June 2010).

# RAPTORS

- **Data Collected & Mapped (2010):**

Coordinates and Shapefile for 2 BAEG nests, provided by USFS.

2 BAEA incidental sightings (12 & 23 July 2010), descriptive locations only.

No Northern Goshawks recorded.

- **Analysis & Reporting (2010):**

2010 Summary Report of Field Investigations.

- **Communication (2010):**

Ms. Benoit (USFS)

Lynnda Kahn (USFWS)

# RAPTORS

## **2013 & 2014 Northern Goshawk Broadcast Call Surveys**

- Field work
  - (2 surveys / year x 2); June & early-July, 2013 & 2014.
  - Methods: USFS, 2000; Woodbridge, et al. 2006
  - Line Survey covering 4000'.
- Data analysis
  - Qualitative Habitat Association.
  - GIS mapping.
- Reporting
  - Prepare a technical report that includes methodology, results, and figures showing the location of raptor nests, and briefly discusses potential Project effects.
- Communication
  - USFS, USFWS, USGS, ADFG, ADNR

# BREEDING LANDBIRDS & SHOREBIRDS

- **Study Objectives:**

Determine which species of landbirds and shorebirds use the study area during the breeding season,

Determine the occurrence and estimate the numbers of landbird and shorebird species of conservation concern that occur in the study area,

Estimate the relative abundance and distribution of breeding landbirds and shorebirds in the study area, and

Describe habitat use in the study area by breeding landbirds and shorebirds.

- **Field Work (2010):**

Breeding landbird and shorebird surveys of the Grant Lake outlet area, penstock, powerhouse, transmission line, and south access road alignment (now abandoned as an access alternative) were completed as planned in summer 2010. (20 points).

# BREEDING LANDBIRDS & SHOREBIRDS

- **Data Collected & Mapped (2010):**

20 Breeding Bird Survey Points.

Coordinates and Shapefile for Survey Points.

17 individual incidental sightings (15 June - 23 July 2010), various landbird and shorebird species, descriptive locations only.

- **Analysis & Reporting (2010):**

2010 Summary Report of Field Investigations.

- **Communication (2010):**

Ms. Benoit (USFS)

Lynnda Kahn (USFWS)

# BREEDING LANDBIRDS & SHOREBIRDS

## 2013 Landbird and Shorebird Surveys

- Field work
  - (2 surveys / year); Mid-May & June, 2013.
  - Methods: Standard ALMS
  - Line Survey covering 4000'.
- Data analysis
  - Qualitative Habitat Association.
  - GIS mapping.
- Reporting
  - Prepare a technical report and associated figures and maps based on field data collected for the study area. The technical report will provide detail about avian species and habitat use within the study area and discuss potential Project effects.
- Communication
  - USFS, USFWS, USGS, ADFG, ADNR

# WATERBIRDS

- **Study Objectives:**

For this study, waterbirds are defined as freshwater waterfowl (ducks, geese, and swans), shorebirds, gulls, loons, and terns. The specific objectives are to:

Describe species composition of waterbirds using Grant Lake and Grant Creek during breeding season,

Determine locations of nesting areas for waterbirds to allow determination of effects of potential water level fluctuations on nesting habitat,

Determine the occurrence and numbers of waterbird species of conservation concern that occur in the study area, and

Determine winter use by waterbirds in open water habitat of Grant Lake.

- **Field Work (2010):**

Four boat-based surveys were conducted on Grant Lake (6/23/2010, 7/9/2010, 7/16/2010, and 7/23/2010) and one foot survey of Grant Creek was conducted on 7/12/2010.

# WATERBIRDS

- **Data Collected & Mapped (2010):**

16 Pages of Raw Data

Coordinates and Shapefile (30 records of habitat and waterbirds).

2 individual incidental sightings (15 June - 23 July 2010), RBME & Goldeneye Sp., descriptive locations only.

- **Analysis & Reporting (2010):**

2010 Summary Report of Field Investigations.

- **Communication (2010):**

Ms. Benoit (USFS)

Lynnda Kahn (USFWS)



# WATERBIRDS

## 2013 - 2014 Winter Waterbird Surveys

- Field work  
(2 surveys / year); November / December, 2013 & February / March, 2014.  
Methods: Ground Based Observations.  
Grant Lake Outlet.
- Data analysis  
Qualitative Assessment of Winter Use for Grant Lake Outlet.
- Reporting  
Prepare a technical report and associated figures and maps based on field data collected for waterbirds in the study area. Briefly discuss potential Project effects.
- Communication  
USFS, USFWS, USGS, ADFG, ADNR

# TERRESTRIAL MAMMALS

- **Study Objectives:**

Document presence and distribution information to allow the Project to minimize or avoid impacts to terrestrial mammal species,

Quantify the distribution and abundance of target wildlife species during key seasons of activity in the study area;

Classify and map wildlife habitat in the study area in conjunction with the Botanical Resources Study.

- **Field Work (2010):**

Bat Survey of the historic cabin on July 23 2010.

# TERRESTRIAL MAMMALS

- **Data Collected & Mapped (2010):**

1 Page of Raw Data for Bat Survey

Coordinates and Shapefile for 1 Brown Bear den & 1 Wolverine den, provided by USFS.

13 individual incidental sightings (15 June - 23 July 2010), various mammal sp., descriptive locations only.

- **Analysis & Reporting (2010):**

2010 Summary Report of Field Investigations.

- **Communication (2010):**

MS. Benoit (USFS)

Lynnda Kahn (USFWS)

Karen O'Leary (USFS)

# TERRESTRIAL MAMMALS

## **2013 – 2014 Winter Moose Surveys**

- Field work  
(2 surveys / year); November / December, 2013 & February / March, 2014.  
Methods: Standard Line Transect Aerial Surveys.
- Data analysis  
Qualitative Assessment of Winter Use for Project Area.
- Reporting  
Prepare a technical report and associated figures and maps based on data collected for the study area. The technical report will provide detail about terrestrial mammal species and habitat use within the study area and discuss potential Project effects.
- Communication  
USFS, USFWS, USGS, ADFG, ADNR

# Recreational and Visual Resources

**Grant Lake Hydroelectric Project (FERC No. 13212)  
Natural Resource Studies Meeting**

**December 12, 2012 – Anchorage, AK**



In Association with



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# Recreational and Visual Resources

- Resource Area Being Discussed
  - Affected areas include Grant Lake, Grant Creek, and the Trail Lakes area
  - Project areas visible from road system, air, or by recreation users
  - All areas subject to recreation use and areas where use could be facilitated by project

# Recreational and Visual Resources Associated Area Studies

- Grant Lake Detailed Feasibility Analysis (EBASCO). 1984
- USDA Forest Service (USFS). 2007a. Kenai Winter Access
- USDA Forest Service (USFS). 2007b. Trail River Landscape Assessment
- USDA Forest Service (USFS). 2002. Final Environmental Impact Statement and the Revised Land and Resource Management Plan for the Chugach National Forest
- Iditarod National Historic Trail (2004)
- FERC Scoping Meetings (J. Wolfe June 2010- stakeholders, local residents, local business owners, and summer/winter recreational users).
- Recreational Feature Map (J. Wolfe - June 2010)
- Foot and boat surveys (J. Wolfe – Summer 2010) – Current use of trails and boat access



# Recreational and Visual Resources

- Work Completed
  - Initial field work
  - Data collection
  - Consultation
- Remaining Tasks
  - Refine collected data and determine what further data is needed
  - Further field work- document winter use, collect photos winter & summer
  - Prepare mapping and simulations, evaluate possible project impacts to resources
  - Prepare evaluation of possible project effects

# Recreational and Visual Resources

- Study Plan
  - Recreational and Visual Resource Studies are composed of 2 main tasks
    - 1 – Recreation Use Studies
      - » To assess recreation use within the study area to evaluate potential Project impacts on recreational resources.
    - 2 – Visual Resource Studies
      - » To analyze possible Project effects on visual resources.

# Recreational and Visual Resources

## 1) Recreation Use Studies

- Recreation Resources – Continuation of Work
- Recreation Resources – Kenai Narrows Access/Powerline

### – Tasks

- Further define winter and summer uses
- Map recreational feature, use patterns
- Coordinate location of INHT
- Determine potential effects of proposed Project
- Outline potential mitigation if necessary

# Recreational and Visual Resources

## 2) Visual Resources Studies

- Visual Resources – Continuation of Work
- Visual Resources – Kenai Narrows Access/Powerline

### – Tasks

- Key viewpoints of Project impacts with simulations
- Use existing criteria and processes for scenery management (i.e., USFS – “*scenic attractiveness*”, “*scenic integrity*”, “*concern levels*”).
- Mapping of visual environment and assessment

# Schedule for Remaining Tasks

- Winter 2013 – Winter Use Assessment
- Winter/Spring 2013 – Update contacts & background
- Summer 2013 – Summer collection of visual conditions & additional recreation information
- Summer/Fall 2013 – Prepare all reports, maps, and renderings.

# Recreational and Visual Resources

- Discussion of comments from stakeholders and how they've been incorporated into study plans

## Comments

- Include INHT for access & routing for effects on users.

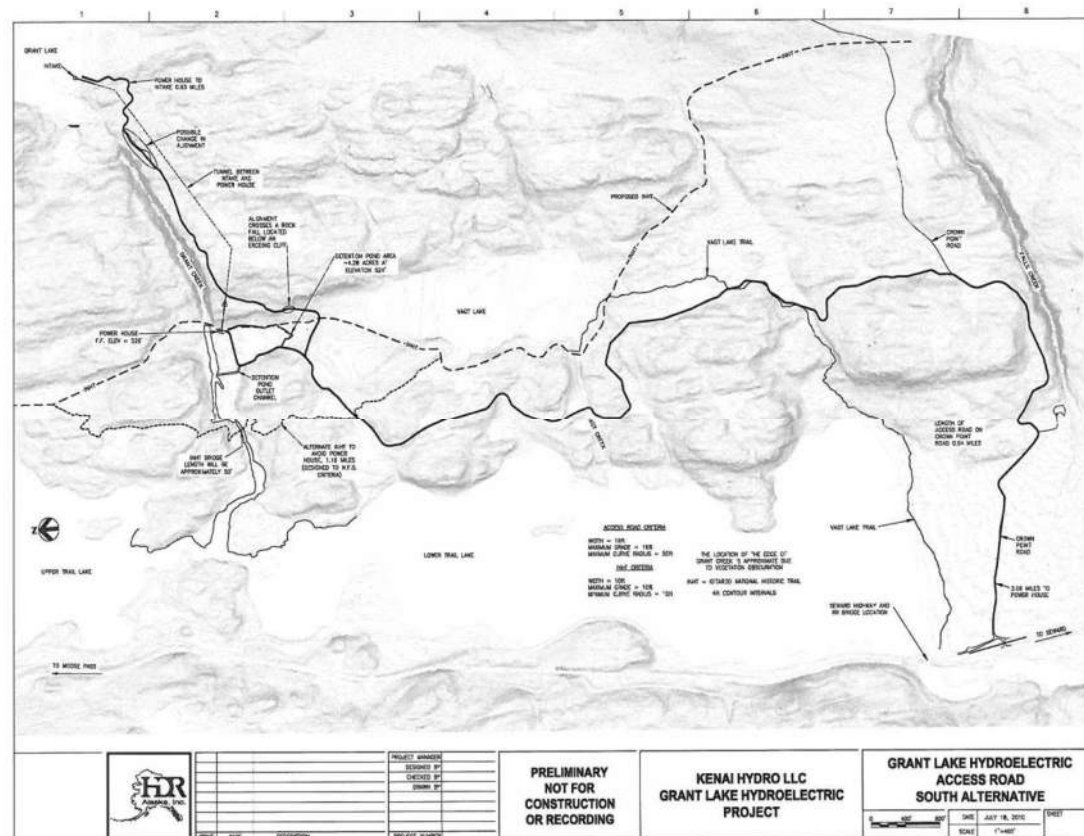
## Responses

- INHT will be studied for access & routing as a separate effort.

# Access Road & INHT Alignment Issues

- Road and Trail share a need for the same natural terrain
- Provided separation with re-alignment of trail
- Current INHT alignment co-located with the Power House
- Will work with agencies to provide separation of trail from Power House

# Project Alignments/INHT





# Access Road and INHT Alignment



# INHT Alignment Resolution Next Steps

- Agreement of proposed INHT re-route
- Initiate the formal process to implement the solution.

- Stakeholder comments continued:

### Comments

- Include winter use evaluation.
- Recognize effects of lake level changes & stream flow changes
- Include consideration of views from air
- Need for more than 4 viewpoint simulations to address summer & winter use
- Not clear how recreation users will be counted

### Responses

- Will conduct field evaluation at high use period in late Feb. or early March.
- Effects will be considered
- Air views will be considered & simulation from air will be generated.
- 1 air, 2 summer, & 1 winter simulations to be provided of primary facilities, and 1 of transmission line & access road.
- Evaluation based for on-ground review as well as past survey info from HDR

# Recreational and Visual Resources

- Discussion of permits that may be necessary for each task.
  - Special Use Permit from USFS to address possible interviews of users/viewers

# Recreational and Visual Resources

- Questions/Comments?

# Cultural Resources Presentation For the Grant Lake Hydroelectric Project

**Grant Lake Hydroelectric Project (FERC No. 13212)  
Natural Resource Studies Meeting**

**December 12, 2012 – Anchorage, AK**



In Association with





Owner



**MIKE SALZETTI**  
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msalzetti@homerelectric.com

Project Manager

**CORY WARNOCK (MCM)**  
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Fisheries Biologist

**JOHN STEVENSON (BA)**  
Fisheries Biologist

**SALLY MORSIEL (NES)**  
Macroinvertebrate & Periphyton

**GARY FANDREI (CIAA)**  
Weir Fabrication & Monitoring

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**DR. GEORGE ROBISON, PE (MCM)**  
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**LEVIA SHOUTIS (ERM)**  
Wetlands Specialist

**KATY BECK (BBS)**  
Botanist Specialist

Shore & Visual Resources  
Task Lead

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dadams@uskh.com

**KIM GRAHAM (USKH)**  
Mapping and Analysis

**Key Team Members:** McMillen (MCM), BioAnalysts (BA), OASIS Environmental, ERM Company (ERM), Cultural Resource Consultants (CRC)  
USKH (USKH), Elemental Solutions (ES), Northern Ecological Services (NES), Beck Botanical Services (BBS)

# Cultural Resources - Area Studies

- USFS
  - Literature Review and Field Studies
- CH2M Hill (1980)
  - Literature Review
- AEIDC (1983)
  - Literature Review and Field Study
- EBASCO (1984)
  - Literature Review



# Cultural Resources - What has been done to date...

- HDR Alaska, Inc. 2010
  - Cultural Resources Draft Study Plan
    - Literature Review, Draft Area of Potential Effects (APE), and Draft Methodology
- HDR Alaska, Inc. 2010
  - Initiation of Section 106 Consultation
    - June 24, 2010
      - APE and Methodology
      - Traditional Cultural Properties
      - Iditarod National Historic Trail

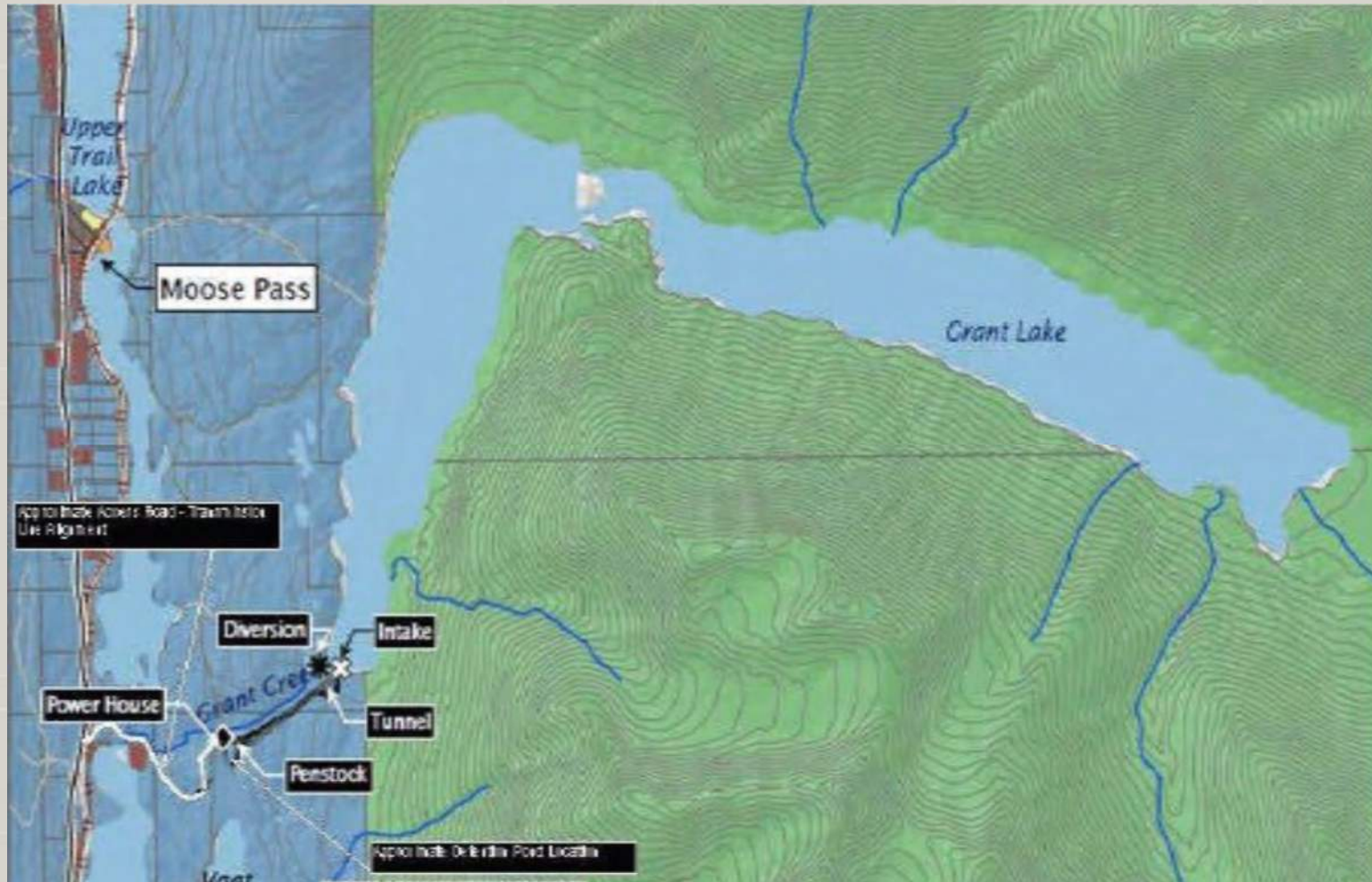
# Cultural Resources - Tasks Remaining

- Re-initiate Section 106 Consultation
  - Initial consultation meeting in June 2010
  - Define the APE
- Iditarod National Historic Trail

# Cultural Resources - Tasks Remaining

- Historical and Archaeological Field Study
  - Survey of the APE
  - Verify known site locations
  - Utilize U.S. Forest Service probability model
  - Document newly discovered sites
- Final Report
- Historic Properties Management Plan (HPMP)

## Cultural Resources Study Area



# Cultural Resources - 2013 Schedule

- Early 2013
  - Literature review
  - Complete probability model
  - Continue Section 106 consultation
  - Reach agreement on APE
- Summer 2013
  - Historic and Archaeological Field Study

# Cultural Resources - 2013-2014 Schedule

- Fall 2013
  - Draft Study Report
  - Section 106 consultations on National Register Determinations of Eligibility and Effect
- Winter 2013/2014
  - Draft HPMP
- January 2014
  - Study Report

# Cultural Resources – Stakeholder Comments

- Comments 118-132
- Study Plan: editing errors
  - Errors have been fixed
- Methodology: needs revision
  - Study methods will comply with current standards and practice and the study plan has been revised.

# Cultural Resources - Stakeholder Comments

- APE: not large enough
  - Consultation will continue to define an appropriate APE.
- Post-project Impacts
  - Potential effects and proposed mitigation will be presented in the draft and final license applications.



# Cultural Resources - Permitting

- U.S. Forest Service Lands
- State of Alaska Lands

# Subsistence

- What is it?
  - The taking of fish, wildlife, or other wild resources for the sustenance of families, communities, and cultures.
  - Highest priority consumptive use of fish and wildlife.
  - Differs from commercial, sport, and personal use harvests.

# Subsistence

- Defined under two regulatory systems:
  - State vs. Federal Lands
    - AS 16.05.258 (State of Alaska)
    - ANILCA (Federal Government)
- Kenai
  - By State law is a mostly “nonsubsistence area.”
  - By Federal law is a mostly rural area.

# Where do Subsistence Harvests and Uses Occur Relative to the Grant Lake Project?

- Project area lies within:
  - GMU-7
  - Cook Inlet Fisheries Management Area
- No prior research has been done by HEA contractors.

# Subsistence - Area Studies

- Several Studies on the Kenai Peninsula
  - i.e., Reed 1984, Seitz et al. 1994, and Fall et al. 2000
- Studies near the Project Area
  - Moose Pass, Seward, Cooper Landing, and Hope (Davis, Fall, and Jennings 2003)
  - Hope, Cooper Landing, and Ninilchik (Fall et al. 2004)

Table 23. Estimated Harvest and Use of Fish, Game, and Plant Resources, Moose Pass, 2000

Resource Name	Percentage of Households					Pounds Harvested			Amount Harvested		95% Conf Limit (+/-)
	Use	Att	Harv	Recv	Give	Total	Mean HH	Percapita	Total	Mean HH	Harvest
Irish Lord	0	0	0	0	0	0	0	0	0	0	0.00%
Unknown Irish Lord	0	0	0	0	0	0	0	0	0	0	0.00%
Unknown Sculpin	1	1	1	0	0	1.49	0.01	0	2.99	0.02	114.20%
Shark	1	0	0	1	0	0	0	0	0	0	0.00%
Unknown Shark	1	0	0	1	0	0	0	0	0	0	0.00%
Skates	0	0	0	0	0	0	0	0	0	0	0.00%
Sole	1	0	0	1	0	0	0	0	0	0	0.00%
Unknown Sole	1	0	0	1	0	0	0	0	0	0	0.00%
Wolffish	0	0	0	0	0	0	0	0	0	0	0.00%
Char	28.3	27.3	23.2	6.1	3	782.76	5.29	1.95	559.11	3.78	36.00%
Dolly Varden	18.2	18.2	14.1	4	1	372.54	2.52	0.93	266.1	1.8	40.70%
Lake Trout	20.2	18.2	16.2	5.1	3	410.21	2.77	1.02	293.01	1.98	38.00%
Grayling	9.1	10.1	8.1	2	4	61.74	0.42	0.15	88.2	0.6	50.80%
Pike	3	1	1	3	0	44.85	0.3	0.11	14.95	0.1	114.20%
Unknown Pike	3	1	1	3	0	44.85	0.3	0.11	14.95	0.1	114.20%
Sturgeon	0	0	0	0	0	0	0	0	0	0	0.00%
Unknown Sturgeon	0	0	0	0	0	0	0	0	0	0	0.00%
Trout	38.4	34.3	30.3	10.1	4	650.9	4.4	1.62	464.93	3.14	22.40%
Cutthroat Trout	0	0	0	0	0	0	0	0	0	0	0.00%
Rainbow Trout	38.4	34.3	30.3	10.1	4	625.79	4.23	1.56	446.99	3.02	22.60%
Steelhead	0	0	0	0	0	0	0	0	0	0	0.00%
Unknown Trout	1	1	1	0	0	25.12	0.17	0.06	17.94	0.12	114.20%
Whitefish	1	1	1	0	0	2.62	0.02	0.01	1.49	0.01	114.20%
Unknown Whitefish	1	1	1	0	0	2.62	0.02	0.01	1.49	0.01	114.20%
Land Mammals	56.6	33.3	22.2	45.5	16.2	9854.41	66.58	24.5	330.38	2.23	74.30%
Large Land Mammals	54.5	31.3	15.2	45.5	15.2	9767.7	66	24.29	61.29	0.41	38.20%
Bison	0	0	0	0	0	0	0	0	0	0	0.00%
Black Bear	17.2	14.1	6.1	11.1	6.1	520.24	3.52	1.29	8.97	0.06	45.40%
Brown Bear	0	1	0	0	0	0	0	0	0	0	0.00%
Caribou	10.1	1	1	9.1	3	1345.45	9.09	3.35	8.97	0.06	114.20%
Deer	14.1	6.1	3	11.1	3	1227.05	8.29	3.05	28.4	0.19	68.20%
Elk	1	0	0	1	0	0	0	0	0	0	0.00%
Goat	5.1	3	2	3	3	216.77	1.46	0.54	2.99	0.02	80.30%
Moose	41.4	28.3	8.1	36.4	9.1	6458.18	43.64	16.06	11.96	0.08	38.90%
Dall Sheep	5.1	4	0	5.1	2	0	0	0	0	0	0.00%
Small Land Mammals	10.1	14.1	10.1	1	2	86.71	0.59	0.22	269.09	1.82	89.80%

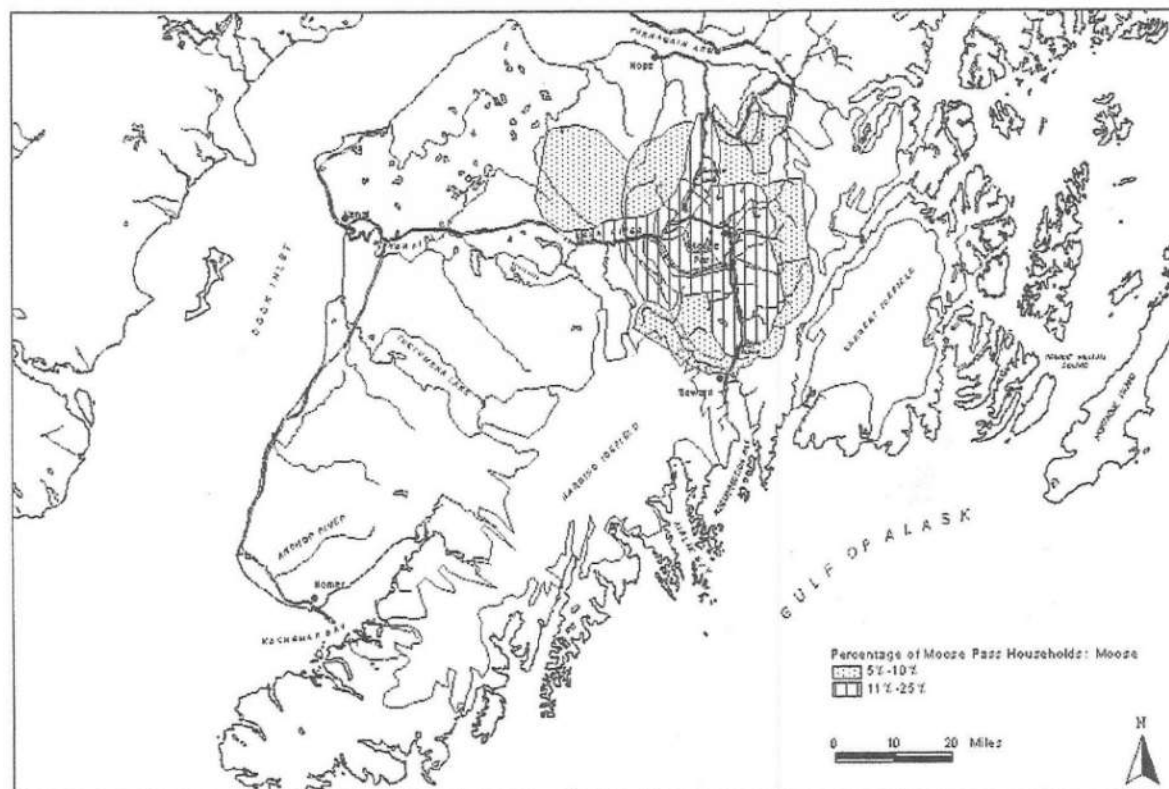


Figure 31. Moose Pass Household Use Areas, Moose  
Showing Percent of Total Households

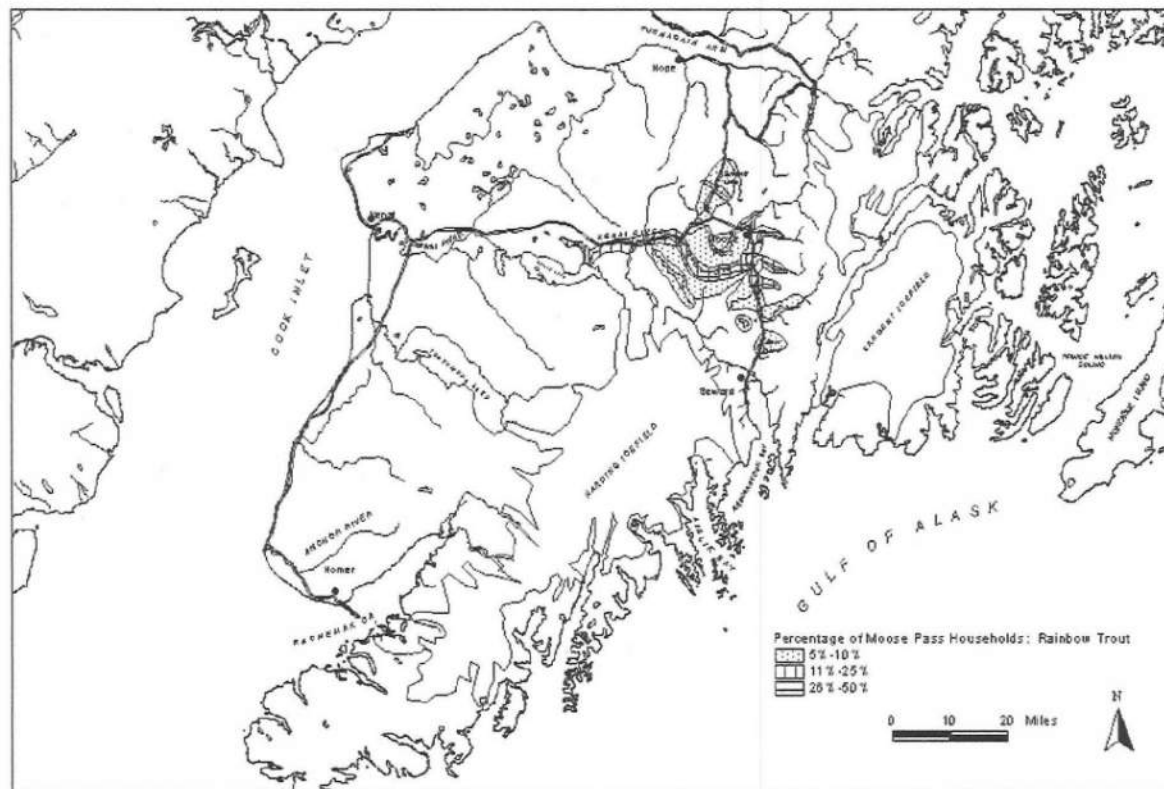


Figure 27. Moose Pass Household Use Areas, Rainbow Trout  
Showing Percent of Total Households



# Subsistence - Tasks Remaining

- Integrated Approach to Information Gathering
- An update of recent harvest activity.
  - Consult agency harvest reports and records.
  - Sample participant households based on chain referrals
- An assessment of hunting and fishing regulation changes since the most recent studies.



U.S. Fish and Wildlife Service  
Bureau of Land Management  
National Park Service  
Bureau of Indian Affairs

## Federal Subsistence Board News Release



Forest Service

**For Immediate Release:**  
August 9, 2012

**Contact:** Ruth D'Amico  
(907) 288-7706

### **Bull Moose Harvest Quota Established for Unit 7 Remainder**

The Seward District Ranger, under authority delegated by the Federal Subsistence Board, has established a harvest quota of three (3) bull moose with spike or fork antlers for Unit 7 remainder (that portion of Unit 7 excluding the Kings Bay drainage) on the Kenai Peninsula. The quota is effective for the 2012 Federal subsistence moose season, which runs August 10-September 20, by Federal registration permit only. The season will be closed to the harvest of spike or fork antlered bull moose once the quota is met. The harvest of bull moose with 50-inch antlers, or with 3 or more brow tines on either antler, will still be allowed. Note that the Kings Bay drainage is entirely closed to the harvest of moose.

Recent surveys conducted by the Alaska Department of Fish and Game indicate a low number of bulls throughout the Kenai Peninsula including Unit 7 remainder. An adequate number of bulls is necessary to ensure timely breeding of cows and maximize productivity of the herd. The harvest quota has been established to improve the bull to cow ratio and improve the productivity of the herd, thereby providing long-term subsistence harvest opportunities.

Under Federal subsistence regulations, only residents of Hope and Cooper Landing are eligible to hunt moose in Unit 7 remainder. Residents of Hope and Cooper Landing can obtain permits by contacting Ruth D'Amico at 907-288-7706. Sealing of all harvested moose is required in order to track the number of bull moose taken.

For additional information, contact U.S. Forest Service Seward District Ranger Travis Moseley at (907) 288-7730.

**-FSB-**

# Subsistence - Stakeholder Comments

- Comments 2, 5, and 6 refer to social and economic issues.
- Comment 7: “Community Identity, Subsistence and Environmental Justice”
  - A subsistence study will be done.

## Subsistence - Permitting

- No permits required

## Subsistence - Schedule

- 2013
  - Literature Review and fieldwork
- January 2014
  - Report

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**From:** Cory Warnock  
**Sent:** Wednesday, March 13, 2013 2:35 PM  
**To:** Van Massenhove, Katherine B -FS  
**Subject:** Re: Executed Amendment for access by snowmobile and helicopter

Thanks Kathy. I've notified HEA and would like to involve them in a call next week once you have a chance to discuss with your supervisor. Let me know of a time late next week that will work and I'll make it happen.

Thanks,

Cory

On Mar 13, 2013, at 12:31 PM, "Van Massenhove, Katherine B -FS" <[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)> wrote:

Hi Cory,

My supervisor is out of the office until next Monday, and I will need to find out from her where this request will fit on the list of workload priorities. At this point I'm not sure if the proposed timeline is something we can meet for what you are requesting, that is a substantial amount of pits (40-60) and will require review of the resource specialist, as it will need to go through the NEPA process. We are not just dealing with the permit administration staff, but also the resource specialists that are now gearing up for field season so I will let you know as soon as I'm able to discuss this next week. Also, you mentioned that the work is to be done in the wetlands, and the US Forest Service is not the regulatory agency for wetlands so there may be additional permitting requirements on top of our special use permit. You will need to contact the local Army Corps of Engineer. This is likely not a use that would be difficult to obtain a permit from ACOE, if one is needed, however only they can make that determination. You can find information regarding their permit regulations at:

<http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx>

Finally, I really need this request to come from the permit holder, and not the contractor. The request to allow for the additional access was a simple action, as it was within the scope of what the NEPA decision analyzed for the permit issuance. Since this request is outside the scope of what was originally analyzed, I need to work directly with the company liable for the terms and conditions set forth in the permit amendment. I'm not saying we can't work together, just that we need to have them at the table agreeing to and understanding what we are authorizing to occur. Would that be Emily Anderson?

Thanks Cory, I will follow up with you next week.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD

[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Tuesday, March 12, 2013 2:07 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

Heard back from our terrestrial folks and the work involving the wetland core samples would occur in July. Will we be able to get the amendment by then? I'd assume that this is enough lead time?

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Monday, March 11, 2013 4:33 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

I thought you were working on an ARPA permit with Mike Yarborough (sp?) to do some cultural resource surveys. If they are one in the same, it's likely that this will be covered in that process. Because you mentioned wetlands, I thought this might be a different study and will need a separate permit.

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Monday, March 11, 2013 2:32 PM  
**To:** Van Massenhove, Katherine B -FS  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

I'm checking on the timeline now. Should hear back soon.

Can you expand a bit on your other question? What do you mean by arch shovel pits?

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Monday, March 11, 2013 3:29 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

When do you need this by? It could be several weeks or more to process a ground disturbing request. Is this related to the arch shovel pits?

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Friday, March 08, 2013 2:09 PM  
**To:** Van Massenhove, Katherine B -FS  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Kathy,

I'll coordinate with our terrestrial folks on Monday and get back to you very soon. Any idea on the timeline for the amendment process?

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, March 08, 2013 1:05 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Thanks Cory,

I'm glad you checked too. We will need information on where these pits will be dug (super important for heritage), the number of pits to be dug and other specific information regarding the pits (depth, filling after, etc.).

You can email a request, you do not need to submit a full application. A map of the areas you want to dig the pits will be most helpful for specialists review.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Friday, March 08, 2013 12:01 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

To be clear, the work done in 2009/2010 was not work we were conducting. It was a previous contractor. We are obviously willing to file the amendment. Can you clarify a bit for me that process or what you need from me to get that going?

Thanks and I'm glad I checked,

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, March 08, 2013 12:57 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Cory,

No, the existing permit does not allow for any ground disturbance, including the digging of holes even when they are to be refilled. You will need to request an amendment to the permit, which will take time to process, if you want to have the ability to do ground disturbing work. This work should not

have been occurring in the previous seasons, I'm not sure Karen O'Leary was aware that you were doing so or she would have required the permit to be amended.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Friday, March 08, 2013 10:08 AM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Levia Shoutis; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Katherine,

I was having a talk with our terrestrial folks today and in the interest of being comprehensive, I wanted to verify something. The wetlands work we will be doing involves temporarily digging small core samples approximately 18 inches deep. Once the on-site analysis is conducted, the holes are immediately filled back in. This is consistent with work that was already done under the existing Special Use Permit in 2009/2010 and I'm sure is fine but again, in the interest of being overly certain, I wanted to verify that this method was acceptable per the existing Special Use Permit that has been in place and the associated amendment.

Thanks,

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, February 08, 2013 3:14 PM  
**To:** Cory Warnock  
**Subject:** Executed Amendment for access by snowmobile and helicopter

Hi Cory,

Attached is the signed and fully executed amendment to the permit for the investigative studies on Grant Lake. You are now authorized access by the same means available to the general public, which include helicopter and snow mobile access.

Please let me know if you have any questions,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Sagner, Helen -FS  
**Sent:** Thursday, February 07, 2013 9:54 AM  
**To:** Van Massenhove, Katherine B -FS; Pence, Sitka -FS



**Cc:** Stovall, Robert -FS

**Subject:**

Per Robert; I have scanned and attached the required documents for you.

Thanks in advance.

Helen

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**From:** Cory Warnock  
**Sent:** Monday, March 25, 2013 9:46 AM  
**To:** Barclay, Andy W (DFG) (andy.barclay@alaska.gov)  
**Cc:** Mike Salzetti; Emily Andersen  
**Subject:** Genetics Call (Grant Lake)

Hi Andy,

I had a chance late last week to update my client (HEA/Mike Salzetti) on our discussion related to genetic sampling on Grant Creek this summer. We would like to have a follow-up call with you to discuss a couple aspects of the approach. At present, we are both free on this Wednesday afternoon. Would this work for you? Please let me know and propose a time that will work and I'll get it set up.

Thanks, Andy. Looking forward to talking with you,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

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C – 360-739-0187  
F – 360-542-2264

**Kenai Hydro, LLC**

3977 Lake Street  
Homer, AK 99603

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March 25, 2013

Secretary Kimberly D. Bose  
Federal Energy Regulatory Commission  
Attn: DHAC, PJ-12.2  
888 First Street, NE  
Washington, DC 20426

**- FILED ELECTRONICALLY -**

**Final Grant Lake Natural Resource Study Plans**

Dear Secretary Bose:

Kenai Hydro, LLC (KHL) hereby submits its Final Natural Resource Study Plans (Plans) for the proposed Grant Lake Project. The complete set of plans includes:

- Grant Lake Aquatic Resources Study Plan
- Grant Lake Water Resources Study Plan
- Grant Lake Terrestrial Resources Study Plan
- Grant Lake Cultural Resources Study Plan (*Due to confidentiality measures, this plan is not included in this package*)
- Grant Lake Recreational and Visual Resources Study Plan

Based upon formal study plan comments received during the scoping process in 2010, KHL modified the Plans to incorporate a majority of the formal stakeholder comments. These more robust Plans are more quantitative in nature than the original drafts.

On December 12, 2012, HEA held a meeting with the Stakeholders (and FERC), to discuss the modifications made to all of the Plans prior to beginning the formal field season in 2013. Although it wasn't required per the TLP, KHL elected to request an additional round of informal comments from the Stakeholders given that a bit of time had passed since the last collaborative meeting. HEA clearly stated at this meeting, (based upon prior discussions with FERC), that per the TLP, the formal scoping process had already passed and any additional comments and/or modification suggestions were appreciated and would be taken under consideration but were not required to be inserted based upon the current status within the process. That said, KHL did evaluate all comments that were submitted and made several modifications to the plans based upon the comments in an effort to accommodate additional Stakeholder comments.

McMillen, LLC has been retained by KHL to conduct the natural resource studies and has put together a team that will implement the Plans attached here in 2013. Over the course of the past three months with the help of many of the Stakeholders, KHL has proactively prepared for the upcoming field season and are nearing completion of the permitting process and the logistical and

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mobilization planning. KHL is looking forward to a very informative and comprehensive 2013 field season. KHL remains fully committed to keeping the Stakeholders and FERC apprised of developments and results during and after the data collection phase.

Incorporated into this package are the following documents:

- The Plans outlined above
- A transcript of the 12/12/12 meeting held in Anchorage, Alaska
- An comment matrix based upon the informal comments received during the 12/12/12 meeting
- A comment matrix based upon the formal comments received in 2010 during the scoping process

Sincerely,

/s/ Mikel Salzetti

Mikel Salzetti  
Project Manager  
Kenai Hydro, LLC

# **Final Grant Lake Natural Resource Study Plans**

Grant Lake Project  
(FERC No. 13212)

# **Aquatic Resources**

## *Final Study Plan*

**Prepared for:**  
**Kenai Hydro, LLC**  
**3977 Lake Street**  
**Homer, AK 99603**

*March 2013*

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### **List of Abbreviations and Acronyms**

<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>AEIDC</b>	Arctic Environmental Information and Data Center (University of Alaska)
<b>AHRS</b>	Alaska Heritage Resources Survey
<b>APA</b>	Alaska Power Authority
<b>ARWG</b>	Aquatic Resources Work Group
<b>AWC</b>	Anadromous Waters Catalog
<b>BLM</b>	Bureau of Land Management
<b>°C</b>	Degrees Celsius
<b>cfs</b>	cubic feet per second
<b>cm</b>	centimeter
<b>CPUE</b>	catch per unit effort
<b>°F</b>	Degrees Fahrenheit
<b>DNR</b>	Alaska Department of Natural Resources
<b>EPA</b>	Environmental Protection Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FL</b>	Fork Length
<b>fps</b>	feet per second
<b>ft</b>	feet
<b>G&amp;A</b>	general and administrative
<b>GPS</b>	global positioning system
<b>GWh</b>	gigawatt hours
<b>HEP</b>	Hydroelectric Evaluation Program
<b>IFIM</b>	Instream Flow Incremental Methodology
<b>in</b>	inch
<b>KHI</b>	Kenai Hydro Inc.
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>kWh</b>	kilowatt hours
<b>LLC</b>	Limited liability company
<b>mg/L</b>	milligrams per liter
<b>mi</b>	mile

<b>MIF</b>	minimum instream flow
<b>mm</b>	millimeter
<b>MSL</b>	Mean sea level
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NWI</b>	National Wetlands Inventory
<b>O&amp;M</b>	Operations & maintenance
<b>RM</b>	river miles
<b>RVDs</b>	Recreation visitor days
<b>TL</b>	total length
<b>TWG</b>	technical working group
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	U.S. Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>YOY</b>	Young of the year

# Aquatic Resources Study Plan Grant Lake Hydroelectric Project (FERC No. 13212)

## **1 Introduction**

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD), along with a Notice of Intent to file an application for an original license, for a combined Grant Lake/Falls Creek Project (FERC No. 13211/13212 [“Project” or “Grant Lake Project”]) under Part I of the Federal Power Act. On September 15, 2009, FERC approved the use of the Traditional Licensing Process for development of the license application and supporting materials. As described in more detail below, the proposed Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake.

The Project will be located near the community of Moose Pass, Alaska in the Kenai Peninsula Borough, approximately 25 miles north of Seward, Alaska and just east of the Seward Highway (State Route 9).

This Aquatic Resources study plan is designed to address information needs identified in the PAD, during the Traditional Licensing Process public comment process, and through early scoping conducted by FERC. A study report will be produced that presents existing information relative to the scope and context of potential effects of the Project. This information will be used to analyze Project impacts and propose protection, mitigation, and enhancement measures in the draft and final license applications for the Project.

### **Proposed Project Description**

The original PAD Project proposal included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

The proposed Project would be composed of a diversion dam at the outlet to Grant Lake, an intake structure in Grant Lake, a tunnel, a surge tank, a penstock, a powerhouse, a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, an overhead or underground transmission line, and a pole-mounted disconnect switch where it ties into the existing City of Seward distribution line or Chugach Electric’s transmission line. The powerhouse would contain two Francis turbine generating units with a combined rated capacity of 5.0 MW with a total design flow of 385 cfs.

Two modes of operation are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at a specific output level. Level control, or balancing of outflow to inflow, will likely only occur during periods of low natural inflow to Grant Lake when the reservoir is at or near minimum pool elevation. Due to the small size of the Project in relation to the size of the interconnected system, the Project is not likely to be used to load follow.

Prior to reinitiating planning efforts for natural resource studies, KHL was evaluating two potential access road routes. The Falls Creek route would be approximately 3 miles long beginning at the south end of Lower Trail Lake, and the Trail Lake Narrows route would be about one mile long beginning at the Seward Highway. In early 2012, KHL determined that the

Trail Lake Narrows route was the most feasible and has eliminated the Falls Creek route from consideration. The Trail Lake Narrows route has not been fully assessed from a natural resource perspective and will be comprehensively evaluated in 2013 as part of this study effort

## **2 Overall Goals Identified during Project Scoping**

Together with existing information, the goals of the study efforts described in this plan are to provide baseline information, and where applicable, information on alternative flow regimes, which will allow an assessment of potential Project impacts on aquatic resources in the study report. These impact assessments will identify potential protection, mitigation, and enhancement measures to be presented in the draft and final license applications.

The goals of this suite of studies are to provide supporting information on the potential resource impacts of the proposed Project that were identified during development of the PAD, public comment, and FERC scoping for the License Application, as follows:

- Impact of Project operation on sediment transport (relative to the availability of spawning gravels) due to changes in flow in Grant Creek.
- Impact of Project operation (fluctuating lake levels in Grant Lake, changes in seasonal flow in Grant Creek, reduced flows between the dam and powerhouse on Grant Creek) on fish abundance and distribution.
- Impact of Project construction and operation on biological productivity and abundance of fish food organisms in Grant Creek and Grant Lake.
- Impact of Project intake structure operation on fish populations.
- Impact of Project construction on fish habitat in Grant Creek.
- Impact of Project facilities (increased access) on fish populations due to potential increased recreational fishing.
- Impact of Project construction and operation on commercial, sport, and subsistence fisheries supported by the Kenai River watershed.

Specific objectives and quantitative objectives are presented below for each individual study component.

## **3 Existing Information**

Information relating to aquatic resources has been collected during previous investigations into the potential development of hydroelectric generation at Grant Creek as well as during pre-licensing studies conducted by KHL in 2009 and early 2010.

### **3.1 Pre-2009 Studies**

Previous FERC licensing efforts in the 1960s and 1980s for a proposed hydroelectric project at Grant Lake included studies of fish resources in Grant Lake and Grant Creek. Arctic Environmental Information and Data Center (AEIDC 1983) conducted fish sampling from 1981 to 1982 as part of a comprehensive environmental baseline study effort and the USFWS (1961) conducted limited sampling from 1959 to 1960. An instream flow study was completed in 1987

as part of a preliminary FERC license application prepared by Kenai Hydro, Inc. (not related to the current Kenai Hydro, LLC; EnviroSphere 1987, KHI 1987a, and KHI 1987b).

**Grant Creek Fish Resources** - Both anadromous and resident fish are present in Grant Creek, including salmon, trout, and other species. Spawning Chinook (*Oncorhynchus tshawytscha*), Sockeye (*Oncorhynchus nerka*), and Coho (*Oncorhynchus kisutch*) salmon, as well as Rainbow trout (*Oncorhynchus mykiss*) and Dolly Varden (*Salvelinus malma*) are found in the lower reaches of Grant Creek (APA 1984; Johnson and Klein 2009; Figure 1). Rearing Chinook, Coho and Rainbow trout are also present (APA 1984, Johnson and Klein 2009). Round whitefish (*Prosopium cylindraceum*) and Arctic grayling (*Thymallus arcticus*) were caught during angling surveys but are not assumed to spawn in Grant Creek (APA 1984).

Upper Grant Creek is impassable to salmon 0.5 mile (APA 1984) to 1 mile (Johnson and Klein 2009) upstream of the mouth; fish habitat is most likely concentrated within the lower portion of stream. Habitat for juvenile fish exists mainly in stream margins, eddies, deep pools, and side channels offering reduced velocities (APA 1984). Substrate material is coarse throughout the entire length of the creek due to high water velocity that tends to wash away smaller gravels (APA 1984). Isolated areas of suitable spawning gravels occur in the lower half of the stream (APA 1984).

Periodic minnow trapping on Grant Creek from July 1959 through January 1961 captured juvenile Chinook salmon, Coho salmon, Dolly Varden char, and sculpin (extent of sampling area unknown; USFWS 1961). Minnow trapping and electrofishing in the lower reaches of Grant Creek for week-long periods in October 1981 and March, May, June, and August 1982 yielded higher catches of trout, salmon, and Dolly Varden in the fall and summer than in winter and spring (AEIDC 1983). Catches of Dolly Varden were generally most abundant in the minnow traps, followed by juvenile Chinook, juvenile Rainbow trout, and juvenile Coho. Juvenile Chinook were the most commonly caught fish during electrofishing surveys (APA 1984).

APA (1984) estimated that Grant Creek supported 250 Chinook spawners and 1,650 Sockeye spawners. The stream was also estimated to support 209 8-inch “trout” (including Dolly Varden and Rainbow trout) (APA 1984). Spawning Coho were not observed (APA 1984) but have been recorded as being present at unknown levels in the stream by the AWC (Johnson and Klein 2009). Maximum counts from intermittent stream surveys by ADFG were 76 Chinook (1963) and 324 (1952) Sockeye salmon.<sup>1</sup>

**Grant Lake Fish Resources** - Sampling during 1981-1982 found no fish in any of the tributaries to Grant Lake (AEIDC 1983). Sculpin and Threespine stickleback were the only fish found to inhabit Grant Lake. A series of impassable falls<sup>2</sup> near Grant Lake’s outlet prevents colonization of the lake by salmonids via Grant Creek (APA 1984). Density of Threespine stickleback was ten times higher in the lower basin than the upper basin of Grant Lake (AEIDC 1983).

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<sup>1</sup> Anadromous Waters Catalog Stream Nomination #08-153,  
<http://www.sf.adfg.state.ak.us/SARR/FishDistrib/Nomination/FDDNomHome.cfm>

<sup>2</sup> 2007 ADFG Stream survey referenced in Anadromous Waters Catalog Stream Nomination #08-153,  
<http://www.sf.adfg.state.ak.us/SARR/FishDistrib/Nomination/FDDNomHome.cfm>



Figure 1. Fish and aquatic resources study area.

Because of the impassable falls below Grant Lake's outlet, no anadromous fish species occur in Grant Lake and its tributaries (USFWS 1961, AEIDC 1983, APA 1984), and Grant Lake is not included in the Anadromous Waters Catalog (AWC) published by ADF&G (Johnson and Daigneault 2008). Grant Lake appears to support only resident populations of sculpin—including Slimy sculpin (*Cottus cognatus*) and Coast Range sculpin (*Cottus aleuticus*)—and Threespine stickleback (*Gasterosteus aculeatus*) (AEIDC 1983, USFWS 1961, Johnson and Klein 2009). Although Sisson (1984) reported that Dolly Varden and a few Rainbow trout occupied Grant Lake, subsequent investigations (USFWS 1961, AEIDC 1983, Marcuson 1989) have documented only sculpin and stickleback. From 1983-1986, coho salmon fry were stocked in Grant Lake by ADF&G, with limited success, though some enhanced returns to Grant Creek were recorded (Marcuson 1989).

**Instream Flow** - Environmental analyses that emphasized the relationship between stream flow and aquatic habitats (instream flow studies) were conducted on Grant Creek in the 1980s by Kenai Hydro, Inc. (KHI; unrelated to Kenai Hydro, LLC). These documents were compiled in support of a license application for hydropower development on Grant Creek. The documents include reports and written communications between KHI and state and federal agencies in 1986 and 1987 relative to a FERC license application for the proposed Grant Lake Hydroelectric Project (FERC No. 7633-002). Included were draft and final reports of a limited but complete Instream Flow Incremental Methodology (IFIM) investigation and negotiated minimum instream flows and ramping rates (Envirosphere 1987, KHI 1987a, and KHI 1987b). A technical memorandum was drafted and shared with the Instream Flow Technical Working Group (TWG) participants in 2009 detailing the results of the previous instream flow study efforts (HDR 2009b).

### 3.2 2009 and 2010 Aquatic Resources Studies

The 2009 aquatic resources study program was intended to begin the process of acquiring resource information needed for FERC licensing and other regulatory requirements. Emphasis was on updating existing information, acquiring more complete information required for specific issue analysis, and providing background information needed to develop more focused studies after initiation of the formal FERC licensing process. The studies were continued in 2010 but the program was discontinued in July, 2010 to revise the study plans as a result of comments received during the FERC scoping process. Most of the studies planned for 2010 were not completed.

**Fish** - The 2009 fisheries study (HDR 2009a) focused on the following objectives:

- Determine the relative abundance and distribution of juvenile fish in Grant Creek.
- Determine the relative abundance and distribution of resident Dolly Varden and Rainbow trout in Grant Creek.
- Estimate abundance and run timing of spawning salmon.
- Estimate abundance and run timing of spawning adult resident fish.
- Determine fish presence and distribution in Grant Lake.

Consistent with studies conducted by AEIDC (1983), Grant Creek was divided into study Reaches 1 through 6. Reaches 1 through 4 were roughly 0.25 mi each in length and Reaches 5 and 6 were established based on geomorphologic characteristics (HDR 2009a; Figure 2).



Kenai Hydro Environmental Baseline Studies

Figure 2

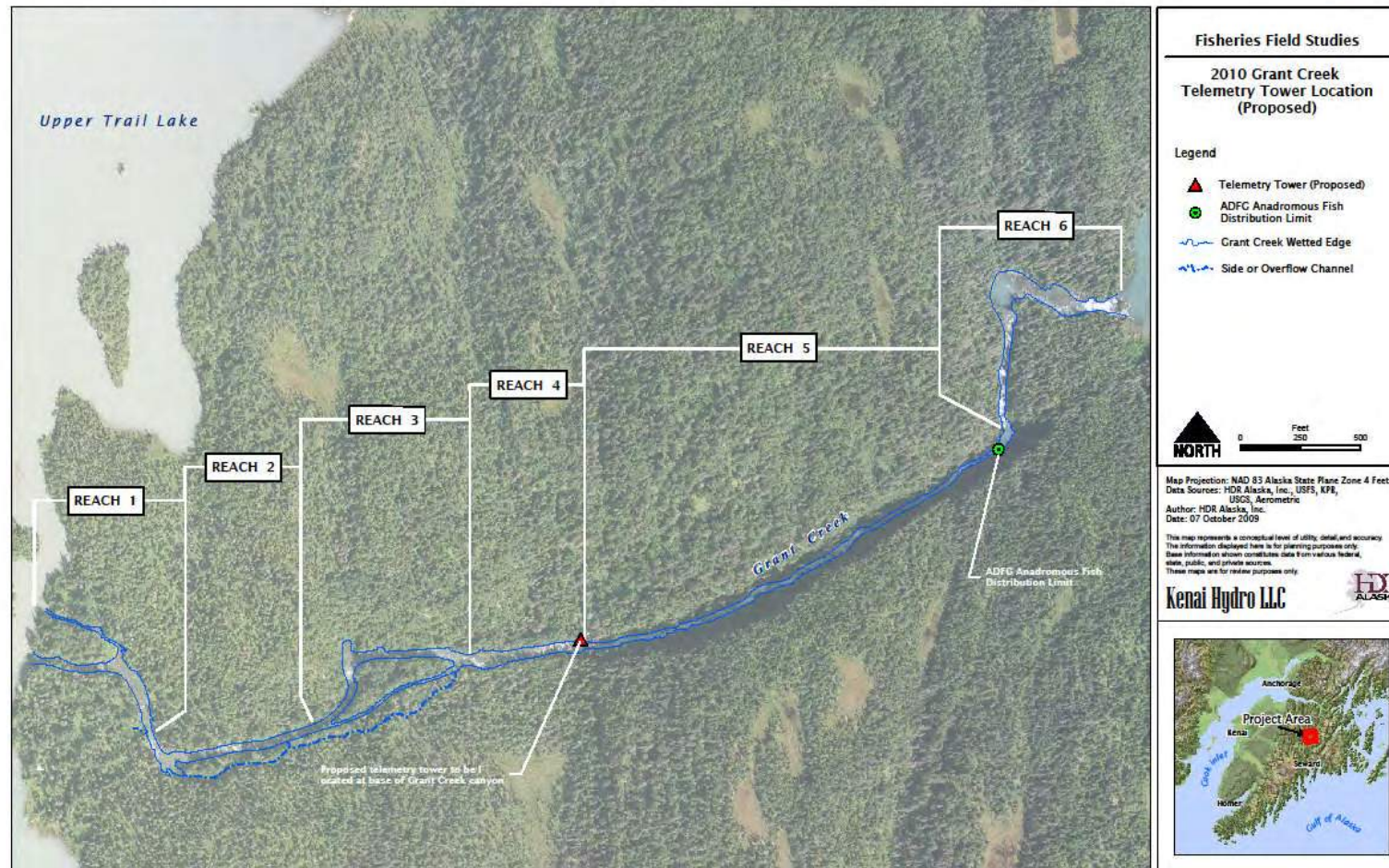


Figure 2. Study reaches designated on Grant Creek and proposed telemetry tower location.



Relative abundance and distribution of juvenile fish were determined by minnow trapping and calculating the catch-per-unit-effort (CPUE) for each reach. Reaches 1 through 4 were sampled relatively evenly, with nine to 13 minnow traps per reach. Terrain was difficult to access in Reaches 5 and 6, so these reaches were sampled less frequently and with only three and five sites, respectively. A total of 50 baited minnow traps were placed throughout the creek in Reaches 1 through 6; mesh size was 0.25 inch. The creek was sampled monthly, with the exception of Reach 6, which was sampled in June and August only. Dolly Varden were found to be the most abundant species in Grant Creek and distributed throughout Grant Creek Reaches 1 through 5, although they had a greater relative abundance in Reaches 4 and 5. Coho salmon was the next most abundant species and individuals were distributed throughout Reaches 1 through 5. However, coho appeared to have the greatest relative abundance in Reach 1. Chinook salmon was the next most abundant species. There was a noticeable decrease in Chinook abundance in upstream reaches, and they were not caught above Reach 4. Other fish present in small numbers were Sockeye salmon, Rainbow trout, sculpin, and threespine stickleback. Most salmon captured were young-of-the-year with few larger juveniles present (HDR 2009a).

Relative abundance of larger size resident salmonids (i.e., Rainbow trout and Dolly Varden) was determined by calculation of angling CPUE (HDR 2009a). A total of 18 angling sites were established along the creek, and each site was fished for 30 minutes approximately every 10 days, from early June through late September. Rainbow trout ( $n = 68$ ) were found to be more abundant than Dolly Varden ( $n = 9$ ) and were caught throughout the creek, although their relative abundance was higher in Reaches 3 through 5 than in Reaches 1 and 2. Dolly Varden were captured in Reaches 1, 2, and 3; their relative abundance was highest in Reach 1. This study was also aimed at determining the timing of spawning of adult resident fish; however, it appeared that spawning, if present, occurred before or after the 2009 study period, since little evidence of spawning fish was seen (HDR 2009a). Rainbow trout angling studies were continued in the spring and early summer of 2010 to confirm the presence of spawning and determine fish numbers. The progression of reproductive condition and the presence of adult rainbow trout in spawning condition confirmed that spawning did occur in Grant Creek in 2010. Capture success was too low to allow population estimates. Adult rainbow trout were observed in the upper portions of the canyon reach.

Abundance and run timing of spawning anadromous fish was estimated through data collected during foot surveys (HDR 2009a). Foot surveys occurred approximately every 10 days beginning in mid-June and ending in late September. Both Sockeye and Chinook salmon were seen in the lower five reaches. Chinook salmon reached Grant Creek first around the beginning of August. Sockeye salmon did not arrive until the end of August. Escapement of Chinook salmon was estimated to be 231 fish, and escapement of Sockeye salmon was estimated at 6,293.

Fish distribution and presence in Grant Lake and its tributaries were assessed using minnow traps, electrofishing, and gill nets (HDR 2009a). Sampling occurred at nine gill netting sites, 18 electrofishing sites, and 28 minnow trapping sites. Threespine stickleback was the dominant species in the lake followed by sculpin. No other species of fish was captured (HDR 2009a).

**Instream Flow** - The collaborative process for a study of “instream flow” effects in Grant Creek was initiated in 2009 (HDR 2009a). The primary goal of the 2009 instream flow study program was to establish a Technical Work Group (TWG) consisting of state and federal resource agency staff, KHL staff, and interested members of the local community. Once established, the TWG met three times during the 2009 study season to review the results of the 2009 aquatic baseline

study efforts, discuss and agree upon an acceptable instream flow evaluation method, and request additional information to support the selection of an instream flow method (HDR 2009a).

As part of the instream flow study, and at the request of the TWG, a sampling event was conducted from 23 to 25 June 2009 on Grant Creek to characterize the types of aquatic habitats used by resident fish and rearing fish (HDR 2009a). Aquatic habitat was described at each sample site by recording macro-, meso-, and micro- habitat characteristics. During the June sampling event, snorkeling was the primary method used to document fish presence. Electrofishing was used primarily to confirm species identification and calibrate fish length estimates (HDR 2009a).

Collaboratively, the TWG and KHL decided to select an instream flow study methodology based on the knowledge obtained from the summer 2009 aquatic resources and hydrology studies (HDR 2009a). Data and analyses from these studies were shared with the TWG in July and September. Based on the knowledge gained of Grant Creek's fish and hydrologic resources, KHL presented a proposed instream flow approach to the TWG on 23 September (HDR 2009a). Physical stream data required for instream flow modeling per the proposed approach were collected at 18 transects during low- and mid-flow conditions in 2010.

