

**Kenai Hydro, LLC
Grant Lake/Falls Creek
Aquatics Technical Work Group Meeting
Kenai Challenger Learning Center
April 21, 2009, 10 am – 4:45 pm**

In attendance

Robert Begich, Alaska Department of Fish and Game (ADFG)
Jenna Borovansky, Long View Associates (LVA)
Tom Cappiello, ADFG
Mike Cooney, Friends of Cooper Landing
Ingrid Corson, HDR
Gary Fandrei, Cook Inlet Aquaculture Association (CIAA)
Jim Ferguson, ADFG
Loren Flagg, Kenai Area Fisherman's Coalition (KAFC)
Eric Johansen, USDA Forest Service (USFS)

Jason Kent, HDR
Paul McLarnon, HDR
Lee McKinley, ADFG
John Morsell, Northern Ecological Services (NES)
Doug Palmer, USFWS
Gary Prokosch, Alaska Department of Natural Resources (ADNR)
Ron Rainey, Kenai River Sportfishing Association (KRSA)
Kim Sager, ADNR
Brad Zubeck, Kenai Hydro, LLC (KHL)

Meeting Summary

Agenda

- Introductions
- Project Overview
 - Project Status
 - Fish Resources
 - Hydrology
- Discussion of Hydrology Station Locations
- Initial Discussion of Instream Flow Methodologies
- Initial Discussion of Focal Species and Lifestages
- Action Items and Next TWG Meeting Agenda
- Schedule Next TWG