**Macroinvertebrates, Plankton, and Periphyton** - Benthic macroinvertebrate and periphyton samples were collected in Grant Creek in August, 2009 (HDR 2009a). Macroinvertebrate population density and taxa diversity can be used to assess stream water and habitat health and macroinvertebrates are an important source of food for fish. Periphyton (algae attached to large rocky substrate) is used to assess chlorophyll *a* content, an indicator of primary productivity. The sampling event was scheduled to occur during the time of year that typically displays the peak of diversity and population densities.

Sampling in 2009 was postponed due to a large rain event (HDR 2009a). This rain event may have scoured Grant Creek, dislodging many larger genera of macroinvertebrates and washing them out of the system. The macroinvertebrates that were found were typically smaller genera, although taxa diversity was at levels expected for south central Alaska streams. Periphyton is not affected as easily by high flow.

Zooplankton and phytoplankton were collected in Grant Lake in August (HDR 2009a). Phytoplankton samples were analyzed for chlorophyll *a* concentrations similar to periphyton in the creek. Concentrations in the lake were lower than that found in the creek.

### **3.3 Need for additional information**

Early study programs and the 2009-2010 baseline study program conducted by KHL have provided a significant amount of background information regarding aquatic resources in the Project area. Following analysis of the 2009 and 2010 study results, information gaps were identified for further study to support the FERC licensing process and accompanying permit requirements. Proposed additional field studies are intended to provide information on the following general topics. Specific objectives for study components will be described below for each component.

- Juvenile fish use of winter habitats.
- Better definition of fish use of microhabitats and overall species composition and relative abundances in Reaches 1 through 4.

- Extent of Rainbow trout spawning in Grant Creek.
- Use of Reach 5 by juvenile and adult fish, with additional emphasis on spawning Chinook salmon use of Reach 5.
- Delineation of aquatic habitats available in Grant Creek; identify key habitats for fish and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.
- Estimation of salmon spawning escapement in Grant Creek.
- Examination of how important individual habitat units may be affected by changes in flow due to the operation of the proposed Project using instream flow assessment methods.
- Baseline diversity and abundance characteristics of benthic macroinvertebrates in Grant Creek.
- Baseline primary productivity of Grant Creek as measured by chlorophyll *a* concentration in phytoplankton samples.
- Fish resources and habitat use of the Trail Lake Narrows at the proposed bridge site.

## **4 Methods**

Aquatic resources of Grant Creek will be studied through an integrated study program with three main disciplines: fish biology, instream flow, and an aquatic ecology element that includes macroinvertebrates and periphyton. Specific methods for aquatic resources are described below.

### **4.1 Study Area**

Water bodies to be investigated as part of the Aquatic Resources Study Plan include Grant Lake and Grant Creek, located near the community of Moose Pass, Alaska, approximately 25 miles north of Seward, Alaska, and just east of the Seward Highway (State Route 9). The proposed Project location is in the Kenai Peninsula Borough. The study area is shown in Figure 1.

### **4.2 Field Study Components**

Field studies will include the following principal components, each designed to address one or more specific concerns:

1. Grant Creek salmon spawning distribution and abundance:
  - Use of a counting weir to inventory upstream migrating salmon.
  - Supplemental foot surveys of Grant Creek to determine distribution and abundance of spawning salmon.
  - Telemetry study of Chinook, Sockeye, and coho salmon spawning distribution, with emphasis on the inaccessible canyon section of Grant Creek (Reach 5).

2. Grant Creek resident and rearing fish distribution and abundance:
  - Use of a counting weir to inventory the movements and abundance of adult resident species.
  - Telemetry study of Rainbow trout to determine the distribution of spawning and feeding areas in Grant Creek.
  - Surveys to determine fish presence in suspected overwintering habitats.
  - Surveys of Grant Creek to estimate distribution and abundance of juvenile fish by habitat type, with emphasis on areas not surveyed in 2009 including Reach 5.
  - Juvenile fish outmigration monitoring in spring and fall.
3. Grant Creek aquatic habitat mapping:
  - Synthesis of fish use and aquatic habitat data for Grant Creek.
  - Delineation of aquatic habitats in Reaches 1 through 5 of Grant Creek.
  - Surveys to ground-truth office-based habitat delineation, fill spatial data gaps, and verify fish use of aquatic habitats.
  - Identification of key habitats based on observed fish use.
  - Analysis of habitat factors that distinguish key habitats from other habitats available in Grant Creek.
4. Grant Creek Instream Flow Study, including the following components:
  - Habitat availability analysis using measurements of stream geometry at the 18 previously selected transect sites.
  - Fish use of meso- and microhabitats.
  - Integration of flow and temperature monitoring.
  - Analysis and modeling to predict habitat response to changes in flow regime.
5. Benthic macroinvertebrates in Grant Creek:
  - Sampling using pseudo-replication Surber sampling methods to estimate population density in riffle/run habitats.
  - Macroinvertebrate identification to genus level (when possible) identification for use in calculating population metrics.
6. Periphyton in Grant Creek:
  - Collecting periphyton samples from riffle areas at two locations within Grant Creek.
  - Analyzing chlorophyll a concentration in individual samples.
7. Trail Lake Narrows Aquatic Resource and Habitat Use
  - Seasonal fish abundance and distribution in the vicinity of the proposed bridge crossing site
  - Assessment of the aquatic habitats at the bridge crossing – Fish habitat use and distribution

### **4.3 Grant Creek Fish Weir**

A weir is being proposed as a principal means of fish capture and inventory for several of the study components. Because of its application to multiple studies, weir methodology is being described in this separate section. Its specific applicability to each of the study components will be described in the appropriate sections below.

Grant Creek is a high gradient stream with substantial flow variation over the course of the open water study season. Consequently, a weir on Grant Creek will need to be designed to accommodate the difficult stream conditions. Many different weir designs have been used in fisheries research that could potentially be adapted to Grant Creek conditions. Resistance board, floating picket weir has been used successfully in fast streams in Alaska and other western states (Stewart, 2002). Such designs use a resistance board and floating pickets to allow debris and high water to pass over the top of the weir. This design minimizes the amount of maintenance required during weir operation and reduces the chance that high water will damage the weir. Regardless of the weir design selected, the spaces between pickets must be small enough to intercept adult sized Rainbow trout. A Grant Creek weir could be custom constructed, borrowed from fish research agencies, or purchased from one of several vendors. Resistance board weirs generally consist of the following components: a trap box to hold fish diverted by the weir, floating panels hinged to the stream bottom, a rail system to attach the panels to the stream bottom, and rigid picket modules at each bank. Other designs consist of rigid pickets extending across the stream. Potential configurations are highly variable depending on the stream characteristics and project needs. The primary intent of the weir is to catch upstream migrating fish. Some designs will also allow downstream passage.

Ideally, the spacing of the weir pickets should be such that it will capture fish of a size range from adult Rainbow trout to adult salmon. However, it is recognized that there are limitations to how closely spaced the pickets can be and still be practical in a high gradient stream. Consequently, a maximum 3 inch spacing is specified to assure capture of all salmon species. Closer spacing would be desirable so that some larger resident species would also be captured.

It may be desirable for the weir to be opened to allow unobstructed passage of fish during part of the open water season when few fish are moving within the stream or when high water makes weir monitoring impractical. When the weir is in place, it will be monitored at least twice per day and trapped fish will be released upstream of the weir. All fish caught in the weir will be identified to species and enumerated. Captured fish will also be measured if time allows and fish quantity is not too large to allow safe handling. Additional processing of fish is described below for the individual study components.

The Grant Creek weir will be installed at a suitable location as close to the stream mouth as possible during low flow in April with monitoring to begin May 1, 2013. It will be left in place until early November, at which time all components will be removed from the stream.

### **4.4 Grant Creek Salmon Spawning Distribution and Abundance**

The purpose of this study component is to characterize spawning salmon distribution, run timing, and relative abundance in Grant Creek. This study effort will consist of two principal components and several subcomponents:

- Use of a counting weir to obtain a direct count of all salmon entering Grant Creek during the open water season.
  - Weir counts will be compared to counts from foot surveys similar to those conducted during 2009 to calibrate earlier surveys and obtain an estimate of observer error when viewing fish from the stream bank.
- A radio telemetry study to further assess the spawning distribution of Chinook, Sockeye, and coho salmon, with emphasis on Reach 5 (Canyon Reach). Coho salmon and Dolly Varden may be included in the study if conditions allow.

#### ***4.4.1 Salmon Escapement to Grant Creek – Relative Species Abundance***

##### **Project-Related Objectives**

- Assessment of numbers and species of salmon in Grant Creek as a whole.
- Identification of key species and critical time periods as required for environmental assessment.
- Identification of key species and critical time periods as may be applied to design of Project mitigation measures.
- Calibration of escapement estimates from foot surveys conducted in 2009.

##### **Quantitative Objectives**

- The primary objective is to obtain a nearly complete count of salmon of each species entering Grant Creek. It is recognized that some fish will likely escape the weir and that extreme flow events can interrupt complete counts. Such events, if they occur, will be documented. Use of the complete count methodology requires no specific statistical analysis.

During 2009 foot surveys, salmon counts were conducted approximately every 10 days from mid-June through September resulting in escapement estimates for Chinook and Sockeye salmon using an area-under-the-curve method based on a trapezoidal approximation using linear interpolation to estimate the number of fish present in the stream for the days not surveyed (Neilson and Geen, 1981; English et al., 1992; Bue et al. 1998). Survey life (the number of days a fish is alive in the survey area) and observer efficiency (the proportion of fish actually seen by the observers) were estimated based on professional judgment. Because of marginal visibility and untested estimates of stream life and observer efficiency (both required for area under the curve estimates), the accuracy of the 2009 estimates was questionable. It was decided that the use of a counting weir, while difficult in Grant Creek, was a preferable method for relative abundance estimation. Use of a weir will have several additional benefits as follows:

- It will provide exact timing of stream entry.
- It will allow capture of fish for age and length measurements.
- It will allow capture of fish for tagging and radio tag implantation (see below).
- It will allow monitoring of larger resident species as well as salmon.
- It will make possible a calibration of the 2009 foot surveys by comparing known fish numbers with visual estimates.

A weir, as described in Section 4.3 above, will be established near the mouth of Grant Creek to monitor the Chinook salmon run in mid-July and will continue to be monitored until early November. The time period will encompass the full run of Chinook and Sockeye salmon and most of the coho salmon run, if possible. The intent will be to keep the weir in place until the coho salmon run is completed; however, icing conditions might require premature removal of the weir. Information regarding the abundance and timing of coho salmon is currently scarce; consequently, the success of a weir at capturing cohos is unknown. If coho salmon are continuing to move upstream after the weir is removed, the run will continue to be monitored using foot surveys, at least through the first week of November. All salmon passing through the weir will be counted and representative samples will be sexed, measured, and tagged with Floy spaghetti tags. Scale samples will be taken from selected fish for aging. To determine the uniqueness of Grant Creek salmon, limited tissue samples for genetic analysis will be collected from selected fish, provided that a cooperative agreement can be arranged with ADF&G to conduct the appropriate analyses.

During times when the weir is being operated in capture mode, salmon will be directly counted by examining all fish in the capture box and releasing them upstream. During salmon runs, personnel will monitor the weir and empty the catch box at least twice per day, more often if necessary.

Foot surveys of lower Grant Creek (Reaches 1-4) will be conducted at least once a week during the Chinook and Sockeye salmon runs using procedures similar to those used in 2009. Numbers of fish visually observed will be compared to numbers of fish known to be present based on weir counts. Locations of fish will be documented using GPS coordinates and paper maps. Floy tags and radio tags will be recorded at the weir if carcasses are encountered.

Personnel on site will document as much incidental information as time allows. For example, carcasses floating downstream into the weir can be counted and tag numbers recorded and removed to provide insight into the duration of stream life (date originally tagged vs. date the carcass was found).

#### ***4.4.2 Distribution of Spawning Salmon in Grant Creek***

##### **Project-Related Objectives**

- Identification of critical spawning habitats as required for general assessment of Project impacts.
- Identification of habitat areas appropriate for use in instream flow analysis.
- Provide input for Project mitigation needs by identifying sensitive stream segments.

##### **Quantitative Objectives**

- Numbers of radio tagged fish must be adequate to provide an acceptable representation of the spawning populations of each species. Hypothesis: distribution of tagged fish is identical to the distribution of the entire population.

During the 2009 preliminary investigations, the crew was unable to access Reach 5 (Figure 2), except for the first 100 meters beyond the reach-break between Reaches 4 and 5. Reach 5 was also not accessed in the 1980s by previous investigators (AEIDC 1983). High-velocity flows

and cascades prevented safe wading of the stream, and precipitous terrain prevented walking along the edge of the stream. As a result, the upstream extent of salmon spawning activity in Grant Creek has not been adequately characterized. Turbid water due to glacial runoff in Grant Creek also lowered observer efficiencies and added to uncertainty of escapement estimates and spawning distribution in the remainder of the stream. A radio telemetry study is proposed to overcome the above shortcomings with emphasis on delineating spawning distribution within Reach 5 (Canyon Reach).

A representative number of Chinook, Sockeye, and possibly coho salmon will be captured near the mouth of Grant Creek in the weir described in Section 4.3 above. The number of Chinook and Sockeye salmon to be tagged will be based on the total escapement numbers estimated in 2009. Chinook salmon will be radio tagged starting in early August, with the goal of distributing the tags proportionately throughout the run, which is expected to last from mid to late August. Sockeye salmon will be radio tagged from August 20 to about September 10. The timing of the coho salmon run is currently unknown, so professional judgment and pertinent literature will be used to assess run timing for Coho. There will be 65 tags allocated for Chinook, 65 tags for Sockeye, and 20 tags for Coho. Once fish are captured, coded transmitters will be inserted into their stomachs. Tags will be lubricated with glycerin and pushed down the esophagus into the stomach using a PVC tube. All radio-tagged fish will also be tagged with Floy spaghetti tags. Radio tags will be programmed to have a 60-day battery life and will include a feature that codes for the death of the fish. A fixed radio telemetry receiver will be installed at the reach-break between Reaches 4 and 5 (Figure 2) to detect when fish enter or exit Reach 5. Tracking surveys using a hand-held mobile receiver will be conducted at least weekly during the period when tagged fish are present in the stream. Frequent telemetry surveys will provide valuable information on stream life (*s*) and position information of tagged fish as part of area-under-the-curve estimation and spawning locations, respectively. A trail has been established along a safe route on the canyon rim paralleling Reach 5. Once a fish is detected, the crew will use triangulation techniques to identify the tagged fish's position. Locations of the tagged fish will be recorded using GPS coordinates as well as marked on hand-held maps.

Installation of a fixed-telemetry site near the confluence of Grant Creek will be pursued, which will provide information regarding Rainbow trout exodus from Grant Creek. The system will consist of either underwater or aerial antennas monitoring each channel, and be combined so that they are monitored as a single antenna. Our approach will be based on the configuration of each channel, potential ambient electrical noise, and the challenges associated with each type of system.

Movements of all radio tagged fish will be mapped and analyzed. Information will be combined with the results of foot surveys as described in Section 4.4.1 to delineate likely spawning locations for each species and probable proportions of salmon that spawn in various stream reaches. Dates of fish death as indicated by the radio tags will be combined with carcass information and tagging dates to estimate stream life duration.



## **4.5 Grant Creek Resident and Rearing Fish Abundance and Distribution**

The purpose of this study component is to characterize distribution and abundance of all species of resident and rearing fish and run timing of Rainbow trout in Grant Creek. This study effort will consist of the following components:

- Weir inventory and telemetry study to assess run timing, relative abundance, and spawning habitat location for Rainbow trout.
- Investigation of juvenile fish presence in Reach 5 of Grant Creek using minnow traps and other sampling techniques.
- Minnow trap and video sampling in late winter/early spring at likely overwintering habitats to determine salmonid overwintering presence in Grant Creek.
- Snorkel sampling to determine fish use of mesohabitats in Grant Creek.

### **4.5.1 Adult Rainbow Trout Abundance, Distribution, and Spawning in Grant Creek**

#### **Project-Related Objectives**

- Assessment of relative numbers of Rainbow trout in Grant Creek as a whole.
- Identification of sensitive time periods as required for environmental assessment.
- Identification of important spawning and feeding habitats as required for general assessment of Project impacts.
- Provide input for Project mitigation needs by identifying sensitive stream segments.

#### **Quantitative Objectives**

- Obtain a count of adult Rainbow trout entering Grant Creek during the open water season. It is understood that some trout will likely escape the weir or be too small to be captured.
- Determine distribution of trout by tracking radio-tagged fish. Ideally, the numbers of radio-tagged fish should be adequate to provide an acceptable representation of the total Grant Creek population.

Angling surveys in 2009 and 2010 documented that modest numbers of adult and sub-adult Rainbow trout were widely distributed in Grant Creek during the open water season and confirmed that some spawning occurs in the creek. Catch-and-recapture numbers in 2010 were too small to allow mark-and-recapture population estimates, and spawning locations remain largely unknown. To obtain more complete information on abundance, distribution, and timing of movements, it is proposed that additional study occur in 2013 that combines angling with possible weir capture of larger fish.

Weir and Angling Study - The weir will be installed in April during low-flow conditions; consequently, it will be in place prior to spring spawning migrations, which typically occur as water temperature approaches 4 °C. The final weir design is unknown and picket spacing may be such that most Rainbow trout will be able to bypass the weir. During the spring migration period only, vexar screen of an appropriate mesh size may be secured to the weir to increase the capture efficiency of the weir for rainbow trout. If the weir is effective at catching rainbow trout then the weir will be operated in capture mode during the spawning period, and all trout will be

measured and sexed and their reproductive condition will be assessed if possible. Depending on the effectiveness of the weir at catching trout, additional fish may be captured by angling during the spring and early summer period. During the remainder of the open water season, trout caught in the weir will be counted and representative numbers will be measured. Two-way passage will be the preferred mode of weir operation in the fall when trout are likely to be moving out of Grant Creek.

**Radio Telemetry Study** - A representative number of mature Rainbow trout will be captured during the early weeks of the spawning migration for surgical implantation of radio transmitters into the abdominal cavity. Capture method will be by weir capture, angling, or a combination of both. Surgical methods will generally follow those described by Summerfelt and Smith (1990). Fish within the dominant size range of mature Rainbow trout (500 - 700 mm) will likely weigh 1,800-6,000 grams (Russell, 1977). It is advised that radio tags should not exceed 2 percent of body weight, thus a tag weighing less than about 35 grams would be suitable. The tags will be individually coded allowing identification of specific fish. Forty radio tags will be secured for the Rainbow trout telemetry study.

A fixed radio telemetry receiver will be installed at the reach-break between Reaches 4 and 5 (Figure 2) to detect when fish enter or exit Reach 5. A second fixed-telemetry site will be located downstream of the weir near the Grant Creek confluence (as discussed above). Tracking surveys using a hand-held mobile receiver will be conducted at least weekly, and more frequently when possible during the spawning period. A trail has been established along a safe route on the canyon rim paralleling Reach 5. Once a fish is detected, the crew will use triangulation techniques to identify the fish's position. Locations of the tagged fish will be recorded using GPS coordinates as well as marked on hand-held maps.

Movements of radio-tagged fish will be mapped and analyzed to determine the locations of probable spawning and feeding habitats.

#### ***4.5.2 Resident and Rearing Fish Use of Study Reach 5***

##### **Project-Related Objectives**

- Assessment of rearing fish use of habitats within the high gradient Canyon Reach as required for impact assessment within the portion of Grant Creek that will be most altered by the Project.
- Assessment of the juvenile fish productivity of Reach 5 relative to the remainder of Grant Creek.
- Assessment of the need for mitigation measures within Reach 5.

##### **Quantitative Objectives**

- Because of the difficulty in safely accessing much of Reach 5 and the dominant turbulent flow, habitat areas sampled were selected purely on the basis of accessibility and feasibility of sampling. These reconnaissance level investigations are non-quantitative in nature. They provide presence/absence information and relative species abundance data for the sample sites. Statistical analyses are not appropriate under these circumstances.

- Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, trap efficiency can be calibrated by releasing marked samples of fish, and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field.

On-site Sampling - During 2009 minnow trap sampling, crews were unable to access Reach 5, except for the first 100 m beyond the reach-break between Reaches 4 and 5 (Figure 2). Most of Reach 5 was also not accessed in the 1980s by previous investigators (AEIDC 1983). High-velocity flows and cascades prevented safe wading of the stream, and steep terrain prevented safe upland access without climbing gear. To assess the presence of juvenile fish in Reach 5, juvenile fish sampling will be expanded to areas not reached in 2009.

An initial reconnaissance of Reach 5 was conducted in late winter 2010 when the creek was frozen and could be accessed on foot at the bottom of the gorge; information was gathered regarding potential summer access points, likely fish habitat, and potential sample sites.

Juvenile fish use of Reach 5 was assessed using the same minnow trapping methods that were employed during 2009, except that special equipment was used to access the creek in Reach 5 in a safe manner. Routine access of Reach 5 during high-flow conditions was accomplished by using roped protection. Sample site locations were based on the ability to safely access this reach from the canyon rim, influenced by the following criteria:

- Safe access via rappel/belay techniques.
- Proximity to safe anchor sites.
- Proximity to likely fish habitats.

Two sampling events were conducted in 2010, May and July. The initially planned September sampling event was not completed. A crew of two set minnow traps in as many locations as possible with 3 to 4 traps each within likely fish habitats, such as plunge pools and eddies. The three sites trapped in 2009 in the lower 300 meters of Reach 5 were also re-sampled, for a total of five sites in Reach 5. Target species were Chinook and coho salmon, Dolly Varden, Rainbow trout, and sculpin. CPUE was defined as the catch per trap-hour.

All sampling sites were marked by a GPS, staked, and flagged for future identification. Habitat characteristics were recorded. Fish captured were identified to species, measured, and released near the point of capture. Salmonid length measurements were based on fork length (tip of the snout to the fork in the tail), and other fish length measurements were based on total length (tip of snout to end of tail).

The procedures described above for the 2010 sampling will be repeated in September to complete the originally planned sampling schedule. Additional sampling techniques including electrofishing, seining, and underwater video may also be employed where feasible. Special effort will be dedicated to determining whether adult Dolly Varden use portions of Reach 5 for spawning. Weir operation, as described in Section 4.3, may provide information on the timing of upstream movements of adult Dolly Varden. If sufficient numbers of spawning condition Dolly Varden are observed, mobile surveys of radio tagged fish will be utilized to identify their final destination. Given the historical data associated with Dolly Varden numbers in Grant Creek, HEA believes 10 radio tags will be sufficient for this analysis.

**Outmigrant Monitoring** - In addition to the sampling described above, outmigration of juvenile fish from Reach 5 will be monitored in the spring using a small inclined plane trap. The trap will be anchored near the boundary between Reaches 4 and 5, immediately downstream from the proposed Project powerhouse and tailrace outfall. The intent will be to determine the outmigrant contribution of the Canyon Reach (Reach 5) relative to the remainder of Grant Creek. Species of primary interest will be juvenile Chinook, coho, and Sockeye salmon and young-of-the-year Rainbow trout. Sockeye salmon fry are known to move out of Grant Creek within a few weeks of emergence; consequently, the outmigrant trap will need to be installed in early spring at the same time as the counting weir. Young fish entering the trap will be held in a fine mesh live box, which will be monitored at least once per day, more often if large numbers of fish are entrapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total outmigrant production from Reach 5. Resident and Rearing Fish Use of Winter Habitats

### **Project-Related Objectives**

- Determine the extent of fish and habitat use of Grant Creek during winter conditions as required for Project environmental assessment.
- Determine the need for winter mitigation measures, especially as related to storage pond release rates.
- Contribute habitat use information for application to instream flow studies.

### **Quantitative Objectives**

- Winter sampling of selected potential habitat use areas will be essentially reconnaissance level efforts and are non-quantitative in nature. They provide presence/absence information and relative species abundance specific to each sample site. In most cases statistical analyses will not be appropriate under these circumstances. Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, then trap efficiency can be calibrated by releasing marked samples of fish and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field
- The results of the 2009 snorkel and minnow trapping surveys provided evidence that very few juvenile salmon observed were older than young-of-the-year fish (YOY; i.e., hatched in spring). Based on these results, there is some question as to whether Grant Creek provides favorable overwinter habitat for juvenile salmon and other species. This study component will assess juvenile salmonid presence in likely overwintering habitats such as open water, springs and seeps, deep pools, and backwater areas.

Likely overwintering habitats will be identified based on existing habitat mapping, knowledge of study area, and 2009 data. Additional areas will be identified based on winter reconnaissance. In addition to likely areas of winter refuge, sampling will also be conducted, where possible, at the locations of the instream flow transects to allow instream flow modeling to include the winter

period. Areas of unfrozen water will be sampled using both minnow traps and backpack electrofisher. In frozen areas where substantial unfrozen water is suspected under the ice, an ice auger will be used to gain access to water under the ice, if necessary. A baited minnow trap or bait container will be lowered into the water along with an underwater video camera. Under-ice conditions will be observed on a monitor. If fish are seen on the monitor, then video will be recorded for later review. Footage will then be analyzed in the office to determine species and age class of any fish attracted to the bait. This one-time sampling event will occur in late winter, before breakup occurs in Grant Creek. The study will likely need to be conducted before break-up in Trail Lake to ensure safe access to Grant Creek.

Spring Outmigration Monitoring - In addition to onsite winter investigations, the outmigration of juvenile fish from Grant Creek will be monitored in the spring to help determine the extent to which juvenile salmon and Rainbow trout overwinter in Grant Creek. Emphasis will be on Chinook and coho salmon smolts. Recently emerged Sockeye salmon fry will likely also be captured in the trap. An inclined plane trap will be installed near the mouth of Grant Creek to intercept juvenile fish moving downstream. The trap will be installed during the low-flow period that immediately precedes spring break-up at the same time that the outmigrant trap is installed below the Canyon Reach. Young fish entering the trap will be held in a fine mesh live box that will be monitored at least once per day, more often if large numbers of fish are trapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total outmigrant production from Reach 5. Calibration of the downstream trap may be coordinated with calibration of the upstream trap, using fish trapped upstream and released for downstream capture. Estimated Chinook and coho smolt outmigration numbers based on the trap catch will provide a direct indication of the contribution of Grant Creek overwinter rearing to the Kenai River system and will be compared to catches in the upstream trap to determine the relative contributions of upstream and downstream areas to Chinook and coho production. Numbers of Sockeye salmon fry will provide an indication of hatching success and can also be compared to catches in the upstream trap to determine the relative contributions of upstream and downstream areas to Sockeye production.

#### ***4.5.3 Resident and Rearing Fish Use of Open Water Habitats in Lower Grant Creek***

##### **Project-Related Objectives**

- Assessment of rearing fish use of habitats within lower Grant Creek as required for Project impact assessment.
- Assessment of the juvenile fish productivity of Reaches 1-4 relative to the remainder of Grant Creek.
- Assessment of the need for mitigation measures within Lower Grant Creek.
- Selection of high fish use areas for incorporation in the instream flow study.

## **Quantitative Objectives**

- Sampling of selected potential habitat use areas will be essentially reconnaissance level efforts and are non-quantitative in nature. They provide presence/absence information and relative species abundance specific to each sample site. In most cases statistical analyses will not be appropriate under these circumstances.
- Obtain a count of adult Rainbow trout, Dolly Varden, and other resident species entering Grant Creek during the open water season. Use of the complete count methodology requires no specific statistical analysis.
- Inclined plane traps used for outmigrant monitoring can be expected to capture a percentage of young fish moving downstream. If numbers are sufficiently high, trap efficiency can be calibrated by releasing marked samples of fish and total outmigration can be estimated. Number of fish in test sample will likely depend on number available from the trap and will need to be determined in the field.

Field Sampling - Investigations in spring, summer, and fall of 2009 and in spring of 2010 sampled a variety of slow-water habitats using minnow trapping and snorkeling techniques, identified habitat types most heavily used by rearing fish, and provided significant information regarding relative species abundance. This task continues those investigations with the intent of filling data gaps and sampling a wider variety of habitat types so that the information can be integrated with the habitat mapping information.

In Study Reaches 1-4, sample sites in which catch of juvenile salmon in minnow traps was poor or sample sites in habitats that were underrepresented by sampling in 2009 and 2010 (e.g., low-velocity habitats, backwaters, undercut banks) will be identified in the office and in the field. Each selected habitat area will be sampled using the method most appropriate to the conditions. Methods may include baited minnow traps, snorkeling, electrofishing, and seining. Sampling methods for this subcomponent will be similar to those used in Reach 5, with the exception of the method of site determination, which will be based on habitat units. Where possible, minnow trapping sites will also be electrofished or snorkeled to attempt to correct for gear bias of the minnow traps (i.e., document species that may not be captured in the minnow traps). This kind of sampling results in a variety of outputs with varying quantitative value.

Electrofishing will not be employed when spawning fish are present within 10 meters of the study site. Instream work will be minimized in the vicinity of spawning fish. Any activity that causes displacement of spawners from spawning areas will be avoided.

Weir Data - The counting weir described in Section 4.3 will be in place throughout the open water season and may allow monitoring of the upstream and possibly downstream movements of larger resident fish throughout the season. The final design of the weir is currently unknown and it may not be effective at catching resident species. The weir may be useful for monitoring the upstream migration of Rainbow trout that occurs coincident with the salmon migration and for observing possible upstream movements of Dolly Varden spawners in the fall. All resident fish passing the weir will be recorded. When the weir is in capture mode, the lengths of all fish will be measured if possible without harming fish or requiring extra effort. As described above, the presence of an obvious pulse of large Dolly Varden will trigger a need for foot surveys to identify spawning locations.

**Outmigrant Monitoring** - Some rearing fish move out of small streams in the fall into winter rearing areas. Others may remain in the stream through the winter. To better understand the life history of resident and anadromous species in Grant Creek, an inclined plane trap will be employed near the mouth of Grant Creek in the fall to intercept juvenile fish moving downstream. The trap will be installed in mid-September and will continue to operate until about mid-October, depending on fish movements. Young fish entering the trap will be held in a fine mesh live box that will be monitored at least once per day, more often if large numbers of fish are trapped. All fish in the trap will be identified to species, counted, and measured (fork length). If substantial numbers of fish are caught, an attempt will be made to calibrate the overall effectiveness of the trap by holding a sample of the trapped fish, marking them with dye, and transporting them for release upstream. The proportion of dyed fish subsequently caught in the trap will provide an indication of the percentage of total outmigrants captured in the trap, thus providing a basis for estimating total number of fall outmigrants contributed by Grant Creek. Combining the results of the spring and fall outmigration monitoring will provide an indication of the total annual productivity of the creek.

## **4.6 Grant Creek Aquatic Habitat Mapping**

### **Project-Related Objectives**

- Prepare an image of Grant Creek upon which aquatic habitat and fish use information can be superimposed.
- Develop a map of aquatic habitats that will provide a basis for describing the distribution of key habitat types.
- Identify important factors that influence fish use of key habitats for input to the instream flow analysis.

### **Quantitative Objectives**

- Habitat should be identified and mapped with sufficient resolution so that the GIS system can be used to accurately calculate surface areas.

The purpose of this study is to fully delineate and map the aquatic habitats available in Grant Creek, identify important habitats for fish (i.e., rearing and resident fish; spawning salmon), and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

It should be noted that much of the work described below has been completed including the basic structure of the GIS system and substantial information regarding fish use of various habitat types. The focus of the 2013 work will be to complete the habitat mapping, integrate all of the field data into the georeferenced database, identify data gaps, and conduct limited fieldwork to fill the gaps.

The approach of this study involves three primary phases. During the first phase, the team will spatially synthesize existing aquatic habitat and fish use data generated during various field efforts throughout the 2009 and 2010 field seasons. This exercise will be completed primarily to identify spatial data gaps. In the second phase, the team will then ground-truth habitat data in

the field, collect additional habitat and fish use data in Reaches 1 through 5<sup>3</sup>, and incorporate other suitable habitat and fish use data collected in 2010 (e.g., instream flow study, Section 4.7). Finally, the team will analyze the suite of habitats and fish use data to identify important factors affecting the distribution of fish. The primary tasks associated with this approach will be:

- Prepare an office-based aquatic habitat map (i.e., based on habitat observations assembled throughout the 2009 and 2010 field seasons).
- Conduct field surveys to ground-truth the office-based mapping effort and fill spatial data gaps relative to aquatic habitat and fish use in Reaches 1 through 4. Actual collection of fish habitat use information will be accomplished by the resident and rearing tasks and the instream flow task.
- Incorporate aquatic habitat fish use data to identify key rearing, spawning, and feeding habitats for salmon and resident fish and potential overwintering habitats.
- Analyze and identify the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

The office-based mapping exercise will incorporate existing habitat data overlain by fish use data into a spatial format, using ArcMap® geographic information system (GIS) software. The initial dataset will include habitat units mapped during a microhabitat fish use reconnaissance study completed in June 2009<sup>4</sup>. The team will also plot locations of salmon spawning activity recorded during 2009 foot surveys and high-use spawning areas identified by historical data (APA 1984). The team will use the preliminary spatial fish habitat information to catalog and identify gaps in coverage.

The team will conduct surveys to ground-truth the preliminary aquatic habitat delineation (i.e., generated through the office-based exercise), redraw mapping boundaries where appropriate and confirm the location of habitat areas that are in need of additional study. The team will delineate aquatic habitats at the mesohabitat category and subcategory scale, consistent with the approach developed for the 2009 habitat reconnaissance study. Mesohabitat subcategories identified in 2009 included fastwater pools and fastwater riffles, margins with undercut bank, margins without undercut bank, large woody debris dams, margin shelves associated with large wood debris, backwater pools, sloughs, and pockets. Additional subcategory characterizations will be added if deemed necessary. Habitats identified as needing additional study will be investigated further under Task 4.5.4.

### **Definition of Terms**

- As mentioned above, mesohabitat types were identified and mapped in 2009/2010. The following definitions are provided for these habitat types (Overton et al. 1997, unless otherwise noted): Backwater: Pool formed by an eddy along a channel margin downstream from obstructions such as bars, rootwads, or boulders, or resulting from back-flooding upstream from an obstructional blockage. Also, a body of water, the stage

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<sup>3</sup> Due to physical access limitations, the field team may be unable to ground-truth aquatic habitats delineated in portions of Reach 5.

<sup>4</sup> The 2009 fish microhabitat use reconnaissance study was initiated to gain insight into the types of habitats that fish occupy in Grant Creek. The team identified discrete microhabitat types and sampled for fish presence at 16 sites in Grant Creek.



of which is controlled by some feature of the channel downstream from the backwater, or in coves or covering low-lying areas and having access to the main body of water.

- Cover: Suspended material covering the land or water; measured as a percentage of the surface area when looking from above.
  - Fish: anything that provides protection from predators or improves adverse conditions of streamflow or seasonal changes in metabolic costs. This may be overhead cover or submerged cover and it may be used for escape, feeding, hiding, or resting.
  - Overhead: Whitewater, surface turbulence, bank vegetation, tree branches, floating logs, or other debris that are touching or are within 0.3m of the water surface.
  - Submerged: Large woody debris, other organic debris, ledges, or aquatic vegetation which are below the water surface.
- Fast water: Habitat types consist of turbulent (cascade, step run, high gradient riffle, and low gradient riffle) and non-turbulent (runs and glides).
- Large Woody Debris: Large pieces of relatively stable woody material located within the bankfull channel and appearing to influence bankfull flows. These are categorized as singles, aggregates, or rootwads.
  - Aggregate: Two or more clumped pieces, each of which qualifies as a single piece.
  - Rootwad: Rootmass or boles attached to a log less than 3 m in length.
- Pocket: Small bed depressions, often less than 30 percent of wetted width, formed around channel obstructions (boulders, logs, irregular bank, jutting peninsulas, and so forth) within fast water habitat types.
- Pool: A habitat type formed by either scour that has carved out a depression in the channel, or a location where the channel has been dammed. Surface velocities may be slow to fast, but subsurface velocities tend to be slow. Pools are characterized by a head crest (upstream break in slope) and a tail crest (downstream break in slope). Types of pool include:
  - Dammed: Pool formed by downstream damming action. Dam pools can be located in main channel (or side channel) or backwaters.
  - Scour: Pool formed by scour action when flowing water impinges against and is diverted by a streambank or channel obstruction (rootwad, woody debris, boulder, bedrock, and so forth). Scour pools may be lateral scour, mid-scour, plunge. Or underscour pools.
    - Lateral scour: A pool formed by the scouring action of the flow as it is directed laterally or obliquely to one side of the stream by a partial

channel obstruction, such as a gravel bar or wing deflector, or by a shift in channel direction.

- Mid-channel scour: A pool formed by the scouring action of the flow as it is directed toward the middle of the channel by a partial channel obstruction.
  - Plunge: A pool formed by scouring action from vertically falling water.
  - Underscour: A pool formed by scouring under an obstruction, such as a log. Sometimes called an upsurge pool
- Riffle: Shallow rapids where the water flows swiftly over completely or partially submerged obstructions to produce surface agitation, but where standing waves are absent.
  - Side Channel: A lateral channel with an axis of flow roughly parallel to the mainstem and which is fed by water from the mainstem; a braid of a river with flow appreciably lower than the main channel.
  - Slow water: Habitat types consist of dammed (main and backwater) and scour (lateral, mid-channel, plunge, and underscour).
  - Stream Margin: edge of the wetted perimeter.
  - Undercut bank: A bank that has its base cut away at least 5 cm by the water or has been artificially made and overhangs directly above the water surface.

The team will identify key fish habitats in Grant Creek, based on observed fish use. This will be accomplished by analyzing the microhabitat fish use data collected in support of this study, data collected in support of the instream flow study (see Section 4.7), and data collected in 2009 during the reconnaissance study (HDR 2009a). These data will be incorporated into the spatial dataset. Other fish use habitat datasets (e.g., foot surveys, telemetry surveys, electrofishing) will be considered when developing key habitat designations. Surface areas of habitat types will be calculated as needed using the capability of the GIS software.

## **4.7 Grant Creek Instream Flow Study**

### **Project-Related Objectives**

- Assist impact analysis by modeling changes in key types of fish habitat relative to potential changes in stream flow.
- Provide a basis for planning Project instream flow mitigation measures.
- Provide a starting point for stream flow discussion.

### **Quantitative Objectives**

- Provide supportable predictions of fish habitat availability in lower Grant Creek under various stream flow scenarios for key species and life history stages.

The Grant Creek instream flow study approach to be applied to lower Grant Creek Reaches 1-4 was collaboratively developed based on input from the Instream Flow Technical Working Group (TWG). Public meetings of the TWG were held in April and September 2009, and a conference

call was held in May 2009; input and suggestions were solicited during these meetings and also through email and phone communications with the TWG and TWG members.

The selected instream flow study approach emphasizes a detailed study of utilized habitat types and addresses the desire of the TWG to examine how important individual habitat units may be affected by changes in flow due to the operation of the Project. Rather than applying a typical habitat study that generalizes mesohabitat units in a study reach, this approach uses several techniques to tie physical microhabitat to flow and timing, and applies *in situ* knowledge of fish habitat use in Grant Creek as tools to determine potential effects of the Project.

For an instream flow study in Grant Creek, an integrated effort provides a cost-effective way of obtaining information that most directly answers the questions the TWG members have regarding the effects of the Project on fish habitat in Grant Creek. The approach includes:

1. A series of single transect analyses, with each transect going through a known fish use area such as high-use spawning or rearing areas.
2. Fish studies that help identify microhabitat factors that affect fish use within each key habitat type.
3. Monitoring temperature and flows at multiple locations on Grant Creek in conjunction with the Water Resources study program to establish baseline stream flow and temperature changes.

These three components will be integrated and analyzed to determine effects of different flow regimes on several factors that are important in the life stages of Grant Creek resident and anadromous fish.

It is important to understand that a significant portion of the work described below has been completed. Specific study sites within high-use habitat types were selected, and transects were established at 18 locations including survey data and complete measurements of transect geometry. Depth, velocity, water surface elevation, discharge, substrate, and cover were measured at the transects during low and medium flow conditions. Incomplete data regarding microhabitat habitat suitability have been collected at various locations.

#### **4.7.1 Habitat Availability**

The purpose of the habitat availability component of the instream flow study is to measure available habitat at proposed mesohabitat sites as a function of discharge (Table 1). Available habitat will be correlated to results of the Habitat Utilization Study described below (Section 4.7.2). This information will be cross-referenced with historic hydrographs, recent hydrologic data, and potential flow scenarios in Grant Creek to determine discrete time periods when the habitat unit may be available for its designated use.

**Table 1. Proposed mesohabitat assessment sites.**

Kenai Hydro - Grant Creek Instream Flow Transect Summary			
Transect #	Channel Type	Fish Habitat Site	Notes
1 100	Rearing Distributary	R1FH11	Linear transect, slow water
2 110	Rearing Distributary	R1FH12	Linear transect, slow water, LWD
3 120	Spawning Main	-	Spawning riffle
4 130	Rearing Main	R1FH05	Main channel fast water, Side chnnl, small mid channel bar, vegetated, LWD upstream
5 140	Rearing Main	R1FH05	Main channel fast water, Side chnnl, small mid channel bar, vegetated, LWD upstream
6 150	Rearing Main	R1FH13	Woody debris LB LUS, fast water main channel
7 160	Rearing Main	R1FH13	Woody debris LB LUS, fast water main channel
8 200	Rearing Main	R1FH06	Backwater lobe
9 210	Rearing Main	R2FH10	Small tertiary channel Main channel, Fast water, undercut bank on
10 220	Rearing Main	R2FH10	RB
11 230	Rearing Main	R2FH10	Main channel, Fast water, undercut bank on RB, surveyed across island to backwater pool
12 300	Rearing Main	-	Backwater lobe
13 310	Spawning Main	R3FH14	Backwater, low vels, main channel fast deep
14 320	Rearing Secondary	R3FH09	LWD, Secondary channel and spawning
15 330	Rearing Secondary and Tertiary	R3FH09	LWD, Secondary channel, spawning and Tertiary channel.
16 400	Rearing Main	R3FH16	Small side channel, cobble/gravel bar - no veg, very deep undercut bank
17 410	Rearing Main	R3FH16	Small side channel, cobble/gravel bar - no veg
18 430	Spawning Main	R5FH15	Pool, deep fast, LWD upstream, shallow slow margin shelf

Channel Type	Count	Percent
Rearing Distributary	2	11.1%
Rearing Secondary or Tertiary	2	11.1%
Spawning Main	3	16.7%
Rearing Main	11	61.1%
Total	18	

Cross section geometry, substrate, cover, and hydraulic data will be measured at each transect using techniques developed for the Physical Habitat Simulation (PHABSIM) method.

Application of PHABSIM techniques on Grant Creek is different from most other studies because transects are selected on important habitat units with known fish use, as opposed to a standard PHABSIM that attempts to represent all habitat units regardless of unique importance or known fish use. Collected data will enable several analyses including:

- Changes in the availability of microhabitat (depth, velocity, substrate, and cover) across a transect or at specific cells or groups of cells along the transect as a function of discharge.
- Lateral connectivity of main channel flow with side-channel, off-channel, or undercut bank habitats as a function of flow.
- Egg incubation effective habitat analysis.

Transects will be oriented across the selected habitat unit to best capture the average condition of interest in that unit, such as spawning or rearing potential. Headpins, tailpins, and a temporary benchmark will be set at each transect. Survey instrument and photo points will be established and marked. Each transect site will be fixed using a handheld GPS. Habitat unit cross sectional profiles will be surveyed using standard differential survey techniques. Cross section survey

points will divide the profile into 1 - 3 foot cells. Dominant and subdominant substrate and cover will be recorded within each cell.

Water surface elevations at each transect will be measured using a survey instrument at 3 - 4 discharges ranging from a low flow of approximately 50 cfs to a high flow of approximately 200 – 300 cfs. Mean column velocities will be measured within each cell at a high flow of 170 - 200 cfs, or the highest possible flow within practical and safety limitations. If feasible and safe to do, an additional water surface elevation will be taken above the high flow in order to extend the range of flows for the model. Numerous photos from established photopoints will be taken at each of the 3 - 4 flow levels.

Proposed cross sections (Table 1) were located during a site visit 24 September 2009. The locations were set based on presence of physical microhabitat (i.e., undercut bank, overhead cover, bedrock outcrops, and pocket water) and observations of fish during the site visit and during snorkeling studies. The site locations will be refined and measured during spring, summer, and early fall. These transects, approved by the TWG and placed in the field during 2010, are shown in Figure 3.

### **Incubation Analysis**

The incubation analysis is proposed to follow methodologies previously conducted for hydropower projects, such as Sullivan Creek in E. Washington (EESC 2009), which modeled the effects on incubating bull trout eggs (*Salvelinus confluentus*) as flows receded.

The Applicant proposes to use the following data in order to conduct the incubation analysis;

- Select calibrated and approved transects from the Grant Lake instream flow study that represent spawning habitat.
- Use the Habitat Suitability Index (HSI) curves developed for the project
- Bed elevation from each transect
- Stage at given flows (from the HYDSIM sub module of RHABSIM)

KHL will use RHABSIM (Riverine Habitat Simulation System) by Thomas R. Payne and Associates (Arcata, CA) to produce Weighted Usable Area (WUA) curves for target species spawning. One of the options available in the program is the ability to evaluate WUA on a cell-by-cell basis along each transect at a variety of flows.

WUA for an individual cell is calculated as:

$$S(\text{depth}) * S(\text{velocity}) * S(\text{substrate}) * \text{the area cell represents},$$

where  $S$  = the suitability index for depth, velocity, and substrate, respectively. A value of 1.0 for each suitability index is optimum, while a value of 0.0 indicates no value for that particular variable. For this analysis, KHL will model existing substrate as reflected in the hydraulic models developed from site-specific transect data.

### Value of Spawning Habitat

There are several options for evaluating spawning habitat. One method is to analyze the impacts on all spawning habitat, regardless of its combined suitability values; this method. Another method, which has been used, is to protect the better quality spawning habitat. As a result, only those cells with a combined suitability value of 0.25 or greater (e.g.,  $S$  (depth) \*  $S$  (velocity) \*  $S$  (substrate)) are evaluated. This methodology has been used previously with McMillen staff and WDFW and WDOE personnel (Hal Beecher and Brad Caldwell) when examining spawning habitat and protection of incubating eggs. If the suitability value was  $\geq 0.25$ , the area of that cell was counted; if the combined suitability value was  $< 0.25$ , the area of that cell was given a value of 0.00.

### Criteria for Protection of Incubating Eggs

The criteria used in this analysis is that the depth of water over a particular cell that is included as spawning habitat has to be at least 0.1 ft or greater (1.2 inches). The analysis conducted to determine the WUA value is:

- The water surface elevation for the transect is calculated (from submodule HYDSIM of RHABSIM) for each modeled flow
- For each modeled flow, the depth of the water over that cell is calculated by subtracting the bed elevation of the cell from the calculated water surface elevation
- If the depth of water over the cell is  $\geq 0.1$  ft, the WUA for that cell was used and added to the total
- If the depth of water over the cell is  $< 0.1$  ft, a value of 0.0 was used
- Flows can be modeled down from the spawning flows in 10 cfs increments (or whatever is deemed appropriate by the TWG)
- Analysis is continued to incubation flows of 10 cfs (or whatever is deemed appropriate by the TWG).

The level of protection afforded incubating eggs is then calculated as the percentage of spawning habitat still covered with at least 0.1 ft of water at a given incubation flow. The following ranges can be used to evaluate level of protection.

Protection (%) of incubating eggs	Range
100%	100%
90%	86 – 99%
80%	76 – 85%
70%	70- 75%



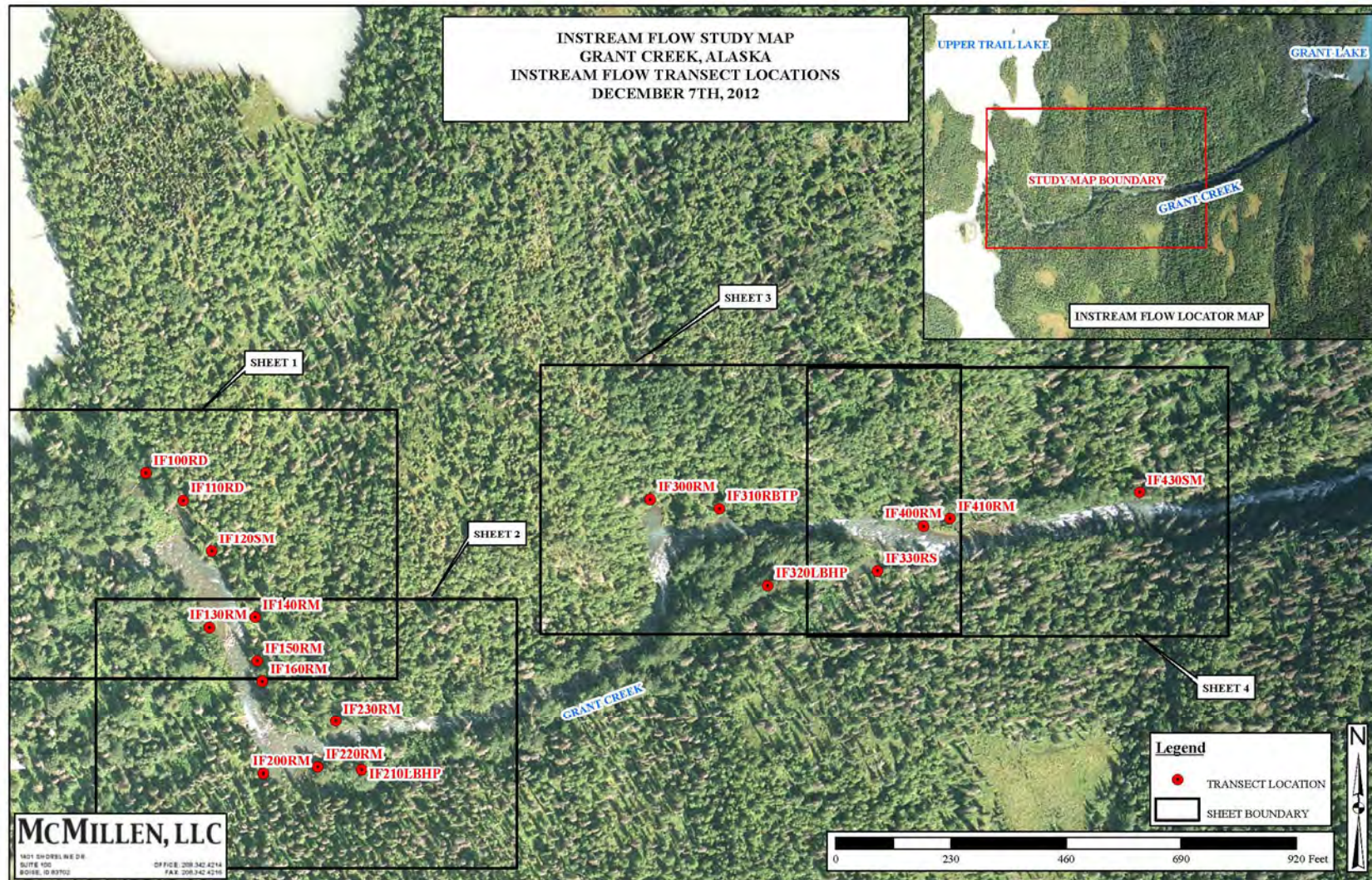


Figure 3. Location of Grant Creek Instream flow transects.

#### 4.7.2 Habitat Utilization

The purpose of the habitat utilization component is to learn what meso- and microhabitat factors the fish in Grant Creek occupy to assess whether the Project would have an effect on instream habitat. To maximize the knowledge of habitat selection factors for fish in Grant Creek, observations will be made at the locations of the transects as described in the previous section.

Fish spawning and rearing microhabitat values will be recorded at programmatically-selected sites in Reaches 1 through 4. Measured microhabitat use parameters will vary by habitat units. During the TWG meeting on September 23, the following table (Table 2) was developed with input from TWG members.

**Table 2. Parameters used in the habitat utilization study.**

Habitat use function by life history	Habitat use parameters to measure
Salmon rearing	Depth, velocity, cover, wetted perimeter, habitat connectivity
Salmon spawning	Substrate, depth, velocity, temperature
Rainbow trout spawning	Substrate, depth, velocity, temperature
Incubation	Depth, wetted perimeter, temperature
Resident rearing and spawning	Salmon rearing will be used as a surrogate

Information relating to site-specific habitat suitability criteria (HSC) will be developed from these data and used in combination with HSC available in the existing literature and professional judgment to determine final HSC to be used in modeling. Development of final HSC will occur as a collaborative effort with the Instream Flow TWG. HSC will be combined with the transect measurements and mesohabitat characterizations to model changes in habitat as a function of discharge.

Habitat use data collection will be similar to the sampling approach developed in 2009, as described in the 2009 baseline study report (HDR 2009) and existing data files furnished by KHL. However, the field effort may be expanded to include multiple sampling events at varying flow regimes, as discussed below. The primary tasks associated with this approach are to:

- Identify and describe discrete mesohabitat sample areas within each sample site, based on habitat factors observed.
- Record fish species presence (or absence) within each mesohabitat sample area.

The field team established 16 sample sites in Grant Creek in June 2009. The sample sites comprise habitats expected to contain high densities of juvenile fish (i.e., backwater areas; along stream margins) as well as those not necessarily expected to contain high numbers of rearing fish (i.e., fast water near the thalweg). As a result, the team identified a number of key habitats for rearing and resident fish. The instream flow team considered the key habitats identified through the June 2009 effort and in September 2009 established cross-sections at these locations (as discussed above). The field team will sample mesohabitats associated with the selected transects. Most transects are co-located with at least one mesohabitat unit sampled in June 2009. Additional sample sites will be established if deemed necessary.



Sites will be divided into discrete mesohabitat sample areas based on habitat characteristics observed within the stream segment sampled. In 2009, the field team identified the following mesohabitat sample areas: fast water pool, fast water riffle, margin with undercut bank, margin without undercut bank, large woody debris dam, and margin shelf associated with large wood debris, backwater pools, pockets, and sloughs, and “other” channels (i.e., tributary, secondary, tertiary). One sample site may be composed of multiple mesohabitat categories. Additional mesohabitat categories will be added if encountered. Mesohabitat factors taken into consideration will include:

- Location relative to the main channel (i.e., stream margin; mid-channel; backwater slough; backwater pocket).
- Depth and flow regimes (i.e., shallow fast, shallow slow, deep fast, deep slow).
- Presence of cover (i.e., no cover; velocity; instream cover).
- Type of instream cover when present (i.e., undercut bank; woody debris; overhanging vegetation; submerged vegetation; substrate).

The field team will record fish presence (or absence) within discrete mesohabitat sample areas, so that fish presence (or fish absence) can be correlated with the microhabitat characteristics present (or absent) at each location sampled.

The team will rely on snorkeling as the primary method to document fish presence (or absence) within each mesohabitat sample area. Electrofishing will be used primarily to confirm species identification and calibrate fish length estimates. Electrofishing will be used in lieu of snorkeling, if conditions preclude the effective use of snorkeling (i.e., shallow conditions). Each fish observed during snorkeling will be identified to species and its fork length will be estimated using 20 mm size intervals.

Within rearing habitats and near stream margins, the field team will record dominant and subdominant types of cover for each separate observed group of fish. Stream depth will be recorded using a wading rod at locations of observed fish use, and fish nose depth will be estimated by the snorkeler. Mean column velocities and velocity at the fish location will be recorded using a Price-AA or Swoffer current meter attached to a USGS top-setting or standard wading rod. Water temperature will be recorded at each station, ideally mid-column and at or near the location of observed fish.

In areas of observed spawning use, high stream depth and velocity may preclude field staff from measuring all microhabitat parameters. When possible, depth and velocity will be recorded as described above. Dominant and subdominant types of substrate size will be recorded by visual estimate using categories as described in Table 3. When direct measurements are not possible, depth at the spawning habitat will be visually estimated, and a GPS point will be taken and the habitat area described. The field team will revisit spawning habitat areas in the fall when flows allow wading, and will record dominant and subdominant types of substrate types immediately outside the redd perimeter for each observed redd. In all cases, surface water temperature will be measured near mid-column in a well-mixed area near the location of the observed redd.

**Table 3. Substrate size classes used on Grant Creek instream flow study.**

<b>Substrate Type</b>	<b>Size (inches)</b>
Organics, vegetation	--
Clay, silt (fines)	<0.002
Sand (coarse)	0.002 - 0.07
Small gravel	0.07- 0.30
Medium gravel	0.30 – 1.25
Large gravel	1.25 – 2.5
Small cobble	2.5 – 5.0
Large cobble	5.0 – 10.0
Boulder	>10.0
Bedrock	--

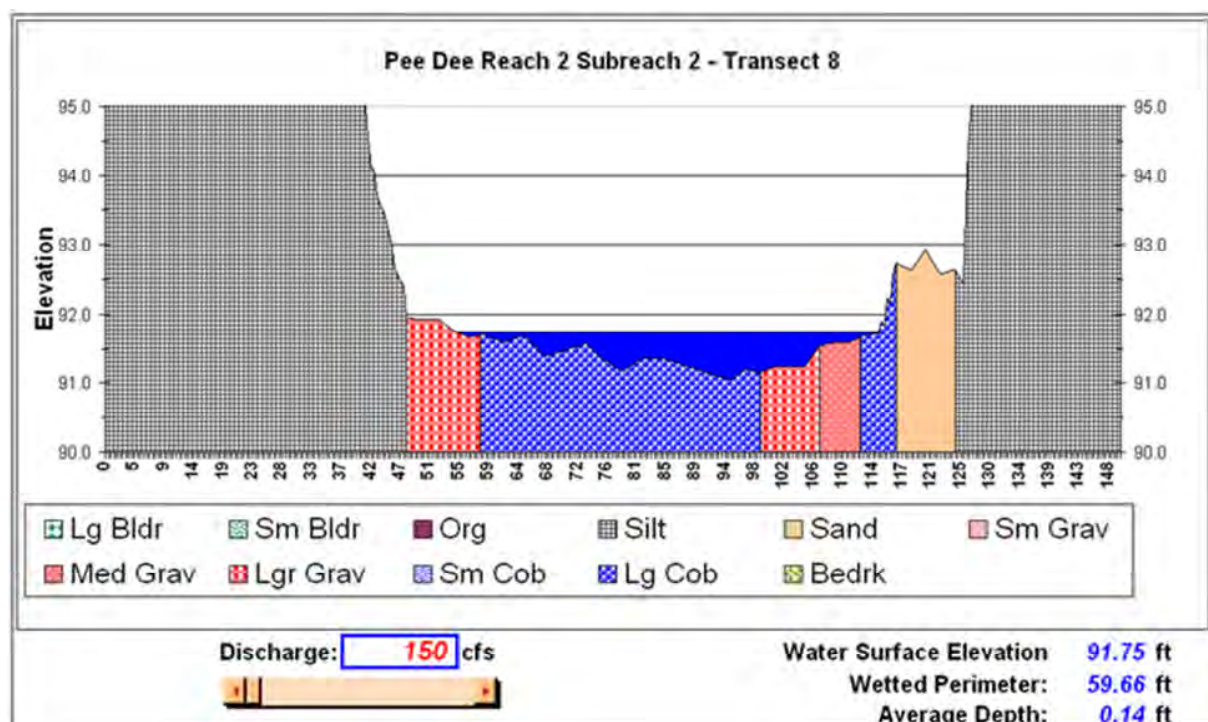
#### **4.7.3 Integration with Flow and Temperature Monitoring**

Grant Creek flow and temperature studies for 2010 are described in the Water Resources Study Plan (HDR 2009c). Specifically, continuous flow and temperature monitoring stations that were set in 2009 will be continued and/or reestablished. The instream flow study relies on integration of the collected data, described in the previous sections, with the data collected per the Water Resources Study Plan. The data loggers will be downloaded at regular intervals to contribute to analysis during the field season.

#### **4.7.4 Analysis Methods**

Field data collected as described above will permit both empirical analysis and habitat modeling as a function of flow.

A number of different graphs can be provided and may include the “wetted perimeter versus flow” relationship, a static cross section of the channel showing substrate distribution and water surface at any flow, and/or a dynamic Excel graphic. A static example of the dynamic graphic is shown below in Figure 4. Changing the value in the “Discharge Window” will adjust the water level up or down corresponding to the stage/discharge formula imbedded in the worksheet. Wetted perimeter and average depth values in the lower right also change with the assigned discharge. Values such as percent of change in wetted perimeter can be easily added to the graphic. This type of dynamic graphic can be provided for any transect, as appropriate.



**Figure 4. Example of a Channel/Flow Response cross sectional profile.**

Collected data will also permit the application of the PHABSIM model for evaluation of changes in suitable habitat at select transects as a function of flow (Bovee et al. 1998). Site-specific habitat suitability will be developed from observations of microhabitat use by fish. A commercial version of PHABSIM, known as Riverine Habitat Simulation (RHABSIM), will be used.

#### **4.7.5 Reach 5 (Canyon Reach) Analysis**

The proposed Grant Lake Hydroelectric Project would necessitate a major reduction in the flow of the portion of Grant Creek upstream from the proposed powerhouse (Reach 5). Because of the extreme flow reduction and the very high gradient of the creek in this reach, standard instream flow analysis methods are not applicable or appropriate. It is expected that available post-Project habitats will be limited to pools that contain sufficient water to support fish.

A simplified modeling effort will be employed to obtain insight into the effects that small changes in flow might have on pool depth, pool connectivity, and fish passage availability. Physical measurements will be conducted at selected step pools including basic cross section, surface area, and depth of downstream control (to determine minimum pool depth at very low flow). Connectivity of the various pools and channels will be measured and assessed using the Oregon Method (Thompson 1972). After 10 years of research on depth and velocity in streams in Oregon, Thompson concluded that the depth over “the shallow bars most critical of adult passage” was the feature that determined the likelihood of successful migration. Thompson recommends a minimum depth of 0.6 feet for large trout and 0.8 feet for Chinook salmon to achieve successful passage. The “Oregon Method” as it is now commonly called, concludes that

the passage flow is adequate when the depth criteria is met on at least 25 percent of the transect width and on at least a 10 percent continuous portion. Transect data will be collected to determine where connectivity meets this criteria and where it does not based on the three flows described above.

Connectivity will be assessed concurrently with the instream flow study being conducted downstream in Reaches 1 – 4, at the same flows, provided data can be collected safely. Photo documentation will be included in the connectivity analyses. Documentation will include transect measurements delineating each pool that is measured at each of the flow levels evaluated.

#### **4.7.6 Instream Flow Modeling**

Input from the instream flow analyses will be used to model the effects on fish habitat under various flow regimes and will examine the habitat and energy trade-offs associated with a range of scenarios.

### **4.8 Baseline Studies of Benthic Macroinvertebrates in Grant Creek**

#### **Project-Related Objectives**

- Provide a reliable measure of baseline stream productivity that can be compared from year to year and with other stream systems.
- Provide some indication of the relative “health” of the Grant Creek ecosystem by employing standard measures that are readily comparable to other Alaska stream systems.

#### **Quantitative Objectives**

- Standard methods will be used that require replicate samples within uniform riffle habitat areas to minimize the effect of between sample variability. Five replicates are generally recommended for initial sampling. An analysis of variance will be employed to determine adequacy for baseline use.

Benthic macroinvertebrates inhabit every wetted habitat within a stream system. The various genera of aquatic macroinvertebrates feed on multiple trophic levels ranging from primary consumers to predators. They are the primary food source for many fish species, so the abundance of macroinvertebrates can directly affect fish populations. Benthic macroinvertebrates also serve a role in understanding long-term water quality trends within a stream system. Many benthic macroinvertebrate genera have been assigned “biotic index” values that rate their relative tolerance for environmental stress (e.g., organic pollution or sedimentation). Assigned biotic index values can be used to calculate an average score for a stream system.

Benthic macroinvertebrate samples will be collected at two stations on Grant Creek (GC 100 and GC 300) in August using the Surber sampling method. This technique is used to accurately characterize population density and taxa richness in a single habitat within a stream system and allows comparison between seasons and/or years.

Five replicate samples will be collected at each station. Each sample is collected from within the same riffle/run area of the stream. A specialized net is placed in the riffle/run, which defines a 1 ft<sup>2</sup> area that is then thoroughly examined for invertebrates by kicking, scrubbing, and moving

substrate and allowing the invertebrates to wash downstream into the net. The contents of the net will be emptied into a sample jar and preserved with 70 percent ethyl alcohol.

Macroinvertebrates will be sorted from substrate material in the laboratory, identified to genus (except for Chironomidae), and counted. Data analyses will include a variety of standard metrics including taxa abundance, taxa diversity, percent dominance, and percent EPT (Ephemeroptera, Plecoptera, Trichoptera).

## **4.9 Baseline Studies of Periphyton in Grant Creek**

### **Project-Related Objectives**

- Provide a reliable measure of baseline stream productivity that can be compared from year to year and with other stream systems.
- Provide some indication of the relative “health” of the Grant Creek ecosystem by employing standard measures that are readily comparable to other Alaska stream systems.

### **Quantitative Objectives**

- Standard methods will be used that require replicate samples to minimize the effect of between-sample variability. Ten replicates are recommended for initial sampling. An analysis of variance will be employed to determine adequacy for baseline use.

Periphyton are single-celled algae that typically grow on rocky substrates in streams and rivers. Periphyton will be collected to assess chlorophyll *a* concentration, representing primary productivity, in Grant Creek. Many genera of benthic macroinvertebrates and some fishes depend on periphyton as their primary food source. Chlorophyll *a* concentration also can provide an indication of stream condition.

Periphyton will be collected by isolating a space of known area on a rock and collecting the algae from the space. This material is then sent to a laboratory to be analyzed for chlorophyll *a* content. Collection procedures will be as follows:

- Periphyton samples will be collected in August at two stream locations within Grant Creek (GC 100 and GC 300).
- Ten periphyton samples will be removed from a defined area on large gravel or cobble collected from the stream substrate.
- The material scrubbed from the rocks will be rinsed and then filtered onto glass fiber filters, preserved, and then frozen.
- The filters will be sent to a laboratory to assess chlorophyll *a* content.

## **4.10 Trail Lake Narrows Fish and Aquatic Habitats**

### **Project Related Objectives**

- Determine the extent of fish use in the vicinity of the proposed access road bridge crossing of Trail Lake Narrows in order to minimize impact to aquatic resources potentially resulting from bridge design, construction timing, and construction methodology.
- Determine habitat use to optimize bridge location and design.

## **Quantitative Objectives**

- The study will primarily be descriptive with some semi-quantitative fish sampling using catch per unit effort or standardized observations. Statistical analysis will not generally be applicable but catch methods will employ standard techniques allowing comparison with other bodies of water.

Field investigations will be conducted in the late July – early August period in the Trail Lake Narrows with emphasis placed on the vicinity of the proposed bridge site. Methods to be employed will include minnow trapping, beach seining, and snorkeling. Water clarity may be too poor for snorkeling to be effective. Use of stream bank habitats by juvenile Chinook and coho salmon will be a primary focus. It is expected that minnow trapping will be the most effective technique for juvenile captures.

Fish habitats within a cross section of the narrows will be subjectively described and will include a discussion of fish and habitat use.

## **5 Agency Resource Management Goals**

Aquatic resources including fish and their habitats are generally protected by a variety of state and federal mandates. In addition, various land management agencies, local jurisdictions, and non-governmental interest groups have specific goals related to their land management responsibilities or special interests. These goals are expressed in various statutes, plans, and directives:

- Alaska Statute 41.14.170 provides the authority for state regulations to protect the spawning, rearing, or migration of anadromous fish. Alaska Statute 41.14.840 regulates the construction of fishways and dams. State regulations relating to fish resources are generally administered by ADF&G. In addition to the state statutes, the following resource management plans and directives provide guidance and direction for protection of fish resources and aquatic habitats on lands within or adjacent to the Project area:
- Magnuson-Stevens Fishery Conservation and Management Act (PL 104-267) provides federal protection to “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” NOAA’s National Marine Fishery Service (NOAA Fisheries) is responsible for designating Essential Fish Habitat (EFH). In the case of anadromous fish streams (principally salmon), NOAA Fisheries has designated the AWC prepared by ADF&G (Johnson and Klein 2009) as the definition of EFH within freshwater habitats.
- Aquatic Resources Implementation Plan for Alaska’s Comprehensive Wildlife Conservation Strategy, September 2006. Prepared by Alaska Dept. of Fish and Game, Div. of Sport Fish.
- Our Wealth Maintained: A Strategy for Conserving Alaska’s Diverse Wildlife and Fish Resources. Prepared by Alaska Department of Fish and Game, Juneau, Alaska. xviii+824 pp.
- Kenai River Comprehensive Management Plan. Prepared by Alaska Department of Natural Resources, Division of Land and Division of Parks and Outdoor Recreation; in

conjunction with Alaska Department of Fish and Game, Habitat and Restoration Division; Kenai Peninsula Borough.

- Kenai Peninsula Borough Comprehensive Plan. Prepared by KPB Planning Department. In 2005. Soldotna, Alaska.
- Kenai Peninsula Borough Coastal Zone Management Plan. Prepared by the Kenai Peninsula Borough Coastal Management Program and LaRoche and Associates. 2008. Kenai Peninsula Borough. Soldotna, Alaska.
- Kenai River Special Management Area (KRSMA), ADNR.
- Final Environmental Impact Statement and the Revised Land and Resource Management Plan for the Chugach National Forest, Chapter 3 Environment and Effects. Prepared by the U.S. Forest Service, 2002.

## **6 Project Nexus**

The proposed Project may have a number of potential impacts on aquatic resources within Grant Creek and Grant Lake. The studies described above are intended to provide sufficient information regarding the nature of the existing aquatic resources such that these potential impacts can be adequately assessed. Each study component is specifically designed to help evaluate potential impacts in the study report. The impact assessments will be presented in the study report, and will be used to inform the development of protection, mitigation, and enhancement measures to be proposed in the draft and final license applications. Some of the direct and indirect Project effects that could impact aquatic resources are itemized below:

- Alteration of the streamflow and temperature regime (depending on the depth of water withdrawal in Grant Lake) in Grant Creek as the result of potential Project operation could affect spawning and rearing habitat for anadromous fish species and habitat for all life stages of resident fish species, depending on the timing and magnitude of flow alteration.
- Changes in water surface elevations in Grant Lake would likely affect aquatic biota in littoral areas, including fish, macroinvertebrates, and macrophytes; the timing and magnitude of lake level changes would dictate the level of effects (the proposed lake level changes would range from 2 feet above to 11 feet below the natural lake elevation of approximately 698 feet). Areas of shoreline wetlands could also be affected.
- Any dredging of Grant Lake in the vicinity of the proposed intake structure could result in short-term impacts on benthic macroinvertebrate populations in the area.
- Water temperatures in Grant Lake could be influenced by operation of the proposed Project, depending on the depth of water withdrawal.

## **7 Consistency with Generally Accepted Practices**

Sampling methodology for Grant Creek and Grant Lake was designed in consultation with the public, resource agency scientists, and members of the Instream Flow TWG. Quality control of all study plans is maintained by using established methods used elsewhere to assess similar potential resource impacts and are reviewed by outside expert scientific reviewers. Methods

proposed herein (use of foot surveys, minnow trapping, angling, block and removal techniques, and radio telemetry) are generally-accepted practices for assessing fish resources.

The instream flow approach, as a whole, is custom-designed for Grant Creek and its unique hydrology, geomorphology, and fish resources. However, each component of the study is a well-known and accepted technique for study application in the field. The integration of these components is accomplished through post-processing and analysis of results.

Macroinvertebrates will be collected using the sampling method described by Eaton et al. (1998). Surber sampling is a preferred method of the USGS and ADF&G. Periphyton will be collected using methods from Eaton et al. (1998).

## **8 Schedule for Conducting the Study**

- May-October 2012 – Re-engage stakeholders and conduct any tasks deemed beneficial in 2012.
- October 2012 – Apply for winter sampling permits.
- February-March 2013 – Conduct winter fish sampling.
- January 2013 (or earlier if any work to be done in 2012) – Apply for fish resources sampling permits, secure field equipment, telemetry tags, telemetry receivers, traps etc., exploration of Reach 5, instream flow transect measurements.
- Mid-April - May 2013 – Begin Rainbow trout survey, juvenile fish habitat use sampling, instream flow habitat suitability measurements.
- June 2013 – Complete Rainbow trout survey, data entry and QC for field data, habitat map GIS work.
- July 2013 – Juvenile fish habitat use sampling, instream flow habitat suitability measurements, instream flow water surface elevation measurements, Trail Lake Narrows assessment, data entry and QC for field data.
- August 2013 – Begin foot surveys for spawning salmon, capture and radio tag Chinook salmon, habitat use snorkel surveys, data entry and QC for field data.
- September 2013 – Continue foot surveys for spawning salmon, tracking radio tagged Chinook salmon, juvenile fish habitat use sampling, instream flow habitat suitability measurements, instream flow water surface measurements, data entry and QC for field data.
- October 2013 – Continue foot surveys for spawning salmon, continue tracking radio tagged salmon, complete field work and demobilize field equipment, data entry and QC for field data.
- November 2013 – Continue foot surveys for spawning salmon, complete data entry and QC for field data, begin development of draft baseline study reports.
- January 2014 – Complete instream flow modeling.
- January 2014 – Complete draft study report for internal review.



## **9 Provisions for Technical Review**

KHL will provide updates and study products for review by the Aquatic Resources Work Group during the licensing process.

- December 2012 – Issue final study plan to Work Group
- April through June 2013 – Start of Study Season [varies by study area].
- Fall 2013 – Work Group update on field activities.
- April 2014 – Distribute draft study report.
- April 2014 – Work Group meeting call to discuss comments on draft study report.
- May 2014 – Distribute final study report.
- September 2014 – File Draft License Application.
- January 2015 – File Final License Application.

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Grant Lake Project  
(FERC No. 13212)

# **Water Resources**

## *Draft Study Plan*

**Prepared for:**  
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March 2013

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### **List of Abbreviations and Acronyms**

<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>AEIDC</b>	Arctic Environmental Information and Data Center (University of Alaska)
<b>AHRS</b>	Alaska Heritage Resources Survey
<b>APA</b>	Alaska Power Authority
<b>AWC</b>	Anadromous Waters Catalog
<b>BLM</b>	Bureau of Land Management
<b>°C</b>	Degrees Celsius
<b>cfs</b>	cubic feet per second
<b>cm</b>	centimeter
<b>CPUE</b>	catch per unit effort
<b>°F</b>	Degrees Fahrenheit
<b>DNR</b>	Alaska Department of Natural Resources
<b>EPA</b>	Environmental Protection Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FL</b>	Fork Length
<b>fps</b>	feet per second
<b>ft</b>	feet
<b>G&amp;A</b>	general and administrative
<b>GPS</b>	global positioning system
<b>GWh</b>	gigawatt hours
<b>HEP</b>	Hydroelectric Evaluation Program
<b>IFIM</b>	instream flow incremental methodology
<b>in</b>	inch
<b>KHI</b>	Kenai Hydro Inc.
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>kWh</b>	kilowatt hours
<b>LLC</b>	Limited liability company
<b>mg/L</b>	milligrams per liter
<b>mi</b>	mile

<b>MIF</b>	minimum instream flow
<b>mm</b>	millimeter
<b>MSL</b>	Mean sea level
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NWI</b>	National Wetlands Inventory
<b>O&amp;M</b>	Operations & maintenance
<b>RM</b>	river miles
<b>RVDs</b>	Recreation visitor days
<b>TL</b>	total length
<b>TWG</b>	technical working group
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	U.S. Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>YOY</b>	Young of the year



# 1 Introduction

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD), along with a Notice of Intent to file an application for an original license, for a combined Grant Lake/Falls Creek Project (FERC No. 13211/13212 ["Project" or "Grant Lake Project"]) under Part I of the Federal Power Act. On September 15, 2009, FERC approved the use of the Traditional Licensing Process for development of the license application and supporting materials. As described in more detail below, the proposed Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake. KHL is planning to file a License Application for the Project in September 2014.

The Project will be located near the community of Moose Pass, Alaska in the Kenai Peninsula Borough, approximately 25 miles north of Seward, Alaska and just east of the Seward Highway (State Route 9).

This Water Resources study plan is designed to address information needs identified in the PAD, during the Traditional Licensing Process public comment process, and through early scoping conducted by FERC. A study report will be produced to present existing information relative to the scope and context of potential effects of the Project. This information will be used to analyze Project impacts and propose protection, mitigation, and enhancement measures in the draft and final license applications for the Project.

## ***Proposed Project Description***

The PAD Project proposal included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

The proposed Project would be composed of a diversion dam at the outlet to Grant Lake, an intake structure in Grant Lake, a tunnel, a surge tank, a penstock, a powerhouse, a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, an overhead or underground transmission line, and a pole-mounted disconnect switch where it ties into the existing City of Seward distribution line or Chugach Electric's transmission line. The powerhouse would contain two Francis turbine generating units with a combined rated capacity of 5.0 MW with a total design flow of 385 cfs.

Two modes of operation are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at a specific output level. Level control, or balancing of outflow to inflow, will likely only occur during periods of low natural inflow to Grant Lake when the reservoir is at or near minimum pool elevation. Due to the small size of the Project in relation to the size of the interconnected system, the Project is not likely to be used to load follow.

Prior to reinitiating planning efforts for natural resource studies, KHL was evaluating two potential access road routes. The Falls Creek route would be approximately 3 miles long beginning at the south end of Lower Trail Lake, and the Trail Lakes Narrows route would be about 1 mile long beginning at the Seward Highway. In early 2012, KHL determined that the Trail Lake narrows route was the most feasible and has eliminated the Falls Creek route from consideration. The Trail Lakes Narrows route would extend eastward to cross the narrows

between Upper and Lower Trail lakes and then continue eastward to the powerhouse. The Trail Lakes Narrows route has not been fully assessed from a natural resource perspective and will be comprehensively evaluated in 2013 as part of this study effort.

## **2 Overall Goals Identified during Project Scoping**

Together with existing information, the goal of the study effort described in this plan is to provide baseline information, and where applicable, information on alternative flow regimes, which will inform an assessment of potential Project impacts on water resources. The impact assessments and potential protection, mitigation, and enhancement measures will be presented in the draft and final license applications.

The goals of this suite of studies are to provide supporting information on the potential resource impacts of the proposed Project that were identified during development of the PAD, public comment, and FERC scoping for the License Application, as follows:

- Impact of Project construction and operation (, changes in flow) on Grant Lake and Grant Creek water quality, hydrology, and water temperature.
- Impact of Project construction and operation on water quality, of Lower Trail Lake and Trail Creek.

Specific project objectives and quantitative objectives will be presented below for each individual study component.

## **3 Existing Information and Need for Information**

### **3.1 Existing Information**

#### **3.1.1 Pre-2009 Studies**

The hydroelectric potential at Grant Lake (Figure 1) has been evaluated several times as a potential power source for the Seward/Kenai Peninsula area. In 1954, R.W. Beck and Associates (cited by APA 1984) conducted a preliminary investigation and concluded that a project was feasible. The U.S. Geological Survey (USGS) conducted geologic investigations of proposed power sites at Cooper, Grant, Ptarmigan, and Crescent Lakes in the 1950s (Plafker 1955). In 1980 CH2M Hill (cited by APA, 1984) prepared a pre-feasibility study for a Grant Lake project and concluded that a project developed at the site would be feasible. The Grant Lake Project was referenced in the 1981 U.S. Army Corps of Engineers (USACE) National Hydroelectric Power Study (USACE 1981). The most extensive study was performed by Ebasco Services, Inc. in 1984 for the Alaska Power Authority (now Alaska Energy Authority; APA 1984). Alternatives evaluated by Ebasco included the diversion of adjacent Falls Creek into Grant Lake to provide additional water for power generation. These investigations have provided hydrological records as follows:

- Historical Grant Creek stream gage data (USGS 15246000) - 11 years of continuous stream gage data from 1947-1958.
- Grant Lake Hydroelectric Project Detailed Feasibility Analysis, by EBASCO, (APA 1984), that includes modeled Falls Creek data.

- Historical Falls Creek discharge data limited to several instantaneous discharge measurements made over various years including 1963-70, 1976, and 2007- 2008.

### ***3.1.2 HDR 2009 and 2010 Water Resources Studies***

The 2009 water resources study programs were intended to begin the process of acquiring resource information needed for FERC licensing and other regulatory requirements. Emphasis was on updating existing information, acquiring more complete information required for specific issue analysis, and providing background information needed to develop more focused studies after initiation of the formal FERC licensing process. Hydrology and water quality studies were continued in 2010; however, the study program was halted in July, 2010 because of various Project uncertainties.

Water quality measurements were made and water samples collected in Grant Lake near the proposed Project intake and near the natural outlet of Grant Lake during June and August, 2009 and in June 2010. In-situ parameters were measured at 1-meter depth increments including temperature, pH, dissolved oxygen, conductivity, and oxygen reduction potential. Water quality samples were collected at several depths for laboratory analysis. A string of logging thermistors was installed in the water column near the proposed intake to a depth of 20 meters. Loggers began collecting temperature data at various depths in June 2009 and continued logging throughout the winter. The lake thermistor string was removed for repair in June 2010 and replaced in early July. The Grant Lake thermistor string remains in place but is inactive and no longer being maintained. All other temperature logging instrumentation was removed from the study area in late July 2010.

Water samples were collected at three sampling sites in Grant Creek and one site in Falls Creek in June and August, 2009 and in June, 2010 for laboratory analysis. Temperature data and other in-situ parameters including pH, dissolved oxygen, conductivity, and oxygen reduction potential were also collected. Temperature data loggers were installed at the three water quality sampling sites.

The 2009 hydrology studies included establishing one gage each on Grant Creek (at the original USGS site), and on Falls Creek, establishing temporary benchmark monuments at the gage sites, and relating the elevations of the monuments to the Project datum, installing continuously recording stage and temperature loggers, and collecting instantaneous discharge measurements when stream flows allowed. Water temperature data loggers were also installed in Grant Creek in four locations in run and pool habitat types.

## ***3.2 Need for additional information***

Early study programs and the 2009-2010 preliminary study program sponsored by KHL have provided a significant amount of background information regarding water resources in the Project area. Additional data will be collected to support the existing record.

Additional water quality field studies will:

- Collect at least one additional set of water chemistry data in Grant Creek and Grant Lake in late summer 2013 to confirm 2009 measurements, complete the seasonal sampling that was initiated in 2010, and better define baseline water quality conditions.

- Continue to collect water temperature data in Grant Creek and Grant Lake to extend the period of record.
- Expand the water quality data collection to incorporate the Trail Lake Narrows access route.

Additional hydrology field studies will:

- Continue discharge measurements at the historical gage station on Grant Creek to validate or calibrate the historical rating curve and extend the period of record. Emphasis will be on medium- and low-flow measurements to fill information gaps.
- Make discharge measurements at Grant Lake outlet and near the proposed powerhouse location during low-flow conditions to attempt to determine if Grant Creek gains or loses water.
- Investigate the fluvial geomorphology of Grant Creek to address issues of material transport in Grant Creek, especially as gravel movement may be related to maintenance of salmon spawning habitat.
- Characterize the erosion potential along the shores of Grant Lake and its tributaries resulting from potential lake impoundment and drawdown scenarios.

## 4 Methods

The following sections describe the proposed Project's study area and proposed methods for the water quality and temperature, hydrology, and Grant Lake and Grant Creek fluvial geomorphology studies.

### 4.1 Study Area

The Project area is located near the town of Moose Pass, Alaska (pop. 206), approximately 25 miles north of Seward, Alaska (pop. 3,016), just east of the Seward Highway (State Route 9); this highway connects Anchorage (pop. 279,671) to Seward. The Alaska Railroad parallels the route of the Seward Highway and is also adjacent to the Project area. The town of Cooper Landing is located 24 miles to the northwest and is accessible via the Sterling Highway (State Route 1), which connects to the Seward Highway approximately 10 miles northwest of Moose Pass.

Grant Creek is approximately 5,180 feet long (approximately one mile) and flows west from the outlet of Grant Lake to the narrows between Upper and Lower Trail lakes (Figure 1). The Grant Creek watershed is approximately 44 square miles and the watershed contains Grant Lake as well as a portion of the Kenai Mountain Range with glacier capped peaks as high as 5,500 feet. Grant Creek has a mean annual flow of 193 cfs, with an average gradient of 207 feet per mile; its substrate includes cobble and boulder alluvial deposits and gravel shoals (APA 1984). The stream is 25 feet wide on average. In its upper half, the stream passes through a rocky gorge with three substantial waterfalls; in its lower half, the stream becomes less turbulent as it passes over gravel shoals and diminishing boulder substrate (APA 1984). Grant Creek's mobile substrate is comprised of well packed, unsorted broken angular rock, and there is minimal rounded material. Some fines may be found in small eddies and a few backwaters.



Figure 1

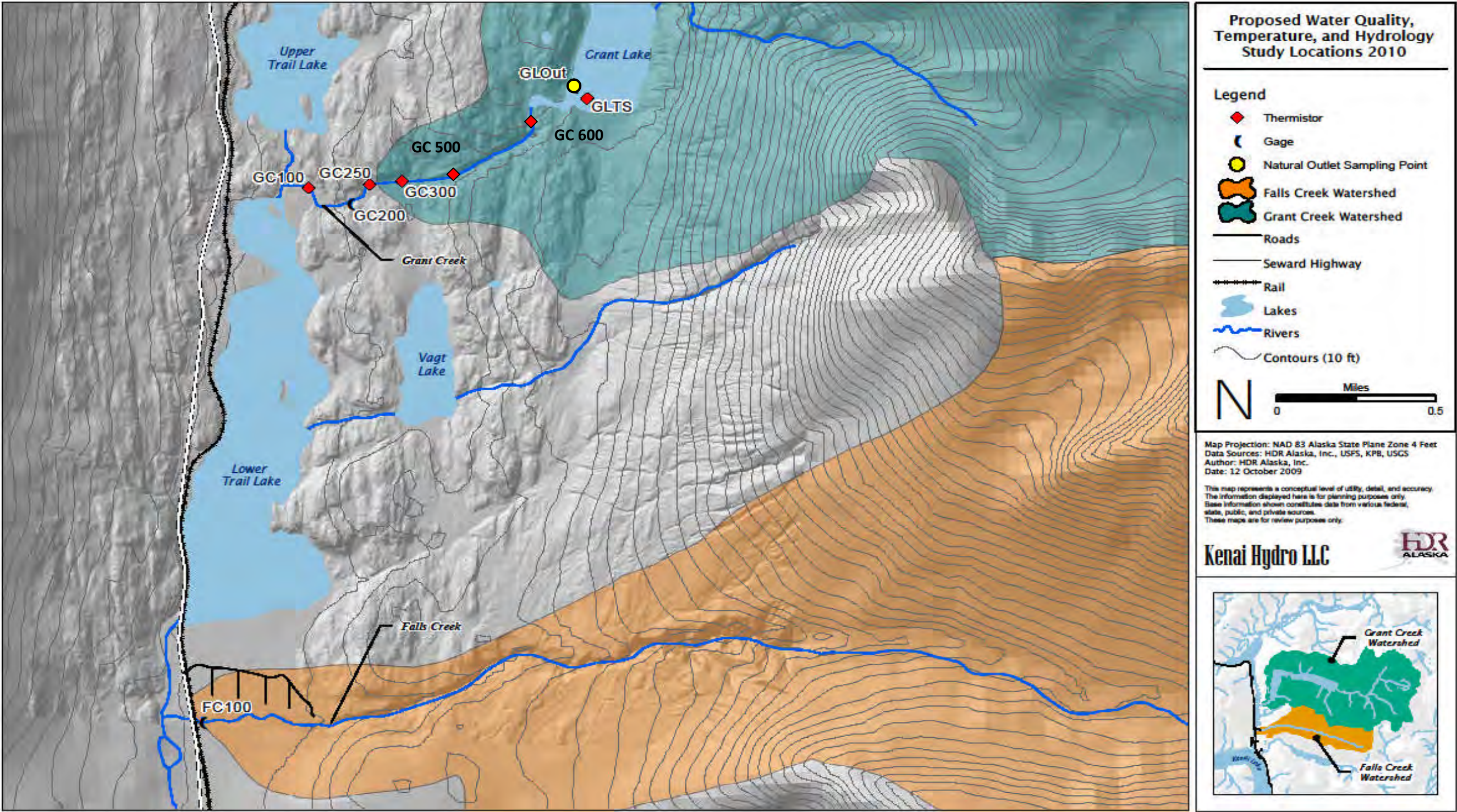


Figure 1. Proposed water quality, temperature, and hydrology study locations.



## **4.2 *Field Study Design***

### **4.2.1 *Water Quality and Temperature***

#### **Project-Related Objectives**

- Obtain baseline water quality data to provide a basis for environmental assessment and allow comparison with future years if needed.
- Obtain baseline information on the seasonal temperature regime to provide input data required for modeling of potential Project impacts to stream temperatures under various operational scenarios.
- Provide input data required for the planning of mitigation measures.

#### **Quantitative Objectives**

- Assure that physical measurements and chemical analyses are sufficiently accurate so that impact analyses and Project planning that depend on them will be meaningful. Use of standard methods, instrument calibration, and laboratory quality control per Environmental Protection Agency (EPA) standards will provide adequate assurance.

Water quality studies will be conducted to further document baseline conditions in Grant Lake and Grant Creek throughout the year. Describing the baseline conditions in each of these systems is necessary for understanding how Project operations may affect water quality. Water quality parameters were chosen for analysis based on several factors: parameters sampled in previous studies, parameters that may be affected by land use practices in the Project area, parameters either necessary for aquatic life or that act as nutrients, and the drinking water and aquatic life criteria that have been developed for fresh water in Alaska. Water quality criteria have been established to set limits on how much certain water quality parameters may change due to human activity.

The water quality and temperature study will contain the following subcomponents: baseline water quality studies in Grant Creek and baseline water quality studies in Grant Lake.

#### **Baseline water quality studies in Grant Creek**

- Water quality samples will be collected at three sites on Grant Creek (GC100, GC200, and GC300; Figure 1) in August to complete the seasonal sampling initiated in 2010.
- In situ parameters will be collected using an YSI or Hydrolab multi-parameter meter at each Grant Creek location.
- Water samples will be collected for laboratory analysis of the analytes listed in Table 1.
- Temperature data loggers will be re-established at four previously monitored sites on Grant Creek (GC100, GC200, GC250, and GC300) and will be downloaded as necessary.
- Two additional temperature data loggers will be established within the canyon reach of Grant Creek (GC500 and GC600) as well as 2-3 off-channel locations where ground water influence is suspected. The off-channel locations will be selected based on observed utilization by spawning and rearing fish species.

#### **Baseline water quality studies in Grant Lake**

- Water quality samples will be collected at two sites in Grant Lake in late summer to complete the seasonal sampling initiated in 2010. Samples will be collected at two depths at the natural outlet site (GLOut) and at three depths at the proposed intake location (GLTS; Figure 1).
- In situ parameters will be measured using an YSI or Hydrolab multi-parameter meter at each site in a vertical transect at one meter increments.
- Water samples will be collected for laboratory analysis of the analytes listed in Table 1. A thermistor string identical to that used in 2009 will be re-established in late winter/early spring near the proposed intake (GLTS) and will log temperature at ten depths in a vertical transect, continuing the period of record from prior measurements.

#### **Baseline water quality studies in Trail Lake Narrows**

- Water quality samples will be collected in Trail lake Narrows at one location about 100 m downstream from the proposed access road bridge site. Samples will be collected at three times during the year, early June (spring runoff), late summer, and September/October (fall runoff). Samples will be collected from the center of the narrows channel.
- Parameters to be analyzed include those in Table 1 plus standard hydrocarbon analytes.

**Table 1. Water Quality Analytes.**

<b>Parameter</b>	<b>Units</b>
Alkalinity (CaCO <sub>3</sub> )	mg/L
Total dissolved solids (TDS)	mg/L
Total suspended sediment (TSS)	mg/L
Kjeldahl Nitrogen	mg/L
Nitrate/Nitrite	mg/L
Orthophosphate	mg/L
Total phosphorous	mg/L
Lead	µg/L
Hardness	mg/L
Calcium	mg/L
Magnesium	mg/L
Sodium	mg/L
Potassium	mg/L
Low level mercury	ng/L
Fluoride	mg/L
Chloride	mg/L
Sulfate	mg/L
pH	STD
Temperature	°C

Dissolved oxygen (DO)	mg/L, %
Specific and Relative Conductivity	mS/cm, $\mu$ S/cm
Oxygen Reduction Potential (ORP)	mV
Turbidity	NTU

The technique used for collecting water quality samples from Grant Creek (sampling sites GC100, GC200, and GC300; Figure 1) will depend on flow rate and water depth. Depth- and width-integrated sampling with a DH-81 sampler will be conducted when it is necessary to collect water from multiple locations within the cross section of Grant Creek. A DH-81 sample bottle will be used to collect one liter sub-samples, and the sub-samples will be combined in one sampling bucket to integrate water collected across the width of the cross section. Depth integration will be accomplished by gradually lowering and raising the sample bottle within the water column allowing it to fill from different depths. Width-integrated grab samples will be collected when the width of the stream is wide enough to require multiple subsamples across the section, yet it is not deep enough to require depth integration. Laboratory sample bottles will be filled from the bucket when integrated sampling techniques are used. In situations where the creek is too narrow and too shallow to warrant integrated sampling, or when the creek is very well mixed, a single grab sample will be collected. In these cases, grab samples will be collected from the most well mixed portion of the stream and transferred directly into the laboratory sample bottles.

Grant Lake water samples will be collected from two sampling sites, GLOut and GLTS (Figure 1), using a Niskin bottle sampler. At GLTS, which is approximately 20 meters deep, samples will be collected at three depths: surface, mid-depth or just below the thermocline when present, and from 1 meter above the substrate. GLOut is shallower, approximately 10 meters, and samples will be collected from the surface and mid-depth of the water column. Depths will vary seasonally at the lake sampling sites as the lake level elevation changes.

In situ parameters will be measured in both Grant Creek and Grant Lake using an YSI or Hydrolab multi-parameter meter. Because of uncertainty regarding some of the 2009 instrument data, a second instrument will be deployed for comparison as a quality assurance measure. Bottles and preservatives for all water quality samples for laboratory analysis will be supplied by the analytical laboratory. All in situ water quality measurements will be recorded on a standard water quality study field data form. Water quality samples will be sent to an approved analytical laboratory in Anchorage, Alaska for analysis

Temperature sensors and data loggers were installed at GC100, GC200, GC250, GC300, and GLTS (Figure 1) in 2009. These instruments were removed in mid-summer 2010 and will need to be reinstalled early in the open water season. Two additional temperature data loggers will also be established within the canyon reach of Grant Creek (GC500 and GC600). Temperature measurements will be collected using HOBO Pro V2 continually recording temperature loggers and HOBO U20 Water Level Loggers manufactured by Onset Computer Corporation. The HOBO Pro V2 logging thermistor has an operating range of -40 to 50 °C, and is accurate to 0.2 °C over 50 °C. The HOBO U20 water level logger has a pressure operating range of 0-207 kPa, with a typical error of 0.05 percent, and a temperature operating range of -20 to 50 °C and is accurate to 0.37 °C at 20 °C. Both HOBO units have 64K bytes of memory. Loggers in the lake and in Grant Creek pools at GC100, GC250 and near GC200 will continue to collect temperature



data throughout the year. Water temperature data loggers will be downloaded periodically throughout the ice-free season as conditions permit and in conjunction with other field efforts for the sake of safety and efficiency. Similar to 2009 studies, stream temperature data loggers will be placed within the stream channel in areas expected to remain submerged during all flows. Temperature data loggers will be kept submerged by anchoring them to boulders using stainless steel wire cable. Each temperature data logger will also be anchored (i.e., tree, log, or boulder) along the shoreline. Additional temperature data loggers will be placed at 2-3 selected off channel sites. Site location will be coordinated with the Aquatic Resources study team and will emphasize locations that may be influenced by groundwater. The off-channel locations will be selected based on observed utilization by spawning and rearing fish species. Temperature measurements in Grant Lake are intended to provide a temperature profile of the water column near the proposed intake. Water temperatures in Grant Lake will be measured both instantaneously and continuously using recording data loggers. At both GLOut and GLTS, temperatures will be measured in a vertical transect during water quality sampling events with a YSI or Hydrolab multi-parameter meter using a 20-meter cable calibrated at one meter intervals. The instantaneous water temperature measurements will be used to supplement the continually recorded temperature data. HOBO Pro V2 temperature data loggers will also be used at the proposed intake site on Grant Lake. A thermistor string was installed in 2009 along a vertical transect in this location to a depth of 20 meters. Data loggers were attached to the string at depths of 0.2, 0.5, 1.5, 3, 6, 9, 12, 15, 18 and 19.5 meters. The data loggers recorded temperature at 4-hour intervals. The thermistor string remained in place through the winter of 2009-2010 and was maintained through mid-summer 2010. It remains in place but is inactive and no longer maintained. It will need to be tested and reinstalled or replaced in late winter/early spring to begin a new period of record.

Temperature information will be summarized and arrayed in a format that will allow information to be easily interpreted for impact analysis purposes and facilitate input into a simple temperature model at a later date, if necessary.

#### **4.2.2 Hydrology**

##### **Project-Related Objectives**

- Continue to obtain baseline hydrologic data to increase the period of record and provide essential information for engineering and environmental assessment.
- Provide stream flow conditions over the full range of flows to provide essential input to instream flow models (see Aquatic Resources Study Plan).
- Determine whether portions of Grant Creek gain or lose water, with emphasis on measurement of accretion in flow that may occur in the Canyon Reach.
- Provide input data required for the planning of mitigation measures.

##### **Quantitative Objectives**

- Assure that physical measurements are sufficiently accurate so that impact analyses and Project planning that depend on them will be meaningful. Use of standard methods, instrument calibration, and redundancy will provide adequate assurance. Statistical

analysis of measurement errors will be essential to determine validity of between-reach comparisons.

Hydrology studies will be conducted in order to further document baseline conditions in Grant Lake and Grant Creek throughout the year. Describing the baseline conditions in each of these systems is necessary for understanding how alterations to seasonal flow regimes might affect aquatic resources. Results will be used in conjunction with data collected in 2009, as well as historical data, to support the Instream Flow Study (HDR 2010), the engineering effort, and other related studies. A major goal for proposed study is to validate or calibrate the historical rating curve at GC200 for discharges less than 400 cfs. Another goal is to determine if Grant Creek gains or loses water. To meet these goals, the study will have two components as follows:

### **Installation of staff gages and continuously recording stream gages**

- Installation of staff gage at GC200.
- Installation and seasonal operation of continuously recording stage recorder at GC200.
- Survey staff gages and stage recorders after spring installation and prior to autumn decommissioning.
- Download data loggers bi-monthly.

### **Measure Instantaneous discharge**

- Make discharge measurements using the wading method for low flows.
- Make discharge measurements from a boat attached to a tensioned line or the use of an Acoustic Doppler Channel Profiler (ADCP) for medium flows.
- Salt dilution or wading method for determining gaining and losing characteristics during low-flow conditions, with emphasis on accretion within Reach 5 (Canyon Reach).

#### **4.2.2.1 Stream Gage Installation (Continuously Recording Data Logger)**

Following guidelines from previously permitted installation activities in 2009, a stream gage will consist of a staff gage and a continuous stage (CQ) data logger, each anchored individually to the stream bank and near the shoreline to avoid catching floating debris. The data loggers used for this project will be a USGS-approved bubbler/pressure transducer system manufactured by Design Analysis Associates, Inc with an accuracy of 0.02%. . These data loggers accurately record pressure, which will be related to water surface elevation of the staff gage. The data loggers will be set to record water depth at 15-minute intervals.

Each staff gage will be mounted vertically in the stream channel to measure water depth for the full range of flow conditions. The data loggers will be housed in a shoreline enclosure with the bubbler line protected in conduit and 2"galvanized pipe within the wetted channel.

The staff gage and logger installation will be placed far enough apart that the minor flow disturbances from one will not affect the other. Figure 2 shows multiple views of the data logger, bubbler line, and staff gage, installation. Grant Creek will have one stream gage at GC200 (Figure 1). Project construction equipment will be limited to a battery powered roto-hammer, hand-held post driver, and small hand tools for assembly.



**Figure 2. Examples of Design Analysis data logger, bubbler line and staff gage installation.**

During field visits, manual readings of the staff gages and the time will be recorded. These manual staff gage readings will be compared with the stage values provided by the data logger during the same time interval. If either of the instruments moves, the movement will be detected by comparing the two gage readings. If movement is indicated, the gage will be resurveyed, and a mathematical adjustment will be applied to the data.

A differential survey will be performed for each of the data loggers and associated staff gages following installation in the spring and prior to decommissioning in the fall. Cross sections at these locations will be surveyed once per year during low-flow conditions. As noted above, an additional differential survey may be performed if elevation movement is observed while the data loggers are in place (i.e., during ice-free months). Multiple temporary benchmarks (TBMs) at each stream gage location will provide differential vertical datum checks for the gage equipment to monitor movement. The Grant Creek stream gage is tied into the elevation of the historical USGS gage and this elevation will be confirmed at installation.

Data loggers will be operated during ice free months. The schedule for these installations is dependent on individual site conditions (e.g., ice cover and water level). Installation of stream gauging equipment will begin as soon as practicable. All installed equipment will actively collect data as long as technical personnel can safely access the site.

Each stream gage will be revisited at least bi-monthly through mid-October and on a monthly basis until site conditions limit safe access. During site follow-up visits the field team will download data from the data logger and take a manual stream discharge measurement when flows permit.

#### **4.2.2.2 Instantaneous Discharge Measurements**

Collecting instantaneous discharge data from Grant Creek may require various methods depending upon seasonal variations in flow conditions. It is not possible to wade Grant Creek during high and medium summer flows, which are common in Grant Creek. Potential instantaneous discharge measurement methods will include:

- Current meter method: Wading method (low-flow events on Grant Creek).
- Current meter method: Boat or ADCP method (medium-flow events on Grant Creek).
- Salt dilution method (low flows on Grant Creek).

Regardless of the method used, all instantaneous discharge measurements will yield comparable results and will follow field procedures laid out in Rantz et al (1982). Each stream gage site will be visited at least monthly, and instantaneous discharge measurements will be taken until freeze-up as stream conditions permit, to collect data to validate or calibrate the rating curve.

Measurements at other sites within the Grant Creek drainage will be conducted as those sites are determined, and when stream conditions permit

Wading Method - When using the wading method, a Marsh McBirney or Swoffer current meter will be used for taking instantaneous discharge measurements. Measurements will be taken by using a top-setting wading rod with the current meter. During higher or fast-water conditions, the boat method will be employed to obtain discharge measurements.

Procedures for taking discharge measurements using a current meter in ice-free conditions are outlined below.

1. Visually check wading rod and current meter for damage. Repair damage to equipment and replace batteries as necessary.
2. Calibrate the current meter at the start of each field event according to manufacture protocols.
3. Anchor survey measuring tape tautly across the stream perpendicular to the direction of stream flow and attach it on either side of the stream with the low numbers of the tape on the left side of the stream. Calculate the width of the entire stream cross section.
4. Determine the spacing of the vertical partial sections (referred to as “verticals”). This is typically accomplished by splitting the entire stream cross section into approximately 25 to 35 verticals. The number of verticals will be based on an estimated distribution of the discharge across the entire cross section. At locations with narrow stream cross sections, a smaller number of verticals may be used. Space the verticals to meet the USGS objective that no vertical partial section should contain more than 10 percent of the total discharge. The ideal measurement is one in which no partial section contains more than 5 percent of the total discharge. Equal widths of verticals across the entire cross section are not recommended unless the discharge is well distributed. Widths of the vertical partial sections should become less as depths and/or velocities become greater (USDOI, 1969). Water column depth readings will be taken at each vertical.
5. The person wading in the stream will call out the location of the first vertical with respect to the surveyor’s tape to the person on shore who is recording data (data recorder). The station or vertical location is recorded on the Kenai Hydro LCC hydrology field form (see example field forms at the end of this document) to the nearest 0.1 feet and the closest spacing for any velocity measurement will be 0.20 feet.
6. Using the wading rod, the person wading in the stream will, if possible, measure water depth at that vertical to the nearest 0.05 foot. The wading person will call out this depth

reading to the data recorder and adjust the height of the current meter on the top-set wading rod according to the depth at that vertical. For water columns less than or equal to 2.5 feet deep, a single measurement of velocity at 60 percent of the water column height from the stream bottom will be recorded. If the water is more than 2.5 feet deep, measurements should be made at 20 and 80 percent of the water-column height.

7. The person wading will stand downstream of the survey measuring tape, facing upstream and holding the wading rod vertical in the water with the current meter facing directly into the current. The wading person should stand to the side, rather than directly behind the meter, to avoid influencing velocity readings. Occasionally flow at a vertical may not be perpendicular to the tape due to a rock upstream or other flow restrictions. If the obstruction cannot be cleared and the flow is more than 20 degrees off perpendicular, the person in the stream should orient the meter directly into the flow and call out the angle of flow with respect to perpendicular. A correction will be applied to the velocity measurement from the vertical when calculating the discharge.
8. The person wading will observe visual output of velocity measurements at each vertical. Velocity measurements will be made for 30 seconds, and velocity will be recorded. The time interval will be noted on the data sheet. In the event of extreme weather or flow conditions, a minimum of 30 seconds may be used for velocity measurements.
9. The person recording data will record this and other appropriate information on the field form.
10. Repeat above procedure at each vertical.

Boat or ADCP Method - When stream flows are high and swift and wading is not a safe option, a boat may be used as a stable platform from which to measure discharge. If a boat is used, it will be tethered to a tensioned safety line securely fastened to either side of the stream. The hydrographer will use the current meter with the standard top-set wading rod as described above, except work will be done from the boat. A range finder may be used to determine vertical spacing along the cross section. Conditions may require that the tethered boat and hydrographer be conveyed across the stream cross section manually by safety line operators on either bank. If velocities are so high that it becomes difficult to hold the wading rod still, a suspended weight may be used to weight the current meter to allow for velocity measurements. If appropriate for the conditions, an ADCP mounted to a River Cat trimaran can be ferried across the channel as described above to measure depth and velocity verticals. The use of an ADCP would represent a viable and safer option than standard current meter techniques via wading or boat techniques.

Salt Dilution Method - The measurement of accretion in the Canyon Reach (Reach 5) will likely involve very small differences and therefore will be conducted at a low flow time of the year (late March). The salt dilution method may be most appropriate for this task because of safety and accuracy issues. Hydrological measurements using the current meter method in upstream portions of Grant Creek have been extremely difficult and unsafe due to the high velocities, turbulent flow, and hazards such as waterfalls and strainers. Data collected with the salt dilution method are comparable to the current-meter method typically used for these data collection efforts when field conditions allow.

The salt dilution method is a standard USGS method used to measure stream discharge. The basic premise is to introduce a known amount of salt at one point in the stream and measure the conductivity (i.e., concentration) wave as it passes a point downstream where it is completely mixed in the flow. Stream flow is calculated from the area under the resulting conductivity curve. The salt dilution method uses common table salt (NaCl) as a tracer to measure discharge without the use of a current meter. Salt is preferred as a tracer over other known tracers because it is non-toxic to aquatic organisms at the concentrations and exposure times associated with the measurements. It is also inexpensive, easily obtained, and convenient to work with. Field measurements can be made with a conductivity meter read by a data logger.

It is recognized that there is a likelihood that flow differences between upstream and downstream measurements will be too small to be detected within the range of error inherent in the method. Nevertheless, the data are considered valuable from the project permitting standpoint regardless of outcome.

#### ***4.2.3 Grant Lake and Grant Creek Fluvial Geomorphology***

The Grant Lake and Grant Creek Fluvial Geomorphology study consists of two study components: a Grant Lake shoreline erosion inventory and comparison and a Grant Creek spawning substrate recruitment assessment.

##### **Project-Related Objectives**

- Provide a basis for predicting and assessing potential lake shore erosion in Grant Lake as a result of proposed reservoir operation.
- Provide a basis for predicting and assessing potential changes to material movement, sedimentation, and gravel recruitment that may occur in Grant Creek with changes in flow, especially as related to the long-term maintenance of fish spawning substrate.
- Provide a basis for predicting and assessing potential changes to material movement, sedimentation, and gravel recruitment that may occur in Grant Creek with changes in flow, especially as related to the long-term maintenance of fish spawning substrate.
- Provide input data required for the planning of mitigation measures.

##### **Quantitative Objectives**

- The proposed Grant Lake shore erosion study is a semi-quantitative inventory of shoreline conditions that might affect erosion potential that will permit comparison with conditions at existing operating reservoirs. Conclusions will combine objective criteria with professional judgment.
- The Grant Creek spawning substrate study will combine quantitative and qualitative elements. Bulk samples will be of sufficient size to be statistically representative using standard methods. The validity of sediment transport equations and their attendant assumptions will be discussed in light of project requirements.

##### **4.2.3.1 Grant Lake shore erosion study**

- Summarize existing topographic, soils, and geology data of potential erosion features.
- Compile and analyze local wind intensity and direction data.
- Map high wave areas on Grant Lake.

- Conduct a boat-based GIS-enabled lake shore inventory.
- Conduct data analysis and QA/QC.
- Produce a technical memorandum.

The purpose of the Grant Lake shore erosion inventory will be to characterize the erosion potential along the shores of Grant Lake and its tributaries resulting from potential lake impoundment and drawdown scenarios. A boat-based inventory will be conducted for areas of current erosion and potential erosion along the shoreline of Grant Lake. Location data, site characteristics, and photos will be collected using GIS mapping techniques. The Grant Lake data will be compared to Cooper Lake shore erosion data (HDR, 2004) and other reservoir conditions as applicable to allow for the general prediction and identification of possible erosion issues under an impoundment and drawdown scenario.

#### **4.2.3.2 Grant Creek spawning substrate recruitment study**

The purpose of the Grant Creek spawning gravel recruitment study will be to assess the existing processes that control the supply of substrate suitable for spawning in Grant Creek and to assess potential changes to substrate composition under the potential scenario of a partially dewatered canyon reach and altered seasonal flow regime.

A three-phase work plan is proposed to accomplish the above objectives: (1) assessment of the substrate at existing spawning areas including aspects of embeddedness and substrate size composition, (2) quantification of material transport conditions under the existing and projected flow regimes, and (3) qualitative geomorphic assessment of existing sediment supply conditions. General methodology and scope will be similar to that employed by Inter-Fluve, Inc. (2004) on Cooper Creek related to relicensing of the Cooper lake Hydroelectric Project.

**For Phase 1:** Standard methods, including Wolman pebble counts and embeddedness indices, will be employed to characterize existing surface spawning gravels conditions. Wolman pebble count (frequency-by-numbers) methods will be determined based on field conditions, but will likely include a grid-type method using 100-stone counts. The grid spacing will be determined by field conditions, but should not affect the final results assuming that the sediment deposit is isotropic in the horizontal directions.

The embeddedness sampling will include measurements of approximately 50 stones of surface substrate of a particle size range that falls within the range of spawning substrate sizes for species using Grant Creek. A qualitative discussion of potential changes in embeddedness under management scenarios will be conducted. Both Wolman pebble count and embeddedness measurements could be used for future monitoring to evaluate potential changes following management scenarios.

Bulk samples (frequency by volume) of subsurface stream margin and gravel bar substrate will be obtained at select study sites to assure statistically significant samples utilizing methods consistent to those discussed in Church *et al* 1987. Grain-size distribution will be determined for each bulk sample by conducting field sieves and hand measurement for the larger grain material and removing the finer-grained sediment for measurement at a laboratory facility. Because of

the large grain sizes present at the site, it is infeasible to remove the full sample for laboratory measurement.

Approximately 10 sampling sites will be established for Phase 1 measurements in the documented spawning reach (Reaches 1-4 downstream of the canyon). Based on field conditions, the sampling sites will be established at or near locations of the established Instream Flow monitoring sites to the extent feasible in order to integrate the Instream Flow modeling outputs into the sediment transport equation(s) (See Phase 2 below). Based upon professional judgment, additional sampling sites may be established depending upon field conditions and substrate changes within the study reach. These sampling sites will be spatially referenced for potential future monitoring.

**For Phase 2:** Sediment transport analyses will combine existing hydrological information, 2013 measurements of hydraulic characteristics at select sites (integrating the Instream Flow modeling outputs to the extent possible), and utilize incipient motion particle size analysis to determine the threshold of mobility for particles of various sizes for a given hydraulic condition predicted under existing conditions and a proposed management scenario. Existing incipient motion equation(s) and literature-referenced calibration estimates will be used and the equation(s) will be selected and applied based on field conditions and professional judgment. Rationale as to the assumptions integrated into the equations and a qualitative discussion of the reliability model outcomes will be documented. Field measured surface and subsurface (bulk sample and Wolman pebble counts) particle sizes, field measured channel geometry, and instream flow modeling outputs collected as part of the IFIM study under Task will be used as input to the selected sediment transport equation(s).

**For Phase 3:** Qualitative geomorphic assessment of the sediment supply for Grant Creek will be based on detailed observations of the Grant Lake watershed, known geological conditions, and professional interpretation of observed geomorphic processes to interpret and discuss potential impacts to the future supply of substrate to the spawning reach in Grant Creek (Reaches 1-4) and anticipated channel response.



## 5 Agency Resource Management Goals

Stated resource agency management goals resulting from coordination include:

- Alaska Department of Fish and Game published *Our Wealth Maintained: A Strategy for Conserving Alaska's Diverse Wildlife and Fish Resources* in 2006. The Strategy is intended to integrate new conservation methods with existing wildlife management and research programs. Maintaining diversity of wildlife (including fish) is the main goal of the Strategy.
- The Kenai River Special Management Area (KRSMA) is managed under Alaska Department of Natural Resources. The area includes public lands and waters that contribute to sustaining Kenai River's fish resources.
- The Revised Land and Resource Management Plan for the Chugach National Forest developed by the United States Forest Service lists multiple goals based around maintaining and/or improving fish habitat within the National Forest.
- The Kenai River Comprehensive Management Plan, managed by the Alaska Department of Natural Resources, is the basis for management of state lands within KRSMA.
- The Alaska Department of Fish and Game published *Aquatic Resources Implementation Plan for Alaska's Comprehensive Wildlife Conservation Strategy (CWCS)* in 2007. The goal of the CWCS is to conserve the diversity of Alaska's fish and wildlife resources, focusing on species and habitats of greatest concern.

## 6 Project Nexus

The proposed Grant Lake Project may have potential impacts on water resources within Grant Creek, Grant Lake, and Trail Lake Narrows. The studies described above are intended to provide sufficient information regarding the nature of the existing water resources such that these potential impacts can be adequately assessed. The impact assessments will be presented in the study report and be used to inform the development of protection, mitigation, and enhancement measures to be proposed in the draft and final license applications.

### 6.1 *Water Quality and Temperature*

Water quality samples will be collected using standard methods approved by the EPA. Sampling equipment will be cleaned and decontaminated between each sampling site/event. Sample frequency during open-water months may vary depending on the needs of the project. The HOBO Pro V2 logging thermistor has an operating range of -40 to 50 °C, and is accurate to 0.2 °C over 50 °C. The HOBO U20 water level logger has a pressure operating range of 0-207 kPa, with a typical error of 0.05 percent, and a temperature operating range of -20 to 50 °C and is accurate to 0.37 °C at 20 °C. Both HOBO units have 64K bytes of memory.

### 6.2 *Hydrology*

Hydrology studies, including the installation and operation of surface water elevation data loggers, and instantaneous discharge measurement methods will be conducted using standard methods as described by Rantz et al (1982). These methods have been developed, standardized, and are in use by the USGS specifically for measuring stream discharges throughout the nation.

### **6.3 *Grant Lake and Grant Creek Fluvial Geomorphology***

The Grant Lake shoreline erosion study is designed to be a reconnaissance-level effort that relies on existing geologic and soils data, hydrologic data, and meteorological data as well as professional experience and judgment to produce a meaningful description of processes and implications for potential Project impacts. The Grant Creek spawning substrate recruitment study combines standard quantitative measures of sediment transport with qualitative analyses. Both studies will incorporate methods used in previous studies (e.g. HDR 2004 and Inter-Fluve 2004).

## **7 Consistency with Generally Accepted Practices**

### **7.1 *Water Quality and Temperature***

Water quality samples will be collected using standard methods approved by the EPA. Sampling equipment will be cleaned and decontaminated between each sampling site/event. Sample frequency during open-water months may vary depending on the needs of the project. The HOBO Pro V2 logging thermistor has an operating range of -40 to 50 °C, and is accurate to 0.2 °C over 50 °C. The HOBO U20 water level logger has a pressure operating range of 0-207 kPa, with a typical error of 0.05 percent, and a temperature operating range of -20 to 50 °C and is accurate to 0.37 °C at 20 °C. Both HOBO units have 64K bytes of memory.

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## **8 Schedule for Conducting the Study**

### **8.1 *Water Quality and Temperature***

- April 2013 - One-day field event to deploy temperature loggers in Grant Creek (main channel reaches only)

- June 2013 - Four-day field event to deploy thermistor string in Grant Lake, download Grant Creek thermistors, collect water quality samples at Trail Lake Narrows.
- August 2013 - Three-day field event to collect water quality samples at Grant Lake, Grant Creek, and Trail Lake Narrows; one day of preparation, download thermistors, potentially deploy off-channel thermistors.
- September/October 2013 - Three-day field event to collect water quality samples at Trail Lake Narrows, download thermistors at Grant Lake and Grant Creek
- November/December 2013 - Two-day field event to download thermistors at Grant Lake (if possible) and Grant Creek.
- February 2014 - Complete QA/QC on all data, complete data processing and analysis.

#### **Baseline water quality studies in Grant Lake**

- Water quality samples will be collected at two sites in Grant Lake in late summer to complete the seasonal sampling initiated in 2010. Samples will be collected at two depths at the natural outlet site (GLOut) and at three depths at the proposed intake location (GLTS; Figure 1).

#### **Baseline water quality studies in Grant Creek**

- Water quality samples will be collected at three sites on Grant Creek (GC100, GC200, and GC300; Figure 1) in August to complete the seasonal sampling initiated in 2010.

#### **Baseline water quality studies in Trail Lake Narrows**

- Water quality samples will be collected in Trail lake Narrows at one location about 100 m downstream from the proposed access road bridge site. Samples will be collected at three times during the year, early June (spring runoff), late summer, and September/October (fall runoff). Samples will be collected from the center of the narrows channel.

## **8.2 Hydrology**

- April 2013 - Prepare equipment and materials for tensioned line and cataraft.
- April-May 2013 - Set up tension line and cataraft; conduct gaining/loosing determination IQ measurements; install gages and data loggers on Grant, make up to two IQ measurements on Grant Creek. These measurements could also be made during autumn low-flow conditions.
- June 2013 - Make one IQ measurement on Grant Creek, conditions permitting.
- July 2013 - Download data loggers in conjunction with other field efforts.

- August 2013 - Make up to one IQ measurement on Grant Creek.
- September 2013 - Make up to one IQ measurement on Grant Creek.
- October 2013 - Make up to two IQ measurements on Grant Creek, download data loggers, and decommission gages.
- February 2014 - Complete QA/QC on all data, complete data processing and analysis.

### **8.3 *Grant Lake and Grant Creek Fluvial Geomorphology***

- May 2013 - Prepare and conduct spawning gravel reconnaissance field visit during spring low-flow conditions.
- July 2013 - Prepare for lake shore erosion inventory field event.
- August 2013 - Conduct Cooper Lake calibration site visit and Grant Lake shore erosion inventory.
- September 2013 - Process and analyze lake shore erosion data.

## **9 Provisions for Technical Review**

KHL will provide updates and study products for review by the Water Resources Work Group during the licensing process.

- December 2012: Issue final study plan to Work Group
- April through June 2013: Start of Study Season [varies by study area].
- Fall 2013: Work Group update on field activities.
- April 2014: Distribute draft study report.
- April 2014: Work Group meeting call to discuss comments on draft study report.
- May 2014: Distribute final study report.
- September 2014: File Draft License Application.
- January 2015: File Final License Application.

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Grant Lake Project  
(FERC No. 13212)

# **Terrestrial Resources**

## *Study Plan*

**Prepared for:**  
**Kenai Hydro, LLC**  
**3977 Lake Street**  
**Homer, AK 99603**

**March 2013**



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### **List of Abbreviations and Acronyms**

<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>AEIDC</b>	Arctic Environmental Information and Data Center (University of Alaska)
<b>AHRS</b>	Alaska Heritage Resources Survey
<b>APA</b>	Alaska Power Authority
<b>AWC</b>	Anadromous Waters Catalog
<b>BLM</b>	Bureau of Land Management
<b>°C</b>	Degrees Celsius
<b>cfs</b>	cubic feet per second
<b>cm</b>	centimeter
<b>CPUE</b>	catch per unit effort
<b>°F</b>	Degrees Fahrenheit
<b>DNR</b>	Alaska Department of Natural Resources
<b>EPA</b>	Environmental Protection Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FL</b>	Fork Length
<b>fps</b>	feet per second
<b>ft</b>	feet
<b>G&amp;A</b>	general and administrative
<b>GPS</b>	global positioning system
<b>GWh</b>	gigawatt hours
<b>HEP</b>	Hydroelectric Evaluation Program
<b>IFIM</b>	instream flow incremental methodology
<b>in</b>	inch
<b>KHI</b>	Kenai Hydro Inc.
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>kWh</b>	kilowatt hours
<b>LLC</b>	Limited liability company
<b>mg/L</b>	milligrams per liter
<b>mi</b>	mile

<b>MIF</b>	minimum instream flow
<b>mm</b>	millimeter
<b>MSL</b>	Mean sea level
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NWI</b>	National Wetlands Inventory
<b>O&amp;M</b>	Operations & maintenance
<b>RM</b>	river miles
<b>RVDs</b>	Recreation visitor days
<b>TL</b>	total length
<b>TWG</b>	technical working group
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	United States Department of Agriculture Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>YOY</b>	Young of the year

# Terrestrial Resources Draft Study Plan

## Grant Lake Hydroelectric Project

### (FERC No. 13212)

## 1 Introduction

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD), along with a Notice of Intent to file an application for an original license, for a combined Grant Lake/Falls Creek Project (FERC No. 13211/13212 [“Project” or “Grant Lake Project”]) under Part I of the Federal Power Act. On September 15, 2009, FERC approved the use of the Traditional Licensing Process for development of the license application and supporting materials. As described in more detail below, the proposed Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake.

The Project will be located near the community of Moose Pass, Alaska in the Kenai Peninsula Borough, approximately 25 miles north of Seward, Alaska, and just east of the Seward Highway (State Route 9) (Figure 1).

This Terrestrial Resources study plan is designed to address information needs identified in the PAD, during the Traditional Licensing Process public comment process, and through early scoping conducted by FERC in June 2010. A study report will be produced to present existing information relative to the scope and context of potential effects of the Project.

### **Proposed Project Description**

The PAD Project proposal included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

The proposed Project would be composed of a diversion dam at the outlet to Grant Lake, an intake structure in Grant Lake, a tunnel, a surge tank, a penstock, a powerhouse, a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, an overhead or underground transmission line, and a pole-mounted disconnect switch where it ties into the existing City of Seward distribution line or Chugach Electric’s transmission line. The powerhouse would contain two Francis turbine generating units with a combined rated capacity of 5.0 MW with a total design flow of 385 cfs.

Two modes of operation are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at a specific output level. Level control, or balancing of outflow to inflow, will likely only occur during periods of low natural inflow to Grant Lake when the reservoir is at or near minimum pool elevation. Due to the small size of the Project in relation to the size of the interconnected system, the Project is not likely to be used to load follow.

Prior to reinitiating planning efforts for natural resource studies, KHL was evaluating two potential access road routes. The Falls Creek route would be approximately 3 miles long beginning at the south end of Lower Trail Lake, and the Trail Lakes Narrows route would be about 1 mile long beginning at the Seward Highway. In early 2012, KHL determined that the

Trail Lake narrows route was the most feasible and has eliminated the Falls Creek route from consideration. The Trail Lakes Narrows route would extend eastward to cross the narrows between Upper and Lower Trail lakes and then continue eastward to the powerhouse. The Trail Lakes Narrows route has not been fully assessed from a natural resource perspective and will be comprehensively evaluated in 2013 as part of this study effort.



**Figure 1. Project Vicinity and Facilities.**

## **2 Study Goals Identified During Project Scoping**

The Terrestrial Resources Study has been developed with the goal of providing supporting information for assessing the potential resource impacts of the proposed Project. Impacts were identified during compilation of the PAD, public comment, FERC scoping for the License Application, and consideration of subsequent changes to Project design to address stakeholder concerns. The following impacts will be evaluated in the reports for the various study components and in the draft and final license applications:

- Impact of Project construction and operation on wildlife distribution and abundance.
- Impact of Project construction and operation on wildlife during critical life stages.
- Impact of Project construction and operation (lake level fluctuations) on Grant Lake shoreline vegetation and/or habitats used by wildlife species.
- Impact of Project construction and operation (lake level fluctuations and Project roads and facilities) on distribution and abundance of invasive plant species.
- Impact of Project construction and operation (lake level fluctuations and Project facilities) on distribution and abundance of rare plant species.
- Impact of Project construction and operation on breeding and rearing habitat and nesting success of waterbirds on Grant Lake and Inlet Creek.
- Impact of Project construction and operation (road/transmission corridor, facilities, lake level fluctuations at the lake inlet) on wetlands and waters.
- Impact of Project construction and operation on wildlife use of wetland, riparian, and littoral habitats.
- Impact of Project construction and operation on wildlife movement across the bench between Grant Lake and Trail Lake.
- Impact of Project transmission lines (if not buried in the road grade) on bird populations (potential collision deaths).

## **3 Botanical Resources: Existing Information and Need for Information**

### **3.1 Existing Information**

A number of investigations of botanical resources have been conducted in the Project vicinity under the auspices of both the Alaska Power Authority (APA) and the US Forest Service (USFS) (APA 1984; Baker, B. O. 2005a; Baker, B. O. 2005b; Bella, E. 2009; Bella, E. 2006; Bella, E. 2004; Benoit, M. A. et al. 2005; Caveney, S. and N. McCusker 2005; DeVelice, R. 2004; Duffy, M. 2003; Holden, T. 2005; Malony, P. 2005; Oja, W. 2004; USFS 2007a; and USFS 2007b). As a result, a variety of vegetation community types are known to occur throughout the Project



vicinity (USFS 2007b). Vegetation communities encompass a wide range of types, including coniferous forests, deciduous forests, mixed conifer/deciduous forests, tall shrublands, low shrublands, muskeg, riparian areas, stream banks, lake margins, ponds, alpine tundra, and grasslands. Coniferous forest types are generally Lutz spruce (*Picea x lutzii*, a hybrid between Sitka spruce [*Picea sitchensis*] and white spruce [*P. glauca*]), mountain hemlock (*Tsuga mertensiana*), and mixed spruce-hemlock stands, with some small pockets of black spruce (*P. mariana*). Hardwood forests include mainly birch (*Betula papyrifera*) and scattered stands of cottonwood (*Populus balsamifera*) and aspen (*Populus tremuloides*). Non-forested communities include grasslands (including *Calamagrostis* stands, sedge meadows [*Carex* spp.], and other mixed graminoid vegetation types), alder (mainly *Alnus sinuata* var. *crispa*), willow (*Salix* spp.), and alpine tundra (including a variety of low forb species, lichens, and subshrubs). Rock, along with snow and ice fields, is present at higher elevations across the landscape. Major shrub species include rusty menziesia (*Menziesia ferruginea*), tall blueberry (*Vaccinium ovalifolium*), devil's club (*Oplopanax horridus*), and Sitka alder (*Alnus crispa* var. *sinuata*). Among the ground-cover plants, the most common include five-leaf bramble (*Rubus pedatus*), bunchberry (*Cornus canadensis*), crowberry (*Empetrum nigrum*), and low-bush cranberry (*Vaccinium vitis-idaea*). Mosses produce a continuous ground cover on parts of the Project vicinity. General vegetation type, as mapped by USFS (USFS 2007b), is shown in Figure 2.

Both natural and human-caused impacts have affected the forest communities near the Project. A high percentage of the large-diameter spruce is dead or dying due to an ongoing spruce bark beetle outbreak (Caveney and McCusker 2005). In addition to beetle-affected spruce, a variety of fungal diseases affect the old-growth spruce and hemlock that dominate the forests in the Project vicinity. However, there is little evidence of recent fire. Evidence of previous railroad tie logging of hemlock is widespread, and evidence of past logging of larger trees occurs near the Project. Fuel reduction activities have taken place around Moose Pass within the past 8 years.

There are no recorded occurrences of sensitive, rare, or threatened plants within the study area. The nearest four known occurrences of three different rare plants are 3.4 miles and 5 miles to the southeast and 5.5 miles to the south.

Invasive plant species are known to be present on the Chugach National Forest and on adjacent State, Borough, and private lands. The USFS has conducted several inventories and studies to determine presence, type, and risk of spread of invasive species (Bella 2009, DeVelice 2004, and Duffy 2003).

National Wetlands Inventory (NWI, Cowardin 1979) mapping exists for the Project vicinity (Figure 3). The Kenai Peninsula Land Cover Classification (KPLCC, O'Brien 2006) also includes wetland areas mapped within the Project area. The NWI mapping indicates that wetlands in the Project vicinity are concentrated in the area between Grant Lake and Trail Lake and at the east end of Grant Lake. While the shore of Grant Lake is very steep, limiting wetlands along the lake, the KPLCC indicates that there are select areas of wetlands along the shore of Grant Lake, concentrated in stream inlet areas and other isolated flat areas of the lakeshore. Other waters of the U.S. potentially affected by Project facilities and operation include lakes and ponds such as Grant Lake, Upper Trail Lake, and Lower Trail Lake, and streams, such as Grant Creek and Inlet Creek. Previous field studies (APA 1984) describe wet meadows ranging from extremely wet, floating mats to firm, treed bogs with many shrubs. Many of the bogs are described as having a wet spot or small pond in the center (APA 1984).

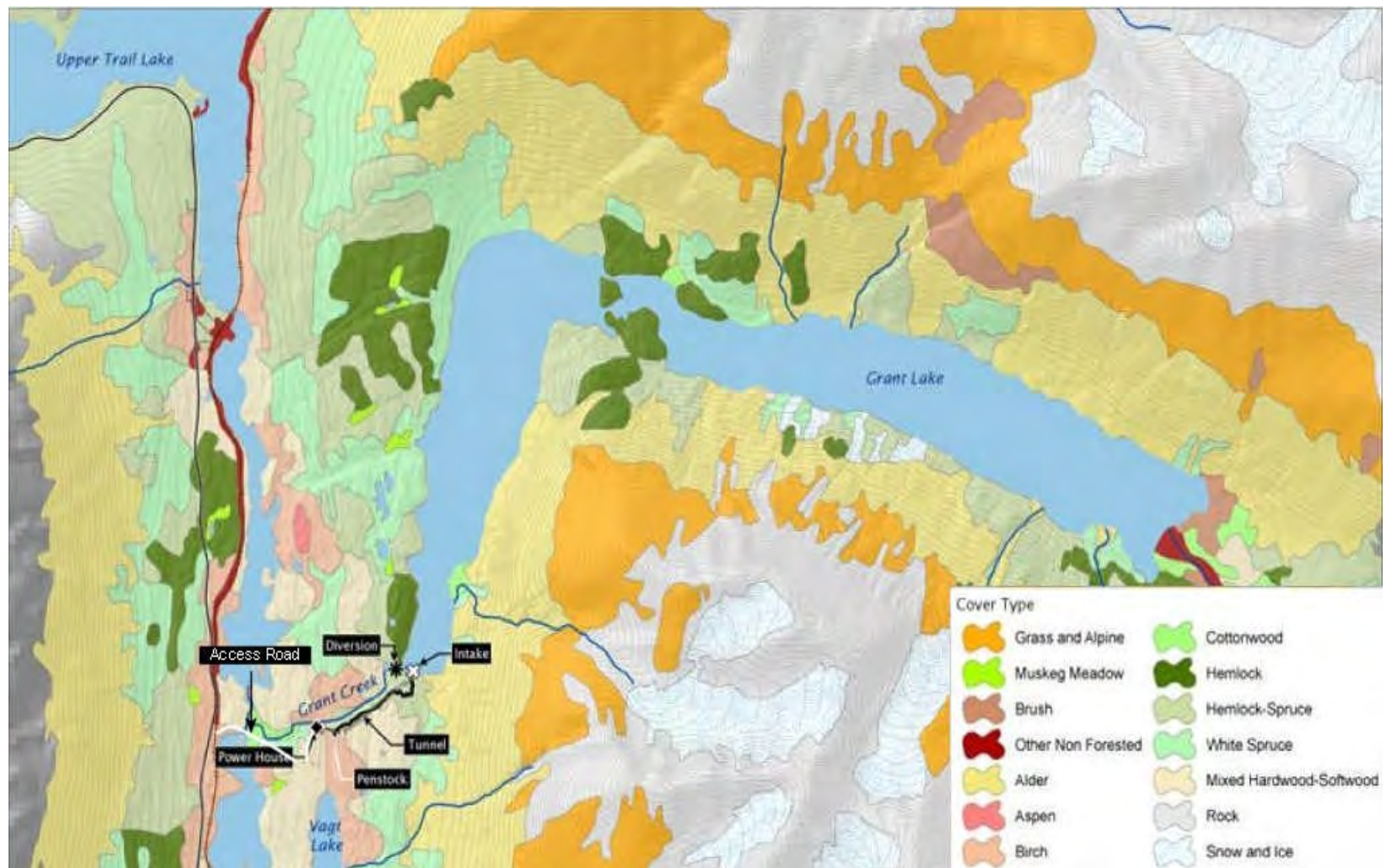
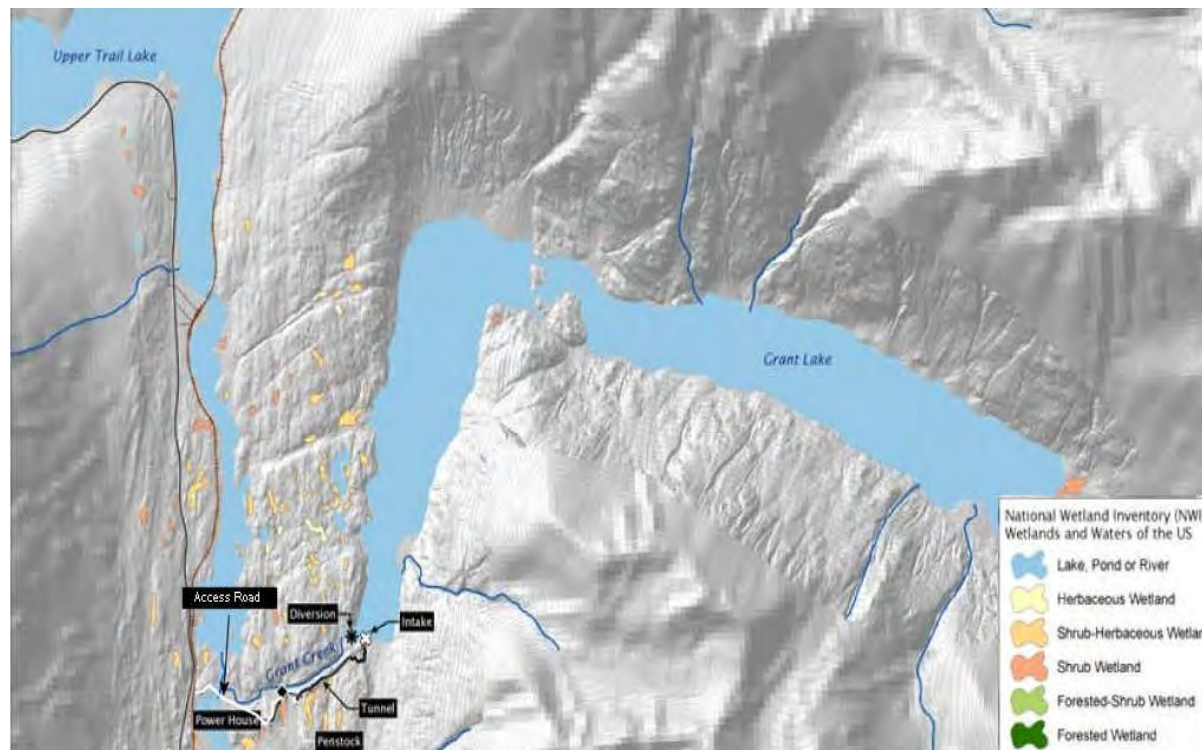


Figure 2. USFS Vegetation Cover Types for the Project Vicinity.



**Figure 3. Wetlands, National Wetland Inventory (NWI) Classification, US Fish & Wildlife Service.**

### **3.2 Need for Additional Information**

In addition to existing information, additional site-specific data are needed to meet the goal of evaluating Project effects. Studies will supplement existing information regarding vegetation mapping, sensitive plants, invasive plants, wetlands, and timber resources. Studies are designed to:

- Refine existing vegetation mapping to support other vegetation and wildlife analyses by reviewing recent aerial photography and digital data.
- Identify the presence and location of any sensitive plant species, in accordance with Forest Service guidelines and practices, to develop a draft Biological Evaluation.
- Locate any populations of invasive plant species in accordance with Forest Service guidelines and practices.
- Identify and classify existing wetlands and other “waters of the U.S.” in accordance with US Army Corps of Engineers practices to define areas subject to federal regulation and policies in areas of direct Project impact not mapped in 2010.
- If necessary, inventory areas not previously assessed for timber resources, in accordance with USFS practices and Federal Energy Regulatory Commission (FERC) requirements.

## **4 Botanical Resources Study Methods**

### **4.1 Study Area**

From west to east the study area extends from east of the Seward Highway and Alaska Railroad adjacent to Moose Pass, to just past the eastern shoreline of Grant Lake. From south to north the study area extends south along the highway to just south of Grant Creek and north to just beyond the north shoreline of Grant Lake. The study area includes all proposed Project facilities along Grant Creek and the Seward Highway (Figure 1).

## 4.2 Study Design

The Botanical Resources Study has four components that will include a combination of office- and field-based efforts: Study Component #1, General Vegetation Type Mapping; Study Component #2, Sensitive Plant Survey and Invasive Plant Survey; Study Component #3, Wetland and Waters Mapping; and Study Component #4, Timber Resource Assessment.

A review of existing information will be conducted for all four study components as an initial study task. The fieldwork for the study components will include the following activities:

- Conduct a sensitive plant survey to produce the baseline information for a Biological Evaluation for plants.
- Conduct an invasive plant survey (concurrent with sensitive plant survey) to produce a technical report and a plan for managing invasive plants.
- Conduct delineations of wetlands and other “waters of the U.S.” (collectively referred to as “wetlands”), in areas not mapped in 2010, sufficient to determine the locations of resources subject to authority of the Clean Water Act and Executive Order 11990. The wetland survey will include a detailed survey of areas not surveyed in 2010 that are directly affected by the Project and a general survey of the larger Project vicinity.
- Conduct a timber stand survey in areas not previously surveyed by the USFS, if any.

### 4.2.1 Study Component #1 – General Vegetation Type Mapping

#### **Vegetation Type Mapping**

The objective of this study is to refine the existing vegetation type map for the Project vicinity using existing GIS layers, existing aerial photography, and available satellite imagery (Figure 2). The map will be used to plan routes for the sensitive and invasive plant surveys, to assist in delineating wetlands prior to fieldwork, to locate timber stand survey plots in areas not previously surveyed, and provide habitat information for the wildlife study. Private lands will not be accessed for surveys.

Vegetation cover information is available for the Project vicinity from the USFS and the Kenai Peninsula Borough. Vegetation layers, including the CovType and the TimType layers, are out-of-date as they were created in the late 1960s and early 1970s; however, they may be used as the basis for new mapping. IKONOS satellite imagery for part of the Project vicinity, as well as aerial photography was obtained in 2010. Several aerial photography sets from different years that can be used for interpretation of vegetation types are also available.

#### **Methods**

To refine the vegetation type map for the study area, the following tasks will be performed:

- Acquire and compile existing GIS vegetation cover type layers from available sources, including the USFS and the Kenai Peninsula Borough. The Project acquired the USFS cover type layer in 2010.
- Examine any visible vegetation boundaries in aerial photos or other imagery to fix or update type polygon boundaries. The Project has already acquired and compiled some existing aerial photography and satellite imagery from the USFS, the Kenai Peninsula Borough, and private sources to overlay on the existing cover type layers.



- Determine specific locations to conduct the sensitive and invasive plant surveys, the detailed wetland delineation, and a timber stand survey if one is needed. Specific areas for survey will be those that may experience physical disturbance during Project construction or operation. These areas include the perimeter of Grant Lake, which may be affected by changes in the water surface elevation; a corridor including the Grant Lake outlet and Grant Creek, which will encompass construction of an intake and diversion structure, a powerhouse, a retention pond, and a tailrace; and the Trail Lakes Narrows access corridor route, to encompass road construction and a transmission line corridor that may include electrical transmission line towers and anchor locations, if the transmission line is located overhead (whether the transmission line will be underground or overhead has not been decided).
- Produce a final vegetation type map that displays vegetation type polygon boundaries, the study area, and specific Project components and impact areas.
- Use the vegetation type map to produce a table of vegetation types and calculate the percent acres of each vegetation type present in the study area in general, in areas potentially affected by the Project, and in directly affected key wildlife habitats (see Wildlife Resources Study for key species).
- Produce a technical report that includes a description of vegetation in the Project vicinity and assesses potential impacts of the Project.

#### ***4.2.2 Study Component #2 – Sensitive Plant Survey and Invasive Plant Survey***

The study area for the sensitive plant and invasive plant surveys includes:

- 2 vertical feet around Grant Lake,
- a 50-foot margin along the proposed road and transmission line,
- a 100-foot margin around all other proposed project features.

##### **Sensitive Plant Survey**

The objective of the sensitive plant survey is to satisfy USFS requirements for a Biological Evaluation for plants on lands under its jurisdiction. Sensitive plants, as referenced throughout this study plan, are plant species formally identified by Region 10 of the USFS in 2009. These plant species are listed in Appendix A. There are no federally listed threatened or endangered plant species known to occur in the study area. The USFS documents its protection of sensitive plant species in conjunction with Projects on lands under its jurisdiction through preparation of a Biological Evaluation for plants. The objectives of the Biological Evaluation for plants are specified in the Forest Service Manual Part 2672.41 (USFS 1995) as: (1) to ensure that actions do not contribute to loss of viability of any native or desired nonnative plant or animal species; (2) to incorporate concerns for sensitive species throughout the planning process; and (3) to ensure that activities will not cause a species to move toward federal listing as a threatened or endangered species. In addition, the Chugach Land and Resource Management Plan (USFS 2002) directs the USFS to “avoid, minimize, or mitigate the effects of human activities in areas containing sensitive plant populations” (page 3-27). It further directs the USFS to conduct surveys to determine abundance and distribution of sensitive plants in areas affected by management activities (page 5-8).

The purpose of this study is to develop the information necessary for Kenai Hydro LLC to meet USFS goals and objectives related to sensitive plant species. This study will determine the locations and abundance of sensitive plants on USFS lands in areas potentially affected by the Project to allow preparation of a Biological Evaluation for plants. Updated Project design will potentially reduce the effects to sensitive plants on USFS lands. The following tasks are necessary after the study for completion of the Biological Evaluation:

- Determine the proposed Project's potential effects on sensitive plant species (including possible PM&E measures).
- Develop appropriate mitigation measures if needed to avoid, minimize, reduce over time, and compensate for adverse effects on sensitive plants.
- Assess the risk the Project would pose to sensitive plants based on the consequence and likelihood of adverse effects.

After these analyses are documented in the Biological Evaluation, KHL will submit the Biological Evaluation for plants to the USFS and FERC.

### **Sensitive Plant Survey Methods**

The study methods are based on the Procedures for Sensitive Plant Biological Evaluations, May 2002, contained in Stensvold (2002); data forms are included here as Appendix B. The study will begin with a review of existing information on the sensitive plants and their habitats that may be found in the Project vicinity. The body of existing information includes:

- List of Alaska Region Sensitive Plants (2009) (see Appendix A).
- USFS protocols for sensitive plant surveys and Biological Evaluations (Stensvold 2002; Appendix B).
- Known habitat preferences and general geographic distributions of listed sensitive plants (Forest Service sensitive plant manual [Stensvold 2002]).
- Known geographic locations of sensitive species on the Kenai Peninsula (USFS digital records; Alaska Natural Heritage Program database).
- Existing vegetation mapping of the Project vicinity (USFS GIS database).
- Existing aerial photography (IKONOS).
- Locations and results of past surveys for sensitive plants on the Kenai Peninsula (USFS files).

The aforementioned records and documents may be obtained from the Chugach National Forest Supervisor's Office, the USFS Alaska Region Botanist, and the Alaska Natural Heritage Program. Based on the available information, staff will identify locations of habitats suspected to support sensitive species within the study area. Habitat may also be identified through interpretation of aerial photographs, existing GIS vegetation layers, known plant locations, consultation with USFS and other resource experts, and incidentally in conjunction with other environmental studies being performed for the licensing study program.

The following survey tasks will be performed:

- Conduct a Level 5 (intuitive controlled) intensity survey in areas potentially affected by the Project using a two-person crew. This level allows intensive searches in those areas with the highest potential for finding sensitive plants. Areas of focus for the sensitive plant survey will be habitats known or suspected to support sensitive plants in the

Chugach National Forest, as directed in the Procedures for Sensitive Plant Biological Evaluations within the USFS sensitive plant manual (Stensvold 2002). These may include heath, alpine and subalpine areas, wet meadows, shallow fresh water, forest edges, rock outcrops, well drained open areas, open forests, waterfalls, and stream banks. The exact areas of focus will be determined after review of available information and based on professional judgment in the field.

- Keep records of field surveys according to current USFS protocols for sensitive species surveys, including use of the R10 2008 TES Plant Element Occurrence Form, the R10 2009 Pre-Field Review Worksheet, and the National 2008 USFS Plant Survey Field Form (Appendix B). Survey locations will be recorded with GPS. Habitats likely to support sensitive plants will be thoroughly searched. The searches will employ the concepts of the timed meander method (Goff et al. 1982) without following that method exactly; each area will be searched until the surveyors are comfortable that further searches would not find any sensitive species. Any sensitive plant populations discovered will be described according to current USFS protocols. A voucher specimen from each sensitive plant population will be collected, pressed, and submitted to the Herbarium, University of Alaska-Fairbanks, if the population includes over 20 individuals and if a voucher is needed for positive identification.
- Identify in the field, or collect for identification, any unknown plants observed in the field.
- Compile field data and develop GIS coverage of survey areas and any sensitive plant sightings.
- Submit voucher specimens and report sensitive plant locations to the USFS and Alaska Natural Heritage Program.
- Prepare a technical report describing the results of the sensitive plant survey and assessing potential Project impacts to any identified populations of sensitive plants. Ultimately, a Biological Evaluation for plants will also be drafted for USFS lands affected by the Project.

### **Invasive Plant Survey**

Invasive plants, for the purposes of this study, are those that are not considered native to Alaska (considered synonymous with exotic for this study). The objective of the survey is to locate and document populations of invasive plants in areas potentially affected by Project construction and operation. This information will be used in preventing the spread of invasive plants due to Project related activities. The Chugach National Forest Land and Resource Management Plan (USFS 2002) cites as a goal to “prevent introduction and spread of exotic plants and reduce areas of current infestation,” and as objectives to “identify infestations of exotic plant species” and “treat infestations with a high potential to spread” (page 3-4). It suggests incorporating exotic plant control into Project planning and design (page 3-25), and conducting surveys to determine abundance and distribution of exotic plants, particularly in areas affected by management activities (page 5-8). Many invasive species are known to exist on USFS lands and on the Kenai Peninsula (Duffy 2003, DeVelle 2004).

A subset of invasive plants is designated as “noxious weeds”, which are plants that are especially destructive and difficult to control. Importation, labeling, and sale of their seed are legally controlled under Alaska Administrative Code 11 AAC 34.020. USFS guidance directs the USFS to manage and control noxious weeds (USFS 1995).



## **Invasive Plant Survey Methods**

The survey will be conducted at the same time as the sensitive plant survey, and will take place within areas on USFS lands potentially affected by the Project (Figure 1). Areas of likely infestation for invasive species include roadsides, soil disturbance areas, motorized vehicle travel routes, boat traffic routes, exiting trails, lake and stream access points, developed or social recreation sites, and other disturbances and human use areas.

The following tasks will be performed:

- Compile and review existing information on any nearby known locations of invasive vascular plants.
- Identify and map potential disturbances caused by Project activities using available GIS layers for roads, trails, access points, cleared areas, or other infrastructure features.
- Identify previous data collection points in the GIS database from prior studies (Duffy 2003, DeVelice 2004, and Bella 2009).
- While conducting the sensitive plant survey, observe any invasive species. If invasive species are identified, record the location with a GPS unit. If large populations of a particular species are found, record only one data point to represent the general area of infestation. If a particular species is found at many sites close to one another, record only one data point. Record at least one data point for each unique invasive species that is encountered. Use judgment in the field to decide if a population represents a unique infestation or is likely to have spread from an adjacent infestation.
- Complete the field form recommended by AKEPIC, which is also recommended for use by the USFS for invasive plant surveys on USFS land (Appendix C). Record GPS location information, data, observers, observer affiliation, detailed site information, detailed location information, and specific species information. This includes: exotic plant species code, infested area, canopy cover, disturbance age, stem count, collection information, control action, and aggressiveness. Details on what these field form terms mean is included on the field form. Not all fields must be filled out, but investigators will answer as many as possible. The important point in this study is to note location by GPS, species name, and approximate size of the infestation.
- Collect and preserve voucher specimens from populations that are not known from this area.
- Submit field form data copies to AKEPIC for the statewide database record.
- Prepare a technical report for the study area that describes the current infestations of invasive species. Assess the impact that Project activities may have on existing populations and also the potential of Project activities to introduce new populations.
- Develop a plan for managing invasive plants, based on potential Project effects. Include in the draft and final license applications, and the construction BMP's.
- 

### **4.2.3 Study Component #3 – Mapping Wetlands and other Waters of the U.S.**

The objective of this study is to identify and describe wetlands and other potential “waters of the U.S.” (collectively referred to as “wetlands”) that will be impacted by the proposed Project, (Figure 1). Following the update of Project design and a review of mapping completed in 2010, potentially affected areas that have not yet been surveyed can be determined. The wetland mapping component will provide information to prepare a wetland report sufficient to apply for a

permit from the US Army Corps of Engineers (USACE). The wetland report will describe locations near the Project that are potentially subject to the authority of Section 404 of the Clean Water Act or Executive Order 11990.

## Methods

Wetland and waters of the U.S. mapping will include the following tasks:

- Prepare a preliminary wetland delineation map prior to field work using existing NWI mapping and interpretation of the most current aerial photography or satellite imagery, the vegetation type map from this study, and other available vegetation mapping (e.g. the Kenai Peninsula Land Cover map).
- Conduct a field survey of wetlands and waters in the road/transmission corridor, facility locations, at the inlet of Grant Lake, and at the dam site (if included in the Project plans). The Grant Lake shoreline and Grant Creek corridor will also be included if deemed necessary based on field observations of suitable wetland terrain in these areas. The 2013 wetland survey will include the following:
  - Collect detailed information on soil conditions, hydrology, and plant community composition in representative upland and wetland sites using guidelines from the 1987 wetland delineation manual (USACE 1987) and 2007 Alaska Regional Supplement (USACE 2007). Use standard 2007 Alaska Regional Supplement data sheets (Appendix D).
  - Collect functional assessment data for each wetland. The functional assessment method used will be discussed with the USACE prior to field sampling.
  - Coordinates of wetland boundaries will be collected by GPS in the field
  - The width or buffer of the wetland assessment area surrounding all project components will be determined based on what was used by HDR in 2010 (this is not known at this time).
- Prepare a final wetland and waters of the U.S. map for areas potentially disturbed by Project activity using field delineation results. Map will include wetlands and other waters by NWI class (Cowardin 1979), and field data collection locations. Prepare a table of acres per NWI class using data and maps.
- Prepare a wetland and waters of the U.S. report that will include a detailed map of areas potentially disturbed by Project activity, the general map of the entire study area, methods and findings, a wetland functional assessment, and copies of the field data forms.

### 4.2.4 Study Component #4 – Timber Resource Assessment

The objective of this study (if needed) is to assess timber resources on USFS lands that may be affected by Project construction and operation. The study would estimate and calculate value for the volume of trees with commercial value, including Sitka, white, and Lutz spruce; paper birch; and mountain hemlock. These are referred to as the “species of interest” for this study.

The Project vicinity was partially delineated into timber stands in a past study (Caveney and McCusker 2005). Plot-level stand exams were conducted to a level of detail sufficient to calculate timber volume. Existing information may reduce or eliminate the need for fieldwork to obtain data sufficient to conduct the assessment. The updated Project design may reduce the area of timber affected. If, based upon project design and pool elevation fluctuation, it is determined that there will be no impact on the Forest Service Land timber that surrounds the lake, this study

will not be necessary. At this time, the bidder is requested to develop a budget for this task with the understanding that it may be eliminated from the overall scope as decisions related to Project development are made.

## **Methods**

The following tasks will be performed:

- Request a copy of existing field data for the Grant Lake Wildlife Habitat Vegetation and Fuels Report (Caveney and McCusker 2005) from the USFS. Review plot locations to determine the extent of coverage and if existing data cover the potential inundation area around Grant Lake (Figure 3). Determine areas, if any, of spruce bark beetle kill within the area affected by the Project using a Kenai Peninsula Borough GIS layer. Exclude these areas from field data collection. Field data collection may not be necessary if data exist, or if the area has been severely affected by spruce bark beetle kill.
- If field data collection is necessary, identify individual vegetation stands that include the species of interest in the potential inundation area using the vegetation type map. Calculate the number of acres in the target field data collection area for each vegetation type with species of interest. Types will include Sitka spruce, white spruce, Lutz spruce, mixed hardwood-softwood, birch, hemlock, and hemlock-spruce. Place one plot per acre in Project activity areas that require field data collection such that all types with species of interest are included. If one plot per acre is impractical for time or access reasons, scale back to one plot for every five acres with coverage in all types. Place plots within stand boundaries to avoid ecotonal/transition areas.
- Collect timber cruise data in the planned field plots using standard timber cruise field equipment. Assemble a crew of two people. Locate plots by GPS and paper map. Record the plot location using a GPS unit. Record data either in a field notebook or with a handheld field computer with a field form designed to include the data collection fields. Record date, observers, slope, aspect, canopy cover in percent class (0, 1-15, 16-30, 31-45, 45-60, 61-75, 75-90, 90+), and vegetation type (DeVelice et al. 1999). Sample trees in the plot with a BAF 30 prism for variable area plots. Record the species of each live tree that is in the plot. Record the DBH in cm using a diameter tape. Record the tree height in meters using a clinometer. Include notes on snags, site characteristics, and other site features if applicable.
- Enter timber cruise data into a database for volume calculations. Apply standard timber volume calculation formulas to calculate volume per acre (in board-feet per acre) for each species. Incorporate current market values for each species of interest using up-to-date information on rates from the U.S. Department of Agriculture. Compile volume calculation totals and value assessments in a table form.
- Prepare a technical report which presents results of analysis of timber volume and value for areas affected by the Project, assesses the impacts of the Project on timber resources, and includes a GIS map of data plot locations and timber resources.

## **4.3 Data Analysis: Objectives and Methods**

The results of the vegetation type mapping component will be used to analyze the potential impacts of the Project on vegetation in the study area. The mapping component will be used to calculate the total and percent acres of each vegetation type present in the study area and in areas

affected by the Project. Data will be presented in a summary table and in GIS mapping. Vegetation type mapping will also be used to support the Wildlife Resources Study.

The sensitive and invasive plant surveys require no specific data analysis. However, the technical reports will include an assessment of potential Project impacts. The results of the sensitive plant survey will be discussed in a technical report and ultimately used to complete a Biological Evaluation for plants. Sensitive plant data will be included in the Project GIS database. Results of the invasive plant survey will be discussed in a technical report and included in a GIS map.

The wetland delineation report will analyze the area of wetlands in the study area. Using GIS mapping of wetland delineation results, the area of total wetlands of each NWI class and other types of “waters of the U.S.” in the study area and area of wetlands potentially affected by the Project will be calculated. Total area and percentages of the types of wetlands will be presented in a summary table and in GIS mapping.

The timber resource survey technical report will present results of analysis of timber volume and value for Project activity areas and assess potential impacts of the Project. Data from the timber resource survey will be entered into a database for volume calculations. Standard timber volume calculation formulas will be used to calculate volume per acre (in board-feet per acre) for each species, and current market values will be incorporated for each species of interest using up-to-date information on rates from the US Department of Agriculture. Results will be compiled in a table and entered into the Project GIS database.

## **5 Wildlife Resources: Existing Information and Need for Information**

A series of reconnaissance-level foot and aerial field surveys were conducted between October 1981 and September 1982 by AEIDC to ascertain the presence, distribution, relative abundance, and use patterns of wildlife species and to identify the distribution and relative value of seasonally-limited habitats in the Grant Lake Project vicinity. Limited additional information on wildlife populations is available in more recent ADF&G reports for some species. For detailed information on wildlife documented during the 1981-1982 surveys, refer to the Grant Lake Hydroelectric Project Detailed Feasibility Analysis (APA 1984) or the PAD (Kenai Hydro, LLC 2009).

There are no federally listed wildlife species in the Project vicinity (USFWS 2009). The USFS has identified three management indicator species (MIS)—brown bear (*Ursus arctos*), moose (*Alces alces*), and mountain goat (*Oreamnos americanus*)—and eight species of special interest (SSI)—lynx (*Lynx canadensis*), gray wolf (*Canis lupus*), wolverine (*Gulo gulo*), river otter (*Lutra Canadensis*), marbled murrelet (*Brachyramphus marmoratus*), Townsend’s warbler (*Dendroica townsendi*), northern goshawk (*Accipiter gentilis*), bald eagle (*Haliaeetus leucocephalus*), and osprey (*Pandion haliaetus*)—that may occur in or near the Project (USFS 2005b). Several species on the State of Alaska list of Species of Special Concern (ADF&G 1998) also likely occur in or near the proposed Project, including the olive-sided flycatcher (*Contopus cooperi*), gray-cheeked thrush (*Catharus minimus*), Townsend’s warbler, Blackpoll warbler (*Dendroica striata*), and the Kenai population of the brown bear.

The AEIDC report estimated that 108 bird species, 34 mammal species, and one amphibian inhabit the Grant Lake Project vicinity at some time during the year (including lake, wetland, terrestrial, and alpine habitats).

The AEIDC study documented a small area at the outlet of Grant Lake into Grant Creek that remains open during winter and provides a winter feeding area for a flock of mallards (*Anas platyrhynchos*). As many as 30 individuals were observed in this opening during winter 1981-1982 field studies. With the exception of the two pools in Grant Creek, this was the only location potentially affected by Project facilities remaining ice-free and possessing an abundant, available food supply during the 1981-1982 winter (APA 1984). Because this relatively unique habitat may be impacted by the construction of a dam, changes in water flow at the outlet, and lake level fluctuation, this area warrants additional investigation.

The Inlet Delta is a gently sloping riparian wetland complex at the eastern end of Grant Lake that is dominated by willow species. AEIDC found the area to be preferred habitat within the Grant Lake Project vicinity for snowshoe hares (*Lepus americanus*), lynx, beavers (*Castor canadensis*), and moose. The area likely also provides nesting habitat for some species of waterfowl and passerines (APA 1984).

Recent studies by the USFS have documented habitat use by terrestrial mammals and birds near the Project (USFS 2003, 2004, 2005a). A bald eagle nest was documented near the Inlet Delta during 2003 Vegetation surveys (USFS 2003). In addition, two recent bald eagle nests have been documented by the USFS during aerial surveys: one nest was documented near the outlet of Grant Creek and the other nest was documented at the east end of Grant Lake (Benoit 2010). There are no known goshawk nests near the Project, but a goshawk nest is suspected to occur in the Project vicinity (USFS 2004, Benoit 2010). When the budget permits, the USFS conducts trumpeter swan (*Cygnus buccinator*) and bald eagle nesting surveys throughout the Kenai Peninsula. No swans have been documented nesting on Grant Lake during these surveys (Benoit 2010).

The ADF&G conducts regular surveys (approximately every 1-3 years) of mountain goats, moose, and bears throughout the Kenai Peninsula, including the Grant Lake watershed (Selinger 2009).

The Kenai Peninsula mountain goat population is subject to considerable short-term annual fluctuations and shifts in ranges that occur primarily due to winter weather conditions and recently to hunting pressures. In the summers of 1979 and 1981, ADF&G conducted a population study, and estimated a population of 246 goats. Of this group, about one-quarter (an average of 50) commonly use the Grant Lake basin through much of the year. Although the entire drainage is used by mountain goats, the principal area of use is the north side of Grant Lake on the south-facing slopes—generally small vegetated benches and ridges between 1,000 to 3,200 feet elevation. The primary areas of interchange between Grant Lake and other subpopulations are the Moose Creek drainage and across the glacier to the Kings River-Kings Bay area (APA 1984). Specific mountain goat surveys are not a component of this study plan because they mainly occur on the higher ridges and slopes beyond the areas potentially affected by the Project.

The Grant Lake area constitutes the southern limit of Dall sheep (*Ovis dalli*) range in Alaska. Dall sheep reportedly range over the entire Grant Lake and Falls Creek drainages in several small bands. During the 1981-1982 field studies, however, they were only noted on the northern

half of the Grant Lake drainage. Frequent interchange apparently occurs with the Moose Creek herd, particularly during summer. As with goats, mid-elevations of the slopes constitute favored range, especially vegetated benches, and the upper edges of timbered areas and exposed ridges where some forage plants are available. Sheep were observed during various seasons from the Lark Mountain ridge line above Moose Pass to slopes in the upper basin of the drainage (APA 1984).

Winter range is the principal limiting factor for sheep. Good winter range in the Grant Lake basin consists of snow-free sites near escape terrain at mid-altitude. In early spring, sheep sometimes move to lower altitudes into subalpine tree cover where emergent vegetation appears soon after the snow recedes. Sheep scats were found in open bluejoint meadows as low as 1,000 feet. The most recent survey of the Kenai Peninsula Dall sheep population was conducted in 1992, when 1600 sheep were counted by ADF&G (McDonough 2008).

Moose are common in the Project vicinity, but were not particularly abundant during the 1981-1982 field studies. After the earlier studies, authors considered that snow depth and a corresponding lack of winter forage limited moose numbers in the Project vicinity. Few moose were documented overwintering in the Project vicinity during the 1981-1982 studies (APA 1984). The Project lies within Game Management Unit 7 (GMU 7), which extends from Resurrection Bay to north of Moose Pass. While limited moose monitoring has been conducted, ADF&G estimates moose populations at between 700 and 1,000 in GMU 7 based on harvest information in the Eastern Kenai Peninsula (McDonough 2007).

In previous studies of the region surrounding the Project, brown bears were sparsely distributed. During the 1981-1982 field studies, only 16 widely scattered sets of tracks and three individuals, a female with one yearling and a mature individual, were observed. Three units of potential denning habitat were delineated based on sightings of individual bears and their sign at the time of den emergence and on the basis of geomorphic and vegetation characteristics. No more than one or two families and possibly two or three solitary animals would den within the proposed study area in any given year. The slopes west of Solars and Lark mountains and the bench partitioning Grant and Trail lakes constitute the principal travel routes to and from the Grant Lake valley, although some travel occurs in the pass intersecting the headwater areas of Moose Creek and Snow River. The period of greatest activity during the 1981-1982 studies was the last half of May, coinciding with den emergence and breeding. Few, if any, brown bears resided year-round within the Project vicinity due to lack of food, limited denning habitat, and residential development along the Seward Highway (APA 1984).

The State of Alaska developed a Kenai Peninsula Brown Bear Conservation Strategy (ADF&G 2000) to address impacts of human activities on brown bear habitat. Kenai Peninsula brown bears are listed as a Species of Special Concern by the State of Alaska and a MIS species by the USFS. The USFS developed a brown bear denning habitat model to identify potential denning habitat on the Kenai Peninsula (Goldstein et al. 2009). This model predicts that potential denning habitat is abundant on the steep slopes in the Trail River Watershed (USFS 2007).

## **5.1 Need for additional information**

Despite the existing information available for the Project vicinity, data is needed to fill gaps in available information on species presence, abundance, distribution, and habitat use in areas potentially affected by the Project. Previous baseline data collected for the Grant Lake

Hydroelectric Project in the 1980s provide a general understanding of wildlife in the region of the proposed Project, but those data are now almost 30 years old and additional information on current wildlife use in the area is necessary to evaluate potential impacts of the proposed Project.

Wildlife groups were identified for study based on a review of agency management goals and existing information. The primary objective of wildlife surveys for the Project is to provide existing baseline distribution and abundance information on target species. This information will be used to guide the impact evaluation and mitigation planning as a result of potential adverse impacts of the proposed Project. In addition, some study components are necessary to meet specific resource agency requirements. The following objectives outlined below have been identified to assess potential impacts to wildlife in the study area:

- Document presence and distribution information to allow the Project to minimize or avoid impacts to protected species, including bald eagles and other raptors, shorebirds, waterbirds, and landbirds of special interest;
- Quantify the distribution and abundance of target wildlife species during key seasons of activity in the study area;
- Document the species composition of avian communities, particularly landbirds, shorebirds, and waterbirds; and
- Classify and map wildlife habitat in the study area in conjunction with the Botanical Resources Study.

## **6 Wildlife Resources Study Methods**

### **6.1 Study Area**

The wildlife study area includes the area east of the Seward Highway and Alaska Railroad adjacent to Moose Pass, extending past the eastern shoreline of Grant Lake. The study area extends south along the highway to south of Grant Creek. The study area includes all proposed Project facilities along Grant Lake, Grant Creek, proposed access road and transmission line routes, and the Seward Highway (Figure 1).

### **6.2 Field Study Design**

The Wildlife Resources Study is composed of four main field based survey efforts: Study Component #1, Raptor Nesting Surveys; Study Component #2, Breeding Landbirds and Shorebirds; Study Component #3, Waterbirds; and Study Component # 4, Terrestrial Mammals. All or part of these study components was completed in 2010. Changes to update Project design may require more effort for some of the components.

A review of existing information was conducted for all four study components as an initial study task. An information review prior to future field work should be updated to include the results of the 2010 surveys. The fieldwork for the study components includes the following activities:

- An aerial and boat survey for nesting raptors, including bald eagles, in suitable habitats near the Project.

- Observations of bald eagle breeding and feeding activities in areas potentially affected by the Project during all studies. This study is completed with the exception of including the goshawk nest survey data in a Raptor Nest Survey Report.
- A ground-based goshawk nest survey in areas directly affected by the Project.
- Point-count surveys to document breeding landbirds and shorebirds in the study area.
- Harlequin duck nesting surveys, waterbird nesting surveys, waterbird brood-rearing surveys and a survey for winter waterbird use in the study area.
- An aerial survey for brown and black bear spring den emergence in suitable habitat near the Project.
- An aerial winter survey of moose use of areas potentially affected by the Project, especially the inlet delta at the east end of Grant Lake.
- A boat-based mountain goat and Dall sheep survey of suitable habitat around Grant Lake.
- A bat survey of historic cabin on Grant Lake.
- Incidental observations of other terrestrial mammal locations, habitats, and behavior during all wildlife studies.

### **6.2.1 Study Component #1 – Raptor Nesting Surveys**

Raptor species are included in these studies because of their legal or conservation status, sensitivity to disturbance, and traditional use of nesting territories. All raptors are currently protected by the Migratory Bird Treaty Act (16 U.S.C. 703-712) and bald and golden eagles are afforded special protection under the Bald and Golden Eagle Protection Act (16 USC, Section 668). Additionally, the northern goshawk and osprey (Osprey are not likely to occur in the study area during the breeding season [USFS 2010]) are listed as USFS SSI (USFS 2005). A 660-foot buffer around bald eagle nests is recommended to minimize the chances that eagles might abandon an active nest (USFWS n.d.).

These laws require any significant development project to identify and protect current nest sites because many raptor species are susceptible to human disturbance during the nesting season. Determining the location of raptor nests is a critical item that needs to be established to avoid impacts to nesting raptors from other field study events and Project development.

The primary objective of the raptor survey is to determine the distribution, abundance, and nesting status of large diurnal raptors near the Grant Lake/Grant Creek Project. The survey effort will focus on protected, sensitive, or high-profile species such as bald and golden eagles, northern goshawks, and ospreys although all raptor species that are observed will be recorded. The objectives of the 2010 raptor survey included the following:

- Locate, identify, and map tree and cliff-nesting raptor nest locations.
- Compile a list of raptor species nesting in the Project vicinity.
- Assess potential Project effects and propose potential strategies to avoid and minimize impacts to raptors.

### **Raptor Survey Area**

The survey area for raptors includes the proposed development footprint of the Project (access roads, transmission line, Grant Creek, Grant Lake, powerhouse and tunnel) and a buffer of 660 feet around Project development features. Tree-nesting raptor habitats in the Project vicinity include mixed broadleaf/coniferous forests, broadleaf forest, and coniferous forests. Suitable habitats for cliff-nesting raptors are not abundant near the Project but include several rocky cliff

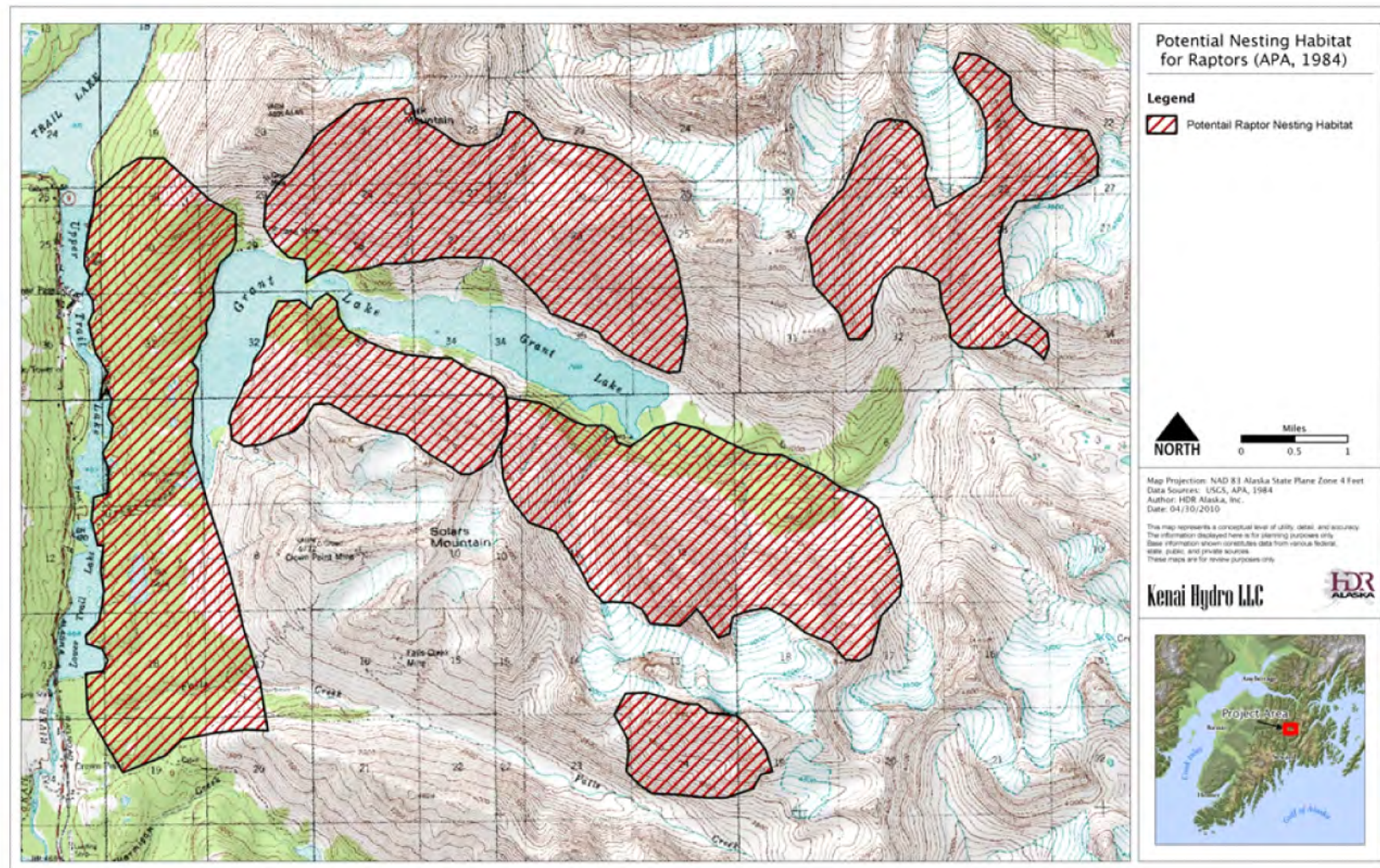


faces and outcroppings above Grant Lake. Potential nesting habitat for raptors, at that time, was delineated during the AEIDC field studies conducted in the Project vicinity in 1981-1982 (APA 1984) and is shown on Figure 4.

**Raptor Nest Survey Methods.** Bald eagle nest surveys were conducted by the USFS in 2010 and that information supplied to the Project. No further bald eagle nest surveys are needed. Incidental observations and data collection on bald eagle use (e.g. breeding and feeding) in areas affected by the Project will continue while other Project related studies are conducted. At the request of the USFS, all observations for cliff and tree nesting raptors around Grant Lake were made by boat during the 2010 waterbird surveys (a permit from the USFS is required for aerial surveys and surveys must follow regulations found in Appendix E). Observations for tree nesting raptors near proposed Project facilities were made during the 2010 breeding bird survey of proposed Project facilities.

**Goshawk Nest Ground-Based Survey Methods.** The goshawk nest survey requires two years of surveys to complete. A survey was conducted in 2010, but will need to be reinitiated after Project design is updated.

A ground-based survey for northern goshawk nests and territories will be conducted along all proposed linear Project facilities (access road and transmission line; powerhouse, retention pond, and tailrace; intake and penstock). The survey methods are based on the Broadcast Acoustical Survey Method as detailed in the USFS Survey Methodology for Northern Goshawks in the Pacific Southwest Region and in Woodbridge and Hargis, 2006 (USFS, 2000; Woodbridge, et al. 2006).



**Figure 4. Potential Raptor Nesting Habitat, 1982.**

Using aerial photography in an office-based exercise, locations for calling stations will be identified every 200 meters along linear Project facilities. Pre-selected calling stations will be found in the field using a GPS receiver. Two separate survey events will be conducted: the first mid-June and the second late June to early July. At each calling station, the surveyors will use a broadcast speaker amplifier to broadcast a 10 second recording of an adult northern goshawk alarm call and wail call. The broadcast speaker will be tested in the field to verify that it is audible at least 200 meters from the source as long as there was no wind or moving water noise nearby. After each broadcast, the surveyors will watch and listen for 30 seconds before continuing with the next broadcast. At each calling station, the calls will be broadcast at 60 degrees, 120 degrees, and 300 degrees. This 3-call sequence will be completed twice at each call station. After the last sequence, the surveyors will walk to the next station, listening and watching carefully for goshawk signs and presence along the way. The food-delivery call will not be used as indicated in the USFS methodology for northern goshawks.

At each survey calling station, the following information will be recorded on the data form (data form to be developed):

- Start and stop times
- Weather conditions
- Description of the detection, if any
- Age of birds detected, if any
- Location of detection, if any, relative to survey station and transect, including details about habitat
- Photos numbers

### **6.2.2 Study Component #2 – Breeding Landbirds and Shorebirds**

The breeding landbird and shorebird surveys of the Grant Lake outlet area, penstock, powerhouse, transmission line, and south access road alignment (now abandoned as an access alternative) were completed as planned in summer 2010. Breeding landbird and shorebird surveys will need to be completed for the Trail Lakes access and transmission line route (Figure 1).

Concerns regarding landbirds have increased in recent years because of population declines of neotropical migrants and an increased awareness of threats to landbird populations, both on the breeding and wintering grounds and during migration (Boreal Partners in Flight Working Group 1999; USFWS 2008). Several species of landbirds are listed on the State of Alaska list of Species of Special Concern (ADF&G 1998) and likely occur in the proposed Project vicinity. These include the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler.

The objective of the breeding landbird study is to collect baseline data on breeding landbirds and shorebirds near the Project. This information is required for the licensing process and will aid in quantifying and evaluating impacts of loss of breeding bird habitats by development of the proposed Project features.

The specific objectives of the breeding landbird and shorebird studies are to:

- Assess landbird and shorebird species use of the study area during the breeding season;

- Qualitatively determine the occurrence and estimate the numbers of landbird and shorebird species of conservation concern that occur in the study area;
- Estimate the relative abundance and distribution of breeding landbirds and shorebirds in the study area; and
- Describe habitat use in the study area by breeding landbirds and shorebirds.

### **Breeding Landbird and Shorebird Study Area**

The study area for breeding landbirds and shorebirds includes the following proposed Project facilities:

- Grant Lake outlet delta area near the proposed tower intake (includes 500 feet on either side of Tower Intake)
- Trail Lakes Narrows access road alignment (100 feet on either side of the centerline of new road), as access allows
- Powerhouse, retention pond, tailrace, and penstock (100 feet on either side of the centerline)
- Transmission line corridor (includes up to 100 feet on both sides of centerline of transmission line), as access allows

Grant Creek is not included in the study area for landbirds because it is virtually impossible to detect singing male songbirds along a loud creek corridor. Only the outlet delta area of Grant Lake is included in the study area for breeding landbirds. The forested habitat type along the shoreline of Grant Lake is common in the study area and will be sampled during surveys of the transmission line and access road. That data can then be extrapolated to similar habitat around Grant Lake. In addition, the steep shoreline features would make foot-based point-count surveys difficult. The study area described above will include a sampling of all habitat types that are considered potential habitat for landbirds near the Project.

### **Breeding Landbird and Shorebird Methods**

Point-count surveys for landbirds and shorebirds are conducted using the methods described below.

Surveys are scheduled in early June to coincide with peak passerine singing and breeding activity in southcentral Alaska. The intent of the survey effort is to sample enough points to ensure that all breeding landbirds in the area are documented and to accurately assess the habitat preferences of breeding bird species. Breeding birds are surveyed using point-count methods based on an established protocol as described in the Alaska Landbird Monitoring System (Handel 2003). Point-count surveys are designed primarily to detect singing male passerine birds defending territories and have become the standard method for surveying breeding landbirds in remote terrain in Alaska (USGS 2006). Using aerial photography in an office based exercise, point-count locations will be selected within the available habitats in the survey area. The survey points will be selected non-randomly in order to make sure that all habitat types evident on the photography are included. Sample points will be located within each habitat type and points will be at least 437 yds (400 m) apart.

Pre-selected point-count locations will be accessed on foot and located using a GPS receiver. Pre-selected point-count locations may be modified slightly in the field if they are found inaccessible. Point-count surveys will be conducted between 0400–1200 h by observers trained in distance estimation and who are experts in identifying birds by sight and song. The point-

counts will be conducted in standard 10-minute intervals at each sample point location. All species encountered either visually or aurally will be recorded, as well as the detection mode, behavior, habitat type, and other observations. Data will be collected on a standardized data sheet (data form to be developed) and multiple photos of the habitat at each point location will be taken. Point-count survey observations will be categorized into distance-estimated categories (e.g. 0-50 m, 50-100 m, 100-200 m) by measuring distance to landmarks on either side of the vocalizing bird by using visual estimation or a laser rangefinder. Habitat types will be categorized in the field to at least level III of the Alaska Vegetation Classification, and further classified to Level IV when possible (Vioreck et al. 1992).

Incidental observations of wildlife encountered while in transit between surveys points or while conducting surveys for other wildlife will be documented. The surveyors will document and obtain GPS coordinates for incidental sightings of birds of conservation concern, state of Alaska Species of Special Concern, MIS, or SSI species or nest sites that were observed in transit between survey points.

### **6.2.3 Study Component #3 – Waterbirds**

Waterbird surveys to determine the distribution and abundance of waterbirds nesting in the study area were completed during the 2010 summer field season. The winter use survey of open water habitat on Grant Lake has yet to be conducted.

Waterbird nesting habitat is limited within the study area. There are no known concentrations of any waterbird nesting or feeding areas near the Project and to date, the USFS has not conducted any surveys on Grant Lake (APA 1984; Benoit 2009). Several species of waterbirds that nest in Alaska and have been recorded in the Project vicinity are currently considered of conservation concern. These species include the trumpeter swan, harlequin duck, and yellow-billed loon. The harlequin duck may nest along Grant Creek. Harlequin ducks were formerly listed as a species of special concern by the USFWS. Although their current conservation status is unclear, they are listed in the Sea Duck Joint Venture Species Status Report and are of particular concern to resource agencies (Seaduck Joint Venture 2008). Trumpeter swan nesting has not been documented in the study area (Benoit 2009). The USFS states that because past trumpeter swan surveys have determined that no suitable nest habitat exists near the Project, these surveys are not needed (USFS, 2010 pers. comm.). Common loons and yellow-billed loons have been observed on Grant Lake and nesting habitat for loons is present on Grant Lake (APA 1984). Potential nesting habitat for waterfowl was delineated on Grant Lake during the AEIDC surveys conducted in 1981-1982 and is shown on Figure 5.

In addition to potential nesting habitat for waterbirds, there is an area of Grant Lake that was observed during the 1981-1982 field studies to be ice-free during winter months. This area of open water near the outlet of Grant Lake may provide winter feeding habitat for waterbirds (APA 1984) (Figure 5).

The purpose of the waterbird study is to allow determination of the effects of fluctuations and flow changes on waterbird nesting habitat on Grant Lake and Grant Creek and to determine if winter waterbird feeding habitat is present on Grant Lake. For this study, waterbirds are defined as freshwater waterfowl (ducks, geese, and swans), shorebirds, gulls, loons, and terns.



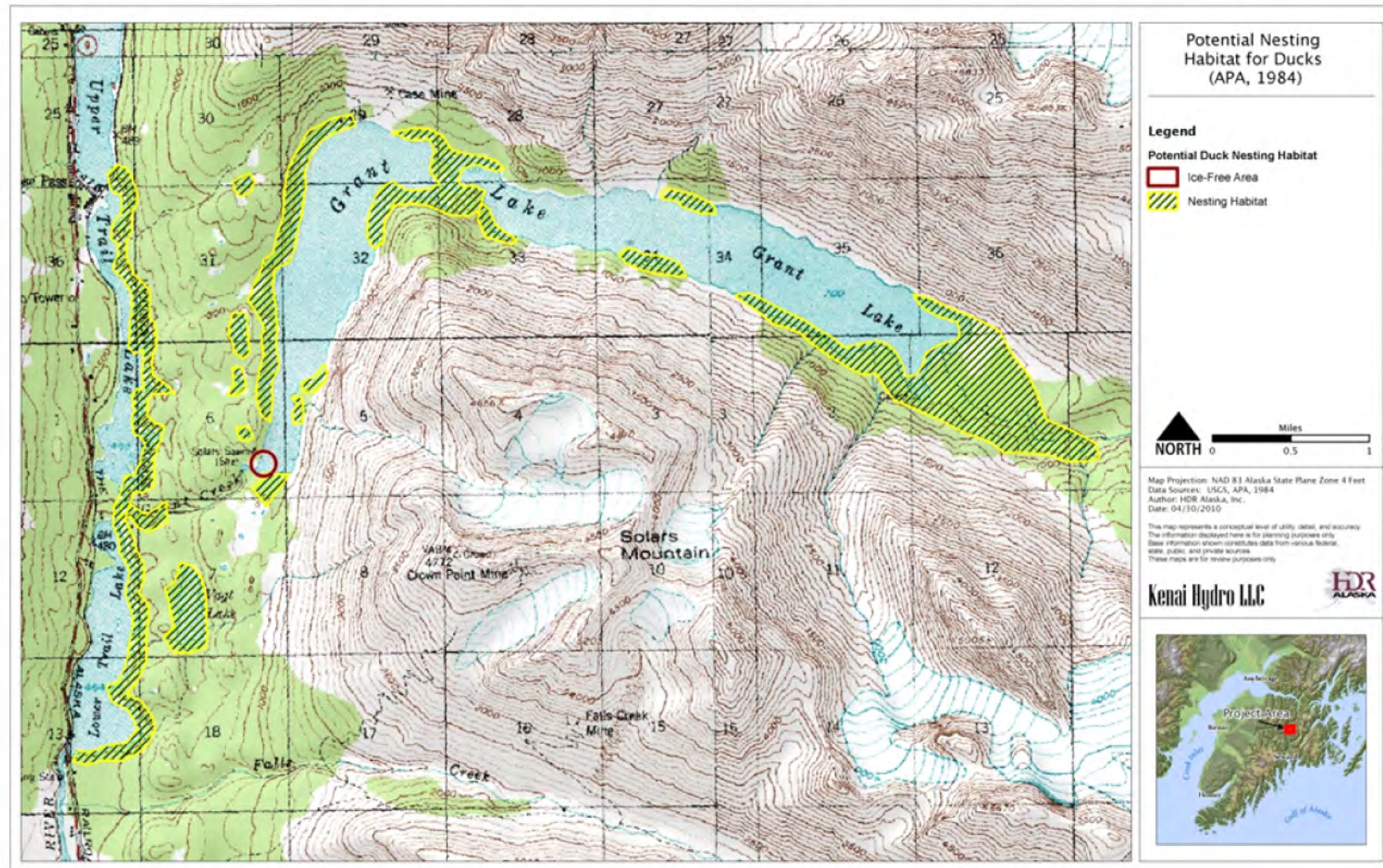


Figure 5. Potential Nesting Habitat for Ducks, 1982.

The specific objectives are to:

- Describe species composition of waterbirds using Grant Lake and Grant Creek during breeding season;
- Determine locations of nesting areas for waterbirds to allow determination of effects of potential water level fluctuations on nesting habitat;
- Determine the occurrence and numbers of waterbird species of conservation concern that occur in the study area; and
- Determine winter use by waterbirds in open water habitat of Grant Lake.

### **Waterbird Study Area**

The survey area for nesting and wintering waterbirds includes Grant Lake. For nesting harlequin ducks, the survey area included the lower reach of Grant Creek below the Gorge Reach.

### **Waterbird Survey Methods**

**Harlequin Duck Surveys.** The harlequin duck survey of Grant Creek has been completed. Observations of American dippers were included as a species of interest noted by the National Park Service (NPS, pers. comm., 2010). Other species that may be encountered along fast moving streams such as American dippers, and common and red-breasted mergansers were documented.

**Waterbird Breeding Surveys.** The waterbird breeding survey of Grant Lake has been completed.

**Waterbird Brood-Rearing Survey.** A boat-based survey for brood-rearing waterbirds was conducted in mid-July, 2010 on Grant Lake.

**Winter Waterbird Survey.** Winter waterbird surveys have yet to be conducted and will verify whether the outlet of Grant Lake remains ice-free and affords winter habitat. This area was documented as a winter feeding area for a flock of mallards during the 1981-1982 field studies (APA 1984). Open water habitat that supports waterbirds on the Seward Ranger District is limited in the winter (Benoit 2009). In order to determine if this area is still being used by waterbirds in the winter, researchers will conduct two snowshoe surveys or, if a special use permit can be obtained from the USFS, aerial surveys of the outlet area of Grant Lake in winter to document waterbird use and the amount of open water habitat available. Surveyors will document species, number of individuals, and percent open water. While transiting to and from Grant Lake, surveyors will document any wildlife species or tracks observed in the study area.

### **6.2.4 Study Component #4 – Terrestrial Mammal Surveys**

Approximately 30 species of terrestrial mammals have been documented or are thought to occur in the Project vicinity (APA 1984). Mammal surveys for the 2010 studies focused on brown and black bears, moose, mountain goats, Dall sheep, and bats, but observations of other species will be recorded incidentally during all wildlife surveys. Several components of the wildlife study plan were completed in 2010. However, records of wildlife observations will continue to be collected as other studies are performed.

**Bears.** Brown and black bears are found throughout the Project vicinity during the spring, summer, and fall. They may be found in a variety of habitat types. The distribution of both species of bears is affected strongly by food availability. Emerging grasses, forbs, other

herbaceous plants, and moose are critical foods in spring, whereas spawning salmon and berries are critical foods in late summer. Both species enter dens during October or November and remain there until early to mid- April, with maternal females entering dens before and emerging later than males (APA 1984).

Disturbance to denning bears could result in human/bear conflicts and abandonment of dens and/or cubs. Brown bears are known to den at all elevations, from alpine snow chutes in the Kenai Mountains down to small upland areas scattered around the Kenai Lowlands. Brown bears denning in the Project vicinity could be disturbed by the development of an access road and transmission line. The analysis for this study will include a discussion of the potential direct and indirect effects on brown bears resulting from construction of the access route and transmission line, as well as the anticipated effects of increased human-wildlife interaction due to use of the new access road.

Peak brown bear denning activity in the Project vicinity was documented as mid-May during aerial denning surveys conducted in 1982 (APA 1984). A bear den emergence aerial survey will be conducted in early to mid-May as bears are leaving their dens in the spring (before snow melts and leaves emerge in the area). Exact timing of surveys and information regarding existing dens in the area will be determined through coordination with the USFS, USFWS and ADF&G. The den emergence survey will encompass all potential denning habitat in the Project vicinity that may be potentially impacted by the Project. Aerial surveys will comply with the USFS guidelines listed in Appendix E: USFS Special Use Permit Mitigation Requirements for Aircraft Use. Recently vacated dens will be identified by the characteristic presence of soil over the snow in den entrances and the presence of fresh tracks around dens or trails leading away. The location, species, and number of cubs and adults will be recorded as well as any prominent movement corridors that are visible in the snow.

The USFS collected some brown bear denning information while completing a bald eagle nest survey on May 6, 2010. The survey areas included habitat along Grant Creek (covers area of Trail Lakes Narrows access route) and around Grant Lake. No further denning surveys are needed for the license application; although, brown bear denning surveys may be required prior to construction. Impacts from increased public access into the Grant Lake/Grant Creek drainage area by way of the proposed access road and other Project features will be discussed in the technical report.

**Moose.** Moose inhabit the Project vicinity, but were not particularly abundant during 1981-1982 field studies. Figure 6 shows summer and winter ranges and travel routes, with one travel route identified that crosses the bench between Grant and Trail lakes as documented during the 1981-1982 field studies. Snow depth and a corresponding lack of winter forage limit moose numbers in the Project vicinity (APA 1984). While little moose monitoring has been conducted, ADF&G estimates moose populations at between 700 and 1,000 in the Eastern Kenai Peninsula Game Management Unit 7 based on harvest information (McDonough 2007).

No specific summer surveys for moose are proposed, however all observations of moose during summer 2010 wildlife survey events were recorded. All incidental observations of moose include the following data: number of moose, approximate location using a GPS receiver, habitat type observed in, sex and age (if possible), and behavior.







The inlet delta of Grant Lake has been reported as a winter forage area for moose. Two winter surveys of the study area will be conducted to determine the presence and travel paths of moose during the winter. Surveys will use aircraft following USFS requirements (see Appendix E), if permitted. The results of the winter survey plus information collected as incidental observations will be included in a wildlife technical report. The report will assess the potential impacts of the Project to moose in the area.

**Mountain goats and Dall sheep.** Both mountain goats and Dall sheep are known to use suitable habitat surrounding Grant Lake. They were observed during the previous studies in the 1980's (APA, 1984). Although their preferred habitat is outside areas expected to be directly affected by the Project, mountain goats and Dall sheep could be impacted by disturbance during construction.

This survey is complete except for incidental observations made during other studies. Observations of suitable habitats around Grant Lake were made in 2010 using binoculars and spotting scopes from a boat. Results of the observations and an assessment of potential Project impacts will be included in the wildlife technical report.

**Bats.** The most common bat in Alaska is the little brown bat (*Myotis lucifugus*). Little brown bats were not sighted near the Project during surveys for mammals completed in 1981-1982 (APA, 1984). However, the USFS noted that bats have been reported using the historic cabin on the west shore of Grant Lake. A bat survey of the historic cabin was conducted in 2010 using standard USFS bat survey protocols for abandoned buildings and mine sites (Reynolds n.d.). No sign of bats was found. At this time the survey is considered complete.

### 6.3 Data Analysis: Objectives and Methods

- **Study Component #1 – Raptors** – Prepare a technical report that includes methodology, results, and figures showing the location of raptor nests, and briefly discusses potential Project effects.
- **Study Component #2 – Breeding Landbird and Shorebirds** – Prepare a technical report and associated figures and maps based on field data collected for the study area. The technical report will provide detail about avian species and habitat use within the study area and discuss potential Project effects. Estimates of relative abundance and distribution of breeding landbirds and shorebirds throughout areas potentially affected by the Project will be derived by inference and interpolating habitat-linked field observations to vegetation mapping conducted for the Botanical Resources studies outlined above. This is necessary for areas not surveyed due to inaccessibility, such as much of the shoreline of Grant Lake, or due to interference in songbird detection, such as the Grant Creek corridor
- **Study Component #3 – Waterbirds** – Prepare a technical report and associated figures and maps based on field data collected for waterbirds in the study area. Briefly discuss potential Project effects.
- **Study Component #4 – Terrestrial Mammals** – Prepare a technical report that includes methodology, results, and figures showing the location in the study area of bear dens, moose wintering use, mountain goat and Dall sheep habitat/sightings, and

the abandoned historic cabin surveyed for the presence of roosting bats. Estimates of relative abundance and distribution of wildlife throughout areas potentially affected by the Project will be derived by extrapolating habitat linked field observations to vegetation mapping (e.g. vegetation type, slope and aspect) conducted for the Botanical Resources studies outlined above. The report will also discuss potential Project effects related to construction and operation and increased public access.

Locations of sensitive wildlife and plants may be treated as confidential in accordance with management agency direction. Results of Wildlife Resource Surveys will be used to evaluate potential impacts of the proposed Project.

## **7 Agency Resource Management Goals**

Management and land use plans relevant to terrestrial resources studies include:

- AKEPIC Database. Updated 2008. Alaska Exotic Plant Information Clearinghouse Database. Available at: <http://akweeds.uaa.alaska.edu>.
- Alaska Natural Heritage Program (AKHNP). 1997. Alaska Rare Plant Field Guide. Environment and Natural Resources Institute, University of Alaska Anchorage. <http://aknhp.uaa.alaska.edu>.
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- ADF&G. 2000. Kenai Peninsula brown bear conservation strategy.
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- KPB. 2005. Kenai Peninsula Borough Comprehensive Plan.
- KPB Coastal Management Program and LaRoche and Associates. 2008. Kenai Peninsula Borough Coastal Zone Management Plan.
- McDonough, T. 2007a. Units 7 & 15 furbearer management report. Pages 91-96 in P. Harper, editor. Black bear management report of survey and inventory activities 1 July 2003 – 30 June 2006.
- McDonough, T. 2007b. Units 7 & 15 caribou management report. Pages 1-13 in P. Harper, editor. Caribou management report of survey and management activities 1 July 2004 – 30 June 2006. Alaska Department of Fish and Game.
- McDonough, T. 2007c. Unit 7 moose management report. Pages 110-115 in P. Harper, editor. Moose management report of survey and inventory activities 1 July 2005–30 June 2007. Alaska Department of Fish and Game.
- Selinger, J. 2006. Units 7 & 15 wolf management report. Pages 59-64 in P. Harper, editor. Wolf management report of survey and inventory activities 1 July 2002 – 30 June 2005. Alaska Department of Fish and Game.

- Selinger, J. 2008. Units 7 & 15 black bear management report. Pages 143-148 in P. Harper, editor. Black bear management report of survey and inventory activities 1 July 2004–30 June 2007. Alaska Department of Fish and Game.
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- U. S. Forest Service. 2002. Revised Land And Resource Management Plan for the Chugach National Forest.
- U.S. Code 16 Subchapters II and III. 1918, as amended 1936, 1960, 1968, 1969, 1974, 1978, 1986, and 1989. Migratory Bird Treaty Act and Migratory Bird Conservation.
- U.S. Code 16 668-668d, 54 Stat. 250. 1940, as amended 1940, 1959, 1962, 1972, and 1977. Bald Eagle and Golden Eagle Protection Act of 1940.
- U.S. Code 33 1343 Section 404. 1977. Clean Water Act. (Section 404 - discharge of dredged or fill material into the navigable waters of the U.S.).

## **8 Project Nexus**

The proposed Project may have potential impacts on terrestrial resources near the Project. The studies described above are intended to provide sufficient information regarding the nature of the existing terrestrial resources such that these potential impacts can be adequately assessed. A discussion of the data will be presented in the study report and will be used to inform the development of protection, mitigation, and enhancement measures to be proposed in the draft and final License Applications.

## **9 Consistency with Generally Accepted Practices**

### **9.1 Botanical Resources**

Mapping techniques will follow standard practices used by the USFS (Forest Service Handbook (FSH) 2409.12) and the Kenai Peninsula Borough and will employ experienced GIS staff.

The sensitive plant survey and completion of a Biological Evaluation for plants will follow guidelines and protocols established by the USFS.

The invasive plant survey will follow guidelines and protocols established by the Alaska Natural Heritage Program and the USFS.

Wetland delineation follows regulations and practices established by the U.S. Army Corps of Engineers and the USFWS NWI.

## **9.2 Wildlife Resources:**

The Raptor nesting surveys will follow standard operating procedures for conducting raptor nesting surveys as required by the USFS.

Breeding landbirds and shorebirds will be surveyed using point-count methods based on an established protocol as described in the *Alaska Landbird Monitoring System* (Handel 2003). Point-count surveys are designed primarily to detect singing male passerine birds defending territories and have become the standard method for surveying breeding landbirds in remote terrain in Alaska (USGS 2006).

## **10 Schedule for Conducting the Study**

### **10.1 Botanical Resources:**

#### *Vegetation Mapping*

Existing information will be acquired and preliminary maps prepared prior to field work in 2013. The technical report will be prepared in winter –2013 - 2014.

#### *Sensitive Plant Survey*

Field surveys will be conducted between mid-July and late August 2013. Data will be compiled, and a draft Biological Evaluation for plants will be prepared in winter –2013 - 2014.

#### *Invasive Plant Survey*

Field surveys will be conducted between mid-July and late August 2013. Data will be compiled and a technical report of the results will be prepared in winter 2013 - 2014.

#### *Wetland Mapping*

Some field surveys were conducted during the growing season in summer 2010. Additional field surveys will be conducted during the growing season in summer 2013. Data will be compiled and a wetland report will be prepared in winter 2013 - 2014.

### **10.2 Wildlife Resources:**

#### *Raptor Nesting Surveys*

The bald eagle survey and survey of raptor nesting habitat around Grant Lake are complete. A raptor nest survey of tree nesting raptors in areas of proposed Project facilities was conducted in mid-May 2010. Two northern goshawk nest surveys will be conducted in mid-June and early July 2013, and two surveys during the same time periods in 2014; (a total of 4). The Raptor Nest Survey Report will be prepared in summer 2014.

#### *Breeding Landbird and Shorebird Surveys*

The 2010 breeding landbird and shorebird surveys were conducted during the first two weeks of June. Two additional surveys will be conducted in mid-May and mid-June of 2013, following

update of the facilities design. Data will be compiled and a Breeding Bird Survey Report will be prepared in winter of 2013-2014.

#### *Waterbird Surveys*

Harlequin duck surveys were conducted in July 2010 and are complete. Waterbird breeding surveys and waterbird brood-rearing surveys on Grant Lake are also complete and were conducted in June and July 2010.

Two winter waterbird surveys on Grant Lake will be conducted in winter 2013-2014. The waterbird survey data will be compiled and a Waterbird Survey Report will be prepared in 2014.

#### *Terrestrial Mammal Surveys*

A bear den emergence aerial survey was conducted in mid-May 2010 by the USFS.

Observations of mountain goats and Dall sheep above Grant Lake were documented as incidental information during the water bird surveys in 2010.

Two winter moose surveys will be conducted in winter 2013-2014.

A bat survey of a cabin on Grant Lake was completed in summer 2010. A Terrestrial Mammal Technical Report will be drafted in winter 2014 and will incorporate all incidental observations of terrestrial mammals and results from the bear denning surveys, mountain goat and Dall sheep surveys, and the bat survey.

## **11 Provisions for Technical Review**

Opportunities for a review of study plans by agencies and the public will be scheduled prior to initiation of field studies in 2013. All study plans and reports will be distributed for review by agencies and interested parties.

- December 2012: Issue final study plan to Work Group
- April through June 2013: Start of Study Season [varies by study area].
- Fall 2013: Work Group update on field activities.
- April 2014: Distribute draft study report.
- April 2014: Work Group meeting call to discuss comments on draft study report.
- May 2014: Distribute final study report.
- September 2014: File Draft License Application.
- January 2015: File Final License Application.



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## Appendix A

### **Alaska Region Sensitive Plant List**

**Abstract**

Plant Name		General Habitat (DRAFT)																	Range District (DRAFT)															
Scientific Name	Common Name	Moist areas wet forest	Moist areas wet	Wetland marsh	Upper beach meadow	Shrub dominated upland forest	Pollinated forest	Forest edge	Open forest	Thicket or shrubland	Alley margins, secondary areas	Sunny or brushy area	Along stream	Grassland	Wet meadow	Wetland and adjacent	Wet slope	Rock outcrop	Submontane scrubland	BARCELONA	ELACER	CORONIA	MUTUA	DURAO	AGUALT	COCONAH	ATUVA	ESTREMOZO	PERIBOLLA	SETICUBAS	CRABA	HOGUE BAY		
<i>Aphragus eschscholtzii</i>	Eschscholtz's little nightmare												X			X				X	X	X	X	X										
<i>Botrychium spatulatum</i>	Spatulate moonwort	X		X	X											X					X	X	X	X	X	X	X						X	
<i>Botrychium lunari</i>	Moosewort fern		X	X	X																X	X	X	X	X	X	X						X	
<i>Botrychium yaucatanense</i>	Moonwort fern, no common name	X		X	X																X	X	X	X	X	X	X						X	
<i>Clisium edule</i> var. <i>mexicanum</i>	Eddie thistle																X	X	X															
<i>Cochlearia sessilifolia</i>	Sessileleaf scurvygrass			X												X	X	X				X	X	X					X	X	X			
<i>Cypripedium guttatum</i>	Spotted lady's slipper															X					X	X	X											
<i>Cypripedium montanum</i>	Mountain lady's slipper				X				X												X					X	X	X						
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Large yellow lady's slipper											X	X	X						X													X	
<i>Ligusticum odoratum</i>	Garden's lovage						X									X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Lobaria amplissima</i>	Lichen, no common name															X	X	X		X														
<i>Papaver abortivum</i>	Pale poppy					X										X	X	X			X	X	X	X										
<i>Pleurozia unguiculata</i>	Atitlán rain orchid								X	X			X	X							X	X	X	X					X				X	
<i>Platanthera orbiculata</i>	Lesser round-leaved orchid						X	X					X																				X	
<i>Polystichum kruckebergii</i>	Kruekeberg's swordfern																									X	X						X	
<i>Romanzoffia unguiculata</i>	Unstakea mist-maid							X		X																							X	
<i>Sidaea hendersonii</i>	Henderson's checkermallow																	X			X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Taraxacum bipinnatum</i> ssp. <i>huronicum</i>	Dune taraxacum				X																								X					

## Appendix B

### **Pre-Field Review Form, Sensitive Plant Survey Form, and Sensitive Plant EO Form**

**PRE-FIELD REVIEW WORKSHEET FOR SENSITIVE PLANTS**  
**Biological Evaluation for Sensitive Plants**  
**USDA Forest Service, Alaska Region (Revised Feb. 2009)**

In some cases this document can serve as a Biological Evaluation (BE)

**PROJECT NAME** (from Project Initiation Form, insert here):

**PROJECT DESCRIPTION** (from Project Initiation Form, include description of vegetation types, insert here):

**LOCATION** (from Project Initiation Form, insert here):

**SENSITIVE PLANTS KNOWN:** Check maps (GIS, herbarium databases, ANHP records, floras, hand-made), contact the Regional Botanist, Forest/District Botanists/Ecologists. Document sources of information. Record the plant's habitat, location and distance from the project area:

Species:

Location:

Date of records search:

**SENSITIVE PLANT HABITAT & SENSITIVE PLANTS SUSPECTED IN THE PROJECT AREA:**

A) Obtain habitat information from people familiar with the project area, project proponent, GIS (eg. soil map units, timber types, channel type covers), aerial photo interpretation, and/or site visits. Highlight methods used.

**Highlight or underline the following habitats that are likely to occur in the project area:**

coniferous forest, deciduous forest, mixed conifer/deciduous forest, dwarf tree forest, forest edge, tall shrublands, low shrublands, rocky areas, rock outcrops, ridgetops, cliffs, serpentine, calcareous areas, gravel, scree, talus, boulder fields, seeps, wet areas, riparian areas (give channel type, if known), streambanks, waterfalls, lake margins, ponds, shallow freshwater, marshes, swamps, estuaries, sphagnum bogs, fens, heath, subalpine meadows, alpine, area dominated by moss or lichen, dry meadows, moist-wet meadows, upper beach meadows, grasslands, maritime beaches, sandy areas, other (describe here)

B) Using your knowledge of sensitive plant habitat needs, or any other sources, indicate the plants (R-10 sensitive plants listed below) suspected that correspond to the above habitats (highlight them below):

<i>Aphragmus eschscholtzianus</i>	<i>Ligusticum calderi</i>
<i>Botrychium spatulatum</i>	<i>Lobaria amplissima</i>
<i>Botrychium tunax</i>	<i>Papaver alboroseum</i>
<i>Botrychium yacudakeit</i>	<i>Piperia unalascentis</i>
<i>Cochlearia sessilifolia</i>	<i>Platanthera orbiculata</i>
<i>Cirsium edule</i> var. <i>macounii</i>	<i>Polystichum kruckebergii</i>
<i>Cypripedium guttatum</i>	<i>Romanzoffia unalascentis</i>
<i>Cypripedium montanum</i>	<i>Sidalcea hendersonii</i>
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	<i>Tanacetum bipinnatum</i> subsp. <i>huronense</i>

USDA FOREST SERVICE 2008  
PLANT SURVEY FIELD FORM  
(® = Required Fields ☉ = Alaska Required)  
DECEMBER 2008

### General Information

General Information				
1) SURVEY ID: ☉		2) SURVEY NAME:		
3) SURVEY STATUS: ☉		4) TARGET: ☉ TESP; INPA; BOTH		5) SOURCE OF WORK:
6) Survey Type: ☉				
7) Survey Focus: ☉				
8) Estimate of Survey Area Size (acres):			9) No. of Traverses:	
10) Elevation: Min:		Max:	Average:	11) Elevation UOM:
12) State: ☉	13) County: ☉	14) Region: ☉	15) Forest: ☉	16) District: ☉
17) Parameters of Survey <i>(Describe any ecological parameters, survey criteria or combinations of these used to focus the survey. (I.e., north slopes, specific habitat types, certain soils within certain forest conditions, survey timing, etc.):</i>				
18) Survey Comments <i>(Directions, area description, specific comments by visit date, etc.):</i>				

## Survey Visits

**Required.** Enter a Date (MM/DD/YYYY) and Examiners for each visit made.

[illegible]

**R10 TES PLANT ELEMENT OCCURRENCE - FIELD FORM - USDA FOREST SERVICE 12/08**

⊗ = required field, ⊗\* = conditionally required field, ⊗\* = required field Alaska Region

**General Information**

1) SITE ID: ⊗		2) DATE: ⊗		3) SITE NAME:	
4) NRCS PLANT CODE: ⊗					
5) SCIENTIFIC NAME: ⊗					
6) RECORD SOURCE: ⊗		7) SURVEY ID: ⊗*		8) Survey Name:	
9) EXAMINER(S) - LAST: ⊗		FIRST: ⊗		MIDDLE INITIAL:	
LAST:		FIRST:		MIDDLE INITIAL:	
10) OWNERSHIP: ⊗		11) Loc. Uncert: ⊗		12) Uncert. Dist: ⊗*	
13) E.O. #		14) STATE: ⊗*		15) COUNTY: ⊗*	
16) REGION: ⊗*		17) FOREST: ⊗*		18) DISTRICT: ⊗*	
19) Area (Est):		20) Area UOM: ⊗*			
21) Canopy Cover Method ⊗* (circle one): COVER PERCENT; DAUBEN; NRMCOV					

**Element Occurrence Data**

22) EO Canopy Cover: ⊗%Cov: or Cover Class Code:		23) Lifeform:	
24) Number of subpopulations:		25) Plant Found (Revisit): Yes or No	
26) Plant Count: ⊗		27) Count Type: ⊗Genets/Ramets/Undetermined	
28) Count: ⊗Actual or Estimate			
29) Revisit needed - Yes or No		30) Revisit Date:	
31) Revisit Justification:			
32) Phenology by %⊗ (Sum to 100%): Vegetative . . . . . Flower/Bud . . . . . Fruit/Dispersed . . . . . Seedlings/ Juvenile . . . . .		33) Population Comments: (e.g., distribution, vigor, density, phenology, dispersal)	
		34) Evidence of disease, competition, predation, collection, trampling, or herbivory: Yes ___ or No ___	
		35) Evidence Comments:	
36) Pollinator observed - Yes or No 37) Pollinator type(s):			
38) Pollinator comments:			

**Site Morphometry**

39) Percent Slope: ⊗		40) Slope position: ⊗	
41) Aspect: ⊗ azimuth: or cardinal:			
42) Elev.: Ave: Min: Max:		43) Elev UOM: ⊗*	

**Soil Characteristics and Light Conditions**

44) Substrate on which EO occurs:		
45) Parent Material:	46) Soil Moisture:	47) Soil Texture:
48) Soil Type:	49) Light Exposure: ⊗	



## Appendix C

### **AKEPIC Mapping Project Inventory Field Data Sheet**

# AKEPIC Mapping Project Inventory Field Data Sheet (2005)

**\*\*=Required item**

**\*\*Survey Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_ **\*\*Observers:** \_\_\_\_\_  
mm / dd / yyyy Last Name, First Name Initial. (e.g.: Smith, J.; Williams, R.)

Observers Affiliation: (circle one) AKNHP ARS BLM CES NPS SCS SCWD TECI UAF USFS  
USFWS USGS Other

## A. Site Information

**\*\*Site Code:** \_\_\_\_\_ Visit Type: Recon Monitoring Research Control Is this a Revisit: Yes No  
**\*\*Study Type:** Exhaustive Species Inventory Highest Priority species Single Species study

**\*\*Area Surveyed:** \_\_\_\_\_ acres  
(Note: 1/10 acre = 37ft radius, 1/2 acre = 83ft radius, 1 acre = 118ft radius)

Site Vegetation Community Description (Viereck Code): \_\_\_\_\_  
Disturbance Type (see instructions below): \_\_\_\_\_

## B. Location Information

**\*\*Latitude:** \_\_\_\_\_ **\*\*Longitude:** \_\_\_\_\_ Elevation: \_\_\_\_\_ ft

Note: Datum is NAD 83 and Coordinate Format is decimal degrees [-146.123456°]

**\*\*Collection Method** (circle one and complete details): GPS 15 min topo Aerial photo Roadmap Other  
Quad name \_\_\_\_\_ Quad number (i.e. A1, B2, C3, D4) \_\_\_\_\_  
**\*\*GPS precision** \_\_\_\_\_ ft. (0-5, 0-30, 0-100, 0-1000, 1000+)  
If 15 min Topographic Map was used: Source \_\_\_\_\_ Scale \_\_\_\_\_ Date \_\_\_\_\_

Notes (location): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## C. Survey Information

<b>**Exotic Plant Species Code</b> (see below)	<b>**Infested Area</b> (acres) (see below)	<b>**Canopy Cover</b> (%) (see below)	<b>Disturbance Age</b> (Yrs.) (see below)	<b>Stem Count</b> (see below)	<b>**Collection Information</b> (see below)	<b>Control Action</b> (see below)	<b>Aggressiveness</b> (see below)

## D. Notes (species):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Appendix D

### **Wetland Determination Form – Alaska Region**

# **WETLAND DETERMINATION DATA FORM – Alaska Region**

Project/Site: \_\_\_\_\_ Borough/City: \_\_\_\_\_ Sampling Date: \_\_\_\_\_  
 Applicant/Owner: \_\_\_\_\_ Sampling Point: \_\_\_\_\_  
 Investigator(s): \_\_\_\_\_ Landform (hillside, terrace, hummocks, etc.): \_\_\_\_\_  
 Local relief (concave, convex, none): \_\_\_\_\_ Slope (%): \_\_\_\_\_  
 Subregion: \_\_\_\_\_ Lat: \_\_\_\_\_ Long: \_\_\_\_\_ Datum: \_\_\_\_\_  
 Soil Map Unit Name: \_\_\_\_\_ NWI classification: \_\_\_\_\_  
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes \_\_\_\_\_ No \_\_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes \_\_\_\_\_ No \_\_\_\_\_  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

**SUMMARY OF FINDINGS** – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____	Is the Sampled Area within a Wetland? Yes _____ No _____
Hydric Soil Present? Yes _____ No _____	
Wetland Hydrology Present? Yes _____ No _____	
Remarks: _____	

**VEGETATION** – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)
4. _____	_____	_____	_____	
Total Cover: _____				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____
50% of total cover: _____ 20% of total cover: _____				
Sapling/Shrub Stratum				OBL species _____ x 1 = _____
1. _____	_____	_____	_____	FACW species _____ x 2 = _____
2. _____	_____	_____	_____	FAC species _____ x 3 = _____
3. _____	_____	_____	_____	FACU species _____ x 4 = _____
4. _____	_____	_____	_____	UPL species _____ x 5 = _____
5. _____	_____	_____	_____	Column Totals: _____ (A) _____ (B)
6. _____	_____	_____	_____	Prevalence Index = B/A = _____
Total Cover: _____				Hydrophytic Vegetation Indicators: ____ Dominance Test is >50% ____ Prevalence Index is <3.0 ____ Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) ____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)
50% of total cover: _____ 20% of total cover: _____				
Herb Stratum				<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes _____ No _____
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
Total Cover: _____				
50% of total cover: _____ 20% of total cover: _____				
Plot size (radius, or length x width) _____ % Bare Ground _____				
% Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ (Where applicable)				
Remarks: _____				

## SOIL

Sampling Point: \_\_\_\_\_

[illegible]

## HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (2 or more required)
Primary Indicators (any one indicator is sufficient)		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Water-stained Leaves (B9)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Presence of Reduced Iron (C4)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input type="checkbox"/> Salt Deposits (C5)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Stunted or Stressed Plants (D1)
<input type="checkbox"/> Algal Mat or Crust (B4)		<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Iron Deposits (B5)		<input type="checkbox"/> Shallow Aquitard (D3)
<input type="checkbox"/> Surface Soil Cracks (B6)		<input type="checkbox"/> Microtopographic Relief (D4)
		<input type="checkbox"/> FAC-Neutral Test (D5)
Field Observations:		
Surface Water Present?	Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input type="checkbox"/>
Water Table Present?	Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____	
Saturation Present? (includes capillary fringe)	Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks: _____		

## Appendix E

### **USFS Special Use Permit Mitigation Requirements for Aircraft Use**

# **USFS Special Use Permit Mitigation Requirements for Aircraft Use**

The following mitigation is standard in Forest Service permits that use aircraft and these should be incorporated in your study plan:

- Helicopters will maintain a minimum of 1,500 ft. AGL distance from all observed wildlife.
- Helicopter flights will be avoided within ¼ mile horizontal or 1,500 ft. AGL separation distance of active bald eagle nests. If it is unknown whether a nest is active, helicopter flights will avoid the nest by a ¼ mile horizontal or 1,500 ft. AGL distance.
- Helicopters will not hover, circle, or harass any species of wildlife in any way.

Aircraft will adhere to No-Fly Zones as identified by the district wildlife biologist, who identifies mountain goat and Dall sheep concentration areas to be avoided by helicopter flight paths. Zones are based on a separation distance of 1,500 ft. from animal and habitat survey data (USFS, 2010 pers. comm.).

**Grant Lake Project**  
(FERC No. 13212)

**Recreational and  
Visual Resources**  
*Study Plan*

**Prepared for:**  
**Kenai Hydro, LLC**  
**3977 Lake Street**  
**Homer, AK 99603**

**March 2013**



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### **List of Abbreviations and Acronyms**

<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>AEIDC</b>	Arctic Environmental Information and Data Center (University of Alaska)
<b>AHRS</b>	Alaska Heritage Resources Survey
<b>APA</b>	Alaska Power Authority
<b>AWC</b>	Anadromous Waters Catalog
<b>BLM</b>	Bureau of Land Management
<b>°C</b>	Degrees Celsius
<b>cfs</b>	cubic feet per second
<b>cm</b>	centimeter
<b>CPUE</b>	catch per unit effort
<b>°F</b>	Degrees Fahrenheit
<b>DNR</b>	Alaska Department of Natural Resources
<b>EPA</b>	Environmental Protection Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FL</b>	Fork Length
<b>fps</b>	feet per second
<b>ft</b>	feet
<b>G&amp;A</b>	general and administrative
<b>GPS</b>	global positioning system
<b>GWh</b>	gigawatt hours
<b>HEP</b>	Hydroelectric Evaluation Program
<b>IFIM</b>	instream flow incremental methodology
<b>in</b>	inch
<b>KHI</b>	Kenai Hydro Inc.
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>kWh</b>	kilowatt hours
<b>LLC</b>	Limited liability company
<b>mg/L</b>	milligrams per liter

<b>mi</b>	mile
<b>MIF</b>	minimum instream flow
<b>mm</b>	millimeter
<b>MSL</b>	Mean sea level
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NWI</b>	National Wetlands Inventory
<b>O&amp;M</b>	Operations & maintenance
<b>RM</b>	river miles
<b>RVDs</b>	Recreation visitor days
<b>TL</b>	total length
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	USDA. Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>YOY</b>	Young of the year

# Recreation and Visual Resources Draft Study Plan

## Grant Lake Hydroelectric Project

### (FERC No. 13212)

## **1 Introduction**

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD), along with a Notice of Intent to file an application for an original license, for a combined Grant Lake/Falls Creek Project (FERC No. 13211/13212 [“Project” or “Grant Lake Project”]) under Part I of the Federal Power Act. On September 15, 2009, FERC approved the use of the Traditional Licensing Process for development of the license application and supporting materials. As described in more detail below, the proposed Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake.

The Project will be located near the community of Moose Pass, Alaska in the Kenai Peninsula Borough, approximately 25 miles north of Seward, Alaska, and just east of the Seward Highway (State Route 9) (Figure 1).

This Recreation and Visual Resources study plan is designed to address information needs identified in the PAD, during the Traditional Licensing Process public comment process, and through early scoping conducted by FERC in June 2010. A study report will be produced that presents existing information relative to the scope and context of potential effects of the Project. This information will be used to analyze Project impacts and propose protection, mitigation, and enhancement measures in the draft and final license applications for the Project.

### **Proposed Project Description**

The PAD Project proposal included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

The proposed Project would be composed of a diversion dam at the outlet to Grant Lake, an intake structure in Grant Lake, a tunnel, a surge tank, a penstock, a powerhouse, a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, an overhead or underground transmission line, and a pole-mounted disconnect switch where it ties into the existing City of Seward distribution line or Chugach Electric’s transmission line. The powerhouse would contain two Francis turbine generating units with a combined rated capacity of 5.0 MW with a total design flow of 385 cfs.

Two modes of operation are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at a specific output level. Level control, or balancing of outflow to inflow, will likely only occur during periods of low natural inflow to Grant Lake when the reservoir is at or near minimum pool elevation. Due to the small size of the Project in relation to the size of the interconnected system, the Project is not likely to be used to load follow.

Prior to reinitiating planning efforts for natural resource studies, KHL was evaluating two potential access road routes. The Falls Creek route would be approximately 3 miles long beginning at the south end of Lower Trail Lake, and the Trail Lakes Narrows route would be about 1 mile long beginning at the Seward Highway. In early 2012, KHL determined that the Trail Lake Narrows route was the most feasible and has eliminated the Falls Creek route from consideration. The Trail Lakes Narrows route would extend eastward to cross the narrows between Upper and Lower Trail lakes and then continue eastward to the powerhouse. The Trail Lakes Narrows route has not been fully assessed from a natural resource perspective and will be comprehensively evaluated in 2012/2013 as part of this study effort.



**Figure 1. Project vicinity and proposed facilities.**

## **2 Study Goals Identified During Project Scoping**

The goal of the study described in this plan is to provide baseline information, which, together with existing information, will inform an assessment of potential Project impacts on recreation and visual resources in the study area. Where applicable, information may be used to guide the final design of Project facilities.

This study was developed to provide supporting information on the potential resource impacts of the proposed Project that were identified during compilation of the PAD, public comment, and FERC scoping for the License Application. The following impacts will be evaluated in the Recreation and Visual Resources Study Report and in the draft and final license applications.

- Impacts of Project construction and operation on distribution of local and tourist recreational use, access, and experience on Grant Lake, Grant Creek, Vagt Lake, and the Iditarod National Historic Trail (INHT).
- Impacts of Project construction and operation on the distribution and abundance of fish and wildlife for anglers and hunters.
- Impacts of Project construction and operation (including roads and facilities) on visual quality in the area.
- Impacts of Project roads and transmission line corridors (if not buried in road grade) on aesthetic and visual resources (including impacts on Scenic Byway viewpoints and views from existing and planned recreational trails and use areas).
- Impacts of Project construction and operation on local and regional recreation resources.
- Impacts of Project facilities and operation (including road access, safety, and use) on local residential land use on Grant Creek and along the road corridor.
- Impact of Project construction and operation on quality of life characteristics of the area (i.e., noise, changes in access to and character of area, light pollution).

## **3 Existing Information and Need for Information**

### **3.1 Existing Information**

The study area is composed of predominantly State and Federal lands open to public use. Recreation access and visual resources have been documented for the area by a number of investigations performed in the Project vicinity under the auspices of the Alaska Department of Natural Resources (ADNR), the Kenai Peninsula Borough (KPB), and the USDA Forest Service (USFS) (ADNR 2009, ADNR 2001, KPB 2005, USFS 2007a, USFS 2007b, USFS 2002, USFS No Date).

The Project is located on the Kenai Peninsula, which is known for its recreational and scenic opportunities. In the study area, however, there has been no formal development, such as a developed trailhead and signage, to enhance recreational opportunities. Ground access to the study area is possible from the Grant Lake Mine Road, Grant Lake Portage Trail, Falls Creek

Road, Vagt Lake Trail, and Crown Point Mine Road and Trail. Based primarily on reports of researches in the field in 2009 and 2010, it appears the Grant Lake Mine Road and the Grant Lake Portage Trail receive very light summer use and light winter use, with evidence of camping and several canoes stored at Grant Lake. Users appear to boat across Lower Trail Lake to the informal trailhead. Once the lakes freeze, some snowmachine and cross-country ski use occurs.

The historic route of the INHT, along the shores of the Trail River and Trail Lakes, traverses the study area. The USFS completed an environmental assessment for a route to reconnect the Iditarod Trail from Seward to Anchorage, and the route—identified by a State public easement held by the USFS—is designated, but the trail is not yet constructed. There is at this time no established use pattern for this trail, although the Vagt Lake Trail is a spur of the INHT. The construction of the INHT will create overland access that is expected to cross other existing informal trails and formalize some of them as spurs to Grant Lake, likely increasing their use and access to Grant Lake. A primary trailhead for the INHT is planned for construction near the outlet of Lower Trail Lake (USFS, pers. comm., 2010).

Although there is limited access and no known game fish in Grant Lake, low levels of hunting, fishing, and hiking occur in the area. Some recreational users travel across the Alaska Railroad trestle bridge by foot or ATV and then continue over the ridge into the Grant Lake basin. The trestle is owned by the Alaska Railroad Corporation (ARRC), and use by the public is technically illegal. There are an abandoned mine and a cabin at the northwest “corner” of the lake. The cabin, owned by the USFS, is located where the Grant Lake Trail and the Grant Lake Mine Road meet. The cabin is not managed for recreational use but is sometimes used by visitors (USFS No Date).

Much of the Grant Lake shoreline is within USFS boundaries and is considered in the Chugach Forest Plan (USFS 2002). The USFS has designated two management “prescriptions” for the Grant Lake area: “Fish, Wildlife, and Recreation” prescription and “Semi-Primitive Motorized” prescription. The very east end of the lake is “Backcountry Prescription.” There is an area that is designated “Mining Claim with Approved Plan of Operations” on Falls Creek Road. The USFS describes the Scenic Integrity Values of most of the Grant Lake area as “Moderate.” The Scenic Integrity Values of the east side of the lake in the Backcountry Prescription are designated “High.” The mining claim is designed “Low.” USFS lands in the study area are open to all motorized use in winter. In summer, the study area is open to motorized use on designated routes only. The backcountry section on the east end of the lake is closed to Off Highway Vehicles (OHVs). In the Kenai Winter Access EIS (USFS 2007a) the Ptarmigan/Grant unit, which the Project falls within, is described as receiving very little winter use from any user group (USFS 2007a). A limited number of requests were received during the scoping process for the Kenai Winter Access EIS to make this unit either motorized or non-motorized. Due to the limited number of requests, there appeared to be little existing conflicts in use type. The Ptarmigan/Grant unit allows exploratory helicopter skiing by permitted commercial guides (USFS 2007a). The area north and east of the Trail Lakes has the potential to support a hut-to-hut trail or trailhead system using existing or new trails and connecting with Grant Lake, Moose Creek (upstream to Grandview), the Johnson Pass Trail, and/or the Summit Lakes area (ADNR 2001). The planned INHT will provide additional access to Grant Lake. These areas have specific value for the hut-to-hut concept, and the area supports modest-scale recreation and tourism development (ADNR 2001).



The ADNR describes the Project vicinity as having scenic value (ADNR 2001). There is a scenic waterfall at the outlet of Grant Lake, and the mountain walls have more than 3,500 feet of relief on the east shore of the lake. Grant Lake and Grant Creek, where the Project is proposed, are not visible from the Seward Highway or any other easily accessed area, except from the air.

### **3.2 Need for Additional Information**

Studies will involve collection of information on current recreational use and visual resources to address site-specific potential Project impacts. The objectives of the studies are to:

- Determine if there are any effects from the minimal pool fluctuations associated with Project operations on recreational travel, fishing, hunting, sightseeing, and boating around the shoreline in summer and in winter by examining access points and trails and by questioning stakeholders.
- Assess the effects of altered or reduced flows on Grant Creek on fishing or other recreational use of the creek by examining access points and questioning stakeholders.
- Evaluate the potential for increased recreational use of the area, such as hunting, fishing, and backcountry activities (hiking, skiing, boating, and snowmachining), due to increased access and how this might affect existing or planned uses, such as the INHT.
- Evaluate current visual value and potential changes by selecting specific assessment points at which to take photographs and create renderings that will be analyzed according to criteria of the USFS.
- Collect baseline sound information for consideration of project effects on existing conditions.
- 

## **4 Methods**

### **4.1 Study Area**

Figure 1 shows the Moose Pass and Grant Lake area. The study area includes recreational and visual resources potentially affected by the Project. In general, these resources are on lands between the Seward Highway and the far eastern end of Grant Lake. The study area includes not only the entire shoreline of the lake that might be affected by fluctuating water level but the areas within the watershed from which the shoreline is readily visible. The study area extends south to Vagt Lake.

### **4.2 Study Design**

The Recreation and Visual Resources Study is composed of two components that will include a combination of office- and field-based efforts: Study Component #1, Recreation Use Study and Study Component #2, Visual Resources Study. A review of existing information will be conducted for both study components as an initial study task. The fieldwork for the study components will be combined whenever possible and will include the following activities to meet study objectives:

- Conduct a summer site visit by foot and boat to survey and document existing and planned trails and access points and other recreational use areas to determine potential effects of fluctuating lake level, creek flow, and Project construction and operation.
- Collect baseline noise information at key locations used or expected to possibly be used by recreation users.
- Conduct a winter site visit by foot, skiing, or snowmachine to document winter use areas to determine potential effects of Project operations.
- Consult with land management agencies and stakeholders regarding recreation and visual resources.
- Visit pre-selected sites for visual assessment by walking on existing and planned trails and other travel ways, such as the frozen lake surface, to view known scenic features, and take photographs and record locations with GPS at potential sites for renderings including an aerial view that would typify scenic overflights of the lake.

#### ***4.2.1 Study Component #1 – Recreation Use Study***

The objective of the recreation study is to assess recreation use within the study area to evaluate potential Project impacts on recreational resources. Work includes the identification of data sources, a literature review, a preliminary assessment of levels and type of recreational use, and identification of potential agency personnel and others with whom to consult by phone or in person. This task was begun in late spring 2010. Follow-up will be required to determine if all pertinent existing information has been obtained and to confirm contacts within the agencies and community.

The study will include a review of management plans, studies, and data that have been developed by resource agencies or government bodies, including the USFS, State, KPB, and review of information collected in 2010 through site visits and discussions with stakeholders. The literature review will provide an understanding of other existing and proposed activities within the region as well as an understanding of the expectations of users and the public as described in the Chugach Forest Plan (USFS 2002).

The FERC Scoping Meetings in June 2010 and the Project study plan comment meeting held afterward provided an opportunity for consultation with agencies and the public. Stakeholders attending the meeting included local residents, local business owners, and summer and winter recreational users. Input was requested primarily at the time of FERC scoping. Follow-up after data collection is completed, in targeted meetings or telephone conversations, will be necessary.

Existing regional plans and studies and stakeholder interviews are meant to provide information about users of recreation resources, duration of use, and activities. Both winter and summer use will be analyzed. Review of the information collected in 2010 may indicate data gaps that need to be addressed in addition to completing the winter use survey.

A recreation features map for the study area was prepared prior to the June 2010 field visit using existing GIS layers, existing aerial photography, and available satellite imagery coupled with field data. The map was used to locate known recreation areas and access points. The map included information on private land ownership parcels within the study area. Trail location information is available for the Project vicinity from the USFS and the KPB. IKONOS satellite imagery is available for part of the Project vicinity, as well as several aerial photography sets from different years.

Foot and boat surveys provided direct information on the condition of trails and boat access points, and provided information about current use. Trail and boat access points in the Project vicinity that may be affected by water level fluctuation were photographed to illustrate potential change. Track lines and waypoints along study area trails were recorded by GPS (subsequently entered into the Project GIS database) and illustrative views photographed. A winter survey is planned to collect direct information on winter use and access in the Project vicinity and a follow up summer field visit will take place to verify existing information and any changes that may have occurred since the 2010 data was collected. Data locations will be recorded using GPS and photographs and entered into the GIS database for the Project. Also, baseline noise information will be documented during the site visits to ascertain existing background noise at key project area locations as a consideration in the possible impacts to recreation resources of project components.

Results of stakeholder interviews, meetings, and field investigations of study area recreation use, and the analysis of the attributes of the the project components will be used in conjunction with existing information on the study area to evaluate potential effects of the Project.

The study report will include a recreation resources map which will display land ownership with indication of state and federal recreational management intent; existing trails and routes (including water travel corridor), constructed and proposed INHT segments and any associated land rights for the trail, formal or informal camp sites and boat access points, and similar information regarding recreation features and patterns. The report will summarize management intent of agencies, information gathered from community and recreation users, describe use patterns indicated on the map, assess potential recreational impacts from expected project infrastructure, and outline potential methods of mitigation, as necessary.

#### ***4.2.2 Study Component #2 – Visual Resources Study***

The objective of this study component is the analysis of Project effects on visual resources. Key viewpoints for evaluation will be determined by the updated Project design; by recreation site visits; by examining available GIS scenic, elevation, contour, and other pertinent layers; and through input from land management agencies and stakeholders. This will be coordinated with the interviews discussed as part of the recreation analysis and was accomplished in part during the meetings held at the time of FERC scoping for the Project in June 2010. Photos taken from these key viewpoints will serve for the existing and simulated scenery conditions for the assessment of changes that may be posed by the Project.

Visual simulations of the view from five viewpoints, showing Project facilities and operations, are currently planned. More views might be necessary if changes are made to Project design. The number of views will be commensurate with the scope and extent of the Project. Examples of key viewpoints may include a view of the Trail Lakes Narrows access road crossing area from the Seward Highway, a view of the intake structure and lake shoreline, a view of proposed facilities from the Seward Highway or Alaska Railroad, an aerial view, or a view of the access road or powerhouse from the from the right-of-way for the proposed INHT. Fieldwork will verify key viewpoints. Simulations will be based on Project photos taken from the site visit. Simulations will be based on similar facilities that have been constructed for similar projects. In addition to the views and simulations of Project facilities listed above there will be two aerial views of the Project vicinity, one to include Grant Lake and one Moose Pass.

The analysis of Project effects on visual resources will rely on evaluation criteria and processes described below. For the affected shoreline of Grant Lake that lies within USFS boundaries, existing scenery management information in the Chugach Forest Plan will be reviewed (USFS 2002). The scenery management analysis completed as part of that plan also will be reviewed. Specifically, the review will cover criteria for “landscape units,” “scenic integrity,” “concern levels,” “scenic attractiveness,” and “landscape visibility” (USFS 1995). An understanding of the scenic criteria will help determine the degree to which proposed Project facilities and operations (fluctuating lake levels) may affect those designations or conflict with USFS visual management objectives. The USFS documentation will be applied generally to state lands, to the extent applicable.

Evaluation of change to the existing character will include an examination of proposed Project components and operations with respect to the ability of the landscape to accept change. This evaluation is based on the “seen areas” and “distance zones” as determined by computer analysis, the “scenic integrity,” and the magnitude of change to existing “scenic attractiveness.” Within this will be an analysis of vegetation, soils, colors, texture, and other landscape attributes; an analysis of these components to accept change; a description of the potential effect of the change; and a description of the effect on stakeholders. This information will be weighed against the objectives that were delineated within the USFS, State, and KPB land management plans (USFS 2002, ADNR 2001, and KPB 2005), to the extent such objectives exist. Analysis will include an evaluation of potential protection, minimization, and mitigation options. Work will include the evaluation of seen areas from the specified viewpoints, analysis of the location of facilities and infrastructure, and the evaluation of design options to minimize visual impacts.

The study report will include a map of the visual environment, an aerial or satellite image or map simulating lake level fluctuation, and a visual resources assessment document. The map will show visual resource management objectives in different areas, any views identified as particularly valuable, and the key viewpoints. The report will present the information and analysis described above and will present before-and-after photographic images from the selected viewpoints, showing visual simulation of the Project components in the landscape. All data collected during the Recreation and Visual Resources studies should be linked into a Master Arc Soft (Arc Map) geo database.

## **5 Agency Resource Management Goals**

Information collected as part of the proposed studies will be used to describe the existing environment, assess potential impacts, and provide essential information that will help to avoid or mitigate Project impacts on recreation and visual resources, consistent with relevant existing resource management goals. Management plans relevant to recreation and visual resources may include:

- ADNR. 2001. Kenai Area Plan.
- ADNR. 2009. Alaska’s Outdoor Legacy Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2009-2014.
- KPB. 2005. Kenai Peninsula Borough Comprehensive Plan. KPB Planning Department.
- USDA Forest Service. 2002. Revised Land And Resource Management Plan for the Chugach National Forest.

## **6 Project Nexus**

The proposed Project may have a number of potential impacts on recreation and visual resources within the Grant Creek and Grant Lake area. The studies described above are intended to provide information sufficient to assess potential impacts to existing recreation and visual resources. The impact assessments will be presented in the study report, and the selected contractor will use these data to inform the development of protection, mitigation, and enhancement measures to be proposed in the draft and final license applications.

## **7 Consistency with Generally Accepted Practices**

Assessment of recreation potential in terms of the USFS ROS will be based on and generally follow USFS standards (e.g. Clark & Stankey 1979). Scenic Integrity Value assessment and scenery analysis will be based on and generally follow the Chugach Forest Plan (USFS 2002) goals and objectives and the Forest Service Landscape Aesthetics Handbook (USFS 1995), with potential also to draw on other standard visual assessment methods, such as those of the Federal Highway Administration or Bureau of Land Management and guidance from the ADNR.

## **8 Schedule for Conducting the Study**

A general outline of the schedule for the visual and recreation studies follows:

- Fall/Winter 2012 – review of information collected in 2010 and additional literature review if necessary.
- February 2013 – Issue Final Study Plan to Work Group
- Winter/Spring 2013\* – winter use site visit.
- Winter/spring 2013 – prepare all reports, maps and renderings.
- Spring 2013 – plan site visit for selection of visual resource site points.
- Summer 2013 – Finalize summer field site visit plans for both recreation and visual resources studies. Visit study area for recreation and visual point survey.
- Summer/Autumn 2013 – Prepare simulations/reports

## **9 Provisions for Technical Review**

Adequate time will be given for technical review of all recreation and visual resource study components in accordance with the Project schedule.

## **10 References**

- Alaska Department of Natural Resources (ADNR). 2009. Alaska's Outdoor Legacy Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2009-2014. ADNR Division of Park and Outdoor Recreation. Juneau. 237 pp.
- ADNR. 2001. Kenai Area Plan. ADNR, Division of Mining, Land, and Water, Resource Development and Assessment Section, Juneau, AK. 505 pp.
- ADNR. 1998. Kenai River Comprehensive Management Plan. ADNR, Division of Land, Division of Parks & Outdoor Recreation, in conjunction with Alaska Department of Fish & Game (ADF&G), Habitat and Restoration Division, and Kenai Peninsula Borough. 130 pp.
- Kenai Peninsula Borough (KPB). 2005. Kenai Peninsula Borough Comprehensive Plan. KPB Planning Department. Soldotna, AK. 348 pp.
- Clark, R. N. and G. H. Stankey. 1979. The Recreation Opportunity Spectrum: A Framework for Planning, Management, and Research. Pacific Northwest Forest and Range Experiment Station, General Technical Report PNW-98. USDA Forest Service, Seattle, WA and Missoula, MT. 39 pp.
- USDA Forest Service (USFS). 2007a. Kenai Winter Access EIS. R10-MB-595. USDA Forest Service, Anchorage, AK. 243 pp.
- USDA Forest Service (USFS). 2007b. Trail River Landscape Assessment. USDA Forest Service, Seward, AK. 148 pp.
- USDA Forest Service (USFS). 2002. Final Environmental Impact Statement and the Revised Land and Resource Management Plan for the Chugach National Forest. Anchorage.
- USDA Forest Service (USFS). 1995. Landscape aesthetics: a handbook for scenery management. Agricultural Handbook No. 701. USDA Forest Service, Washington, DC.
- USDA Forest Service (USFS). No Date. Draft Grant Lake Scenic Resource Analysis, Grant Lake Wildlife Habitat Improvement Project. Chugach National Forest, Seward, AK.

## **Transcript From The 12/12/12 Stakeholder Meeting**

**Grant Lake Hydroelectric Project (FERC No. 13212)**  
**Natural Resources Studies Meeting**  
**Residence Inn Midtown, 1025 35<sup>th</sup> Avenue, Anchorage, AK**  
**December 12, 2012, 8:00 am to 5:00 pm**

**In Attendance**

Dwayne Adams, USKH  
Amal Ajmi, ERM *[via phone]*  
Audrey Alstrom, Alaska Energy Authority (AEA)  
Emily Andersen, Long View Associates (LVA)  
Jeff Anderson, U.S. Fish and Wildlife Service (USFWS)  
Patti Berkahn, Alaska Department of Fish and Game (ADF&G) *[via phone]*  
John Blum, McMillen LLC (McMillen)  
Valerie Conner, Alaska Center for Environment  
Ted Deats, Alaska Department of Natural Resources (ADNR) *[via phone]*  
Shina Duvall, ADNR *[via phone]*  
Gary Fandrei, Cook Inlet Aquaculture Association (CIAA) *[via phone]*  
John Gangemi, ERM  
Ricky Gease, Kenai River Sportfishing Association (KRSFA) *[via phone]*  
David Griffin, ADNR (Alaska State Parks)  
Ken Hogan, Federal Energy Regulatory Commission (FERC) *[via phone]*  
Jan Konigsberg, Hydro Reform Coalition (HRC) *[via phone]*  
Denise Koopman, Army Corps of Engineers (ACOE)  
Ginny Litchfield, ADF&G *[via phone]*  
Katie McCafferty, ACOE *[via phone]*

Mark Miller, BioAnalysts (BA) *[via phone]*  
Monte Miller, ADF&G  
Sally Morsell, Northern Ecological Services (NES) *[via phone]*  
Travis Moseley, U.S. Forest Service (USFS) *[via phone]*  
Paul Pittman, Elemental Solutions (ES) *[via phone]*  
Krissy Plett, ADNR *[via phone]*  
Eric Rothwell, National Oceanic and Atmospheric Administration (NOAA Fisheries)  
Pam Russell, ADNR *[via phone]*  
Kim Sager, ADNR *[via phone]*  
Mike Salzetti, Kenai Hydro, LLC (KHL)  
Charles Sauvageau, McMillen  
Lesli Schick, ADNR  
Levia Shoutis, ERM  
John Stevenson, BA  
Ron Stanek, Cultural Resource Consultants, Inc. (CRC) *[via phone]*  
Robert Stovall, USFS  
Cassie Thomas, National Park Service (NPS) *[via phone]*  
Sue Walker, NOAA Fisheries  
Cory Warnock, LVA  
Mike Yarborough, Cultural Resource Consultants (CRC)

**Meeting Summary**

**Introductions and Agenda**

Cory Warnock (LVA) began the meeting with introductions and then reviewed the proposed meeting agenda (see [Attachment 1](#)):

- Project Overview and Update
- Licensing Path Forward
- Natural Resources Studies
  - Aquatic Resources
  - Water Resources
  - Terrestrial Resources
  - Cultural Resources
  - Recreation and Visual Resources
- Closing



## Project Overview and History

Mike Salzetti (KHL) presented an overview and history of the Grant Lake Hydroelectric Project (Project) (see PowerPoint included as Attachment 2). Mike S. gave a general description of the utility, Homer Electric Association (HEA), noting that Kenai Hydro, LLC (KHL), the applicant for the Project, is a wholly-owned subsidiary of HEA (*Slide 3*<sup>1</sup>). Mike S. indicated that the purpose for the Project is three-fold (*Slides 4-7*): 1) to meet the Board of Director's goal for an increase in its renewable energy portfolio; 2) to become a more independent utility by adding to its generation capacity, and 3) to create an alternate, reliable energy source in light of the anticipated impending shift to higher gas prices.

Mike S. briefly described the history of the proposed Project to date (*Slides 8-10*), explaining that feasibility studies were conducted for four potential sites (Grant Lake, Falls Creek, Ptarmigan Lake, and Crescent Lake), two of which (Grant Lake and Falls Creek) were carried forward and environmental baseline studies were conducted in 2009. The results of these studies were used in the development of the Pre-Application Document (PAD), filed with FERC August 2009, and in the development of the formal draft study plans.<sup>2</sup> The study program got underway in 2010, but was suspended by KHL later that year following FERC scoping, which led to significant stakeholder comments on the draft plans, in order to take the comments into consideration and revisit the draft study plans. Since that time, KHL has received a second preliminary permit (March 2012), hired McMillen as the Natural Resources Study consultant, and made significant updates to the study plans to address stakeholder comments.

Mike S. introduced the key parameters of the Project (*Slide 11*), noting that there are currently two proposals under consideration: one with a 2-foot dam, and the other without a dam. He reminded the group that the original proposal, as described in the PAD, was for a 10-foot dam. Mike reviewed a series of aerial views (*Slides 12-17*) showing the location of the proposed Project. The proposed Project is generally located to the west of the Moose Pass area (*Slide 12*). Mike S. noted that the original proposal included two potential transmission line access road options, but that one had since been eliminated ("Option 1" in *Slide 13*) to avoid its running parallel to the proposed path of the Iditarod National Historic Trail (INHT). Mike S. described the general layout of the proposed Project facilities (*Slide 14*). Mike S. pointed out that not all issues related to the INHT have been resolved – the proposed INHT route currently runs through the proposed site of the Project powerhouse – but KHL will be working with the relevant agencies and organizations to come up with a potential re-route of the INHT around the powerhouse area. Mike S. stated that due to a large waterfall on Grant Creek that creates a natural anadromous barrier, no salmonids can access the lake and there are no resident salmonids in the lake. The only known species to inhabit Grant Lake are stickleback and sculpin (*Slide 15*). Mike S. indicated that the need for the Project to have a dam is partially dependent on what is determined to be necessary for bypass flows, but noted that given the relatively steep topography of the lake and shoreline, the impact on resources in the lake due to lake level changes, are expected to be minimal (*Slides 16-17*).

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<sup>1</sup> For all PowerPoint presentations given during the meeting, slide numbers refer to the PDF page number.

<sup>2</sup> In May 2010, a revised Project description was filed with FERC, which indicated that the Falls Creek diversion had been removed from the Project proposal, and the associated impacts for which would no longer be studied.

Mike S. concluded his presentation with a summary of the key benefits for building the Project (*Slide 18*).

- *Comment:* Jeff Anderson (USFWS) asked if the current Project proposal is documented anywhere.  
*Response:* Cory Warnock (LVA) indicated that the revised study plans contain the current proposal. Mike S. added that the description in the PAD (August 2009) together with the FERC-filed updated Project descriptions (May and August 2010) (available on the Project website), also reflect the changes made to the current to the original proposal.
- *Comment:* David Griffin (ADNR) asked what from the feasibility analysis, led to the ultimate decision to move forward with Grant Lake.  
*Response:* Mike S. indicated that it was a combination of the expected environmental impacts and economical factors. Valerie Conner (Alaska Center for Environment) noted that the other options were viewed as more controversial, primarily due to recreational and visual resources issues.
- *Comment:* Travis Moseley (USFS) noted that, related to the INHT, KHL should anticipate needing to negotiate with ADNR related to rights-of-way and land ownership.  
*Response:* Mike S. agreed and said that he expected the interested parties to include the USFS, ADNR, and Kenai Borough, among others.
- *Comment:* Jan Konigsberg (HRC) asked if the cost of Project construction is yet known or what financing mechanisms may be used. Jan also asked whether the energy generated by the Project would be used for HEA customers or put on the wholesale market.  
*Response:* Mike S. replied that the Project cost will be determined by the yet-to-be hired engineering consultant (a request for proposal (RFP) for which will go out this winter), but shared that the preliminary estimate is approximately \$35 million. Mike S. indicated a portion of the funding may be covered by KHL and some was going to be sought via grants. As for the intended use of the power, Mike S. stated that the energy would primarily be used by their customers.
- *Comment:* Valerie Conner asked the reason why the expected rated generator output to be the same (5 megawatts [MW]) for the originally proposed 10-foot dam and for the currently proposed no dam and 2-foot dam options.  
*Response:* Mike S. clarified that the 5-MW is the maximum capacity for use during peaking periods, but that a Project will typically run at less than full capacity. He noted that a higher dam (10-foot versus 2-foot or no dam), allows for more storage capacity for use during high-use periods.

## Licensing Overview

Cory Warnock (LVA) presented an overview of the licensing process (see PowerPoint included by [Attachment 3](#)). Cory briefly reviewed the licensing process to date (*Slides 2-3*), reiterating many of the same points made by Mike S. earlier. Cory noted that when formal stakeholder

comments were filed in April-July 2010, KHL developed a matrix of the comments by resource area, and that since, KHL has updated the matrix with responses that include, as appropriate, cross-references to the relevant page/section of the respective study plan where a given comment is addressed (see Draft Study Plans Comment/Response Table included as [Attachment 4](#)).

- *Comment:* Eric Rothwell (NOAA Fisheries) asked the reason for selection of the Traditional Licensing Process (TLP).  
*Response:* Cory indicated that while the process decision preceded his involvement with the Project, it is his understanding that the decision was made in consultation with stakeholders at the time. Ken Hogan (FERC) added that because the Integrated Licensing Process (ILP) is the default process, an applicant has to file with FERC a request to use the TLP, which FERC then reviews and either denies or approves.

Cory reviewed the main objectives of the meeting (*Slide 4*), which are to: 1) identify and modify, as needed, current stakeholder contacts; 2) introduce the McMillen Natural Resources Studies team; 3) review proposed studies, by resource area, and 4) distribute the final study plans.

Cory explained that KHL's general plan is to move forward with the final study plans, which will be implemented in 2013/14, and noted that FERC has been consulted regarding KHL's general approach and has confirmed its consistency with the TLP requirements (*Slides 5-6*). To this end, Cory indicated that some team members (Mike S., John Blum, John Stevenson, Chuck Sauvageau, Gary Fandrei, and himself) were at the Project for an initial site visit the day before (December 11). Cory also laid out the steps and schedule for the 2<sup>nd</sup> stage consultation (*Slides 7-8*), noting that KHL is currently at the beginning of the stage, with the commencement of the study program, and that it would conclude with the filing of a Draft License Application (DLA) and meeting thereafter to discuss the study results, reports, and DLA (in summer 2014).

- *Comment:* Jeff Anderson asked whether there would be an opportunity to comment on the final study plans. Monte Miller (ADF&G) echoed the need for stakeholders to have an opportunity to submit written comments in light of the time that has lapsed since the draft study plans were discussed, and the significant changes that have since been made to them.  
*Response:* Cory noted that consistent with the TLP, the formal commenting on draft study plans was completed in 2010; that said, Cory added that questions and suggested clarifying edits to study plans would be accepted. Cory encouraged stakeholders to communicate any questions (via email or phone) directly with the appropriate resource area lead as specified in the team organizational chart (see *Slide 11* and [Attachment 5](#)). Ken Hogan emphasized that any suggested substantive edits to study plans should be focused on any proposed significant changes in the status of a particular resource area (RTE designation) since the initial study planning phase, or a significant change in the proposed Project infrastructure that necessitates a corresponding modification to a study plan. Mike Salzetti noted that no significant changes related to RTE species or Project infrastructure existed. Jan Konigsberg pointed out that there is additional opportunity to comment on studies and make additional study requests as part of commenting on the DLA, and Ken Hogan added, also again as part of commenting on the Final License Application (FLA). Monte Miller also noted that if there is a dispute regarding a study

request that FERC does not concur with, the agency or organization requesting the study has the discretion to conduct it at its own expense.

Cory summarized KHL's overarching commitments to making the licensing process a success (*Slide 9*), noted that the Project website will be the conduit for sharing of Project-related materials throughout the process (*Slide 10*), and reviewed once again the Natural Resources Studies Team organizational chart (*Slide 11*).

- *Comment:* Sue Walker (NOAA Fisheries) asked if the Project website includes the formal stakeholder and FERC draft study plan comment letters.  
*Response:* Cory concurred, and stated that the website is currently up to date with all relevant Project materials. Mike S. also noted that historic existing information about the Project is available on the website.
- *Comment:* Monte Miller asked if the Project website has a dedicated area for the public to post comments.  
*Response:* Cory indicated that it currently does not, but noted that it was a good idea, and something KHL would look into the possibility of adding to the website.

## **Fish and Aquatics**

John Blum (McMillen), the Aquatics Resources task lead, started the presentation for the Fisheries and Aquatics Study Plan (see [Attachment 6](#)), by introducing the other members of the Aquatics Resources team and the eight major components of the Aquatics Resources Study (*Slides 2-3*), which include: 1) Fish Weir Installation and Monitoring; 2) Resident and Rearing Fish Abundance and Distribution; 3) Salmon Spawning Distribution and Abundance; 4) Trail Lake Narrows Fish Study; 5) Aquatic Habitat Mapping; 6) Instream Flow Study; 7) Macroinvertebrate Studies, and 8) Periphyton Studies.

Gary Fandrei (CIAA) described the objectives, orientation of the crew, field camp setup, weir installation, monitoring and schedule for the Fish Weir Installation and Monitoring study component (*Slides 4-7*) – field work to occur May through mid-November and comprehensive Aquatics Resources Study report to be submitted January 2014 – and photos of a sample weir and typical field camps (*Slides 8-9*). Gary noted that the monitoring spans a relatively long period of time to try to capture all fish species. He also noted that in the event of a significant flood, the weir pickets would be pulled out.

- *Comment:* Jeff Anderson (USFWS) asked what locations are under consideration for setting up the field camp.  
*Response:* Gary responded that the current plan to set up as close to the weir as possible, probably somewhere in the lower 200 yards of Grant Creek, but not directly on the streambank.

John Stevenson (BA) introduced the Grant Creek Resident and Rearing Fish Abundance and Distribution study component, starting with a review of the available background information, USFWS (1961) and Arctic Environmental Information and Data Center (AEIDC; 1983)(*Slides*

10-13), and summarized the study details of the 2009/2010 KHL work (*Slides 14-23*). John S. noted that the field work in 2010 was suspended early, and therefore, the results for which were incomplete. John S. then outlined the proposed effort for 2013, noting that the intent is to continue the study where it had left off in 2010, conducting field work in the same 5 reaches, with the addition of winter habitat and fish monitoring and rainbow trout habitat use and spawning using radiotelemetry in response to stakeholder comments (*Slide 24*). John S. outlined the proposed data analysis (*Slides 25-27*) and field work and reporting schedule (*Slides 28-29*) – field work to occur February through March (winter work) and May through mid-October and comprehensive Aquatics Resources Study report to be submitted January 2014.

Mark Miller (BA) introduced the Grant Creek Salmon Spawning and Abundance study component, starting with a review of the available background information, ADF&G (1951/1981) and AEIDC (1983)(*Slide 30*). Mark summarized the study details of the 2009/2010 KHL work (*Slides 31-35*). Mark noted that most spawning ended within Reach 4, and also that escapement estimates for Chinook and sockeye in 2010 (231 and 6,293, respectively) were significantly higher than those from the earlier work (19 and 61, respectively).

- *Comment:* Sue Walker (NOAA Fisheries) asked for clarification regarding the data analysis used for the historical counts compared to that of the 2010 work.  
*Response:* Mark replied that the historical counts were characterized as single time, visual peak counts, whereas, the 2010 work used area-under-the-curve and visual counts collected over a study season.

Mark then outlined the proposed effort for 2013, describing the field work, data analysis, reporting and work schedule (*Slides 25-28*) – field work to occur late July through early November and a comprehensive Aquatics Resources Study report to be submitted January 2014. Mark also reviewed the stakeholder comments that were incorporated into the two fisheries study components (*Slides 39-41*).

Related to the Trail Lake Narrows Fish Study, Mark stated that no previous work has been conducted in Trail Lake Narrows in association with the potential bridge site location (*Slide 42*). Mark outlined the proposed 2013 effort, including the field work, data analysis, reporting, and work schedule (*Slides 43-45*) – field work to occur late July through early August and a comprehensive Aquatics Resources Study report to be submitted January 2014.

John B. introduced the Grant Creek Aquatic Habitat Mapping study component, starting with a review of the study details, including stakeholder consultation during study planning, of the 2009/2010 KHL work (*Slides 46-48*). John B. then outlined the proposed 2013 effort, noting that the intent is to ground truth the 2010 work, and modifying as needed. John showed an aerial photo of the transect locations of key habitats, the work schedule, and reviewed the comments from the draft study plan that were incorporated into the current plan (*Slides 49-53*) – field work to occur April through May and a comprehensive Aquatics Resources Study report to be submitted January 2014.

- *Comment:* Jeff Anderson asked whether a winter survey would be considered in light of the potential change in flows due to Project operations.

*Response:* John B. indicated that they can utilize the data collected from the Resident and Rearing Fish Abundance and Distribution winter work to evaluate aquatic habitat.

John B. introduced the Grant Creek Instream Flow Study component, starting with a review of the 2009/2010 KHL work (*Slides 54-55*). John B. noted that no high flow water surface area (WSE) measurements were taken and that, as a result, data analysis was not completed. John B. then outlined the proposed 2013 effort, noting that the primary objective is to verify the information collected at the same 18 transects of the 2009-10 effort and determine what has changed since then. John B. described the field work, data analysis, reporting, and work schedule, and showed photos of flows in select reach locations (*Slides 56-62*) – field work to occur April through November and study report to be submitted January 2014. John B. explained that he had discussed the Project with Thomas Payne, to develop an appropriate suite of models for Grant Creek. Also, for Reach 5, they would be utilizing Thompson (1972) to assess connectivity for upstream passage into representative pools (*Slide 58*). John B. pointed out that the study report would be detailed, to include calibration and habitat suitability index (HSI) data, the Instream Flow Incremental Methodology (IFIM) information, and Reach 5 calibration data (*Slide 59*). John B. also reviewed the stakeholder comments on the draft study plan that were incorporated into the current plan (*Slide 63*).

- *Comment:* Eric Rothwell (NOAA Fisheries) noted that he was not familiar with Thompson (1972), and asked 1) without having existing velocity measurements, whether there was a way to verify the use of the Thompson method in Grant Creek; and 2) whether any stream in the Thompson paper was similar to Grant Creek.

*Response:* John B. indicated that velocity measurements would be taken as part of the 2013 field effort, which could be used to verify the use of Thompson in Grant Creek, and noted that he would locate the paper and forward it to Eric.

- *Comment:* Valerie Conner (Alaska Center for Environment) asked what the threshold is for a “reasonable” impact of a hydropower facility on the surrounding environment and who makes that decision.

*Response:* Cory Warnock explained that the studies are designed to determine the existing environment and that the study information coupled with the engineering information should allow for the determination of the Project impact. Ken Hogan added that the “threshold” decision is ultimately FERC’s.

Sally Morsell (NES) introduced the Grant Creek Macroinvertebrate Study and Periphyton Study components, starting with a review of the work completed by KHL in 2009 (*Slides 64-67 and Slides 69-70, respectively*) and then outlined the proposed 2013 efforts. The primary objective of these studies is to replicate the 2009 effort and to combine the two sets of results to further establish the baseline condition. Sally described the field work, sample processing and identification, and data analysis and reporting for both efforts (*Slides 68 and 71, respectively*), the work schedule, and the stakeholder comment that were incorporated into the study plan (*Slides 72-73*) – field work to occur mid-August and a comprehensive Aquatics Resources Study report to be submitted January 2014.

- *Comment:* Monte Miller (ADF&G) asked whether a single sampling in August is a sufficient representation of the stream's productivity, or if potential early season development is not being captured.  
*Response:* Sally replied that because the study is not intended to be a benthic macroinvertebrate ecological study, the single-sample being collected in two different years accomplishes the objective to characterize the macroinvertebrate and periphyton populations.

John B. briefly reviewed the stakeholder consultation that occurred during the development of the draft aquatics study plans in 2009 and 2010 (*Slides 74-77*) and then reviewed the permits anticipated for the various components of the Aquatics Resources Study (*Slides 78-79*) – for weir installation/monitoring and fisheries investigations, ADF&G Fisheries Resource Permit and Fish Habitat Permit, USFS Special Use Permit (SUP), and KPB Floodplain Permit – and asked that if any permits appear to be missing from the list, to inform KHL and/or McMillen.

- *Comment:* Pam Russell (ADNR) stated that she does not see ADNR identified in the presentation, and recommended submittal of a Multi-Agency Permit Application. Jenny Litchfield (ADF&G) added that a permit may be required for the macroinvertebrate study, which does not appear to be included on the current permit lists.  
*Response:* Cory Warnock replied that the plan is to submit a Multi-Agency Permit Application, which is identified in a summary table of 2013 study permitting requirements, available as a meeting handout and on the Project website (see [Attachment 7](#)). Cory added that KHL appreciates any input folks have regarding necessary permits.

## Water Resources

Chuck Sauvageau (McMillen), the Water Resources task lead, started the presentation for the Water Resources Study Plan (see [Attachment 8](#)) by introducing the other members of the Water Resources team and the three major components of the Water Resources Study (*Slides 2-5*), which include: 1) Water Quality (WQ) and Temperature Study; 2) Hydrology Study, and 3) Geomorphology Study. Chuck showed a map depicting the location of thermistors, gages, and the natural outlet sampling point for the WQ and hydrology studies (*Slide 6*).

Chuck introduced the Water Quality and Temperature Study component, starting with a review of existing information for Grant Lake, USGS (1950's), AEIDC (1981-1982), and 2009/2010 KHL work (*Slide 7*), and for Grant Creek, USGS (1950-1958), AEIDC (1982), and 2009/2010 KHL work (*Slide 9*). Chuck then outlined the proposed 2013 effort (*Slides 8, 10 and 13*), noting that the September 2013 water quality sampling is intended to complete the data collection efforts that occurred in June/August of 2009 and 2010. Related to collection of water quality and temperature data in Trail Creek Narrows, Chuck pointed out that there is no historical information for that specific area; as such, the 2013 effort would include three water chemistry sampling efforts in spring, summer, and fall (*Slide 12*).

Chuck introduced the Hydrology Study component, starting with a review of the historical work completed (*Slide 14*). He then outlined the proposed 2013 effort (*Slides 15-16*).

- Comment:* Eric Rothwell (NOAA Fisheries) asked whether winter flows would be collected as part of the Hydrology Study.

*Response:* Chuck indicated that winter flows could be collected provided there are personnel available to do so. Chuck noted that one concern is that the relatively short battery life of the loggers (3-4 weeks) requires regular replacement, which could pose a potential safety concern in light of the inclement weather conditions. Eric suggested point measurements rather than continuous ones, to which, Chuck indicated this would be a possibility.
- Comment:* Eric Rothwell stated that between the Aquatics Resources Study, habitat information is being collected, and Hydrology Study, where discharge measurements are being taken for the development of a stage-discharge rating curve, the studies do not seem to propose a step for conducting an impacts analysis, which might include the development of a routing model and that perhaps it would be worthwhile to consider expanding the 2013 data collection effort, to ensure all necessary data are available for development of such a model, should the need arise.

*Response:* Chuck replied that the intent of the Water Resources Study is to collect existing information, the initial building blocks of a routing-type model. Cory Warnock pointed out that since operation scenarios have yet to be developed; it might be a challenge to identify all necessary data parameters before the 2013 study effort gets underway.
- Comment:* Sue Walker (NOAA Fisheries) asked if there is an overview of the proposed Project operations that could be shared.

*Response:* Referring back to the Overview and History presentation for the key Project parameters (Slide 11), Mike Salzetti explained that the proposal has not changed significantly since the revised Project description was filed in August 2010, with the exception of the proposed access route/transmission line alignment.

Paul Pittman (ES) introduced the Geomorphology Study component, noting that minimal work has been conducted to date for both Grant Lake shoreline erosion or Grant Creek sediment transport (*Slides 17-18*). Paul then outlined the proposed efforts for 2013 (*Slides 17-18*).

- Comment:* Eric Rothwell asked how the impact of Project operations on the existing geomorphic environment would be assessed (e.g., would there be a shear stress analysis to assess shoreline erosion impacts in Grant Lake).

*Response:* Paul acknowledged that changes to lake elevation could change the littoral zone, and similarly, a change in creek flows could impact the transport processes. Paul indicated that the Shields equation would likely be used to quantify the sediment transport impacts. Eric suggested detailing the equations and impacts analysis in the study plan. Paul and Eric agreed to have a follow up discussion regarding this topic.

Chuck reviewed the permitting needs (Multi-Agency Permit Application for WQ/temperature and geomorphology and a Fish Habitat Permit for hydrology) and work schedule for each of the three Water Resources Study components (*Slides 19-20*) – field work for WQ/temperature to occur September (Grant Lake and Grant Creek) and April through September (Trail Creek



Narrows), for hydrology April through mid-November, and for geomorphology mid-April through mid-June, with a comprehensive Water Resources Study report to be submitted January 2014.

- *Comment:* Katie McCafferty (ACOE) noted that ACOE's oversees permitting related to fill of wetlands, and based on the discussion, it does not appear that such a permit would be applicable to the Water Resources Study. She will, however, plan to review the Multi-Agency Permit Application to confirm.

*Response:* Cory thanked Katie for the comment.

- *Comment:* Sue Walker asked if temperature monitoring will be done within salmon redds, and if not, whether it could be. Sue added that defining the operational proposal now would be beneficial to allow for study of the potential impact of Project operations on temperature as it relates to redds, noting that spawning is a key resource value, and thus, it is important to assess the Project impacts on upwelling and/or downwelling within spawning redds.

*Response:* Mike S. stated that it is a challenge to refine the operational proposal before completion of the environmental analysis, specifically before knowing the minimum flows needed in the bypass reach. John Stevenson (BA) commented that monitoring within the redds is not currently planned. He noted concern with potentially disrupting redds, in particular when needing to regularly replace batteries in the sensors, and wondered if it would be acceptable to sacrifice a few redds in order to take the desired measurements. Eric Rothwell reiterated earlier concerns about the need to evaluate the Project impacts. Sue Walker stated that once the initial data are in, the Water Resources Study would possibly need to be expanded to assess egg survival.

- *Comment:* Jeff Anderson (USFWS) noted that the high flow measurement currently planned is for 200 cfs, and asked whether, after initial measurements are taken, the high flow value will be modified, as needed. Jeff also asked if un-manned measurement collection was considered.

*Response:* John Blum responded yes, the high flow could change, but noted that instream flow can be modeled 2.5 times the high flow value. Chuck indicated that the field crew may utilize an existing cable system and un-manned ADCP to collect high flow discharge data.

<<LUNCH BREAK>>

## Terrestrial Resources

John Gangemi (ERM), the Terrestrial Resources task lead, started the presentation for the Terrestrial Resources Study Plan (see [Attachment 9](#)) by introducing the other members of the Terrestrial Resources team and the seven major components of the Terrestrial Resources Study and the study work schedule (*Slides 2-5*), which include: 1) Vegetation-type Mapping; 2) Sensitive Plant and Invasive Plant Survey; 3) Mapping of Wetlands and Other Waters of the

U.S.; 4) Raptor Nesting Surveys; 5) Breeding Landbird and Shorebirds Surveys; 6) Waterbird Surveys, and 7) Terrestrial Mammal Surveys. Field work for the three botanical components to occur July 2013, for raptors June-July 2013 and 2014, for landbirds/shorebirds May-June 2013, waterbirds and terrestrial mammals, November-December 2013 and February-March 2014, and a comprehensive Terrestrial Resources Study report to be submitted January 2014.

In the absence of the study lead, Katy Beck (Beck Botanical Services), John G. introduced the Vegetation-type Mapping and Sensitive and Invasive Plant Survey components, explaining that vegetation type mapping exists for the general Project area (USFS 2007), but that no work has been done to date related to sensitive and invasive plants (*Slide 8*). John G. outlined the proposed 2013 effort, including the goals, study area, pre-field steps, field sampling, data analysis, reporting, intended communications with stakeholders, and work schedule (*Slides 6-7 and 9-12*), pointing out that a Biological Evaluation (BE) would be developed related to the sensitive plants survey and would be submitted as part of a comprehensive Terrestrial Resources Study report in January 2014, then finalized in May 2014 based on USFS' feedback.

Levia Shoutis (ERM) introduced the Mapping of Wetlands and Waters of the U.S. component, starting with a description of the goals and assessment area of the mapping exercise (*Slides 15-16*), and then a review of the 2009/2010 KHL work (*Slides 17-19*). Levia then outlined the proposed 2013 effort, including pre-field tasks, field sampling, data quality control, reporting, communication with stakeholders, and work schedule (*Slides 20-24*).

Amal Ajmi (ERM) introduced the four terrestrial wildlife study components, describing the objectives, the 2009/2010 KHL work, and proposed 2013 effort for each (*Slides 25-37*). Cory Warnock noted that due to the summer 2014 goshawk nesting survey work, and the winter 2013-2014 waterbird and terrestrial mammal surveys, the data for these components would be submitted as an addendum to the already completed Terrestrial Resource Report (January 2014).

## **Cultural Resources**

Mike Yarborough (CRC), the Cultural Resources task lead, started the presentation for the Cultural Resources Study Plan (see [Attachment 10](#)) by introducing the other members of the Cultural Resources team and the two major components of the Cultural Resources Study (*Slide 2*), which include: 1) Cultural Resources, and 2) Subsistence Use.

Mike Y. reviewed the cultural resources work conducted in the Project area to date USFS, CH2M Hill (1980), AEDIC (1983), and EBASCO (1984), and most recently, the work that commenced in 2010, but was suspended after initiation of Section 106 consultation (*Slides 3-4*). Mike Y. then outlined the proposed 2013 effort, which will start with a re-initiation of the Section 106 consultation, to define the Area of Potential Effect (APE)(*Slides 5-6*). Mike Y. pointed out that related to historic trails, there are two pieces to assess relative to cultural resources: the commemorative INHT, as well as other trails that may run through the Project area.

Mike Y. showed a map of the study area and reviewed the work schedule (*Slides 7-9*) – literature review and Section 106 consultation to occur early 2013, field work summer 2013, draft Historic

Properties Management Plan (HPMP) in winter 2013/2014, and a comprehensive Cultural Resources Study report January 2014. Mike Y. explained that the USFS' probability model (developed through a Programmatic Agreement with the State Historic Preservation Office [SHPO]) would be utilized for the historic and archaeological field study. Mike Y. noted that field work would commence once the ground was thawed and there was no snow, typically before vegetation begins to fill in.

Mike Y. reviewed the stakeholder comments received on the draft study plan and KHL's responses as well as the permitting requirements (USFS and ADNR)(*Slides 10-12*).

In the absence of the study lead, Ronald Stanek (CRC), Mike Y. introduced the Subsistence Use Study component, starting with a general definition of subsistence and noting that from a regulatory perspective, it is defined under both federal and state laws, the Kenai Peninsula being mostly a "non-subsistence area" by state law, and a "rural area" by federal law (*Slides 13-14*). Mike Y. stated that there had been no previous work done on subsistence use relative to the Project area, but that there is some relevant work that has been done on the Kenai Peninsula (Reed, Seitz et al. 1994, and Fall et al. 2000) and near the Project area (Davis, Fall, and Jennings 2003, and Fall et al. 2004) (*Slide 16*). Mike showed a data table and maps of the type of information that is collected for a subsistence use study (*Slides 17-19*). Mike then outlined the proposed 2013 effort, including the literature review, stakeholder comments received on the draft study plan, and work schedule, noting that no permits are required for the study (*Slides 20-23*) – literature review/field work to occur 2013 and a comprehensive Cultural Resources Study report to be submitted January 2014.

- *Comment:* Valerie Conner (Alaska Center for Environment) asked whether the Kenai River will be included as part of the study area and whether the APE to be defined as part of the Cultural Resources component, will be applied across all resource areas.  
*Response:* Mike Y. replied that the Kenai River will be taken into consideration as part of the information gathering effort of the Subsistence Use Study component. Regarding the APE, Mike Y. stated that the APE is specific to cultural resources, which are focused on historic resources, whereas, other resources are of the present, and therefore, the study areas for each study will be defined as such. (*Ron Stanek joined via phone*) Ron added that as part of the information gathering, he will follow up with all communities that qualify as subsistence areas, either by federal or state law.
- *Comment:* Travis Moseley (USFS) noted that as a cooperating agency related to tribal consultation, maybe there should be a call with the USFS to discuss the study area relative to subsistence use.  
*Response:* Mike Y. noted that as part of the Section 106 consultation, KHL will be already be talking with all interested tribes, native organizations, and village corporations at which point, subsistence use can also be discussed.

## **Recreational and Visual Resources**

Dwayne Adams (USKH), the Recreational and Visual Resources task lead, started the presentation for the Recreational and Visual Resources Study Plan (see [Attachment 11](#)) by

introducing the other members of the Recreational and Visual Resources team and the two major components of the Recreational and Visual Resources Study (*Slide 2*), which include: 1) Recreational Use Study, and 2) Visual Resources Study.

Dwayne described the general study area for both study components, noting that it will likely be more expansive than the area being assessed in the other studies, and that it will be informed by a scenic viewing analysis (*Slide 3*). Dwayne also reviewed the work conducted in the area to date, most of which was done in association with the INHT (*Slide 4*). Dwayne then outlined the proposed 2013 effort (*Slides 5-9*), noting that the effort will be a continuation of the work started but then suspended in 2010 as well as focus on the Trail Lakes Narrows access route.

- *Comment:* Monte Miller (ADF&G) asked if there would be field cameras deployed on the trails.  
*Response:* Dwayne responded that the plan is for the field crew to be on the trails at opportune times to determine use at high use periods and to interview some users; therefore, there is no need for cameras.

Dwayne explained that one of the stakeholder comments received on the draft study plan was to include the INHT for access and routing for effects on users, and that KHL planned to study that as a separate effort, the steps of which, Dwayne outlined (*Slides 11-14*).

Dwayne reviewed the balance of draft study plan comments received and KHL's corresponding responses and anticipated permit needs (i.e., a Special Use Permit [SUP] from the USFS) (*Slide 15*).

- *Comment:* Cassie Thomas (NPS) asked if an assessment of the natural soundscapes would be part of the Recreational Use Study and if so, what would be the methodology used to determine baseline conditions, similar to the use of key observation points (KOP) in visual impacts assessments.  
*Response:* Dwayne indicated that noise would be part of the Recreational Use Study, specifically the impact of Project construction and operation on quality of life characteristics; however, taking baseline noise readings in the field was not currently planned, though it would not be significantly more effort to do so. Dwayne noted that the assessment could not be completed, however, until the Project operational scenario is better understood. Cassie suggested looking at the Visual Resources Study Plan proposed for the Susitna-Watana Hydroelectric Project (P-14241).
- *Comment:* David Griffin (ADNR) asked if KHL knows yet by what modes of transportation the Project area will be accessed by for the various studies.  
*Response:* Mike S. responded that a helicopter will be used to drop off equipment, a boat will be used on the lake, and a floatplane may be used to move equipment to and from the lake.
- *Comment:* David Griffin (ADNR) asked if geotechnical work is planned yet.

*Response:* Cory Warnock indicated that such an effort may be a component of the future engineering study. Mike S. added that some work has already been done by Jacobson during the 2009/2010 work.

## Closing

Cory Warnock stated that the draft notes from the meeting would be issued in approximately two weeks, at which time, KHL would request that stakeholders provide by January 20, 2013 comments on the meeting notes as well as comments/questions/points of clarification on the final study plans (ideally, as a single comprehensive response from each agency/organization), and suggested edits/additions to the Permitting Requirements table. Cory reiterated that all materials discussed during the meeting, including the final study plans, are available on the Project website.

- *Comment:* Monte Miller (ADF&G) asked when the next study plan meetings would be held.  
*Response:* Cory replied that if and when additional meetings are warranted, is dependent on the input provided by the stakeholders related to the final study plans.

## Action Items

- **KHL** to consider developing a section of the project website for the public to post comments regarding the project, licensing process, study program, etc.
- **John Blum (McMillen)** to locate Thompson (1972) and provide to Eric Rothwell (NOAA Fisheries).
- **Paul Pittman (ES) and Eric Rothwell (NOAA)** to have a follow up conversation about possible equations to include in the Water Resources study plan that might be used to estimate the potential change in sediment transport processes resulting from Grant Lake Project operations.
- **Cory Warnock (LVA)** to email stakeholders about providing by January 20: 1) comments on meeting notes; 2) comments/questions/requests for clarification on study plans; and 3) suggested modifications to the Permitting Requirements table.

## **Attachments**

Attachments are available on the Natural Resources Studies Meeting (December 12, 2012), Work Groups page at [www.kenaihydro.com](http://www.kenaihydro.com).

- Attachment 1: Meeting Agenda
- Attachment 2: Grant Lake Project Overview and History PowerPoint presentation
- Attachment 3: Licensing Overview PowerPoint presentation
- Attachment 4: Draft Study Plans Comment/Response Table (dated 12/1/12)
- Attachment 5: Grant Lake Team Organization and Contact Chart
- Attachment 6: Fisheries and Aquatics PowerPoint presentation
- Attachment 7: 2013 Study Permitting Requirements
- Attachment 8: Water Resources PowerPoint presentation
- Attachment 9: Terrestrial Resources PowerPoint presentation
- Attachment 10: Cultural Resources PowerPoint presentation
- Attachment 11: Recreational and Visual Resources PowerPoint presentation

## **Comment Matrix**

**(Based Upon Informal Comments Received During and After 12/12/12 Meeting)**

Agency	Comment	Additional Detail Location (pg.)	HEA Comment Response
<b>Aquatic Resources Study Plan</b>			
NOAA-NMFS	<p><i>4.6 Grant Creek Aquatic Habitat Mapping</i></p> <p>The habitat delineation will be conducted at a mesohabitat level, with the following categories: fastwater pools; fastwater riffles; margins with undercut bank; margins without undercut bank; large woody debris dams; margin shelves associated with large wood debris; backwater pools; sloughs; and pockets. We request that each of the mesohabitat categories be defined in the revised study plan. It appears from the draft study plan that the mesohabitats will be mapped from remote imagery at one flow, it is unclear if changes in habitat delineation with flow will be accounted for, or if it is necessary to assess project effects on habitat distribution and size. Ground truthing of the mesohabitat mapping may provide some insight into the need to correct the classification and if accounting for changes in habitat area with flow is necessary. Study plan revisions should discuss the need and methods for quantifying habitat availability over a range of discharges and be able to predict habitat availability under project operation scenarios. Understanding the range of habitats available over the range of baseline and operating flows will be necessary to assess project effects.</p>	Pg. 22	<p>Aquatic Habitat Mapping has already been conducted by HEA and has been prepared as a GIS layer. HEA will also conduct an aerial reconnaissance in 2013 to determine if these mesohabitat types and locations have changed. This mapping will be ground truthed during the 2013 field season at low – medium flows; at higher flows, habitat characteristics tend to “wash out” and it is not possible to differentiate habitat types with any level of precision at higher flows. Any changes in mesohabitat types noted through the ground truthing effort will be noted and maps will be revised to reflect these changes.</p> <p>Transects for this instream flow study were selected through extensive consultation with the natural resource agencies to measure those habitats that were most important for spawning and rearing life history stages. The calibrated model for each of these transects will show changes in habitat associated with flows for each of target species and life history stages.</p>



NOAA-NMFS	<p><b>4.6 Grant Creek Aquatic Habitat Mapping</b></p> <p><i>The study component to “Analyze and identify the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek”</i> appears to utilize the mesohabitat mapping effort and fish observations to identify fish habitat use and make inferences as to what factors influence habitat use. The methodology to achieve this task should identify how factors will be determined, as many of the factors may be microhabitat features that are not identifiable through remote imagery. The results of the aquatic habitat mapping and fish observations should be a baseline understanding of species and lifestage habitat use, and then use this information to inform the effort to development site specific habitat criteria (as discussed in the instream flow section).</p>	Pg. 22	<p>See previous comment. Measurement of depth, velocity, substrates, cover, distance to cover, and temperature will be taken for those fish sampled.</p> <p>Habitat types will be ground-truthed to ensure that any changes in habitat types since the previous mapping effort will be noted and the maps revised.</p>
NOAA-NMFS	<p><b>4.7 Grant Creek Instream Flow Study</b></p> <p>Two modes of operations are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at specific output level, level control of Grant Lake will occur during periods of low inflow to Grant Lake. The revised study plan should include a description of how project operations likely to occur in a dry, average, and wet year will be assessed in the instream flow study to adequately analyze project effects to fish habitat.</p>		<p>Comment noted. The instream flow study will provide WUA, an index of useable habitat, for each target species and life history stage, at any simulated range within the calibration limits of the model. The potential effects on target species and life history stages for differing flow regimes for wet, dry, and average years can be analyzed with the model results.</p>
NOAA-NMFS	<b>4.7 Grant Creek Instream Flow Study</b>		HEA concurs.

	Due to the nature of Grant Creek we believe a series of single transect analysis, in combination with the mesohabitat mapping and site specific understanding of the microhabitat factors that influence habitat use, should be sufficient to understand the flow habitat relationships for spawning and rearing areas.		
NOAA-NMFS	<i>4.7 Grant Creek Instream Flow Study</i> We see little value in the wetted perimeter analysis, as many of the habitats utilized for rearing will probably occur near margins, woody debris, or other pocket habitats. We agree that modeling flow effects to lateral connectivity to margins, areas of thermal refugia, side-channel, off-channel, and undercut bank habitats will be an important component of the instream flow study.		HEA concurs.
NOAA-NMFS	<i>4.7 Grant Creek Instream Flow Study</i> The proposed egg incubation component lacks the detail to determine if it is appropriate or sufficient to assess project effects on spawning success. After identification of spawning locations by species the analysis should consider factors that influence spawning success under baseline conditions and then assess how the project may change those conditions, including habitat availability and quality (structure, substrate, access, temperature, etc.). Additional factors including surface/groundwater exchange, proximity to rearing habitat (if applicable), and biologic factors should be consider.	Pg. 27	A detailed revised methodology has been provided in the study plan. This approach has been used and accepted on FERC-related hydropower licensing and relicensing efforts by McMillen staff.
NOAA-NMFS	<i>4.7 Grant Creek Instream Flow Study</i> Additionally, the revised study plan for instream flow should include:		Table 1 in the Study Plan summarizes the 18 locations that have been agreed to for the study; a map indicating the location of these transects has

	<p>☐ The number and location of instream flow cross-sections, or how they will be determined based on the habitat mapping and fish observations.</p> <p>☐ Methods for analyzing project effect from operations downstream for instream flow, temperature, and bedload transport.</p> <p>☐ Detailed methodologies describing what the egg incubation study component will consist of, what data is necessary, and why the methods are appropriate.</p>	Pg. 29	<p>been inserted into the study plan.</p> <p>The instream flow study will produce 18 calibrated transects that will be modeled over a wide range of flows. The outputs will include transect and station-specific depths, velocities, and substrate types over this range of flows.</p> <p>Velocity/flow data from the transects will be provided for the geomorphology study to examine which flows will initiate and maintain bedload transport.</p> <p>See previous comment re: incubation study.</p>
<b>Water Resources Study Plan</b>			
NOAA-NMFS	<p><b>4.2.1 Water Quality and Temperature</b></p> <p>The objectives for the water quality and temperature include collection of baseline data to provide basis for environmental assessment and allow comparison with future study years; and obtain baseline information on the seasonal temperature regime to provide input data required for modeling of potential Project impacts to stream temperatures under various operational scenarios. It is unclear how the baseline data would be used to model stream temperature effects associated with project operations or if the proposed data collection is sufficient to meet the modeling needs.</p>	Pgs. 5-6 and 8	<p>A temperature model such as Heat Source or SNTMP requires a sampling node from an upstream location to predict changes downstream. Water temperature data will be collected at Grant Lake, as well as 6 sampling nodes downstream in Grant Creek. For a stream with no tributaries, the baseline temperature sampling array is adequate. Additional information on climatological conditions, channel hydraulics, and shading can be collected at a later date if a temperature model is necessary.</p>
NOAA-NMFS	<p><b>4.2.1 Water Quality and Temperature</b></p> <p>Monitoring of temperature and flows at multiple locations (including and understanding of winter flow and temperature) in Grant Creek should provide a good baseline understanding of longitudinal temperature. Temperature data</p>	Pgs. 6 and 9; 11-12; 19	<p>In an effort to assist Aquatic Resource studies with degree day calculations, 2 continuous temperature loggers were deployed at site GC 200 in mid-December of 2012. Therefore, the 2013 water temperature study will include winter temperature</p>

	<p>collection, Page 8 and 9, proposed to collected temperature data throughout the year, this is important but it is unclear how many years of winter temperature data is available? We also encourage that thermal refugia be examined in habitats used by spawning and rearing fish. Although baseline conditions will be captured it is unclear how project operations will be routed downstream to conduct the instream flow and temperature analysis of project operation effects. There is mention of quantifying seepage and/or accretion of flow for a few time periods. For hydraulic analysis it may be appropriate, in the case of Grant Creek except for ramping analysis, to assume operation flows are translated downstream instantaneously, but this assumption would not be applicable for assessment of water quality and temperature effects associated with operations. Rather a routing of flow and water quality parameters (temperature) downstream would be necessary to assess project effects.</p>		<p>data in Grant Creek. Prior to this deployment, no winter water temperature data have been collected at Grant Creek or Grant Lake.</p> <p>Thermal refugia are relevant when temperatures exceed a specified criterion. Although it is not known if Grant Creek exceeds temperature criteria for the spawning or rearing fish species present, an active search for thermal refugia will be conducted throughout the 2013 study season. If detected, a maximum of 3 thermal refugia locations will be continuously monitored to assess temperature conditions.</p>
NOAA-NMFS	<p><i>4.2.1 Water Quality and Temperature</i></p> <p>Additional temperature data loggers will be placed at 2-3 selected off channel sites, and will emphasize locations that may be influenced by groundwater. We encourage additional sites selected by the Aquatic Resources study team at locations of biological significance, both spawning and rearing locations with the goal of characterizing the temperatures of habitats chosen by spawning fish and to characterize thermal heterogeneity.</p>	Pg. 9	<p>The need for water quality and temperature modeling will be discussed with stakeholders following the assessment of 2013 monitoring data. However, temperature models such as SNTMP and Heat Source inherently have a routing component to predict temperature changes downstream (e.g. velocity and slope). With a calibrated temperature model, a variety of operational scenarios can be run to determine their effect on water temperatures.</p>

	<p>4.2.3 Grant Lake and Grant Creek Fluvial Geomorphology</p> <p>“The validity of sediment transport models and their attendant assumptions will be discussed in light of project requirements”. During the Dec. 2012 meeting the use Shield’s Equation was proposed to assess incipient motion. Description of why Shield’s equation and how it will be applied is necessary in the revised study plan. We request that the RSP discuss the methods for modeling spawning gravel recruitment and data needs, along with assumptions</p>	Pgs. 15-16	Additional detail has been provided in the study plan related to development of the appropriate incipient motion equation, the bulk sampling regime and analysis determinations that will be made based upon field visits and associated attributes.
NOAA-NMFS	<p>4.2.3 Grant Lake and Grant Creek Fluvial Geomorphology</p> <p>The three phase work plan described for the Grant Creek spawning substrate recruitment study is a solid conceptual approach but methodologies need more detail to be understood and assessed. The first phase is an assessment of the substrate at existing spawning areas including aspects of embeddedness and substrate size. This is achieved through Wolman pebble counts and embeddedness indices with the addition of bulk samples. The embeddedness indices should be described in the revised study plan with a description of why they are appropriate. Also the location and number of sampling locations should be provided in the revised study plan; the number should be sufficient to characterize spawning in each of the spawning reaches.</p> <p>The second phase is the quantification of material transport conditions under the existing and</p>	Pgs. 15-16	<p>As stated in the Objectives section of the Water Resources Study Plan, the incipient motion equation will be used to compare the existing hydrology to the anticipated decrease in peak flows under management scenarios and see if there is a decreased potential for movement of the bedform. Additional detail has been provided in the study plan related to:</p> <ul style="list-style-type: none"> <li>• Embeddedness methods</li> <li>• Assessment and final determination of sampling sites</li> <li>• Development of the appropriate incipient motion equation</li> </ul>

	<p>project flow regimes. During the December 12, 2012 natural resources study meeting the methods were described as consisting of a desktop analysis ( geomorphic mapping and characterization); field sediment characterization; field geomorphic characterization; and prediction of potential geomorphic response to stream flow under management scenarios. The applicant's contractors described using Shield's Equation, as was conducted by Inter-Fluve on Cooper Creek; with the intent to evaluate the availability of spawning gravel under proposed operating scenarios. More detail about the methodologies to predict geomorphic response to instream flow changes is needed to assess whether they are appropriate.</p> <p>It is unclear how Shield's equation will be applied, or where it will be applied. Shields expressed incipient grain motion as a dimensionless ratio of critical bed shear stress to grain weight per unit area; the experiments used mixed bed material that was nearly uniform; the dimensionless critical shear stresses are not grain-size specific but are derived from bulk measures of sediment movement; and a variety of bed forms and relative roughness were not accounted for (Buffington 1999<sub>1</sub>). Revisions and modifications of Shields curve have recognized that incipient motion of a particular grain size is a statistical problem depending on geometry, grain shape, sorting, and packing (Buffington and Montgomery 1997<sub>2</sub>). Will relative roughness be accounted for through shear stress partitioning,</p>		
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	<p>to account for sorting, grain size shape, bed form, and channel shape?</p> <p>We request that the revised study plan for water resources describe the approach being taken to assess project effects to sediment transport for long-term maintenance of fish spawning substrate. This should include the equations used and why they are appropriate, a description of how modeling approaches or equations will be validated with baseline information; what value is used for Shields parameter (dimensionless critical shear stress) and why, and how the equation will be applied to quantify the effects associated with project operations, and limitations of the study. Additionally it is unclear how operations will be routed downstream to the spawning areas to assess transport conditions? And where will the shear stress calculations be performed?</p> <p>Route operations downstream and predict changes in transport as a calculation of a shear stress threshold to achieve incipient motion may be the correct approach but the equations and methods used should be described, with assumptions and why the model/equation are appropriate.</p>		
<b>Recreation and Visual Resources</b>			
National Park Service	<p>NPS would like to reiterate its request that baseline soundscape data be collected for this project so that project-related impacts on natural sounds can be assessed. For your consideration, FERC approved the Watana Aesthetics Resources study plan today, with a modification NPS had suggested, i.e. the collection of baseline sound data in all seasons. I would be happy to provide a</p>		<p>KHL will collect baseline background noise as part of its on-site recreation analysis in winter and summer.</p>

	<p>copy of the revised study plan for this resource, along with FERC staff's modifications, to you if this would be helpful.</p> <p>While the proposed Grant Lake project would be much smaller than Watana, project construction and operation will nonetheless generate noise that could have an impact on recreational experiences, as acknowledged in KH's response to our comment #104 in the 1-27-11 comment/response table. We can only avoid, minimize, or mitigate those impacts if we know the level of background sound, and which areas, activities, and times of year are most sensitive to noise.</p>	<p>Pgs. 6-8</p>	
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# **Comment Matrix**

**(Based Upon Formal Comments Received During The 2010 Scoping Process)**

**Summary of comments on draft study plans for the Grant Lake Project (No. 13212) (List of Abbreviations and Acronyms attached)**

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
<b>General/Additional Study Requests</b>					
1	06-04-10	KWF	PAD	Thank you for the opportunity to comment on the PAD. Please provide a return receipt and if you could clarify how these comments will be incorporated into the process it would be appreciated. It is unclear who receives these comments, if they are transmitted to FERC.	This response to comment table will become a part of the project record submitted to FERC with the draft license application. The table is also posted on KHL's website (www.kenaihydro.com).
2	07-06-10	M. Cooney	PAD	In recognition of significant probable negative project impacts to the local and unique quality of life, individual businesses, and local economies, Socio-economic issues related to this project should not be evaluated peripherally or as a by-product of other studies as currently proposed by HEA. I again request HEA immediately establish an independent Technical Working Group to comprehensively identify and to investigate these issues. The Socio-Economic TWG membership should be significantly comprised of recognized Alaska professionals in the field, and residents from local project area communities, including local business owners. I look forward to participating and working with that Technical Working Group.	A comprehensive protection, mitigation, and enhancement proposal is necessary before socio-economic information can be fully considered. Socio-economic information consistent with FERC regulations, and commensurate with the scope of the project will be provided in the final license application Exhibit E (see 18 CFR §4.41), and will be available for review and comment by stakeholders.
3	07-06-10	ACE	PAD	Forest-related industries-how much income and investment is currently generated by forest-related industries including the non-consumptive values of the forest economy including: Direct use, human development, community benefits, scientific values, off-site benefits, ecosystem services, and passive uses and then assigning a dollar value to each.	See response to Comment 2.
4	07-06-10	ACE	PAD	Value of wild salmon watersheds-the PAD acknowledges (p61) that the Kenai River system is one of the most productive salmon rivers <i>in the world</i> . No mitigation is proposed as a result of the proposed projects because wild salmon are	A comprehensive protection, mitigation, and enhancement proposal will be presented in the final license application following completion of resources studies and consultation with resource agencies and stakeholders. In addition to resource effects analyses, a developmental analysis consistent with FERC regulations will be

<sup>1</sup> The full text of comments is included in this column, unless otherwise noted. Where the full text is not included, a reference for the full comment is included.

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				impossible to replace. Is 4.5 MW (actually the reality is much less) of power worth sacrificing the viability of one of the most productive salmon streams in the world? It would be helpful to see a completed cost/benefit analysis that examines what will be lost and gained if this project was to move forward.	included in the final license application to address the effects of recommended environmental measures on project generation and economics and the effects of construction, operation, and maintenance on project economics.
5	07-06-10	ACE	na	Additionally, we recommend a separate and stand-alone working group to analyze the socioeconomic impacts.	See response to Comment 2.
6	07-06-10	ACE	PAD	Economic Impacts-who benefits and who pays?	See response to Comments 2 and 4.
7	07-06-10	ACE	PAD	Community Identity, Subsistence and Environmental Justice	The scope of the currently proposed Cultural Resources Study includes evaluation of subsistence use in coordination with the terrestrial and aquatic resource study efforts.
8	07-06-10	ACE	PAD	National Interests-the Chugach is a federally-owned forest known for its recreational values and surrounds the project area. The Black Mountain Research Natural Area is in close proximity to the project area and there should be some research completed about if the development could have impacts to the area.	FERC's Scoping Document 2 identifies the geographic scope of analysis as sufficiently broad to address potential impacts on the Kenai lake-Black Mountain Research Natural Area. Consultation with the USFS will continue throughout development of the project proposal to ensure consistency with the Chugach National Forest Plan.
9	07-06-10	ACE	PAD	Potential Conflicts with Goals or Objectives of Other Agencies and Landowners	The PAD and FERC's Scoping Document 2 identified comprehensive plans and planning documents that will be considered in evaluating the project proposal.
10	07-06-10	ACE	PAD	Irreversible and Irretrievable Commitment of Resources	The FERC licensing and NEPA process is designed to fully consider economic and environmental resource issues associated with project development.
<b>Terrestrial Resources Draft Study Plan</b>					
11	07-02-10	USFS	p.3, and all document Figures	The vicinity and facilities map is not the same one displayed in the scoping document (SD1), other draft study plans or at the public meeting on June 2, 2010. All study plans should display the same, updated maps.	KHL filed with FERC a revised project description and facilities figure on August 13, 2010. This description was also considered in FERC's Scoping Document 2. An updated facilities description and figure is included in all study plans. <b>Pg. 3 Terrestrial Resources Study Plan</b>
12	07-02-10	USFS	Botanical Resources	The draft study plan for botanical resources was reviewed. We have no recommended changes at this time for sensitive and invasive plant survey or wetland mapping methodology.	KHL appreciates the USFS review of the proposed methodology.

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13	07-02-10	USFS	Botanical Resources	No mention is made of the timber resource. The timber resource (commercial or otherwise) needs to be quantified in the area influenced by the proposed lake level change. Vegetation clearing likely will need to occur around the lake perimeter and volume estimates will be required on National Forest System lands.	A timber resource inventory, which would evaluate timber resources in the area of potential inundation around Grant Lake, was added to the Terrestrial Resources Study Plan.  <a href="#">Pg. 15 Terrestrial Resources Study Plan</a>
14	07-02-10	USFS	Wildlife Resources (p. 16, PP2)	Change to note that the Management Indicator Species (MIS) and Species of Special Interest (SSI) may occur IN or NEAR the project area.	The Terrestrial Resources Study Plan was revised to reflect the recommended change.  <a href="#">Pg. 17 Terrestrial Resources Study Plan</a>
15	07-02-10	USFS	Wildlife Resources (p. 16, PP3)	What data supports the statement “the project vicinity provides only a small to moderate amount of wildlife habitat relative to other areas of the northern Kenai Peninsula?” If there are no data to support this statement, it should be removed.	The statement indicated was based on conclusions of authors of earlier studies (APA, 1984). The Terrestrial Resources Study Plan was revised to reflect the recommended deletion. Current habitat conditions will be discussed in the Terrestrial Resources Study Report and draft and final license applications.
16	07-02-10	USFS	Wildlife Resources (p. 17, PP1)	Trumpeter swan and bald eagle nest surveys are not conducted annually, only when budget permits.	The Terrestrial Resources Study Plan was revised to clarify nest survey frequency.  <a href="#">Pg. 18 Terrestrial Resources Study Plan</a>
17	07-02-10	USFS	Wildlife Resources (p. 17, PP1)	A goshawk nest is suspected to occur in the project vicinity, but no nests have been located. Change references for (Benoit 2009) to (Benoit 2010).	The Terrestrial Resources Study Plan was revised to reflect the recommended changes.  <a href="#">Pg. 18 Terrestrial Resources Study Plan</a>
18	07-02-10	USFS	Wildlife Resources (p. 17, PP6)	Check with the Alaska Department of Fish and Game (ADF&G) for data regarding moose counts for the Grant Lake area more specific than a general count for the whole GMU 7.	The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  <a href="#">Pg. 19 Terrestrial Resources Study Plan</a>
19	07-02-10	USFS	Wildlife Resources (p. 18, PP2)	Cite the data to support that brown bears are sparsely distributed and the number of bears the area could support. The APA 1984 data is too old to represent current conditions. Consider asking Sean Farley from ADF&G for more recent information on dens, telemetry data, and habitat.	As stated in the study plan, one purpose of the studies and consultation is to update information collected in the area in the early 1980’s. The Terrestrial Resources Study Report will provide updated information based on observations and on consultation with appropriate agency personnel.  <a href="#">Pg. 19 Terrestrial Resources Study Plan</a>
20	07-02-10	USFS	Wildlife Resources (p. 19, PP1)	An aerial survey is only sufficient to determine nesting habitat for bald eagles and trumpeter swans; it is insufficient to find northern goshawk nests. The Chugach Land and Resource Management Plan	The Terrestrial Resources Study Plan was revised to include goshawk nest surveys following USFS protocols. We appreciate the assistance of USFS personnel in planning the survey effort.

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				(LMP) guidelines for raptor nest protection, including northern goshawks, are on page 3-31. The current protocol for goshawk nest surveys is a ground based method, rather than aerial. Forest Service protocols require two surveys per year for two years. We are happy to assist in identifying areas that need to be surveyed.	<a href="#">Pg. 22 Terrestrial Resources Study Plan</a>
21	07-02-10	USFS	Wildlife Resources (p. 19, PP2)	Ospreys are unlikely to occur in the project area during the breeding season.	The Terrestrial Resources Study Plan was revised to include this clarification.  <a href="#">Pg. 21 Terrestrial Resources Study Plan</a>
22	07-02-10	USFS	Wildlife Resources (p. 20, PP1)	<p>Flying at less than 150' Above Ground Level (AGL) looking for nesting birds is extremely disturbing to nesting birds and other wildlife. Forest Service aerial surveys do not allow flights below 500' AGL.</p> <p>The investigative studies special use authorization held by Kenai Hydro, LLC does not authorize the use of aircraft to conduct wildlife or other surveys. If you wish to conduct aerial surveys, please work with the Forest Service to amend your permit. The following mitigation is standard in Forest Service permits that use aircraft and these should be incorporated in your study plan:</p> <ul style="list-style-type: none"> <li>• Helicopters will maintain a minimum of 1,500 ft. AGL distance from all observed wildlife.</li> <li>• Helicopter flights will be avoided within ¼ mile horizontal or 1,500 ft. AGL separation distance of active bald eagle nests. If it is unknown whether a nest is active, helicopter flights will avoid the nest by a ¼ mile horizontal or 1,500 ft. AGL distance.</li> <li>• Helicopters will not hover, circle, or harass any species of wildlife in any way.</li> <li>• Aircraft will adhere to No-Fly Zones as identified by the district wildlife biologist, who identifies mountain goat and Dall sheep concentration areas to be avoided by helicopter flight paths. Zones are based</li> </ul>	<p>The Terrestrial Resources Study Plan was revised to reflect comments regarding use of aircraft. Observation from boats of cliffs around Grant Lake was included in the survey plans for cliff nesting raptors. We appreciate the data on bald eagle nests supplied by the USFS in 2010.</p> <p><a href="#">Multiple modifications throughout the document including Appendix G</a></p>

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				<p>on a separation distance of 1,500 ft. from animal and habitat survey data.</p> <p>As stated previously, aerial surveys are not appropriate to locate northern goshawk nests. The Forest Service conducted bald eagle nest surveys in 2010 and has already provided the data to HDR, so further surveys are not needed. Trumpeter swan surveys have been conducted in the past and suitable nest habitat does not occur, so these surveys are not needed. To reduce disturbance to wildlife, we recommend scanning the project area from boats during shorebird surveys to determine the presence of cliff nesting raptors rather than using aircraft.</p>	
23	07-02-10	USFS	Wildlife Resources (p. 23, PP 4)	<p>The statement “There are no known concentrations of any water bird nesting or feeding areas near the Project (APA 1984; Benoit 2009)” should be re-worded to state that the Forest Service has not conducted surveys for water bird nesting or feeding areas at Grant Lake.</p> <p>Please remove the citation of Benoit 2009 from the statement “Although their current conservation status is unclear, they are listed in the Sea Duck Joint Venture Species Status Report and are of particular concern to resource agencies (Seaduck Joint Venture 2008; Benoit 2009)”. While they are a concern, Ms. Benoit did not state that they are of particular concern to the Forest Service. Also, Ms. Benoit did not state that “Common loons and yellow-billed loons have been observed on Grant Lake and nesting habitat for loons is present on Grant Lake (APA 1984; Benoit 2009).” They may be present, but Ms. Benoit does not recall seeing them and does not know if they have nesting habitat there.</p>	<p>The Terrestrial Resources Study Plan was revised to reflect the recommended changes.</p> <p><b>Pg. 26 Terrestrial Resources Study Plan</b></p>
24	07-02-10	USFS	Wildlife Resources (p. 26, PP2)	<p>Please change Kenai Peninsula to the Seward Ranger District in this statement “Open water habitat that supports waterbirds on the Kenai Peninsula is limited (Benoit 2009).”</p>	<p>The Terrestrial Resources Study Plan was revised to reflect the recommended change.</p> <p>See response to Comment 22 regarding aircraft.</p>

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				Again, the special use authorization for investigative studies currently does not authorize use of aircraft for surveys.	
25	07-02-10	USFS	Wildlife Resources (p. 26, PP4)	<p>Please contact ADF&amp;G and review more recent literature on brown bears to validate the statements listed in the following paragraph. The statements in boldface are not consistent with our knowledge of brown bear behavior.</p> <p><b>Bears.</b> Brown and black bears are found throughout the Project vicinity during the spring, summer, and fall. They may be found in a variety of habitat types, but <b>brown bears tend to prefer open habitats, particularly shrub and tundra communities at higher elevations</b>, while black bears tend to prefer forested habitats at lower elevations (APA 1984). <b>Forage resources and denning habitat as determined during 1982 surveys</b> are shown in Figure 6 (APA 1984). The distribution of both species of bears is affected strongly by food availability. Emerging grasses, forbs, and other herbaceous plants are critical foods in spring, whereas spawning salmon and berries are critical foods in late summer. Both species enter dens during October or November and remain there until <b>early to mid-May</b>, with maternal females entering dens before and emerging later than males (APA 1984).</p> <p>Brown bears are found in most habitat types and to our knowledge do not prefer shrub and tundra communities or high elevations in this area. Denning habitat information that is more current should be obtained from ADF&amp;G. Moose are also an important food source in the spring. Most brown bears emerge from their dens around mid-April.</p>	<p>The Terrestrial Resources Study Plan was revised to reflect the recommended change.</p> <p><b>Pg. 28 Terrestrial Resources Study Plan</b></p>
26	07-02-10	USFS	Wildlife Resources (p. 26, last PP)	If you plan to use the survey data the Forest Service collected on brown bear dens while doing bald eagle nest surveys on May 6, 2010, please note that a complete den survey was not conducted in the	The Terrestrial Resources Study Plan was revised to clarify the brown bear denning survey will include all areas potentially affected by the Project.

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				project area. The survey only included habitat along Grant Creek and the hills adjacent to Grant Lake. The Forest Service survey protocol does not allow flights below 500' AGL as stated in the study plan. Again, the current special use authorization for investigative studies does not authorize the use of aircraft for wildlife surveys (see above).	<a href="#">Pg. 29 Terrestrial Resources Study Plan</a>  See response to Comment 22 regarding aircraft.
27	07-02-10	USFS	Wildlife Resources (p. 27, PP3)	Please document how the moose range and travel corridors identified in Figure 7 were determined. They do not match the ranges identified by ADF&G.	The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  <a href="#">Pg. 29 Terrestrial Resources Study Plan</a>
28	07-02-10	USFS	Wildlife Resources (p. 32)	<i>Raptor Nest Surveys</i> - Please note that goshawk surveys should be conducted in mid and late June.	The Terrestrial Resources Study Plan was revised to reflect the recommended change.  <a href="#">Pg. 24 Terrestrial Resources Study Plan</a>
29	07-02-10	USFS	Wildlife Resources (p. 32)	<i>Terrestrial Mammal Surveys</i> - Please note that an additional bear den emergence aerial survey should be conducted in mid-May 2011 if you want a complete survey of the project area. In addition, bats have been reported to roost in the historic cabin on the west end of Grant Lake. If the project could affect water levels to the extent that this cabin might be affected, a bat survey of the cabin must be conducted.	See response to Comment 26 regarding bear denning surveys.  A bat survey of the historic cabin has been completed and will be reported on in the Terrestrial Resources Study Report.
30	07-06-10	USFWS	Goals and Objectives	Because of the wide-ranging movement of fish, birds, and wildlife (in general) throughout this ecosystem, Kenai Hydro must put the potential effects to birds and wildlife in a landscape/watershed context. Grant Lake is part of the larger Kenai River watershed and the proposed studies are too limited in scope.	The draft and final license applications will analyze study results and provide information commensurate with the scope of the project. The license application will include analysis adequate to inform a cumulative effects analysis in FERC's EA.
31	07-06-10	USFWS	Goals and Objectives	Before we can effectively evaluate the potential effects of the proposed project on our trust resources, we must have well-defined, statistically valid, measurable, achievable/realistic, specific and quantifiable objectives for each study component with a clearly specified level of precision and accuracy such that the objectives are statistically sound. (See USFWS comment letter p. 9 for full	The Terrestrial Resources Study Plan was revised to clarify goals and objectives.  <a href="#">Multiple modifications throughout the document</a>



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				detail of comment.)	
32	07-06-10	USFWS	Botanical Resources (p. 5)	On pg. 5, reference is made to invasive plant species being present on the Chugach National Forest and adjacent State, Borough, and private lands. Construction and maintenance of facilities may disperse invasive plants throughout the area. A detailed plan will be necessary to effectively address this issue, with specific protocols mandated for contractors and others working in and around the project area. Proper implementation of measures to avoid the spread of invasives will be critical throughout the life of the project.	A plan, which will be included in construction BMPs, will be developed as necessary based on potential Project effects and will be detailed in the draft and final license applications.
33	07-06-10	USFWS	Wetland Mapping	For wetland mapping, we recommend using other sources [than NWI maps], such as the Kenai Peninsula Land Cover Classification. (See USFWS comment letter p. 10 for full detail of comment.)	The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel and the best current mapping and information. <b>Pg. 15 Terrestrial Resources Study Plan</b>
34	07-06-10	USFWS	Wildlife Resources, Existing Information	Ground-truthing efforts to accurately map wetlands and other habitats in the watershed that may be affected by the proposed project will be necessary. We encourage Kenai Hydro to use Mike Graez's Wetland Mapping and Classification protocol. (See USFWS comment letter p. 10 for full detail of comment.)	Site-specific vegetation mapping and wetland delineations of the Project foot print was included in the Terrestrial Resources Study Plan.
35	07-06-10	USFWS	Wildlife Resources, Existing Information	Without the appropriate data to support the statement that "the Project vicinity provides only a small to moderate amount of habitat for wildlife resources relative to other areas of the northern Kenai Peninsula", we suggest you omit or revise such accordingly. (See USFWS comment letter p. 10 for full detail of comment.)	See response to Comment 15.
36	07-06-10	USFWS	Wildlife Resources, Existing Information	Again, on Pg. 16, reference is made to the eastern end of Grant Lake being preference habitat for snowshoe hare, lynx, beavers and moose, with the area likely also providing nesting habitat for some waterfowl and passerine species. However, there does not appear to be any mention of analyzing the potential effects to wildlife from displacement when the area [eastern end of Grant Lake] is inundated. Appropriate studies will be necessary to ascertain	The Terrestrial Resources Study Plan is designed to collect vegetation and wildlife data in potentially affected areas along the Grant Lake shoreline. If inundation will occur based on the final Project design proposal, potential effects of this inundation will be discussed in the Terrestrial Resources Study Report and presented in the draft and final license applications.

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				the potential effects to all of the terrestrial resources utilizing the habitat around Grant Lake, especially those areas that will be flooded as a result of project operation.	
37	07-06-10	USFWS	Wildlife Resources, Existing Information (p.16)	We believe mountain goat surveys are a necessity and that these surveys should be conducted to ascertain potential effects from the proposed project. (See USFWS comment letter p. 11 for full detail of comment.)	The Terrestrial Resources Study Plan was revised to include observation of mountain goats during other wildlife surveys on Grant Lake.  <a href="#">Pg. 36 Terrestrial Resources Study Plan</a>
38	07-06-10	USFWS	Wildlife Resources, Existing Information	On Pg. 17, the Draft TRSP again references outdated studies to infer that Dall sheep will not be studies since they mainly occur on the higher ridges and slopes beyond the areas potentially affected by the project. Yet, it states that as with goats, sheep sometimes move to lower altitudes. While they are generally high country animals, Dall sheet sometimes occur in rocky gorges below timberline. We encourage Kenai Hydro to contact ADF&G for further information about sheep in and around the study area.	The Draft Terrestrial Resources Study Plan and PAD provide information available through 2009. The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.
39	07-06-10	USFWS	Wildlife Resources, Existing Information (p. 17)	The assumption is made that snow depth and a corresponding lack of winter forage limit moose numbers in the project vicinity... We therefore recommend this and similar assumptions be omitted, and that an appropriate level of study be initiated to support the findings. We encourage you to contact the appropriate ADF&G staff to obtain moose data for this area. (See USFWS comment letter p. 12 for full detail of comment.)	The Draft Terrestrial Resources Study Plan and PAD provide information available through 2009. The Terrestrial Resources Study Plan has been revised to clarify that the information is the result of earlier studies of the Project area. The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  <a href="#">Pg. 19 Terrestrial Resources Study Plan</a>
40	07-06-10	USFWS	Wildlife Resources, Existing Information (p.18)	We reject claims [regarding sparse bear populations] and again recommend further, detailed analysis of brown and black bear movements and habitat in the project area to accurately assess the potential for impacts from the project. (See USFWS comment letter p. 12 for full detail of comment.)	See response to Comment 19.
41	07-06-10	USFWS	Wildlife Resources, Study Methods	[Low level flights] are not acceptable and we are hopeful that HDR utilized USFS aerial bald eagle nest data collected in May 2010. (See USFWS comment letter p. 12 for full detail of comment.)	See response to Comment 22.
42	07-06-	USFWS	Wildlife	Kenai Hydro must not only map eagle nests, but	The Terrestrial Resources Study Plan was revised to reflect an

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	10		Resources, Study Methods	because of the new eagle “take” regulations, should also determine locations of breeding and feeding territories within and adjacent to the project area if the project poses a potential impact to eagles, their nesting, and their young. (See USFWS comment letter p. 12 for full detail of comment.)	emphasis on observing breeding and feeding behaviors of bald eagles in and near the study area.  <b>Pg. 20 Terrestrial Resources Study Plan</b>
43	07-06-10	USFWS	Wildlife Resources, Study Methods	Regarding northern goshawks and other raptors, HDR should use the USFS protocol for surveying as appropriate.	See response to Comment 20.
44	07-06-10	USFWS	Wildlife Resources, Study Methods	Breeding landbirds and shorebirds - Nesting along the lakeshore that is to be inundated is an issue with respect to “take” of waterfowl, gulls, and other shorebirds under the MBTA, as “take” will not be authorized. Please explain how “take” will be avoided in the above scenario. Also, please indicate what aspects of the project will impact migratory birds – lake level fluctuations; clearing for roads, powerhouse and transmission lines, etc. Studies commensurate with potential direct and cumulative effects are needed.	The Terrestrial Resources Study Plan, and subsequent analysis of potential effects to be presented in the draft and final license application, will include analysis to address the scope identified by FERC in Scoping Document 2.
45	07-06-10	USFWS	Wildlife Resources, Study Methods	Provide supporting documentation to verify this assertion [that natural lake levels fluctuate 9 ft.], and conduct proper studies to address how far lake levels could rise and expand outward from the current lake edge, and the extent of impacts to breeding landbirds and shorebirds. (See USFWS comment letter p. 13 for full detail of comment.)	Field data will be collected to verify natural, seasonal lake level fluctuations. If inundation will occur based on the final Project design proposal, potential effects of this inundation will be discussed in the Terrestrial Resources Study Report and presented in the draft and final license applications.
46	07-06-10	USFWS	Wildlife Resources, Study Methods (p.22)	On Pg. 22, HDR indicates that Grant Creek is not included in the study area for landbirds because it is virtually impossible to detect signing songbirds along a loud creek corridor. Please explain, in detail, how songbird data will be assessed and quantified for this area, and how relative abundance and density will be determined.	The Terrestrial Resources Study Plan was revised to clarify methods used to collect and analyze wildlife data, consistent with the scope and scale of the Project.  <b>Pg. 25 Terrestrial Resources Study Report</b>
47	07-06-10	USFWS	Wildlife Resources, Study Methods	Please explain the rationale to support the association of various species of birds to particular habitats when discussing the type and level of surveys to be conducted.	The Terrestrial Resources Study Plan was revised to clarify methods used to collect and analyze wildlife data.  <b>Multiple modifications throughout the document</b>

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48	07-06-10	USFWS	Wildlife Resources, Study Method	Regarding potential effects to migratory birds, there is no mention of how the clearing of the road and transmission line corridors will affect nesting and roosting habitat. An assessment will be needed to determine the extent of direct, indirect, and cumulative effects on migratory birds and their habitat in conjunction with these proposed corridors. The added foot and motorized traffic that will result once roads and other right-of-ways are cleared must be considered in this analysis.	The draft and final license applications will analyze potential Project effects on migratory birds (including corridor clearing and changes in use) commensurate with the scale of the Project.
49	07-06-10	USFWS	Terrestrial Mammal Surveys	We recommend contacting Mr. Sean Farley (ADF&G) and Mr. Jeff Selinger for more recent data on habitat, movement corridors, den locations, etc, for both brown and black bears. (See USFWS comment letter p. 13 for full detail of comment.)	Thank you for the recommendation. The Terrestrial Resources Study Report will provide updated information based on consultation with appropriate agency personnel.  Multiple modifications throughout the document based on consultation with aforementioned individuals.
50	07-06-10	USFWS	Terrestrial Mammal Surveys	Opening up access in conjunction with the project could have serious implications to brown and black bears and other wildlife in the area. Den disturbance through site development as well as that resulting from recreational access via snow machine along with newly found hunting opportunities, is likely. (See USFWS comment letter p. 13 for full detail of comment.)	Potential impacts to wildlife from increased access related to the Project will be assessed in the draft and final license applications.
51	07-06-10	USFWS	Terrestrial Mammal Surveys	Anadromous runs are important food resources for brown and black bears. With the potential for fisheries impacts, more information will be needed to ascertain what effects such would have on the brown bear which inhabit the study area. (See USFWS comment letter p. 14 for full detail of comment.)	The Aquatic Resources Study will collect information on fisheries that will be used in the draft and final license applications to address the effects impacts to fisheries might have on other wildlife species.
52	07-06-10	USFWS	Terrestrial Mammal Surveys	Appropriate studies will be needed to ascertain what, if any effects, the proposed lake level increases will have on all terrestrial resource habitats around Grant Lake. In addition, appropriate mapping to show the acreage to be inundated and extent of potential habitat impacts will be required. (See USFWS comment letter p. 14 for full detail of comment.)	See response to Comment 36.
53	07-06-	ADFG	Study	We support the delineation of the zone of inundation	See response to Comment 36.

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	10		Methods	potential along the entire shore of Grant Lake and recommend quantifying the distribution of each riparian/terrestrial habitat type and the relative abundance of aquatic and riparian species utilizing each habitat. We are primarily concerned with habitats selected by waterbirds (waterfowl, shorebirds, loons, gulls and terns) for breeding and those selected by moose for browse, cover and thermoregulation. To evaluate the proposal of increasing lake levels, a quantitative summary of the relative abundance of these species by specific habitat types is needed along with the extent to which these habitats will be inundated. Waterbird surveys should also be conducted for Grant Creek by noting habitat associations with the meso habitats identified in the Aquatic Resources Study and with particular riparian habitat types being mapped in the Terrestrial Resources study.	
54	07-06-10	NPS		<p>NPS's comments on this draft study plan are directed at terrestrial resources associated with recreational use, including watchable and huntable wildlife.</p> <p>KHL's terrestrial resources study should include an evaluation of the potential for land clearing activities associated with construction of the project access road to have ongoing impacts on vegetation due to windthrow and erosion. The evaluation should identify areas along the proposed road, penstock, and transmission line rights-of-way that could be vulnerable to such unplanned or uncontrolled changes because of steep slopes, soil type, and other factors. The effects of any resulting unplanned or uncontrolled loss of forest cover on recreational experience, wildlife distribution and abundance, and water quality should be assessed.</p> <p>Does the proposed study area, which is bounded by the Seward Highway to the west, encompass the full range of habitat utilized by wildlife in the project area? E.g., do Moose, Bear, etc. utilize habitat on both sides of the highway? Where will wildlife</p>	<p>The draft and final license applications will analyze results of the Terrestrial Resources Study, the geotechnical survey, and engineering and design efforts to evaluate and describe potential effects of the project.</p> <p>The Terrestrial Resources Study Report will provide updated information on wildlife use of the general Project vicinity based on consultation with appropriate agency personnel.</p>

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				displaced from the immediate project area during construction likely seek refuge? The study area should include all such habitat. For Dall sheep and mountain goat, this may include areas outside the Grant Lake watershed.	
55	07-06-10	NPS		Do Moose currently utilize the frozen surface of Grant Lake for winter travel? If so, what impact would there be on winter movement between wetland habitat at the eastern end of the lake, and areas west of the mouth of the lake, if the lake were open, or had inadequate ice, for longer periods? Given the animal's popularity for hunting, why are no Moose surveys proposed?	The Terrestrial Resources Study Plan was revised to include a winter survey of moose presence and use of the Grant Lake area. <a href="#">Pg. 32 Terrestrial Resources Study Plan</a>
56	07-06-10	NPS		Why are no goat or sheep surveys proposed? Goats in particular are known to be highly susceptible to disturbance, including helicopter use. How will KHL and FERC be able to evaluate the impact of project construction and operation, including improved access, on goat and sheep populations in the absence of baseline data?	The Terrestrial Resources Study Plan was revised to include observations of mountain goats and Dall sheep. <a href="#">Pg. 32 Terrestrial Resources Study Plan</a>
57	07-06-10	NPS		How would fluctuating lake levels, potentially dewatering wetland habitat in the Inlet Delta and causing changes in vegetation, have on the distribution and abundance of huntable or viewable wildlife species?	See response to Comment 54.
58	07-06-10	NPS		The study plan should include a survey of American Dipper nest sites and foraging areas within Grant Creek. Dippers are known to build nests on creekside cliffs and to feed in fast-flowing streams like Grant Creek.	The Terrestrial Resources Study Plan was revised to include dipper surveys. <a href="#">Pg. 19 Terrestrial Resources Study Plan</a>
59	07-06-10	NPS		A single winter waterbird survey, via helicopter or snowshoe, is unlikely to yield meaningful data about the project area's utilization by such species. Multiple surveys throughout the open water season would be necessary to determine whether the project area provides important winter habitat for waterfowl, and to establish baseline conditions.	The Terrestrial Resources Study Plan was revised to increase the number of winter surveys of Grant Lake wildlife use. <a href="#">Pg. 28 Terrestrial Resources Study Plan</a>
60	07-09-10	USACOE		The proposed study plan discusses wetlands delineation and states that the information will be collected as required by the 1987 wetland	Thank you for the review of the methods.

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				delineation manual and the 2007 Alaska Regional Supplement. This is appropriate.	
61	07-09-10	USACOE		The study plan states that representative boundaries of wetlands will be identified and then wetland boundaries will be drawn using GIS. The method described is appropriate for scoping purposes, however, more detailed wetland delineations information may be necessary to complete the alternatives analysis. For the purposes of determining the amount of direct impacts resulting from the final design, the wetland boundaries must be determined by filed delineations and recorded using GPS.	Comment noted. KHL will continue consultation with the USACOE during development of the Project proposal to ensure the appropriate level of wetland information is available for the final environmental document.
62	07-09-10	USACOE		The Wetland Field Data Form referenced in the study plan and included in Attachment E is incomplete. The second page is missing.	The Terrestrial Resources Study Plan was revised to include the full attachment. <b>Appendix E Terrestrial Resources Study Plan</b>
63	07-09-10	USACOE		The draft study plan refers only to the identification of wetlands. Because we regulate the discharge of dredged or fill material into waters of the U.S., we must know the location and size of all waters that would be impacted by the proposed project. Waters of the U.S. include channels with an ordinary high water mark (streams) and open waters with a mean high water mark (ponds or lakes) in addition to wetlands. Each stream, open water, and wetland that may be impacted by a proposed alternative must be identified, described, and mapped.	The Water Resources Study Plan was revised to acknowledge this information.
64	07-09-10	USACOE		Direct impacts to waters of the U.S. must be identified and quantified for all portions of the project that would involve the placement of fill in waters of the U.S.; this includes any waters crossed by the proposed road and utility corridor, any waters flooded by the raised waters in Grant Lake or wetlands flooded by increased flows in Grant Creek, and any waters that would be filled during the construction of the powerhouse, dam or other structure.	The assessment of Project impacts in the license application will include an assessment of potential effects to all waters of the U.S.
65	07-09-10	USACOE		Secondary impacts to waters of the U.S. must be identified and assessed for each water of the U.S.	The assessment of Project impacts in the license application will include an assessment of potential effects to all waters of the U.S.

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				(See USACOE comment letter p. 2 for full detail of comment.)	
66	07-09-10	USACOE		Cumulative impacts to waters of the U.S. must also be identified and assessed. Cumulative impacts are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. The geographic extent may be different for each cumulative impact.	The draft and final license applications will analyze study results and provide information commensurate with the scope of the project. The license application will include analysis adequate to inform a cumulative effects analysis in FERC's environmental document.
67	07-09-10	USACOE		If compensatory mitigation is required, it will be necessary to complete a functional or condition assessment for each water of the U.S. that would be impacted by the proposed project. There are a variety of metrics or methods available. We recommend that you contact us to discuss your selected method, prior to its implementation, to ensure that it is appropriate.	KHL will consult with the USACOE as potential mitigation measures are developed commensurate with the scope of the Project and its effects.
68	07-09-10	USACOE		As we mentioned at the meeting, the Alaska District has written Regulatory Guidance Letter (RGL) 09-02, which provides guidance regarding the evaluation of compensatory mitigation plans to the Regulatory Project Management and the public. We have attached a copy of the RGL to our letter.	KHL thanks the ASACOE for the information.
69	07-06-10	ACE	p.22	In the Terrestrial Resources study plan, it states on p 22 that surveys will be done in June 2010 for landbirds along the road corridor, yet there is no firm plan regarding the placement of the road. Four species of landbirds are listed on the State of Alaska list of Species of Special Concern that likely live in the project area.	The project study schedule has been revised to allow for consultation with agencies regarding a revised Project facilities proposal. The species list for landbirds was reviewed to include State of Alaska Species of Special Concern.
70	07-06-10	ACE		The clearing of the road corridor and possibly a transmission line corridor, will impact the vegetation beyond the edges of the road. Trees along the corridor will have a greater risk of blow down, and invasive plants will have better access into the area. With this area already facing huge swaths of die off due to the spruce bark beetle, an assessment should be made of the standing forest and how taking additional trees will impact the forests recovery.	Results of the Terrestrial Resources Study will be analyzed in the draft and final license applications to evaluate and describe potential effects of the project. A plan to prevent the spread of invasive plants will be developed for Project construction and operation as necessary and commensurate with the Project scope.



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71	07-06-10	ACE	p.15	The plan states that the primary objective of wildlife surveys is to provide existing baseline distribution and abundance information on target species. The plan then refers to studies done in the early 80's. Much has changed in thirty years, and these references should be considered with that in mind. Dramatic changes to forest stocking levels and to understory vegetation and forest structure have changed dramatically over the last 20 years due to extremely high levels of spruce (Sitka, Lutz and White spruce) mortality resulting from a spruce bark beetle epidemic.	Comment noted. The Terrestrial Resources Study Report will provide updated information based on current studies and on consultation with appropriate agency personnel.
72	07-06-10	ACE	p 16	The plan states that no federally listed wildlife species occur in the project vicinity. While this may be true, if FERC considers the geographic scope to be the Kenai River basin (and we fully support this decision), then this statement is not true as the Cook Inlet beluga whale, which is listed as an endangered species, has been documented to occur in the project area. Impacts to their food source will need to be considered.	Scoping Document 2 has defined the geographic scope for cumulative effects as the Kenai River basin and concluded that "extending the geographic scope to include open ocean habitat utilized by beluga whales is not appropriate."
73	07-06-10	ACE		Interesting to note that even though moose have been identified as a management indicator species, that the project proponent has decided not to perform specific surveys. According to local residents, moose are seen quite often in the area, (hence the name Moose Pass), and use the browse on the east end of Grant Lake during winter time (which would be flooded if the dam is built). Again the study plan refers to a one year study performed 30 years ago. Critical moose winter range (willow flats) located on the east end of Grant Lake comprises one of only a very few good winter browse areas in a forested landscape largely devoid of good moose winter habitat.	See response to Comment 55.
74	07-06-10	ACE	p 16	The study admits that the inlet delta at the eastern end of Grant Lake is preferred habitat for snowshoe hares, lynx, beavers and <i>moose</i> . There is no indication that the proponents plan to study the effects of displacing these populations by flooding the area.	The Terrestrial Resources Study area includes the area of potential inundation.  See response to Comment 55.

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75	07-06-10	ACE	p.18	[Study plan] states that no more than one or two families of Kenai brown bear would den in the proposed area. Because the Kenai Brown bear is listed as a Species of Special Concern, we believe that the geographic scope of this study should extend beyond the boundaries of Grant Lake. If animals are going to be displaced by the development of the project the study area should be expanded.	Comment noted. Results of studies and agency consultation will be analyzed in the draft and final license applications to evaluate impacts to brown bears.
76	07-06-10	ACE	p.22	We wonder why only the outlet delta area of Grant Lake is included in the study for breeding landbirds.	Breeding habitat in other areas of the shoreline of Grant Lake is limited due to topography and vegetation type. However, incidental observations of all wildlife will be recorded during surveys of the shoreline for breeding waterbirds.
77	07-06-10	ACE	p.23	The draft study plan optimistically states that the intent of the bird surveys is to sample enough points to “ensure that all breeding landbirds in the area are documented”. Though this is a laudable goal, we feel it is a misleading and inaccurate statement that should be amended to reflect the realities of field work.	The Terrestrial Resources Study Plan was revised to clarify the data that will be collected, commensurate with the scope of the Project.  <b>Pg. 24 Terrestrial Resources Study Plan</b>
78	07-06-10	ACE	p. 23	The study states that there are no know[n] concentrations of any waterbird nesting or feeding in the project area, yet many have testified that they had seen trumpeter swans during the winter at the outlet of Grant Lake which provides a relatively rare, ice-free zone. We are glad that the proponents plan to visit the site in the wintertime to see if they can document this, however, we are skeptical if the use of a helicopter is an effective way to do wildlife studies and encourage a less intrusive method.	Comment noted. See response to Comment 22.
79	07-06-10	ACE	PAD	Identify denning and foraging habitat for the Kenai Brown Bear in and adjacent to the project area. Recognize that this is a species of special concern and that reducing the number of fish available is going to impact the species. More access to the area will open it up for more disturbances and the possibility of out-migration of bears to other areas of higher densities of both people and bear which always lead to a higher mortality rate for the bears. The number of kills in defense of life and property always goes up along roadsides, so we can easily	The Terrestrial Resources Study Plan was designed to collect data regarding Kenai brown bear in the Project area. Potential effects of the Project on the brown bear will be evaluated in the draft and final license applications.

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				predict that bears will be impacted. The natural and existing wildlife travel corridors need to be identified, and every effort made to avoid contributing to the decline of this species. There needs to be a scientific study to determine more about this species, and not rely on anecdotal evidence or information 50 years out of date.	
80	07-06-10	ACE	PAD	Grant Lake shoreline, outlet and the head of Grant Lake are all significant habitat for birds and further studies need to be done to identify specific species and numbers of birds who are using the lake to feed and nest.	See Terrestrial Resources Study Plan.
<b>Recreation and Visual Resources Draft Study Plan</b>					
81	07-02-10	USFS		<p>There are numerous references to the “proposed Iditarod Trail” throughout the document. The Iditarod National Historic Trail (INHT) is more than proposed. It was designated by Act of Congress in 1968 as part of the National Trails System. It is managed under the guidance the 1986 Comprehensive Management Plan for The Iditarod National Historic Trail: Seward to Nome Route, with the Secretary of the Interior designated as the federal Trail Administrator.</p> <p>The Forest Service is constructing and reconstructing the INHT through the Chugach NF to provide recreation opportunities, including within this project area (on easements across State lands). Depending on location, the INHT is “existing,” “under construction,” or “planned for construction.”</p>	<p>The Recreation and Visual Resources Study Plan was revised to consider the current and future status of the INHT within the study area.</p> <p><b>Multiple modifications throughout the document.</b></p>
82	07-02-10	USFS	p. 2	Under Goals and Objectives, the first bullet should also include the Iditarod National Historic Trail (INHT) in the list.	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><b>Pg. 4 Recreation and Visual Resources Study Plan</b></p>
83	07-02-10	USFS	p. 2	Under Goals and Objectives the fourth bullet, last line should read "from existing and planned recreational trails and use areas."	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><b>Pg. 4 Recreation and Visual Resources Study Plan</b></p>
84	07-02-10	USFS	p. 2	Under Goals and Objectives the seventh bullet, last line should read "...changed access to, and character	The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.

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				of, remote area...."	<a href="#">Pg. 4 Recreation and Visual Resources Study Plan</a>
85	07-02-10	USFS	p. 3, PP 1	<p>The statement that there is "no developed trailhead and minimal signing" should also state that a primary INHT trailhead is currently planned for construction near the outlet of Lower Trail Lake.</p> <p>The same paragraph describes uses as "light," "very light," and "some." These qualifiers are not based on data. The study plan should include a determination of the amount of use the area receives throughout the year. It appears that field studies are to be conducted only during July and August. This will not provide an accurate assessment of use patterns and numbers. Winter recreation use should be quantified. The possible effects to recreation users by fluctuating water levels and lake ice changes should also be studied.</p>	<p>See response to Comment 81.</p> <p>Comment noted. A winter site visit was added to the Recreation and Visual Resources Study Plan. Information gathered on winter recreation use of the area will be evaluated in the draft and final license applications.</p>
86	07-02-10	USFS	p. 3, PP2	The Forest Service will be constructing the INHT from Ptarmigan Creek to Vagt Lake in 2010 and 2011. The INHT alignment will be cleared of brush and logs from Vagt Lake north to Trail Creek in 2010. This construction project includes upgrades to the existing Vagt Lake Trail to its start near the mouth of Trail Lake. (The Vagt Lake Trail is part of the INHT.)	Comment noted. KHL looks forward to continued coordination with the Forest Service and ADNR regarding the INHT.
87	07-02-10	USFS	p.4, PP1	It should be noted that access to Grant Lake will be available via the planned INHT.	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><a href="#">Pg. 5 Recreation and Visual Resources Study Plan</a></p>
88	07-02-10	USFS	p. 4	In the section titled "Need for Additional Information," in the first bullet, sightseeing should be added to the list of activities.	<p>The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.</p> <p><a href="#">Pg. 6 Recreation and Visual Resources Study Plan</a></p>
89	07-02-10	USFS	p. 4	In the section titled "Need for Additional Information," it should be stated that there is a need to assess the effects on the user experience of those traveling the planned INHT.	<p>Comment noted. KHL looks forward to continued coordination with the Forest Service and ADNR regarding the INHT.</p> <p><a href="#">Pg. 6 Recreation and Visual Resources Study Plan</a></p>
90	07-02-10	USFS	p. 6	In the section titled "Field Study Design" in the first bullet, it should read "existing and planned trails and	The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.

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				access points" and "potential effects of fluctuating lake level or creek flow and project construction and operation."	<a href="#">Pg. 6 Recreation and Visual Resources Study Plan</a>
91	07-02-10	USFS	p. 6	In the section titled "Field Study Design" in the third bullet, it should read "walking on existing and planned trails, and other travel ways such as the frozen lake surface."	The Recreation and Visual Resources Study Plan was revised to reflect the recommended change.  <a href="#">Pg. 7 Recreation and Visual Resources Study Plan</a>
92	07-02-10	USFS	p. 6	The visual assessment should also include views from the air due to the occurrence of private and commercial scenic flights in the area.	The Recreation and Visual Resources Study Plan was revised to include aerial views.  <a href="#">Multiple modifications throughout the document.</a>
93	07-02-10	USFS	p. 7	The section titled "Study Component #2" in the second paragraph states that visual simulation from up to four viewpoints will be provided. This number seems inadequate due to the size of the area and the variety of use areas and recreation activities identified. The number of viewpoints should be identified during the field study of recreation use of the area. Examples of viewpoints should also include those found in the eastern portion of the study area, and should include both winter and summer seasons.	The number of visual simulations is based on the extent of Project facilities, the scope and scale of the Project, and the potential views of the facilities from areas most likely frequented by potential viewers (e.g. Moose Pass, the Seward Highway, and the planned alignment of the INHT). Study Component #2 has been revised to include aerial views.  <a href="#">Pg. 8 Recreation and Visual Resources Study Plan</a>
94	07-06-10	NPS		As a general comment, both of these study plans [Recreation and Visual Resources and Terrestrial Resources] would benefit from clarification of the geographic boundary of the proposed study area(s). While KHL is still refining the design and location of project facilities such as roads and transmission lines, it is nonetheless possible to outline study areas for known project features. For example, project operations would result in fluctuating elevations in Grant Lake, causing impacts to the entire shoreline of the lake, including the eastern end of the lake. Therefore all plans, including the terrestrial resources study plan, should include surveys of existing conditions in this area. Likewise, the visual resources study plan should include the viewshed that could be affected by the project; generally, the area bounded by the height of land surrounding Grant Lake, to include locations south, west, and north of Moose Pass wherever new structures, roads,	The Terrestrial Resources Study Plan and the Recreation and Visual Resources Study Plan are designed to collect data regarding the potentially affected resources. Potential effects of the Project will be presented in the draft and final license applications.

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				powerlines, or the altered lake shoreline would be visible. The vicinity map provided in the draft plans lacks such details.	
95	07-06-10	NPS	p.9	<p>The schedule provided on p. 9 of the RVRDSP for completion of the study reports is wholly unreasonable. To NPS's knowledge, the Human Environment Work Group has not yet formed. KHL's deadline for written comments on the RVRDSP is today, 7/6/2010, and it will likely take the applicant and its consultants several days to analyze the comments. KHL's study designs are still quite vague, amounting to little more than a literature search with limited field reconnaissance. It is not clear if or how recreational users will be counted or interviewed, or how these subjects – including visitors from outside the area, and participants in fall, winter, or spring activities – will be chosen. Yet KHL proposes to have its study reports completed by November, just four months away. NPS does not believe this approach will provide the necessary level of detail or scientific rigor to allow FERC to make an informed decision about the likely impact of the proposed original project license on public interests, including recreational and aesthetic resources.</p> <p>For all known and potential recreational resources in the project area, including those identified below, KHL should develop specific study plans. Such plans should include sample locations, methods, timing, frequency, data analysis, and review process. NPS encourages KHL to form a "Human Environment" technical working group as soon as possible to help guide this effort, and would be an active participant. Based on the vague description of this group's formation, role and function on p.6 of the RVRDSP, it is not clear whether the work group has already been established, nor whether KHL intends to involve the group in helping develop sound recreational use study design.</p>	<p>The schedule for consultation and development of the study report has been revised. KHL will consult with agencies regarding the most efficient means of consultation during ongoing study work.</p> <p><b>Pg. 10 Recreation and Visual Resources Study Plan</b></p>
96	07-06-	NPS		Where available, KHL should use the land	The Recreation and Visual Resources Study Plan was developed

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	10			managing agencies' goals for recreational experience in the area to help inform study objectives. If such goals have not been established, KHL needs to evaluate existing <b>recreational opportunities</b> – not just recreational use <i>per se</i> -- and then determine, through use of ROS or similar methodology, what affect the project would have on the recreational setting. Interviews with recreational users should also be conducted in advance of developing use-specific study plans to help determine what specific experiences these users are seeking.	commensurate with the scope and scale of the Project.
97	07-06-10	NPS		The type and amount of recreational use in Alaska is highly dependent on ease of access. Easier access does not, however, make for “better” recreation. It merely alters the kind of use an area receives, and, in many cases, the kind of user attracted to the area. If the Grant Lake project is built, existing users may be displaced because the project area no longer meets their needs and preferences. When interviewing current and potential recreationists, KHL should include questions about whether the users would continue to visit the area once the access road and powerline were built, and if Grant Lake no longer supported activities like skating or skiing due to lake level fluctuations. Where would these users go instead and what impact would this displacement have on other areas?	Comment noted. KHL appreciates the recommendations for study considerations.
98	07-06-10	NPS		Likewise, depending on KHL's proposed access policies (which should be described in the study report), new users may be attracted to the area for fishing, car-top boating, hunting, ATVing, and snow-machining. How will KHL accommodate these users? Would parking, including space for trailers, be needed?	Kenai Hydro will rely upon the relevant land management agency direction to determine recreational access to the area, and will work with agencies to develop proposed access management policies, as appropriate, for the license application.
99	07-06-10	NPS		Will any parts of the proposed project be off-limits to recreationists due to security or safety considerations? If so, how will this affect recreational opportunities and experiences? What method does KHL intend to use to implement any access limits?	The final license application and facilities proposal will describe access consistent with appropriate land management agency objectives, and any potential safety issues that are identified with the facilities proposal.

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100	07-06-10	NPS		The timing and duration of each study should be based on relevant factors. In some cases, a single season or year of data collection may not be adequate to determine existing levels of recreational use due to variability in snow cover, ice formation, salmon returns, tourism levels, barriers to access such as avalanches or major road and bridge work on the Seward Highway, etc. KHL's study plans and schedules should take this reality into consideration.	Comment noted. Relevant conditions that occur during the study will be discussed in the Recreation and Visual Resources Study Report and as part of the analysis in the draft and final license applications.
101	07-06-10	NPS		<p>NPS is aware of the following recreational resources in the project area; however, additional types of use, including potential new uses over the term of any FERC license, doubtless exist:</p> <ul style="list-style-type: none"> <li>• Hiking, including backpacking</li> <li>• Camping</li> <li>• Day use</li> <li>• Nordic Skiing</li> <li>• Backcountry (metal-edge) Skiing</li> <li>• Skating</li> <li>• Mushing</li> <li>• Snow machining</li> <li>• ATVing</li> <li>• Hunting (Moose, goat, sheep, etc.)</li> <li>• Fishing (both for resident species and for salmon)</li> <li>• Berrying</li> <li>• Bird-watching</li> <li>• Wildlife-viewing</li> <li>• Boating</li> <li>• Sight-seeing</li> </ul>	Thank you for the comment.
102	07-06-10	NPS		<p>Project facilities will affect the Iditarod National Historic Trail. Studies to assess these impacts are needed. What recreational experiences do existing and future users of this important trail resources seek? What types of recreation occur, or are likely to occur over the next 50+ years, along the trail? How would the project's facilities (road, powerline, power house, fences, gates, and security lighting) and operations (access across the INHT) affect</p>	See response to Comment 81.



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				users' experience along this historic route?	
103	07-06-10	NPS		The project may also affect conceptual plans for the area as developed by the KPB Trails Commission, the State of Alaska, and the U.S. Forest Service. KHL should evaluate the impact of the project on these plans, which include development of local and regional trails, including a hut-to-hut route.	Consistency with existing plans will be addressed in the final license application.
104	07-06-10	NPS		NPS suggests that the visual resources section of the overall study plan be expanded to include other aesthetic impacts, such as potential changes in the natural soundscape resulting from project construction and operation. For example, there will be noise from motorized vehicles used to access project construction and operation sites, and the altered flow regime downstream of the Grant Lake weir may affect the natural sounds of the creek. The magnitude and duration of such project-related noise and changes in natural sounds should be estimated and evaluated.	Estimation and evaluation of the effects of Project construction and operation on area noise and natural sounds will be included in the draft and final license applications.
105	07-06-10	NPS		As mentioned above, the recreational resources studies need to have clear geographical boundaries. Key observation points for recreational users should help inform the geographical scope of the aesthetics study. Flight-seers should be included as recreational users. The visual effect of the "bathtub ring" around Grant Lake should be included in the impact analysis, as should any likely changes in the extent or duration of ice formation on the lake.	See response to Comments 92 and 94.
106	07-06-10	NPS		How will KHL determine which four viewpoints should be used in developing visual simulations of the project? Why four? Does KHL have criteria with which to rank the relative importance of project viewpoints? What methods (e.g. an online visual preference rating survey, focus group, interviews with existing project area users, evaluations by potential visitors) will KHL use to assess the impact of the simulated project? How will KHL capture the opinions of tourists?	The Recreation and Visual Resources Study Plan was revised to clarify the methods.  Multiple modifications throughout the document.
107	07-06-10	NPS		The effect of any security lighting associated with the project on night skies should also be evaluated.	The license application will state whether any lighting is necessary with the final facilities proposal, and will consider the potential

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					effects of lighting, if any is proposed.
108	07-06-10	NPS		The project, if licensed, will affect recreation and visual resources for 30-50 years. How does KHL intend to estimate future recreational demand in the area? What methods will KHL use to assess the cumulative impact of this project and other developments on the affected area's visual and recreational resources?	The Recreation and Visual Resources Study Report and draft and final license applications will present information on recreation trends in the Project area. FERC has identified recreation resources as an area that will be included in the cumulative effects assessment in the Project EA.
109	07-06-10	NPS		Are new facilities (e.g. boat launches, parking areas, or improved trails) needed or desirable to accommodate changing recreational use in the area?	The need for new facilities will be evaluated in consultation with agencies and stakeholders based on the study results and assessment of Project effects in the draft and final license applications.
110	07-06-10	ACE	p.4	The road is of particular interest to many local residents as they know from experience the impacts roads can have on an area. On p 4 of the draft plan, are four identified areas that need further study. We would also like to see an analysis of potential impacts that could result from increased access into the area and adjacent backcountry.	See response to Comment 98, regarding agency coordination to formulate a management plan for public use of the Project access road. The impacts to resources from construction and use of the Project access road will be analyzed in the draft and final license applications.
111	07-06-10	ACE		Many of the local residents are concerned about whether the lake will be safe to ski on in the winter months as the level of the water is drawn down over the course of the winter.	Impacts to winter recreational use of Grant Lake will be discussed in the Recreation and Visual Resources Study Report and analyzed in the draft and final license applications.
112	07-06-10	ACE		Mentioned in the draft study plans is a plan to organize a Human Environment Working Group, and we encourage the proponents to follow through with their schedule as proposed.	Comment noted. KHL will consult with agencies regarding the most efficient means of consultation during ongoing study work.
113	07-06-10	ACE	PAD	Recreation-one of the region's top sectors of employment and economic development this topic needs to be evaluated in more depth by a qualified consultant who has an understanding of the intrinsic and off-site benefits of recreation. The PAD claims (p108) no adverse impacts have been identified on recreation resources, illustrating that this is an area that needs further study.	Comment noted. The Recreation and Visual Resources Study will be collecting data on recreation use in the Project area. The Recreation and Visual Resources Study Report and the draft and final license applications will evaluate Project related impacts to recreation resources.
114	07-06-10	ACE	PAD	Motorized vs. non-motorized – what happens to the value of recreational lands when access by motorized vehicles is introduced? What additional maintenance and enforcement will be needed with the introduction of new roads? What precautions will be taken to minimize poaching, litter, fire,	Access management needs will be evaluated in consultation with agencies and stakeholders based on the resource goals of the land management agencies.

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				illegal camping, invasive species, erosion? Current levels of law-enforcement by the Forest Service is insufficient to prevent degradation of wetlands, forested areas, and even alpine habitats (sheep and mountain goat habitat in the Falls Creek drainage, as one example) on the Chugach National Forest due to unauthorized ATV use.	
115	07-06-10	ACE	PAD	Carrying capacity-how many more people, and what type of uses will occur in the area if access is improved?	Access management needs will be evaluated in consultation with agencies and stakeholders based on the resource goals of the land management agencies.
116	07-06-10	ACE	PAD	Tourism- what do people who visit the area do now? What draws them here? How might this change with increased development in the area? The PAD implies that activities such as scuba diving occur in the area. Obviously the information needs some refinement and updating.	See response to Comment 113.
117	07-06-10	ACE	PAD	Community Quality of Life Values-what do people most appreciate about living/working/playing in the area?	See response to Comment 113.
<b>Cultural Resources Draft Study Plan</b>					
118	07-02-10	USFS		The methodology and consultation process for cultural resources defined in the draft study plan is acceptable. However, the figure displayed on page 11 should reflect the current, updated map. The Area of Potential Effect (APE) needs to be adjusted to accurately encompass the proposed project facilities and access roads. The cultural resources and surveys listed in the tables on Pages 4 and 5 may also need to be modified.	Comment noted. The Cultural Resources Study Plan will be revised to include updated information and maps of Project facilities. The APE will be adjusted as necessary.
119	07-01-10	RBCA	p.7	RBCA believes the APE as proposed is too narrowly defined...  We believe that the vertical measurement is appropriate but the horizontal measurement should be increased to 100 feet. Additionally, all structures, turnarounds, transmission corridors, pipelines corridors, dam sites, surge tank, power plant, staging areas, fill areas, pullouts, appurtenant facilities and road alignments should be specified and located. All known site areas including current and formerly	Consultation for Section 106, including the appropriate extent of the APE will continue. Recommendations of the consulting parties will be incorporated into a revised APE. The schedule for consultation and completing the resource studies was revised.

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				used trails should be included in the APE and the 100 foot measurement extended beyond those site area boundaries. The APE should include all the small alluvial fans that drain into Grant Lake. These areas may have offered usable space to earlier inhabitants.	
120	07-01-10	RBCA		KHL has not committed to a road corridor nor transmission line type (which would affect corridor width). Three route alignments have been proposed. Defining an APE without a KHL commitment to infrastructure locations creates inefficiency and introduces the possibility of error. Until an APE is defined, KHL should consider surveying a larger study area that would include the area north of Falls Creek to Grant Creek.	KHL filed with FERC a revised project description and facilities figure on August 13, 2010. This description was also considered in FERC's Scoping Document 2. KHL will continue consultation with appropriate agencies regarding the road alignment and facilities location. An updated facilities description and figure will be included in all study plans.
121	07-01-10	RBCA		The reported (Ebasco study page 4-8) trail between site SEW-285 (Solars Sawmill) should be relocated and surveyed.	Potential Project mitigation activities will be assessed relative to the final proposed Project presented in the draft and final license application.
122	07-01-10	RBCA	Methodology	Typically, all artifacts uncovered in shovel tests or test units are collected and curated. We think that should occur with this study as well.	Comment noted. Study methods will comply with current standards and practice. The Cultural Resources Study Plan will be revised to clarify methodology.
123	07-01-10	RBCA	Methodology	Because the vegetation along the shoreline is dense and choked with beetle-killed fallen spruce, walking is difficult but not impossible. We think than in addition to a pedestrian reconnaissance of the shoreline within the APE, the entire shore should be surveyed by boat.	See response to Comment 122.
124	07-01-10	RBCA	Methodology	Should construction of the Grant Lake dam occur and the lake level reduced, KHL should inventory newly exposed shoreline for cultural artifacts and features, especially, but not limited to, near known historic sites. Water bodies provide an attractive place to dispose of trash historically and currently.	See response to Comment 122. The Historic Properties Management Plan required for the Project will provide guidance for handling exposure of cultural artifacts during Project construction and operation.
125	07-01-10	RBCA		We'd like to reiterate comments made by Judy Bittner, Alaska State Historic Preservation Officer at the HDR-sponsored cultural meeting in Anchorage on June 24, 2010. She emphasized that the Iditarod National Historic Trail is of <i>national</i> importance, not just important locally or regionally. She also mentioned the need to consider the Iditarod trail in	Comment noted.

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				the context of a recreational resource and as a cultural resource.	
126	07-01-10	RBCA		Do not rely on existing cultural resource inventories. The USFS studies focused on selected areas in conjunction with proposed prescribed burning. The EBASCO study didn't address the shoreline of Grant Lake. Plus in the 26 years since the EBASCO study was conducted, sites have deteriorated. For example, the cabin standing at SEL-285 in 1984 has collapsed.	Comment noted.
127	07-01-10	RBCA		Because the rising lake levels will have an adverse effect on cultural resources, KHL should begin planning immediately on how to address the impact.	If inundation will occur based on the final Project proposal, potential effects of this inundation, and any proposed mitigation, will be presented in the draft and final license applications.
128	07-01-10	RBCA		<p><b>Excavation</b> RBCA suggests KHL assess the threat to the stability of the log cabin at SEL-659 by higher water levels and if necessary develop a mitigation program.</p> <p>Intact subsurface deposits exist within the 10 foot level at SEL-659. Because the site area is large (approximately an acre) and located at the shoreline, it is reasonable to expect that this deposit is extensive horizontally, potentially as much as 200 feet. Intact subsurface deposits exist at SEL-285 though they appear to be much less extensive than at SEL-659. KHL should be aware of the cost and complexity of site excavation in its study plans and budgeting for the proposals. We suggest planning on a 100% excavation (see RBCA comments on the KHL Pre-Application Document) of the portions of the site directly impacted by rising water levels (Grant Lake elevation plus 10 feet vertical).</p> <p>Increased access to Grant Lake and other known and not yet discovered sites within the APE will subject them to the threat of vandalism. KHL should assess the threat of vandalism and develop a plan for mitigation.</p>	If inundation will occur based on the final Project proposal, potential effects of this inundation, and any proposed mitigation, will be presented in the draft and final license applications.
129	07-01-	RBCA	Table 2, page	Solars Sawmill is misidentified as SEW-00258. It's	Comment noted. The Cultural Resources Study Plan was revised as

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	10		5	actually SEW-00285. The site has not been determined not eligible as indicated.	necessary.
130	07-01-10	RBCA	Page 5	We noticed that SEW-155 (Brosius cabin) was not included in the tables.	Comment noted. The Cultural Resources Study Plan was revised as necessary.
131	07-01-10	RBCA		Other sites nears Falls Creek should be included in the study plan.	Comment noted.
132	07-01-10	RBCA	Page 5	The Carter Lake trail is misidentified as being within one mile of the proposed APE.	Comment noted. The Cultural Resources Study Plan was revised as necessary.  <b>Pg. 6 Cultural Resources Study Plan</b>
<b>Water Resources Draft Study Plan</b>					
133	7-9-10	USACOE	Erosion Study Component	This study plan indicates that an erosion study will be done on the shores of Grant Lake to determine how raising the elevation of the water would affect shore erosion and we support this analysis. However, no mention is made of studying the effects of the dam and altered flow on aspects of Grant Creek other than the potential effect to fishes. In order to fully address the effect of the potential fill, we must also know the anticipated effects of the project on Grant Creek. How would the change in current patterns and water circulation alter or erode the physical substrate, not just the suitable spawning habitat, of Grant Creek? In addition, how would the proposed project affect sediment transport and deposition in both the lake and the stream?	Comment noted. The qualitative erosion study initially proposed for Grant Creek will be replaced with a program that includes quantitative sediment sampling and modeling of sediment availability and transport. The license application will analyze potential effects on both Grant Creek and Grant Lake substrate commensurate with the scope of the Project.
134	07-02-10	USFS	p.3	A reference identified in the Aquatic Resources Draft Study Plan (Source: Grant Lake Morphology in Marcuson, P. 1989. Coho Salmon Fry Stocking in Grant Lake, Alaska, USDA Forest Service, Seward Ranger District, Chugach National Forest, February 1989) states: “An upper basin of Grant Lake has a maximum depth of 80 feet and a lower, outlet end exceeding 90 feet in depth. The two basins are separated by a narrow isthmus with an island and less than 10 feet of depth.” Lake depths in the area in question should be evaluated and this statement verified. If true, there	The maximum drawdown of the lake as currently designed will be to an elevation of 687 feet, whereas the elevation of the isthmus between the basins is at elevation 685 per the existing bathymetry. Consequently, there should be no disproportionate drawdown.  These depths will be confirmed during pre-licensing field work, and any potential effects will be discussed in the final license application.

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				could be a disproportionate drawdown of the lower basin and there may be a need to dredge between, or otherwise connect, deeper regions of the upper and lower portions of Grant Lake.	
135	07-02-10	USFS	Figure 1	Please note that the draft study plan should display the updated project map.	Comment noted.
136	07-06-10	USFWS		USFWS recommends developing SMART objectives with statistical criteria, sampling design, and methods that will provide quantitative estimates for the impact of Project construction and operation on water quality, hydrology, and ice conditions of Lower Trail Lake and Trail Creek. (See USFWS comment letter p. 8 for full detail of comment.)	The intent of the study plans is to provide information commensurate with the scope of the proposed Grant Lake Project. While KHL questions whether the SMART system of developing objectives is fully applicable to all the required studies for the Grant Lake Project, revised plans provide additional definition of objectives. The study plans were modified to include a hierarchical discussion of objectives that includes overall project objectives, specific study objectives, and statistical objectives with emphasis on hypothesis testing where applicable.
137	07-06-10	USFWS	Erosion Study	The Grant Lake shoreline erosion study and Grant Creek substrate recruitment studies would both benefit from SMART objectives. As currently proposed, both studies will result in qualitative assessments that will be open to interpretation.	See response to Comment 136.
138	07-06-10	USFWS		USFWS recommends targeting data collection to adequately describe coho salmon spawning habitat and suitability criteria. Coho salmon likely spawn in Grant Creek as late as November, which may coincide with increase stream flows during project operations in future years. Adequately describing adult coho salmon spawning habitat is necessary as baseline data to evaluate potential Project impacts and cumulative effects.	Determination of numbers, spawning locations, and suitability criteria was included in the Aquatic Resources Study Plan.
139	07-06-10	USFWS		USFWS recommends describing flow conditions at transects during winter months. (See USFWS comment letter p. 9 for full detail of comment.)	The winter study program was expanded to include Instream Flow transects.
140	07-06-10	ADFG	Goals and Objectives	As with the Aquatic Resources Draft Plan, we recommend that the objectives are revised to be more specific and repeatable. Objectives need to be specific in terms of what parameters are being estimated and when relevant, under what criteria for accuracy and precision. The overall goal is to	See response to Comment 136.

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				<p>estimate how proposed operation scenarios will alter hydrologic, thermal and chemical regimes and how these alterations will influence the maintenance of fish habitat.</p> <p>Flowing water has been referred to as the “master” variable that drives the creation and maintenance of aquatic and riparian habitats. Reductions in flow and flow variability have predictable, albeit general, consequences. Reductions in flow reduce the availability of aquatic habitat and reductions in flow variability impair a streams competence to maintain habitat. Stabilization of the flow regime typically results in coarser substrates, channel incision and reduced lateral hydrologic connectivity. Since the lateral margins and off-channel areas of streams are important for spawning and rearing, reductions in lateral hydrologic connectivity can result in substantial reductions in biological productivity.</p>	<p>Comment noted. See Instream Flow Study Component of the Aquatic Resources Study Plan.</p>
141	07-06-10	ADFG	4.2.1	<p>We support the general approach for the collection of water quality and continuous temperature data. We recommend, however, the installation of an additional continuous temperature data logger in the off-channel environment. In addition, and as stated above, we also recommend the collection of instantaneous field measurements throughout the full range of meso habitats identified in the Aquatic Resources study.</p>	<p>Continuous temperature data loggers will be added at selected off-channel locations. Instantaneous temperature measurements have been and will continue to be collected at meso habitat locations. See Instream Flow Study Component of the Aquatic Resources Study Plan.</p>
142	07-06-10	ADFG	4.2.2	<p>One stream gage is proposed near the historic USGS gage location. This should be sufficient provided that additional field measurements of discharge are made at various locations along Grant Creek. We recommend periodically taking synoptic discharge measurements at the outlet of Grant Lake, near the outlet of the canyon, and downstream of the gage to assess accretion due to tributaries and/or interactions between ground and surface water. Accretion in the canyon reach, if present, will be important to consider when evaluating instream flow needs in the proposed bypass reach. Accretion below the proposed powerhouse location will be important</p>	<p>Meaningful accretion estimates will be very difficult to measure in Grant Creek because small differences will be masked by measurement errors. Nevertheless, an accretion study at low flow using either salt dilution or direct measurement techniques has been added to the study program.</p>



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				<p>when evaluating proposed releases from the powerhouse.</p> <p>In support of the development of hydrologic records at the proposed stream gage, we recommend conducting more than three discharge measurements. A sound stage-discharge rating typically requires more than three measurements. We also recommend conducting measurements in early April to measure base flow conditions and throughout the summer and fall. The data from the stream gage should also be frequently downloaded to ensure that it is still working properly and replaced if necessary.</p>	Comment noted. Combined discharge measurements between the hydrology and instream flow study programs will provide an adequate number of measurements at a variety of flows.
143	07-06-10	ADFG	4.2.3	<p>More specificity is needed for these studies. Procedures used to evaluate sediment transport and erosion should be described. We also recommend using the hydrologic record to estimate the magnitude, timing and duration of flows needed to transport sediments and maintain downstream fish habitat. High flows are also needed to maintain off-channel habitat and provide seasonal access to these habitats.</p>	<p>The qualitative study initially proposed for Grant Creek was replaced with a program that includes quantitative sediment sampling and modeling of sediment availability and transport. Methods to be used in the Grant Lake Shoreline Erosion Study have been clarified.</p> <p><b>Pg. 14 Water Resources Study Plan</b></p>
144	06-04-10	KWF	PAD	<p>The PAD for water resources and aquatic resources are insufficient to provide meaningful comment.</p> <p>The premise of the proposed studies as described in the PAD are to gather baseline data, not to address impacts from potential hydro development scenarios. Gathering baseline data is not adequate in this context. It is unclear what the scope of the hydro-development project is. The range of publicly stated options by the applicant Kenai Hydro has been very wide, the scope must be narrowed to provide more meaningful comment on specific studies necessary.</p>	The intent of the PAD was to report existing information. Where information gaps exist, or more recent information is necessary for evaluation of Project effects, the water resources and aquatic resources study reports will provide additional information regarding existing resources in the Project area.
145	06-04-10	KWF	PAD	<p>Hydrologic Data Records</p> <p>The period of record for all aspects of hydrological data is both too historic and of insufficient duration to support any assumptions or predication that are flow dependent. Statistical measures of hydrology</p>	Very few Alaska projects are accompanied by a hydrological record that is sufficient for optimal statistical analysis. The combination of historic and current hydrological measurements will provide a reasonable framework for engineering and environmental analysis. Limitations of the data will be discussed in the study reports and in

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				play a key role in every aspect of modeling and predicting impacts from altering natural flow regimes. Statistically valid flow frequencies and temporal rates-of-change will not be available with the proposed studies, a longer and more modern record is required.	the license application documents. Ongoing hydrological monitoring including post-construction will extend the record and allow project adjustments if needed.
146	06-04-10	KWF	PAD	<p>Sediment Transport</p> <p>The relationship between flow regimes and sediment transport is a well-developed, complex science. A wide range of numerical models are available; however the PAD suggests studies related to sediment transport will be limited to a qualitative 2-day field observations and reported in the form of a “memo”. Given the relative importance of the role sediment has on economically important species this approach seems woefully inadequate.</p> <p>The ability to model 2-D varied unsteady flow with realistic and statically valid flow data, coupled with existing sediment transport models that have been calibrated to the existing conditions should be available for analysis. Any sediment transport model used should be calibrated to empirical data representative of the existing condition; with simulations under the full range of proposed modifications AND full range of uncertainties should be produced. The suggested modeling exercise should also include predictions of catastrophic impoundment failure.</p> <p>Recruitment of stream substrate, woody debris and other detritus are fundamental components of the physical environment and appear to be absent from either basic monitoring or study plans. Detailed bulk grain-size analysis of sufficient sample size to characterize the sediment distribution from both the active bed and sub-active layer are required to evaluate predicted changes to stream-bed over the engineered design life. Wolman pebble counts or similar methods are insufficient to characterize grain-size distributions.</p>	See response to Comment 143.

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				Sediment data derived from bulk samples should be collected in multiple reaches, as the stream is recognized to have segments that are in equilibrium with the available sediment, as well as reaches of erosion and deposition. It is not possible to offer valid predictions on how the substrate will respond without quantifying the existing substrate. This should include, but not be limited to the discharge required to maintain channel form in each segment; flooding frequencies and flows required to mobilize bed material should be available as well as the range of flow required to recruit and transport the full distribution of bed sediment. Each of these sediment concerns must be related to stream biota downstream of impoundment and delineated through the entire downstream zone of influence, including Trail Lake.	
147	06-04-10	KWF	PAD	Implication of altered thermal regimes: No information is planned to evaluate the altered temperatures in the context of the relationship to existing food at the time of organism emergence. While temperature concern is recognized in the studies, the implications of altering the emergence of aquatic life is not addressed. The relationship between aquatic life in Grant Creek and Trail Lake is not mentioned, and may be significant. That is, how are available food resources linked to emergence timing, are sufficient food resources available if emergence times are altered? Will there be increased competition for food resources?	The draft and final license applications will assess the impact of changes to temperature regimes (if any) on emergence timing and discuss potential impacts to fish.
148	07-06-10	ACE	PAD	Identify cumulative impacts to the watershed-there is currently no discussion of this in the PAD.	Scoping Document 2 identified resource issues that will be analyzed for cumulative effects in the final environmental documents.
149	07-06-10	ACE	PAD	Climate change-there should be some discussion about how water flows will change as a result of climate change. Bradley Lake is already suffering from a lack of water leading to diminished energy production. What will happen to Grant Lake in 30 or 50 years?	FERC noted in its Scoping Document 2 that predictions of future flow scenarios on any given stream would be too speculative given the state of the science [on climate change] at this time. However, we do suggest that when making flow recommendations and conditions, agencies consider whether different requirements for high and low water years are appropriate.
150	07-06-10	M. Cooney	PAD/Study Plan	As a show of good faith to project area residents and to demonstrate a strong commitment to environmental stewardship and protection, the	KHL will obtain all necessary state and federal permits to operate the Project. KHL does not control the policy of Alaska DEC regarding Clean Water Act Section 401 water quality certification.

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				applicant (HEA) should voluntarily seek formal water quality (Section 404, Clean Water Act) certification for the project though certification is not currently required by Alaska DEC for hydropower projects in Alaska.	
<b>Aquatic Resources Draft Study Plan</b>					
151	07-06-10	USFWS	Goals and Objectives	Specific objectives should be developed for each study component with a clearly specified level of precision and accuracy such that the objectives are statistically sound. USFWS recommends SMART objectives with statistical criteria, sampling design, and methods to provide quantitative estimates of potential project impacts identified for study. (See USFWS comment letter p. 3-4 for full detail of comment.)	See response to Comment 136.
152	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	A fish counting weir would provide better estimates. An objective was identified in the 2009 Draft Aquatic Biology Baseline Study Plan to conduct a feasibility study for siting and installation of a counting weir...Was this feasibility study completed? If so, what was the outcome? (See USFWS comment letter p. 4-5 for full detail of comment.)	Assessment of stream conditions in 2009 and 2010, in conjunction with evaluation of recently developed floating weir technology, suggest that a weir is feasible. The Aquatic Resources Study Plan was modified to include the use of a weir, possibly in combination with a video counting system, to enumerate salmon and rainbow trout, provide capture for telemetry studies, provide insight into stream life, and calibrate foot surveys.  Multiple modifications throughout the document. Primary weir discussion begins on Pg. 12
153	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	A SMART objective with statistical criteria could help guide sampling designs and methods to estimate abundance and spawning distribution of adult salmon in Grant Creek...a single estimate for observer efficiency for all counts is likely not appropriate because stream and observation conditions can be variable over the course of a spawning season. (See USFWS comment letter p. 5 for full detail of comment.)	See response to Comment 136.  Methods for refining observer efficiency estimates are described in the Final Aquatic Resources Study Plan  Multiple locations throughout the document
154	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	Regardless of the method selected, counts need to be continued through November to estimate numbers of adult coho salmon returning to Grant Creek. The only information for coho salmon collected to date in Grant Creek includes juvenile numbers and a small number of adults counted during the last	Comment noted. The existing study plan specifies that counts will continue through November.

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				walking survey in late September 2009. Coho salmon spawning abundance, distribution, and timing are key baseline population parameters that are necessary to evaluate potential Project impacts and cumulative effects.	
155	07-06-10	USFWS	Salmon Spawning Distribution and Abundance	Develop SMART objectives with statistical criteria, sampling design, and methods to assess spawning distribution in Reach 5 for all salmon species, not just Chinook salmon. (See USFWS comment letter p. 6 for full detail of comment.)	See response to Comment 136.
156	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Minimize sampling effects on spawning fish during this critical and vulnerable time of their life history. Develop rigorous sampling protocol to address CPUE differences. (See USFWS comment letter p. 6 for full detail of comment.)	The Aquatic Resources Study Plan was modified to include sampling protocols in the vicinity of spawning fish.  <b>Pg. 22 Aquatic Resources Study Plan</b>
157	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Based on results of juvenile sampling in 2009, it appears that Dolly Varden are an important component of the fish assemblage in Grant Creek, yet little is known about their life history or habitat use in Grant Creek, particularly of adults. We therefore recommend investigations that describe the basic life history and habitat use of Dolly Varden in Grant Creek that includes estimates of spawning abundance and distribution and estimates of seasonal habitat use and migration patterns. (See USFWS comment letter p. 6 for full detail of comment.)	The Aquatic Resources Study Plan was modified to include expanded sampling during the late fall spawning period and during the winter to provide a more complete picture.  <b>Multiple locations throughout the document.</b>
158	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Develop SMART criteria to describe the migratory patterns of rainbow trout and Dolly Varden throughout the Kenai River watershed as baseline data. (See USFWS comment letter p. 6-7 for full detail of comment.)	See response to Comment 136.
159	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Round whitefish and Arctic grayling have been caught during angling surveys in Grant Creek and an assumption was made (page 5) that these species do not spawn in Grant Creek. We request additional information to justify this conclusion.	The suggestion of no spawning by grayling and whitefish was a conclusion drawn by earlier investigators. There is no assumption on the part of the current study team. However, ongoing and historical studies have indicated that these two species are so rare that targeted sampling would not be justified. Opportunistic observations of these species will continue to be made as part of general sampling programs and information updated as it becomes available.

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160	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Basic life history investigations should be completed to address a series of baseline data questions. (See USFWS comment letter p. 7-8 for full detail of comment.)	The Aquatic Resources Study Plan was revised to reflect more clearly data to be collected. The license application will use these data to evaluate potential Project effects.
161	07-06-10	USFWS	Resident and Rearing Fish Distribution and Abundance	Develop SMART criteria to investigate overwinter survival and the availability of suitable overwinter habitat ... The information is necessary as baseline data to evaluate potential Project impacts and cumulative effects. [Additional methods such as PIT tags and mark-recapture are suggested.] (See USFWS comment letter p. 7 for full detail of comment.)	See response to Comment 136. A statistically supportable overwinter survival study would be difficult to conduct and is beyond the scope of the Grant Lake Project. However, the addition of a smolt outmigration study with spring sampling will provide direct evidence of juvenile fish production and overwinter stream use.
162	07-06-10	USFWS	Habitat Mapping and Critical Factors Analysis	USFWS 21: USFWS recommends that Habitat Availability and Habitat Utilization studies be conducted during winter so that results of the Instream Flow Analysis will also be applicable during winter.	The winter study program was expanded to include habitat utilization at the instream flow transects.  <b>Pg. 19 Aquatic Resources Study Plan</b>
163	07-06-10	USFWS	Habitat Mapping and Critical Factors Analysis	USFWS 22: We recommend presenting a table or other analysis using information available in the peer-reviewed literature that models emergence timing of Chinook salmon, coho salmon, sockeye salmon, rainbow trout, and Dolly Varden based on changes in water temperature from current incubation temperature regimes.	The environmental analysis included in the draft and final license applications will include such an analysis based on the integration of study results and available models.
164	07-06-10	USFWS	Habitat Mapping and Critical Factors Analysis	USFWS 23: We recommend adding temperature as a "Habitat use Parameter" for "rainbow trout spawning" in Table 2 on Page 23 because it is likely an environmental cue that influences the onset of spawning for rainbow trout in Grant Creek.	Temperature was added to Table 2.
165	07-06-10	ADFG	Goals and Objectives	In general, we recommend that the objectives are revised to be more specific and repeatable. Objectives need to be specific in terms of what parameters are being estimated and when relevant, under what criteria for accuracy and precision.	The general goals expressed at the beginnings of the study plans were intended to be consistent with those expressed in the PAD and to conform to the requirements of the FERC application process. The objectives of specific study elements are explained more fully and made more specific. See response to Comment 136.
166	07-06-10	ADFG	Goals and Objectives	Impact of project operation on sediment transport. Comment: such an assessment would require an estimate of the particle size distribution of the surface layer of the stream bed, an estimate of flows needed to mobilize this distribution and the flow	See response to Comment 165.

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				duration of these flows based on the historic period of record. We recommend restructuring this statement into an objective statement that specifically addresses the estimation of these physical parameters.	
167	07-06-10	ADFG	Goals and Objectives	<p>Impact of project operation (in terms of hydrologic regulation) on fish abundance and distribution. Comment: this statement requires more specificity and several prerequisite objectives. To assess impacts to the distributions of fish, the distributions of habitats utilized by fish must first be assessed, followed by quantitative assessments of fish habitat utilization. These should be two separate objectives. The relationships between utilized habitats and the natural flow regime must then be modeled to estimate instream flow needs to support existing fish habitat utilization patterns and comparison with alternative operation scenarios.</p> <p>We recommend framing a separate objective to estimate the impacts of hydrologic regulation on fish abundance and question whether or not estimations of abundance can be used to assess impacts associated with hydrologic alteration resulting from the proposed project. Specifically, we question whether or not adequate levels of accuracy and precision for population estimates can be met to attribute any changes in populations to hydrologic alteration associated with the proposed project. We agree that there is value in enumerating populations of fish and putting those populations in the context of the Kenai watershed, but we question whether these estimates with their associated variability and uncertainties, can be used to measure changes in fish populations with sufficient accuracy and precision. These estimates, when put in a watershed context, can be useful in a comparative analysis and possibly for future mitigation analysis, if needed. At this point, however, our focus will be on the avoidance of impacts to fish habitat.</p>	Comment noted. See response to Comment 165.

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168	07-06-10	ADFG	Goals and Objectives	Impact of project construction and operation on biological productivity and abundance of fish food organisms in Grant Creek. Comment: impacts resulting from project construction should be quantified in terms of the total amount of habitat lost or converted to project infrastructure. Objectives for estimating biological production and the abundance of fish food organisms need to be specific in terms of what parameters are being estimated.	Comment noted. See response to Comment 165.
169	07-06-10	ADFG	Goals and Objectives	Impact of project construction on fish habitat in Grant Creek. Comment: we recommend quantifying the total amount of fish habitat displaced or converted by project infrastructure.	Comment noted. See response to Comment 165.
170	07-06-10	ADFG	Need for Additional Information	2009 field studies provide a good foundation for this summer's studies but were more reconnaissance and qualitative in nature. Results of 2009 fisheries investigations are primarily reported by study reaches of the stream that are more for reference purposes. The results were also more qualitative in nature. In 2010, specific habitat attributes and fish habitat utilization patterns need to be quantified for each of these reaches so that instream flow needs can be assessed. The following list of information needs is listed in the 2010 aquatic resources draft study plan. We briefly provide our comments following each identified need and address each need in greater detail in the following respective sections. In general, we also recommend that specific and repeatable objectives are framed for each of the following data needs.	See responses to following Comments 171 through 179.  See response to Comment 127.
171	07-06-10	ADFG	Need for Additional Information	Determine juvenile fish use of winter habitats. Comment: we recommend that smolt trapping be conducted in addition to winter surveys. Although we are supportive of winter surveys, it is unknown whether or not they will be feasible. Smolt trapping in the fall and then again in spring is recommended to estimate the timing of outmigration and provide a better understanding of the rearing ecology of juvenile salmon in Grant Creek.	The Aquatic Resources Study Plan was modified to include smolt trapping in spring and fall.  <b>Pg. 19 Aquatic Resources Study Plan</b>
172	07-06-10	ADFG	Need for Additional	Better define fish use of microhabitats and overall species composition and relative abundances in	The Aquatic Resources Study Plan includes a habitat mapping component where all meso habitats will be identified. Within that



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			Information	reaches 1-4. Comment: we recommend a hierarchical approach to surveys and characterizations of aquatic habitat. The 2010 study plan switches between different spatial scales at which habitats are studied and referred to. We recommend a more thorough definition of meso habitats prior to definition of micro habitats. Similarly, we recommend greater detail and definitions for the habitat classification study. As with the 2009 studies, the USFS Tiered Habitat Survey 1 could be referred to for structuring the stratification and surveys of each stratum.	framework, important subcategories will be identified as appropriate for the conditions in Grant Creek. The Study Plan was clarified to include better definition of habitat types and classifications.
173	07-06-10	ADFG	Need for Additional Information	Determine the extent of rainbow trout spawning in Grant Creek. Comment: we assume this means the extent of the spatial distribution of rainbow trout spawning. If possible, we recommend telemetry for this purpose since access into the canyon reach (reach 5) is difficult and hook and line surveys may provide limited information, especially if rainbow trout are only using these upstream reaches for short periods of time.	The Aquatic Resources Study Plan was modified to include a telemetry component for rainbow trout.  <b>Pg. 17 Aquatic Resources Study Plan</b>
174	07-06-10	ADFG	Need for Additional Information	Determine use of reach 5 by juvenile and adult fish, with additional emphasis on spawning Chinook salmon use. Comment: We recommend the use of telemetry to assess the upstream distribution of sockeye as is proposed for Chinook. Sockeye are probably just as likely, if not more likely to utilize this reach for spawning.	The Aquatic Resources Study Plan was modified to include the use of telemetry to assess the distribution of sockeye salmon.  <b>Pg. 15 Aquatic Resources Study Plan</b>
175	07-06-10	ADFG	Need for Additional Information	Delineate aquatic habitats available in Grant Creek. Identify key habitats for fish and describe and distinguish the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek. Comment: This objective requires more specificity. We recommend characterizing meso habitats, as mentioned in #2 above, and then taking specific micro habitat measurements within the most heavily selected meso habitat units and within those that are relatively unselected. Appropriate statistical methods will be required to identify which micro habitat parameters are influential to site selection if	The Aquatic Resources Study Plan was modified to include greater specificity for this objective.  <b>Multiple locations throughout the document</b>

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				micro habitat parameters are to be used when modeling instream flow needs.	
176	07-06-10	ADFG	Need for Additional Information	Provide an estimate of salmon spawning escapement in Grant Creek. Comment: we recommend maintaining consistency with the 2009 methods and that assumptions used for the Area Under the Curve (AUC) method be tested with site specific observations of stream life and observer efficiency.	The Aquatic Resources Study Plan includes provisions for testing the assumptions used for the 2009 escapement estimates. See response to Comment 152.
177	07-06-10	ADFG	Need for Additional Information	Examine how important individual habitat units may be affected by changes in flow due to the operation of the proposed project using instream flow assessment methods. Comment: we recommend more specificity for this need/objective. We need quantitative estimates of how hydrologic connectivity with meso habitats and important micro habitat parameters change as a function of flow in Grant Creek.	The Aquatic Resources Study Plan specifically addresses this information need. Nevertheless, the greater specificity for this objective was provided in the study plan.  Multiple locations throughout Section 4.7
178	07-06-10	ADFG	Need for Additional Information	Collect benthic macroinvertebrates in Grant Creek to establish baseline diversity and abundance characteristics. Comment: this need/objective requires more specificity with respect to spatial scale how abundance will be quantified. We recommend estimating the relative density for each genus by habitat type. We also recommend providing these estimates for each meso habitat instead of leaving this unspecified.	The Water Resources Study Plan was modified to include greater specificity for this objective. The existing study plan is focused on providing a statistically valid baseline of relative productivity that can be compared from year to year. Duplicate sampling within uniform riffle habitats using approved methods is the commonly accepted methodology.
179	07-06-10	ADFG	Need for Additional Information	Collect periphyton samples in conjunction with macroinvertebrate samples in Grant Creek to establish baseline chlorophyll a availability. Comment: as with macroinvertebrates we recommend that these samples are stratified by meso habitats.	See response to Comment 178.
180	07-06-10	ADFG	Section 3.2.1	We support the continuation of ground surveys to assess the distribution and abundance of spawning salmon in Grant Creek but feel that telemetry or aerial surveys will most likely be needed to fully assess the distribution of spawning into the canyon reach (reach 5). We also recommend that surveys are performed frequently enough to account for stream life (the length of time fish are alive and	The Aquatic Resources Study Plan was revised to include a telemetry study of rainbow trout. See response to Comment 174 relative to sockeye telemetry.  Pg. 17 Aquatic Resources Study Plan  The frequency of ground surveys will be reviewed in light of existing data to determine whether more frequent observations

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				spawning in Grant Creek) of species being observed. As proposed, the frequency of surveys would be every 10 days. When conducting ground surveys and estimating populations using the AUC method, stream life and observer efficiency must be accurately estimated. If stream life is not greater than 10 days, population estimates will be underestimated. We support the use of telemetry to estimate the distribution of adult Chinook in Grant Creek and encourage the use of this method for adult sockeye and rainbow trout. Since fixed repeating stations are being installed to support the use of telemetry to estimate the distribution of Chinook it seems like a missed opportunity to not utilize this existing instrumentation to estimate the distributions of other species. For sockeye, we recommend spreading out the implantation of radio tags throughout the sockeye run to account for any life history differences that sockeye in the canyon reach may have. We recommend consultation with agencies on the number of radios that would be needed to assess adult sockeye distribution. This same recommendation applies to the objective of assessing the distribution of rainbow trout. It is important to know which species of fish are distributed within reach 5 since it is the proposed bypass reach and instream flow releases will depend upon the species that are present and the timing of their presence.	would be appropriate. Additionally, aerial surveys will be considered, and may be proposed to accompany at least some of the ground surveys with emphasis on Reach 5.  Comment noted.
181	07-06-10	ADFG	3.2.2.1	In 2009, the use of angling to estimate catch-per-unit-effort was not successfully used to obtain a sufficient number of recaptures to allow population estimates for rainbow trout. Instead of continuing this approach in the future, we recommend putting resources into a rainbow trout telemetry study so that the full spawning and rearing distribution of this species can be estimated. This will also prevent the need to conduct angling surveys in the canyon reach which will be restricted by access and implemented with unknown effectiveness.	The Aquatic Resources Study Plan was modified to include a telemetry program for rainbow trout.  Pg. 17 Aquatic Resources Study Plan
182	07-06-	ADFG	3.2.2.3	We support the proposed efforts to document rearing	See response to Comment 171.

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	10			of anadromous and resident fish in winter but are concerned that opportunistic minnow trapping and electro-fishing will not adequate to document the winter ecology and life history of rearing fish. We support these efforts, but recommend trapping smolts in the fall and spring to estimate when fish emigrate from Grant Creek. If the majority of smolts are trapped in fall, rearing is likely limited in winter. This would certainly be supported by the presence of young of year fish and the lack of juvenile salmon in Grant Creek. Understanding the life history of rearing fish in Grant Creek is needed to assess instream flow needs for rearing on a seasonal basis.	
183	07-06-10	ADFG	3.2.2.4	In general, we support the procedures and gear types proposed to assess resident and rearing fish use of open-open water habitats. We recommend electro-fishing of young of year and juvenile fish, in compliance with collection permits, to allow more accurate identification of habitat associations and to quantify utilization, or the relative density of fish by specific meso habitats. We recognize that there are issues with deeper water and the presence of adult fish when using this gear type, but recommend its use in shallow off-channel habitats and habitats providing lateral refugia for young of year and young rearing fish. In many of these habitats, electro-fishing is the only viable method to sample fish and assess habitat utilization.	Comment is noted. Electrofishing will be employed as appropriate.
184	07-06-10	ADFG	3.2.3	Sampling and assessments of fish habitat utilization needs to be stratified by habitat. The delineation of meso habitats needs to be diversified. Several important meso habitats are not readily apparent in 2009 classification, which may result in their exclusion and unrepresentative flow-habitat relationships. In particular, sockeye salmon are commonly observed spawning along shallow shores or margins of the stream channel. It is not clear whether or not this would be included in the proposed “margins without undercut banks” meso habitat category. Units of the riffle-pool sequence are also not fully represented. This is important	<p>In order to be consistent with terminology used in the instream flow study, mesohabitats are defined as general habitat types. We recognize that specialized sub-categories of mesohabitats are particularly important in Grant Creek and agree that more sub-types need to be added to those identified in 2009 study reports.</p> <p>Regarding stratification and random sampling, because of the physical nature of Grant Creek (high gradient, dominance of riffles and cascades), the decision was made (and discussed with the Instream Flow Technical Work Group) to emphasize the identification and sampling of specialized high use habitats rather than attempt stratified random sampling. Quantitative sampling of 90% of the stream would be difficult or impossible. It is our</p>

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				because bed topography (Montgomery et al.; 19992) is an important driver of redd site selection. We realize that, due to its high gradient, Grant Creek is more like a continuous series of rapids. Still, this series is discontinuous and segmented by topographic highs and lows in the longitudinal stream profile. The tailouts of pools and channel bifurcations, although rare in this system, may be important spawning locations as they are in other stream systems. Off-channel habitats also need diversification. There are shallow –water habitats peripheral to both primary and secondary channels that should not be overlooked and there are shallow pond-like habitats present in several locations. These should be included in the mesohabitat classification and their relative distribution should be quantified as is proposed for the other meso habitats.	contention that the use of a statistically rigorous stratified random sampling approach to examine critical factors is not a viable technique under Grant Creek conditions. Targeting known fish use areas was seen as a more efficient and effective means of assessing potential impacts from hydrological changes. The 2009 study program identified high use fish areas that have highly specific characteristics that promote fish use. In most cases, fish observations combined with site specific physical measurements and professional judgment will be adequate to identify probable critical factors.  The Aquatic Resources Study Plan was modified to clarify these points.
185	07-06-10	ADFG	3.2.3	<p>Critical factors influential to habitat utilization patterns are difficult to identify and in some cases may not be possible to identify. The proposal is to record fish presence, and by default absence within discrete mesohabitat so that presence can be “correlated” with the specific habitat features (we assume micro habitat features) present at each location sampled. This will require a rigorous stratification of sampling of habitat and the presence and absence of spawning and rearing fish.</p> <p>This stratification will then require a statistical method to analyze the variance microhabitat parameters in mesohabitats utilized and those not. In cases where utilization of particular meso habitats is not consistent, it may be possible to attribute presence to a particular critical factor. In cases where utilization is high in a particular habitat that is rare, it may be difficult to attribute presence to any one particular critical factor. In such cases it will need to be assumed that such habitats are important to the production of fish in Grant Creek and that instream flow needs to support the continued use of these habitats will need to be assessed.</p>	See response to Comment 184.

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186	07-06-10	ADFG	3.2.3	An adequate suite of micro habitat features needs to be surveyed and quantified within occupied meso habitats to support assessments of instream flow needs. This suite of features includes water depth, cover of large wood debris and overhanging vegetation, distance to cover, distance from shore and site-specific water temperature. Water depth allows assessment of the range of depths that are suitable, and most importantly, what depths are needed to support specific life history stages of fish. Cover of living and dead wood provides refugia for young of year and juvenile fish, and distance to shore allows assessment of lateral hydrologic connectivity with undercut banks and shallow banks associated with the main channel. Temperature is a micro-habitat variable that is known to influence the distribution of fish on a seasonal basis and can be used to assess which habitats provide thermal refugia for young of year and juvenile fish.	<p>Comment is noted. Our approach is specifically designed to examine the kinds of factors described in the comment. The Aquatic Resources Study Plan was modified to clarify that a full suite of factors will be considered.</p> <p>Multiple locations in Sections 4.6 and 4.7</p>
187	07-06-10	ADFG	3.2.4	<p>An instream flow technical working group has been formed for this project and recently met in June, 2010 to discuss specific study plans for this proposed project. At these meetings, we learned of the proposal by the applicant to use a variety of instream flow assessment techniques and methodologies. The proposal discussed was to use a physical habitat simulation model (PHABSIM) and a wetted perimeter model.</p> <p>ADF&amp;G supports the meso and micro habitat analyses and their use in developing flow-habitat relationships. We also support the placement of transects at reaches most utilized by fish. We do not, however, support the use of these transects to assess habitat availability or assess habitat utilization. We recommend those procedures outlined in the preceding habitat mapping and critical habitat factors analysis section. As proposed, we have several concerns about the use of PHABSIM to model micro habitat parameters as a function of flow. The use of literature or “library” habitat suitability criteria and curves to model/simulate</p>	<p>See response to Comment 184.</p> <p>We agree that any habitat suitability models taken from the literature for use in Grant Creek analysis will need to be selected carefully to match stream conditions as closely as possible.</p>

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				<p>physical habitat as a function of flow is not expected to yield biologically meaningful estimates. For example, sockeye have been observed by project and agency biologists spawning in shallow, tranquil shoreline conditions, deep and hydraulically turbulent conditions, and within deep pools within the lower reaches of the canyon. It is not likely that literature curves can be used to represent this range of conditions. Furthermore, the curves for sockeye that are available from other Alaskan studies represent a different life history strategy exhibited by sockeye. Available curves for sockeye were developed within groundwater side sloughs of the Susitna River, which differ from Grant Creek in terms of hydrology, hydraulics and water quality. These curves do not appear to be transferrable to Grant Creek.</p> <p>Site-specific habitat suitability criteria (critical factors) could be identified and site-specific curves could be developed but these curves would only be meaningful if the criteria could be demonstrated to influence habitat selection. As stated in our comments on the identification of critical habitat factors, this would require comparative statistical analyses of sites heavily utilized and those with little to no utilization (Railsback; 1993). This would need to be done for each life stage and species whose habitat was being simulated with PHABSIM.</p>	<p>As discussed in the response to Comment 184, a stratified random sampling approach to developing site-specific HS criteria is not considered viable in Grant Creek. Rather, habitat characteristics will be measured at transects placed within known high use fish areas. Habitat suitability models will be developed based on fish presence within these selected areas, supplemented by literature based models, and professional judgment including coordination with the Instream Flow Working Group. All HSI models to be employed in the Grant Creek analysis will be determined in consultation with the Instream Flow Working Group.</p>
188	07-06-10	ADFG	3.2.4	<p>Another issue with the use of PHABSIM for this particular project involves the hydraulic environment of Grant Creek and hydraulic modeling. One dimensional hydraulic modeling with the PHABSIM methodology often leads to a scale mismatch between the scale at which fish are selecting habitat and the scale at which hydraulics are modeled (Kondolf et al.; 20004). In other words, fish may be selecting habitat at scales that cannot be modeled with a one-dimensional PHABSIM model. Although we do not feel this is always the case, the overall roughness, gradient, and resultant hydraulic turbulence of Grant Creek could lead to a PHABSIM model that provides poor predictions of</p>	<p>There are trade-offs associated with 1-D and 2-D modeling. 1-D measurements were collected during the 2010 study period. This information will be presented and its use discussed at an Instream Flow Working Group meeting to be held prior to additional field study.</p>

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				<p>habitat area as a function of flow for this project. Two dimensional (2-D) modeling would allow for more accurate modeling of micro habitat parameters at the scale at which habitats are being selected. Still, if this approach were adopted, the issue with habitat suitability criteria remains. The use of library curves or those developed with professional judgment in conjunction with 2-D modeling can provide more accurate hydraulic modeling if designed, calibrated and developed appropriately, but may result in the inability to credibly attach biological relevance to modeled conditions. In order to identify which criteria influence habitat selection and develop curves that are representative, site-specific measure are needed. And, as described elsewhere in the Aquatic Resources Draft Study Plan, these measures must follow a strict stratification and include sites selected by each species and life stage under study, and those not. Only then can a statistical analysis of the variability in utilization be attributed to particular physical habitat parameters. Curves could then be developed for these criteria and, if used in conjunction with 2-D modeling would yield more realistic predictions of the area of important habitat based on how micro habitat conditions vary with flow.</p>	See responses to Comments 184 and 187.
189	07-06-10	ADFG	3.2.4	<p>Another approach identified in the Aquatic Resources Draft Plan is the use of a wetted perimeter model used to model wetted perimeter, depth and flow relationships. We recommend using these relationships to model the availability of meso habitats (e.g. shallow shorelines) utilized for spawning and rearing and important microhabitat features (e.g. cover) as a function of discharge. We also support the proposed use of these relationships to model thresholds of lateral hydrologic connectivity with lateral refugia and off-channel habitats utilized for spawning and rearing. This is necessary to assess instream flow needs to maintain hydrologic connectivity with habitats important to anadromous and resident fish species. This would allow estimation of how seasonal reductions in</p>	Comment is noted. The Aquatic Resources Study Plan supports this approach.



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				flows would disconnect Grant Creek from important off-channel and channel margin habitat and when important main channel micro habitats, such as wood debris become inaccessible to spawning and rearing fish.	
190	07-06-10	NOAA – Fisheries		NMFS recommends studying the effects of powerhouse operations on instream flows and anadromous fish habitat. This study should include a comprehensive, scale-appropriate analysis of available habitat for spawning and rearing sockeye, Chinook and possible coho salmon in Grant Creek, to determine precisely where, when and to what extent spawning occurs, and an analysis of how that habitat is related to stream flow. (See NMFS comment letter p. 1-2 for full detail of comment.)	The Aquatic Resources Study Program is specifically designed to collect information regarding these potential effects. The environmental analysis in the license application will present effects analysis and any necessary protection, mitigation, and enhancement measures. See responses to comments regarding specific components of the program below.
191	07-06-10	NOAA – Fisheries		The primary life-history functions of Grant Creek by all anadromous fish species are not well understood. (See NMFS comment letter p. 2 for full detail of comment.)	The intent of the Aquatic Resources Study Program is to provide a better understanding of life history functions. See responses to comments regarding specific components of the program.
192	07-06-10	NOAA – Fisheries		For all proposed studies, study designs and sampling methods need to be refined to yield appropriate quantitative estimates of the impacts of project construction and operations on biological productivity and habitat parameters of all anadromous and resident fish species within the Kenai River watershed, as identified in the goals, objectives and impacts, but not addressed completely in the draft study plans.	See response to Comment 136.
193	07-06-10	NOAA – Fisheries		Ecological flow requirements below the dam and below the tailrace need to be designed to avoid or minimize adverse impacts to anadromous fish and their habitat. (See NMFS comment letter p. 2 for full detail of comment.)	The purpose of the Instream Flow Study is to allow prediction of flows that will optimize conditions within the constraints of project engineering requirements. The Aquatic Resources Study Plan was modified to include a quantitative instream flow evaluation of Reach 5 (low flow conditions only) in addition to lower reaches.
194	07-06-10	NOAA – Fisheries		We concur with the U.S. Fish and Wildlife Service's recommendations that objectives should be based on SMART objectives. (See NMFS comment letter p. 2-3 for full detail of comment.)	See response to Comment 136.
195	07-06-10	NOAA – Fisheries		Sediment transport models should be developed under current hydrologic conditions and compared to proposed operational conditions to estimate	See response to Comment 143.

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				project effects on this critical habitat function. (See NMFS comment letter p. 3 for full detail of comment.)	
196	07-06-10	NOAA – Fisheries		Consider 2-D modeling rather than PHABSIM. (See NMFS comment letter p. 3 for full detail of comment.)	See response to Comment 188.
197	07-06-10	NOAA – Fisheries	Need for Additional Information	Grant Creek below Reach 5 is only half mile long. This short reach should be thoroughly inventoried by habitat type and geomorphology. (See NMFS comment letter p. 3 for full detail of comment.)	We agree. The Aquatic Resources Study Program is designed to collect data on habitat type.
198	07-06-10	NOAA – Fisheries	Need for Additional Information	Limited fish sampling for adults and juveniles in the lowest section of Reach 5 indicates the habitat is used by anadromous fish for spawning and rearing, thus this reach will need to be studied to investigate the extent of fish use by all species and life stages, and how changes in flow would affect habitat availability, sediment recruitment, and water quality. (See NMFS comment letter p. 4 for full detail of comment.)	Comment noted. See responses to Comments 143, 173, 174, and 193.
199	07-06-10	NOAA – Fisheries		We recommend that outmigrant smolt trapping occur in addition to winter sampling given the difficulties and possible failure of sampling efforts under heavy snow and ice cover, and the limited types of habitats that can be sampled during the winter season. (See NMFS comment letter p. 4 for full detail of comment.)	See response to Comment 171.
200	07-06-10	NOAA – Fisheries		We recommend that assumptions inherent in using foot surveys and Area Under the Curve methodology to estimate escapement be discussed. (See NMFS comment letter p. 4 for full detail of comment.)	See response to Comment 176.
201	07-06-10	NOAA – Fisheries		We agree with the suggested Chinook spawning telemetry method to locate preferred spawning areas in Grant Creek, as well as the utility in determining if spawning occurs in Reach 5. In addition, we suggest conducting a sockeye telemetry study to determine preferred spawning locations (this should corroborate the visual observations) and to investigate the use by sockeye of Reach 5. (See NMFS comment letter p. 4 for full detail of	See response to Comment 174.

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				comment.)	
202	07-06-10	NOAA – Fisheries		NMFS Comment 13: We suggest a collection method near the mouth of Grant Creek to estimate the production of outmigrating juvenile salmonids and to determine the timing of out-migrating juveniles relative to temperature and flow. Fyke-netting or more robust rotary screw trapping might be successful in such a dynamic setting, and such an outmigrant study should record the full extent of fall and spring juvenile outmigration in order to estimate the magnitude of production originating in Grant Creek, based upon an appropriately designed SMART objective.	See response to Comment 171.
203	07-06-10	NOAA – Fisheries		NMFS recommends that the results of the 2010 studies and 2011 winter sampling and spring outmigrant sampling be presented to agencies for collaborative review and use in determining any necessary additional data needs. (See NMFS comment letter p. 5 for full detail of comment.)	Data from 2010-2011 investigations will be provided for agency review.
204	06-01-10	KAFC	Goals and Objectives	The goals and objectives section does not relate the anticipated impacts and how the studies will address them. The idea that impacts of project operation and construction on fish populations will be answered without specifics is too broad.	See response to Comment 164.
205	06-01-10	KAFC	Goals and Objectives	This section states that construction and operation of the project on the biological productivity and abundance of fish food organisms in Grant Creek and Grant Lake will be addressed. However, there are no real studies of Grant Lake to provide data to deal with this broad objective.	See response to Comments 164 and 178. Zooplankton abundance and Chlorophyll <i>a</i> concentrations were measured in Grant Lake in 2009 to provide a measure of baseline productivity. Additionally, there is substantial historical information available for the limnological characteristics of Grant lake.
206	06-01-10	KAFC	Existing Information	The 2009 studies indicated 231 and 6293 Chinook and sockeye salmon in Grant Creek. Given the exploitation rate of the various fisheries in UCI it would be easy to calculate the production of these stocks. However, there does not appear to be any age composition data presented. Was it collected?	The 2009 study program did not involve the capture of any salmon, consequently age data were not collected. The planned Chinook salmon telemetry study for 2012 will require the capture of fish and allow scale sampling for age determination without additional effort. The Aquatic Resources Study Plan was modified to include the collection of scales for a sample of captured chinook and sockeye salmon.
207	06-01-10	KAFC	Section 2.2	There are several omissions in this section. These include the total lack of studies in Grant Lake, yet this lake will have significant changes in water level.	Zooplankton abundance, Chlorophyll <i>a</i> concentrations, and water chemistry were measured in Grant Lake in 2009 to provide baseline productivity which can be compared to future conditions.

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				The impact of the project on the biological productivity of this system on the structure and function of the lake and surrounding waters is not addressed.	
208	06-01-10	KAFC	Section 2.2	Over 500 Chinook and probably 12-20 thousand sockeye salmon are produced from the Grant Lake/Creek system. There is an extensive data set for the Kenai River on the genetic makeup of the various sub-populations. There are in that data set indications of a number of systems that are very unique – Russian River and Hidden Lake. Are Grant Lake/Grant Creek salmon unique genetically? There are no sample protocols or plan to answer this question. It is an obvious omission.	The collection of tissue samples for genetic analysis would be a worthwhile addition to the study program that can be accomplished at no extra cost (assuming that genetic analysis would be contributed by the ADF&G genetic lab). After consultation with ADF&G, the Aquatic Resources Study Plan was modified to include tissue sampling protocols, if appropriate.  <b>Pg. 14 Aquatic Resources Study Plan</b>
209	06-01-10	KAFC	Section 2.2	There is no program to address stream macro-invertebrate drift. Organisms produced in Grant Lake may be important in these evaluations.	See responses to Comments 178 and 207. Additionally, the high gradient of Grant Creek would make the collection of statistically credible drift sampling very difficult.
210	06-01-10	KAFC	Section 3.2.11	The stream life is an important part of making a population estimate. It should be defined for this system by tagging and recovery of salmon. Professional judgment is not precise enough to make a reasonable estimate.	See response to Comment 176.
211	06-01-10	KAFC	Section 3.2.11 and 3.2.1.2	There does not appear to be any studies to age and sex salmon in Grant Creek. This is necessary if one wants to do run reconstruction to get a total production estimate for the Creek. There appears to be a sufficient abundance of salmon to get these data sets.	See response to Comment 206.
212	06-01-10	KAFC	Section 3.2.2.3	The use of a backpack electrofisher should not be used in winter. Delayed mortality has been associated with this method in the Kenai and the abundance of fish may be very concentrated in winter. Therefore, visual means is a better method and should be the only method used besides minnow traps.	This comment directly contradicts ADF&G Comment 183. KHL will follow ADF&G guidance. Electrofishing will be deployed very carefully using programmable shocking equipment and strict protocols to minimize harm. In any event, electrofishing opportunities in the winter will be minimal.
213	06-01-10	KAFC	Table 2	Salmon rearing will be used as a surrogate for resident species rearing and spawning. This is not defensible given the differences in life history and habitat use.	In the high gradient environment of Grant Creek where slow water habitats are scarce, it makes sense to consider small, juvenile fish as a single guild. Fish size and swimming ability are likely more important than species differences.
214	06-01-	KAFC	Section 3.2.5	There are no studies to deal with macroinvertebrate	See response to Comment 209.

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	10			drift and where those organisms are being produced. The role of Grant Lake should be evaluated.	
215	06-01-10	KAFC	Section 3.2.5	The focus of the studies on a number of study reaches and yet only two stations for macroinvertebrates is not acceptable. If the goals are to be realized then more baseline data is needed for each study reach.	See response to Comment 178.
216	07-06-10	ACE		Quantify, by species, the average annual production of juvenile Pacific salmon, rainbow trout and other species of fish that are spawned in Grant Creek and that out-migrate into the greater Kenai River Basin ecosystem, including reaches of the Kenai River located downstream of Kenai Lake.	The draft and final license applications will integrate all the study results and provide estimates of production as part of the required environmental analysis. Smolt outmigration studies, including spring and fall, was added to the study program to assist in this analysis.
217	07-06-10	ACE		Determine and map the locations, characteristics and extent of spawning gravels used by all 5 species of Pacific salmon and rainbow trout in Grant Creek, and to study and document the natural dynamic forces and processes in the Creek that have created and maintained these spawning gravels over time.	The combined efforts of the habitat mapping, instream flow, and geomorphology study components of the Aquatic Resources Study Plan are designed to accomplish this objective.
218	07-06-10	ACE		Determine the importance of fish habitat located in the “canyon section”, that is the reach of Grant Creek that will be de-watered, to spawning, rearing and resident fish species.	The canyon reach will not be de-watered but flow will be significantly reduced. The Aquatic Resources Study Plan was modified to include additional emphasis on the canyon reach. See responses to Comments 164, 165, and 184.
219	07-06-10	ACE		The genetic diversity of salmon species should be considered and maintained.	See response to Comment 208.
220	07-06-10	ACE	PAD	Commercial Fishing - how will these projects impact commercial fishing interests downstream?	See response to Comment 216. Environmental analyses in the draft and final license applications will discuss Grant Creek productivity in the context of regional fisheries.
221	07-06-10	ACE	PAD	Increased erosion from roads and cleared areas. What will the results be? Fish are very sensitive to increases in suspended solids and turbidity.	The draft and final license applications will include a discussion of potential sedimentation impacts related to disturbed areas.
222	07-06-10	M. Cooney	PAD/Study Plan	A study to quantify, by species, the average annual production of juvenile Pacific salmon, rainbow trout and other species of fish that are spawned in Grant Creek and that out-migrate into the greater Kenai River Basin ecosystem, including reaches of the Kenai River located downstream of Kenai Lake. Estimating annual production of juvenile salmon from Grant Creek should be based on actual field	See responses to Comments 216 and 220.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				sampling (catch and re-catch ratios as necessary) of fry and must not rely on estimates derived from adult spawning escapement combined with non-site specific various computer modeling methods. HEA's fisheries consultant, Northern Ecological Services, has agreed and stated that certain recommended studies (including the one referenced above) and study methodologies would provide more reliable fisheries data than will result from study plans currently proposed by HEA, but has also suggested the applicant (HEA) is unwilling to fund certain recommended studies or study methodologies.	
223	07-06-10	M. Cooney	PAD/Study Plan	A study to determine and map the locations, characteristics and extent of spawning gravels used by all 5 species of Pacific salmon and rainbow trout in Grant Creek, and to determine and document the natural dynamic forces and processes in the Creek that have created and maintained these spawning gravels over time.	See response to Comment 217.
224	07-06-10	M. Cooney	PAD/Study Plan	A study to determine the importance and use of fish habitat located in the "canyon section", (that is the reach 5 of Grant Creek that will be de-watered), to spawning, rearing and survival of anadromous and resident fish species.	See response to Comment 218.
<b>Comments Applicable to All Study Plans</b>					
225	07-09-10	USACOE	All Study Plans	The 404 (b) guidelines [40 CFR 230.404 (b) (1)] require that we assess the potential short-term or long-term effects of a proposed fill activity on the chemical, physical, and biological components of the aquatic environment. To that end, we must have sufficient information to be able to make factual determinations regarding the effects of the proposed discharge. We will utilize all available information in order to make these factual determinations.	Comment noted.
226	07-09-10	USACOE	All Study Plans	Our assessment of impacts to waters of the U.S. is not limited solely to Grant Lake and to Grant Creek. Our evaluation of the effects of the proposed discharge of fill material will encompass the direct effects to waters of the U.S., which includes	Comment noted. The study plans were reviewed as recommended.

Comment Number	Date	Affiliation (Individual)	Report Reference	Comment <sup>1</sup>	Kenai Hydro, LLC (KHL) Response
				wetlands, streams, and open waters. In addition, we will also consider the secondary and cumulative effects of the proposed fill on waters of the U.S. The draft study plans should be reviewed to ensure that sufficient information is collected to fully assess the potential effects of the project on waters of the U.S. that may be impacted by the proposed road, utility corridors, or other appurtenant structures.	

### **List of Abbreviations and Acronyms**

<b>ACE</b>	Alaska Center for the Environment
<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>ADFG</b>	Alaska Department of Fish and Game
<b>ADNR</b>	Alaska Department of Natural Resources
<b>AGL</b>	above ground level
<b>APA</b>	Alaska Power Authority
<b>APE</b>	Area of Potential Effect
<b>ATV</b>	all terrain vehicle
<b>AUC</b>	area under the curve
<b>CFR</b>	Code of Federal Regulations
<b>CPUE</b>	catch per unit effort
<b>-D</b>	dimensional
<b>DEC</b>	Alaska Department of Environmental Conservation
<b>DNR</b>	Alaska Department of Natural Resources
<b>FERC</b>	Federal Energy Regulatory Commission
<b>GIS</b>	geographic information system
<b>GMU</b>	Game Management Unit
<b>HEA</b>	Homer Electric Association
<b>HS</b>	habitat suitability
<b>HSI</b>	Habitat Suitability Index
<b>IFIM</b>	Instream Flow Incremental Methodology
<b>INHT</b>	Iditarod National Historic Trail
<b>KAFC</b>	Kenai Area Fisherman's Coalition
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>KWF</b>	Kenai Watershed Forum
<b>LLC</b>	limited liability company
<b>LMP</b>	Chugach Land and Resource Management Plan (USFS)
<b>MBTA</b>	Migratory Bird Treaty Act
<b>MIS</b>	Management Indicator Species (USFS)
<b>MSL</b>	mean sea level
<b>MW</b>	megawatt
<b>NEPA</b>	National Environmental Policy Act
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NPS</b>	National Park Service
<b>NWI</b>	National Wetlands Inventory
<b>PAD</b>	Pre-Application Document (FERC)
<b>PHABSIM</b>	Physical Habitat Simulation Model
<b>PIT</b>	Passive Integrated Transponder
<b>RBCA</b>	Resurrection Bay Conservation Alliance
<b>RGL</b>	Regulation Guidance Letter (USACOE)
<b>ROS</b>	Recreation Opportunity Spectrum
<b>RVRDSP</b>	Recreation and Visual Resources Draft Study Plan
<b>SD1 and SD2</b>	Scoping Document 1 and Scoping Document 2 (FERC)
<b>SMART</b>	Specific Measurable Attainable Relevant Time-bound



<b>SSI</b>	Species of Special Interest (USFS)
<b>TL</b>	total length
<b>TRSP</b>	Terrestrial Resources Study Plan
<b>TWG</b>	technical working group
<b>UCI</b>	Upper Cooke Inlet
<b>USACOE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	U.S. Department of Agriculture Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey

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**From:** Cory Warnock  
**Sent:** Monday, March 25, 2013 8:01 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** StLouis, Deidre S -FS; Mike Salzetti; Levia Shoutis; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

I'll send out an invite for Friday morning....

Thanks.

---

**From:** Van Massenhove, Katherine B -FS [mailto:kvanmassenhove@fs.fed.us]  
**Sent:** Monday, March 25, 2013 12:03 PM  
**To:** Cory Warnock  
**Cc:** StLouis, Deidre S -FS; Mike Salzetti; Levia Shoutis; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Cory,  
Thursday doesn't work for me, but I could do a call on Friday, will that work for you?

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [mailto:cory.warnock@mcmillen-llc.net]  
**Sent:** Monday, March 25, 2013 10:06 AM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** StLouis, Deidre S -FS; Mike Salzetti; Levia Shoutis; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

My mistake.....I said Wednesday and meant Thursday. Would a call on Thursday morning work? Too many calls!! ☺

Cory

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**From:** Cory Warnock  
**Sent:** Monday, March 25, 2013 11:04 AM  
**To:** 'Van Massenhove, Katherine B -FS'  
**Cc:** StLouis, Deidre S -FS; Mike Salzetti; Levia Shoutis; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

Per your request below, I'd like to set up a call with you to discuss the particulars of the amendment. Would this Wednesday morning work for you? Mike Salzetti (HEA) will be on the call as well as Levia Shoutis (terrestrial expert) to clarify some of the specifics associated with the work on FS lands. Let me know if a call at this time will work and I'll get it set up.

Thanks,

Cory

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Wednesday, March 13, 2013 12:31 PM  
**To:** Cory Warnock  
**Cc:** StLouis, Deidre S -FS  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Cory,

My supervisor is out of the office until next Monday, and I will need to find out from her where this request will fit on the list of workload priorities. At this point I'm not sure if the proposed timeline is something we can meet for what you are requesting, that is a substantial amount of pits (40-60) and will require review of the resource specialist, as it will need to go through the NEPA process. We are not just dealing with the permit administration staff, but also the resource specialists that are now gearing up for field season so I will let you know as soon as I'm able to discuss this next week. Also, you mentioned that the work is to be done in the wetlands, and the US Forest Service is not the regulatory agency for wetlands so there may be additional permitting requirements on top of our special use permit. You will need to contact the local Army Corps of Engineer. This is likely not a use that would be difficult to obtain a permit from ACOE, if one is needed, however only they can make that determination. You can find information regarding their permit regulations at:

<http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx>

Finally, I really need this request to come from the permit holder, and not the contractor. The request to allow for the additional access was a simple action, as it was within the scope of what the NEPA decision analyzed for the permit issuance. Since this request is outside the scope of what was originally analyzed, I need to work directly with the company liable for the terms and conditions set forth in the permit amendment. I'm not saying we can't work together, just that we need to have them at the table agreeing to and understanding what we are authorizing to occur. Would that be Emily Anderson?

Thanks Cory, I will follow up with you next week.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Tuesday, March 12, 2013 2:07 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

Heard back from our terrestrial folks and the work involving the wetland core samples would occur in July. Will we be able to get the amendment by then? I'd assume that this is enough lead time?

Cory

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**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Monday, March 11, 2013 4:33 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

I thought you were working on an ARPA permit with Mike Yarborough (sp?) to do some cultural resource surveys. If they are one in the same, it's likely that this will be covered in that process. Because you mentioned wetlands, I thought this might be a different study and will need a separate permit.

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Monday, March 11, 2013 2:32 PM  
**To:** Van Massenhove, Katherine B -FS  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

I'm checking on the timeline now. Should hear back soon.

Can you expand a bit on your other question? What do you mean by arch shovel pits?

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Monday, March 11, 2013 3:29 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

When do you need this by? It could be several weeks or more to process a ground disturbing request. Is this related to the arch shovel pits?

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Friday, March 08, 2013 2:09 PM  
**To:** Van Massenhove, Katherine B -FS  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Kathy,

I'll coordinate with our terrestrial folks on Monday and get back to you very soon. Any idea on the timeline for the amendment process?

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, March 08, 2013 1:05 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Thanks Cory,

I'm glad you checked too. We will need information on where these pits will be dug (super important for heritage), the number of pits to be dug and other specific information regarding the pits (depth, filling after, etc.).

You can email a request, you do not need to submit a full application. A map of the areas you want to dig the pits will be most helpful for specialists review.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Friday, March 08, 2013 12:01 PM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Kathy,

To be clear, the work done in 2009/2010 was not work we were conducting. It was a previous contractor. We are obviously willing to file the amendment. Can you clarify a bit for me that process or what you need from me to get that going?

Thanks and I'm glad I checked,

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, March 08, 2013 12:57 PM  
**To:** Cory Warnock  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Cory,

No, the existing permit does not allow for any ground disturbance, including the digging of holes even when they are to be refilled. You will need to request an amendment to the permit, which will take time to process, if you want to have the ability to do ground disturbing work. This work should not have been occurring in the previous seasons, I'm not sure Karen O'Leary was aware that you were doing so or she would have required the permit to be amended.

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.com>]  
**Sent:** Friday, March 08, 2013 10:08 AM  
**To:** Van Massenhove, Katherine B -FS  
**Cc:** Levia Shoutis; Emily Andersen  
**Subject:** RE: Executed Amendment for access by snowmobile and helicopter

Hi Katherine,

I was having a talk with our terrestrial folks today and in the interest of being comprehensive, I wanted to verify something. The wetlands work we will be doing involves temporarily digging small core samples approximately 18

inches deep. Once the on-site analysis is conducted, the holes are immediately filled back in. This is consistent with work that was already done under the existing Special Use Permit in 2009/2010 and I'm sure is fine but again, in the interest of being overly certain, I wanted to verify that this method was acceptable per the existing Special Use Permit that has been in place and the associated amendment.

Thanks,

Cory

---

**From:** Van Massenhove, Katherine B -FS [<mailto:kvanmassenhove@fs.fed.us>]  
**Sent:** Friday, February 08, 2013 3:14 PM  
**To:** Cory Warnock  
**Subject:** Executed Amendment for access by snowmobile and helicopter

Hi Cory,

Attached is the signed and fully executed amendment to the permit for the investigative studies on Grant Lake. You are now authorized access by the same means available to the general public, which include helicopter and snow mobile access.

Please let me know if you have any questions,

Kathy Van Massenhove  
Special Uses Service Team  
Chugach National Forest/ Glacier RD  
[kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)  
(907) 754-2315

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**From:** Sagner, Helen -FS  
**Sent:** Thursday, February 07, 2013 9:54 AM  
**To:** Van Massenhove, Katherine B -FS; Pence, Sitka -FS  
**Cc:** Stovall, Robert -FS  
**Subject:**

Per Robert; I have scanned and attached the required documents for you.

Thanks in advance.

Helen

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**From:** Cory Warnock  
**Sent:** Tuesday, March 26, 2013 9:56 PM  
**To:** Ayers, Scott D (DFG)  
**Cc:** Begich, Robert N (DFG); 'Mark Miller (mark.miller@bioanalysts.net)'; John Stevenson; Mike Salzetti; Emily Andersen; Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Thanks, Scott.

Really appreciate the quick response.

Cory

---

**From:** Ayers, Scott D (DFG) [mailto:scott.ayers@alaska.gov]  
**Sent:** Tuesday, March 26, 2013 5:23 PM  
**To:** Cory Warnock  
**Cc:** Begich, Robert N (DFG); 'Mark Miller (mark.miller@bioanalysts.net)'; John Stevenson; Mike Salzetti; Emily Andersen; Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Good Afternoon Cory (et al.),

Please see the attached amendment to your permit SF2013-105. Note that all other conditions specified in the original permit remain in effect and that a copy of this amendment must be attached to the original.

After review of your request, the size range for rainbow trout to be tagged has been altered to greater than or equal to 300 mm.

Scale and length samples would presumably be taken at the same time that you would take genetic samples at the weir. Otoliths may be taken from dead, post-spawn fish.

May your project have smooth sailing from here on out.

Cheers,  
-Scott

---

**From:** Cory Warnock [mailto:cory.warnock@mcmillen-llc.net]  
**Sent:** Wednesday, March 20, 2013 8:48 AM  
**To:** Ayers, Scott D (DFG); [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)  
**Cc:** Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller (mark.miller@bioanalysts.net)'; Emily Andersen; Boyle, Larry R (DFG)  
**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hi Scott,



In response to your comments below, we are submitting a request to lower the size range for taggable rainbow trout in Grant Creek. For a bit of supplemental justification, I've attached some length-weight data from a Klamath River rainbow trout study some of our team members did (see table below). In looking back at the work done in 2009 on Grant Creek, most of the fish were centered in the 200-350 mm (8-14 inches). No fish were above the 500 mm class. Given this site specific data and the attached table for reference, we'd like to be able to tag rainbow as small as 300mm FL. We will certainly strive for larger fish >500 mm and may have that opportunity with the weir.

Additionally, one of our team members brought up a question last night associated with scale and/or otolith samples. We are currently discussion with Eric Volk (ADF&G) the potential of collecting scale and/or otolith samples from anadromous species for aging purposes (per our study plan). I'm assuming that this won't be an issue given that scales (if the selected method) would be taken during the same time as the approved DNA collection and otoliths would only be taken on dead, presumably, post-spawn fish. I'd appreciate it if you could let me know if my assumption is correct.

Thanks Scott and let me know if the requested modification will work for you agency,

Cory

**Table 2. Summary information collected on rainbow trout radio-tagged in different reaches of the Klamath River.**

Reach	Tag ID	Tag Site (RM)	Date	Fork Length (mm)	Weight (g)
Lower Peaking	01	206.4	7-Feb-03	298	320
	02	206.4	7-Feb-03	348	510
	30	206.4	10-Feb-03	405	880
	31	206.9	9-Feb-03	367	540
	32	206.9	9-Feb-03	398	720
	34	205.3	9-Feb-03	376	700
	35	208.0	8-Feb-03	375	600
	36	205.3	9-Feb-03	378	630
	40	208.0	8-Feb-03	393	680
	41	208.9	8-Feb-03	347	460
	42	206.4	7-Feb-03	334	445
	43	206.4	7-Feb-03	321	380
	44	208.9	8-Feb-03	353	460
	45	206.4	7-Feb-03	429	860
			Min	298	320
			Max	429	880
			Mean	361	563
Upper Peaking	05	217.3	5-Feb-03	302	295
	06	220.1	5-Feb-03	313	380
	08	217.3	4-Feb-03	293	240
	09	217.3	4-Feb-03	291	270
	10	217.3	4-Feb-03	300	300
	11	217.3	4-Feb-03	328	330
	12	217.3	4-Feb-03	287	260
	13	217.3	4-Feb-03	283	255
	16	217.3	4-Feb-03	356	450
	17	217.3	4-Feb-03	342	435
	18	217.3	4-Feb-03	320	315
	23	220.1	3-Feb-03	277	250
	24	220.1	3-Feb-03	250	175
	29	215.7	20-Feb-03	276	225
			Min	250	175
			Max	356	450
			Mean	303	304
Boyle Bypass	03	220.9	6-Feb-03	263	200
	04	220.9	6-Feb-03	276	240
	14	221.3	18-Feb-03	265	240
	15	221.3	18-Feb-03	302	360
	19	224.3	4-Feb-03	271	226*

20	221.4	19-Feb-03	265	205
21	220.8	21-Feb-03	274	230
22	224.3	4-Feb-03	307	327*
26	223.4	13-Feb-03	303	300
27	222.2	18-Feb-03	268	220
28	221.1	19-Feb-03	254	200
33	223.4	13-Feb-03	312	315
37	223.4	13-Feb-03	287	280
39	221.7	18-Feb-03	266	230
		<b>Min</b>	<b>254</b>	<b>200</b>
		<b>Max</b>	<b>312</b>	<b>360</b>
		<b>Mean</b>	<b>281</b>	<b>254</b>

**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]

**Sent:** Tuesday, March 19, 2013 3:34 PM

**To:** Cory Warnock; [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)

**Cc:** Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen; Boyle, Larry R (DFG)

**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hello Cory,

Thank you for your questions about the Fish Resource Permit SF2013-105. I'll answer the questions in the order that you asked.

1. 1. In the "Final Disposition" paragraph, it stipulates that  $\leq 40$  rainbow trout  $> 500$  mm (nearly 20") may be tagged. We are assuming that the state's requirement that the fish exceed 500 mm is due to concern that the tag will create an undue burden on the tagged fish. However, the transmitters that will be used on the rainbow only weigh 2.8 g in air; using the criteria developed by Winter (1983)<sup>1</sup>, which is generally the standard in radiotelemetry research, (the transmitter weighing up to 2% of the body weight of the fish in air), that allows the tagging of fish as small as 140 g. That equates to a fish much smaller than 500 mm. Would it be possible for the state to amend the permit, and base fish selection on fish weight ( $\geq 140$  g)? Our team has conducted a telemetry study on redband trout in the Klamath Basin using the same transmitter that will be used on Grant Creek, and tagged fish much smaller than 500 mm without any apparent ill effects. This combined with literature concluding that the types/size of tags we will be using would cause no harm to fish much smaller have led us to this request.

The size range for the rainbow trout ( $> 500$  mm) to be tagged came directly from the study plan that was provided to me for the permitting process (page 17, paragraph 2):

*Fish within the dominant size range of mature Rainbow trout (500 - 700 mm) will likely weigh 1,800-6,000 grams (Russell, 1977). It is advised that radio tags should not exceed 2 percent of body weight, thus a tag weighing less than about 35 grams would be suitable.*

I am amenable to altering the size range. The size of fish, however, must still fit within the objective that you are trying to answer with these tags, which I believe to be locating spawning locations within Grant Creek. I do not believe you are going to find rainbow trout as small as 140mm in spawning condition in Grant Creek. If you would like, please submit a lower end size range and I will consider an amendment to the permit.

2. In the same paragraph, it requires all rainbow trout to be marked with an external transmitter (I am assuming a floy tag). Per my communication with you on 3/13, we would prefer not to utilize an additional, external tag. As I mentioned, an approximate 9 inch braided cable antennae will be visible, exterior of the fish very

clearly establishing that these fish have been tagged and essentially acting as an external tag. Additionally, during discussions with the floy tag representative, she acknowledged that some researchers have reported anecdotal information suggesting that fish marked with floy tags are more susceptible to predation relative to non-marked fish.

While I understand your concern about increasing the risk of predation upon fish that have an external tag (e.g., Floy tag), the addition of a secondary external marker is a stipulation required by the Area Management Biologist for all radio-tagged rainbow trout in this study. Tags now come in a large variety of colors and choosing a color that more closely matches the fish and/or is less flashy may decrease the risk of predation.

If you would like to discuss the secondary external mark further, I suggest you speak with the Area Management Biologist, Robert Begich (907) 260-2920. He is out of the office this week, but should be back on March 25<sup>th</sup>.

Wishing you well.

Cheers,  
-Scott

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**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]

**Sent:** Tuesday, March 19, 2013 1:21 PM

**To:** Ayers, Scott D (DFG); [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)

**Cc:** Cory Warnock; Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG); John Stevenson; John Blum; 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; Emily Andersen

**Subject:** RE: PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Hi Scott,

On behalf of Mike Salzetti and HEA we have developed a couple of questions/clarifying points related to the Fish Resource Permit for Grant Creek. They are as follows:

1. In the "Final Disposition" paragraph, it stipulates that  $\leq 40$  rainbow trout  $> 500$  mm (nearly 20") may be tagged. We are assuming that the state's requirement that the fish exceed 500 mm is due to concern that the tag will create an undue burden on the tagged fish. However, the transmitters that will be used on the rainbow only weigh 2.8 g in air; using the criteria developed by Winter (1983)<sup>1</sup>, which is generally the standard in radiotelemetry research, (the transmitter weighing up to 2% of the body weight of the fish in air), that allows the tagging of fish as small as 140 g. That equates to a fish much smaller than 500 mm. Would it be possible for the state to amend the permit, and base fish selection on fish weight ( $\geq 140$  g)? Our team has conducted a telemetry study on redband trout in the Klamath Basin using the same transmitter that will be used on Grant Creek, and tagged fish much smaller than 500 mm without any apparent ill effects. This combined with literature concluding that the types/size of tags we will be using would cause no harm to fish much smaller have led us to this request.
2. In the same paragraph, it requires all rainbow trout to be marked with an external transmitter (I am assuming a floy tag). Per my communication with you on 3/13, we would prefer not to utilize an additional, external tag. As I mentioned, an approximate 9 inch braided cable antennae will be visible, exterior of the fish very clearly establishing that these fish have been tagged and essentially acting as an external tag. Additionally, during discussions with the floy tag representative, she acknowledged that some researchers have reported anecdotal information suggesting that fish marked with floy tags are more susceptible to predation relative to non-marked fish.

Thanks for your attention to these Scott and I'll look forward to hearing from you,

Cory

<sup>1</sup>Winter, J. D. 1983. Underwater biotelemetry. Pages 371-395 In: L. A. Nielsen and D. L. Johnson, editors. Fisheries techniques. American Fisheries Society, Bethesda, Maryland.

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**From:** Ayers, Scott D (DFG) [<mailto:scott.ayers@alaska.gov>]

**Sent:** Monday, March 18, 2013 12:05 PM

**To:** [MSalzetti@HomerElectric.com](mailto:MSalzetti@HomerElectric.com)

**Cc:** Cory Warnock; Begich, Robert N (DFG); Pawluk, Jason A (DFG); Lewis, Bert A (DFG); Litchfield, Virginia P (DFG); Daigneault, Michael J (DFG); Miller, Monte D (DFG); Morris, Michelle I (DFG)

**Subject:** PERMIT: Fish Resource Permit SF2013-105 (Salzetti/Homer Electric-grant creek/trail lake narrows-local species)

Dear Mr. Salzetti:

Please find enclosed your ADF&G Fish Resource Permit (SF2013-105). You need to read this permit carefully not only to understand what you are authorized and required to do but also to check for mistakes that must be corrected immediately by contacting us. If your plans are modified later on (e.g. personnel changes, larger than expected collections, different sampling locations, etc.), contact us as soon as you know so that an amendment to your permit can be prepared and issued in time to avert disruptions to planned field work. Failure to abide by permit requirements or to amend your permit when conditions change are permit violations that can result in a citation and/or loss of your permit.

Please be sure that you and all authorized personnel carry a copy of the permit while conducting collecting activities.

A report detailing all collections for this permit is due on or before December 31, 2013. Please use the ADF&G data submissions form for this task. If you do not have the opportunity to utilize your permit, please submit a letter or email stating that the permit was not used. A telephone message is not sufficient.

**Please use the subject line in all future correspondence regarding this permit--thanks**

Wishing you success with your project,  
-Scott

Scott D Ayers  
Fish Resource Permit Program Coordinator  
Alaska Department of Fish and Game  
Division of Sport Fish  
333 Raspberry Road  
Anchorage, AK 99518  
(907) 267-2517 – phone (907) 267-2464 – fax  
[scott.ayers@alaska.gov](mailto:scott.ayers@alaska.gov)

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STATE OF ALASKA  
DEPARTMENT OF FISH AND GAME-SPORT FISH  
P.O. BOX 115525  
JUNEAU, ALASKA 99811-5525

FISH RESOURCE PERMIT AMENDMENT #1

Permit No. SF2013-105

Permit Issued To: **Mike Salzetti** (signature required below for permit validation)

**This amendment of Fish Resource Permit SF2013-105:**

- 1) under Final Disposition; alters the permit language **from the following**:

≤40 rainbow trout >500 mm may be marked with surgically implanted radio tags, and released alive during the early portion of their spawning migration (March 25 – June 30). These fish must also be tagged with an external tag.

**To the following:**

≤40 rainbow trout >300 mm may be marked with surgically implanted radio tags, and released alive during the early portion of their spawning migration (March 25 – June 30). These fish must also be tagged with an external tag.

**All other conditions specified in Fish Resource Permit SF2013-105 remain in effect.**

***This amendment must be attached to the original permit.***

  
\_\_\_\_\_  
Division of Sport Fish

  
\_\_\_\_\_  
Date

**PERMIT AMENDMENT VALIDATION requires permittee's signature agreeing to abide by conditions of this permit amendment:**

\_\_\_\_\_  
**Signature of Permittee**

cc: Robert Begich, Division of Sport Fish, Soldotna  
Jason Pawluk, Division of Sport Fish, Soldotna  
Bert Lewis, Division of Commercial Fisheries, Anchorage  
Ginny Litchfield, Division of Habitat, Soldotna  
Mike Daigneault, Division of Habitat, Anchorage  
Fish and Wildlife Protection, Soldotna

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Andy Barclay and Bill Templin

*Agency/Organization:* ADF&G

*Phone No./E-mail Address:* 907-267-2475, [andy.barclay@alaska.gov](mailto:andy.barclay@alaska.gov)

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*Date:* 3/27/13

*Time:* 2:00 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Mr. Warnock and Mike Salzetti discussed genetic sampling materials, methods and analysis. The discussion focused on two primary topics:

1. Sampling Materials – Mr. Warnock and Mr. Barclay discussed the logistics of getting the individual sampling kits to the CIAA facility in advance of the beginning of the sampling timeframe. It was agreed that Mr. Barclay would talk with the ADF&G lab and get the kits to Nathan Weber at CIAA by late April.
2. Costs Associated with ADF&G Analysis – Mr. Warnock and Mr. Salzetti discussed their belief that the previously discussed approximate \$10,000 cost associated with ADF&G's analysis of the samples should be discussed given that this was a mutually beneficial effort that would save the agency the cost of collecting the samples internally on a project that they had already planned to allocate funds. Mr. Warnock asked if given this savings, ADF&G would be willing to be flexible with these costs and consider doing the analysis at no cost. Mr. Barclay brought his supervisor Bill Templin onto the call to discuss the financial arrangement. Mr. Templin stated that once we get to the point where it is determine that the analysis piece is needed, ADF&G will be open to discussing the cost (if any) associated with the effort. He stated that ADF&G would be willing to be flexible with cost and the level of flexibility would be associated with:

- Timing of analysis relative to other analyses that ADF&G is doing.
- Number of samples to be analyzed.
- State funding received by ADF&G during the coming months/years.

Everyone agreed to revisit the topic if and when it is determined that the analysis needs to take place to reach final agreement.

Call Duration: 20 minutes.

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**From:** Cory Warnock  
**Sent:** Wednesday, March 27, 2013 8:16 AM  
**To:** Volk, Eric C (DFG)  
**Cc:** 'Mark Miller (mark.miller@bioanalysts.net)'; John Stevenson; Emily Andersen  
**Subject:** RE: Scale Sample Call (Grant Lake)

Hi Eric,

Just checking in to see when you might be available for a call. Let me know.

Thanks,

Cory

---

**From:** Volk, Eric C (DFG) [<mailto:eric.volk@alaska.gov>]  
**Sent:** Wednesday, March 20, 2013 6:00 PM  
**To:** Cory Warnock  
**Cc:** 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; John Stevenson; Emily Andersen  
**Subject:** RE: Scale Sample Call (Grant Lake)

Hello Cory;

I will be involved in BOF meetings this week, but I did speak with Gary Fandrei who reminded me that we were mainly talking about spawning sockeye salmon in this work. You probably already know that dealing with spawning sockeye scales is very problematic and most investigators turn to otoliths for age determination. Perhaps we can hook up next week to discuss this further.

Eric

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Wednesday, March 20, 2013 3:30 PM  
**To:** Volk, Eric C (DFG)  
**Cc:** 'Mark Miller ([mark.miller@bioanalysts.net](mailto:mark.miller@bioanalysts.net))'; John Stevenson; Emily Andersen  
**Subject:** Scale Sample Call (Grant Lake)

Hi Eric,

Just checking in to see if your schedule has become clearer and we can nail down a time (hopefully later this week) to discuss Grant Lake.

Let me know when you have a chance and thanks,

Cory

**Cory Warnock**  
*Senior Licensing and Regulatory Consultant*

McMillen, LLC  
[www.mcmillen-llc.com](http://www.mcmillen-llc.com)  
5771 Applegrove Ln.  
Ferndale, Wa. 98248  
O – 360-384-2662



# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Mark Willette

*Agency/Organization:* ADF&G

*Phone No./E-mail Address:* 907-260-2941, [mark.willette@alaska.gov](mailto:mark.willette@alaska.gov)

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*Date:* 3/28/13

*Time:* 2:00 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Mr. Warnock called Mr. Willette to discuss the potential for his group to provide scale cards and subsequent analyze Chinook scales collected in Grant Creek in an effort to assess age of the fish. Mr. Warnock conveyed that approximately 100 fish would need to be analyzed and Mr. Willette stated that his group could provide that service with minimal effort. Mr. Willette committed to getting HEA the necessary scale cards. Mr. Warnock and Mr. Willette agreed to discuss the logistics and timing of the work to be done as it gets closer.

Call Duration: 5 minutes.

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* None

*Agency/Organization:* ADF&G Division of Habitat

*Phone No./E-mail Address:* 907-714-2475

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*Date:* 3/28/13

*Time:* 11:00 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Per the requirements of HEA's Fish Habitat Permit, Mr. Warnock left a message with ADF&G's Division of Habitat informing them of project initiation. Mr. Warnock left his office number and requested a call back if any additional information was needed.

Call Duration: 1 minute.

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Robert Begich

*Agency/Organization:* ADF&G

*Phone No./E-mail Address:* 907-260-2920, [robert.begich@alaska.gov](mailto:robert.begich@alaska.gov)

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*Date:* 3/28/13

*Time:* 10:45 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Per the requirements of HEA's Fish Resource Permit, Mr. Warnock called Mr. Begich to inform him that HEA would be beginning collection activities very soon on Grant Creek and needed authorization to move forward. Mr. Begich confirmed authorization and thanked Mr. Warnock for his call.

Call Duration: 2 minutes.

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Judy Berger

*Agency/Organization:* ADF&G

*Phone No./E-mail Address:* 907-267-2175, [judy.berger@alaska.gov](mailto:judy.berger@alaska.gov)

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*Date:* 3/28/13

*Time:* 10:50 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Per the requirements of HEA's Fish Resource Permit, Mr. Warnock called Ms. Berger to inform him that HEA would be beginning collection activities very soon on Grant Creek. Per previous discussions with Andy Barclay (ADF&G) Mr. Warnock discussed the logistics associated with getting data collection kits from Ms. Berger. Ms. Berger thanked Mr. Warnock for his call and discussed being in further contact once the kits were assembled and shipped to HEA.

Call Duration: 2 minutes.

# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Tim McKinley

*Agency/Organization:* ADF&G

*Phone No./E-mail Address:* 907-260-2913, [tim.mckinley@alaska.gov](mailto:tim.mckinley@alaska.gov)

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*Date:* 3/28/13

*Time:* 2:10 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Per Mark Willette's (ADF&G) recommendation, Mr. Warnock called Mr. McKinley to inquire about the potential for scale reabsorption to be an issue with Chinook in the upper Kenai Watershed. Mr. McKinley stated that he did not think reabsorption would be an issue for Chinook that would hinder the ability to use scales for aging purposes. Mr. Warnock thanked him and stated that he was planning on following up with Mark Willette to plan for utilizing ADF&G's capabilities to conduct the analysis.

Call Duration: 3 minutes.

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**From:** Cory Warnock  
**Sent:** Friday, March 29, 2013 10:49 AM  
**To:** Leclair, Claire H (DNR)  
**Cc:** Emily Andersen  
**Subject:** RE: Field studies for Grant Lake Hydro project

Thanks for the update.

Let me know if you need anything from my end,

Cory

---

**From:** Leclair, Claire H (DNR) [<mailto:claire.leclair@alaska.gov>]  
**Sent:** Friday, March 29, 2013 10:41 AM  
**To:** Cory Warnock  
**Subject:** RE: Field studies for Grant Lake Hydro project

Thanks Cory, got your phone message too. Just out of a two day statewide staff meeting. Have meeting scheduled with Kenai staff today at 10AM to review the determination.

-Claire

---

**From:** Cory Warnock [<mailto:cory.warnock@mcmillen-llc.net>]  
**Sent:** Wednesday, March 27, 2013 9:01 AM  
**To:** Leclair, Claire H (DNR)  
**Cc:** Emily Andersen  
**Subject:** RE: Field studies for Grant Lake Hydro project

Hi Claire,

Just touching base to see how things are coming with the permit. Our folks arrived on site Monday and have begun the work we discussed (below). Are things still looking good for receiving the permit prior to our helicopter lift on April 3<sup>rd</sup>?

Thanks,

Cory

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**From:** Leclair, Claire H (DNR) [<mailto:claire.leclair@alaska.gov>]  
**Sent:** Wednesday, March 20, 2013 1:33 PM  
**To:** Cory Warnock  
**Cc:** Blackwell, Jack D (DNR); Salzetti, Mikel  
**Subject:** Field studies for Grant Lake Hydro project

Cory-

This email is to confirm for you that an authorization from the Division of Parks & Outdoor Recreation is not required for field crews to perform fish surveys by foot along Grant Creek and within lands managed as part of the Kenai River Special Management Area. I understand field crews will be on site for day trips starting March 25 and will access the area by power boat across Trail Lake and then on foot.

Claire Holland LeClair  
Deputy Director/Chief of Field Operations  
Division of Parks & Outdoor Recreation  
907-269-8702

*The Division of Parks & Outdoor Recreation provides outdoor recreation opportunities and conserves and interprets natural, cultural, and historic resources for the use, enjoyment and welfare of the people.*

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# Grant Lake Hydroelectric Project (FERC No. 13212) Licensing

## Consultation Record

### Phone/E-mail /One on One Meeting Log

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*Contact Name:* Katherine Van Massenhove

*Agency/Organization:* USFS

*Phone No./E-mail Address:* (907) 754-2315, [kvanmassenhove@fs.fed.us](mailto:kvanmassenhove@fs.fed.us)

*Date:* 3/29/13

*Time:* 11:00 PST

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*Grant Lake Licensing Team Contact:* Cory Warnock

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#### *Summary of Conversation and/or E-mail Exchange:*

Mr. Warnock and Mike Salzetti (HEA) had a call with Ms. Van Massenhove to discuss the pending amendment to the existing Special Use Permit that will allow the wetlands core samples to be collected as described in the Terrestrial Study Plan. Mr. Warnock clarified that the number of samples that would need to be collected on USFS land was very small and limited to the headwaters of Grant Lake. Ms. Van Massenhove stated that this information helped and may assist in limiting the amount of work required by USFS personnel (specifically the cultural department) to conduct an assessment and get the amendment issued to HEA. Ms. Van Massenhove stated that none of the other resource departments had expressed concern or would require a significant amount of time to process their portion of the requested amendment.

It was agreed that this topic would be discussed in detail with the appropriate cultural staff from the USFS during the April 3, 2013 APE meeting for the upcoming cultural work related to the Grant Lake Project. With the appropriate level of clarity provided to individuals within the USFS, the hope is that a path forward related to their analysis can be established. The potential approach that was discussed during the call was to have HEA's cultural consultant (Mike Yarborough) conduct the appropriate assessment on behalf of the USFS during their June survey work. This would presumably allow the USFS enough time to process the amendment in advance of the wetlands work, currently proposed for late July.

Mr. Warnock asked Ms. Van Massenhove what level of cost HEA would be required to pay for the amendment effort conducted by the USFS. Ms. Van Massenhove stated that this would be



much clearer after the meeting on the 3<sup>rd</sup> but it would range between \$400 and \$1150 depending on the number of hours required to do the work.

Mr. Warnock sent out amended invitation for the APE meeting to include Ms. Van Massenhove and it was agreed that the formal discussion related to this issue would take place with the appropriate individuals during that meeting.

Call Duration: 30 minutes.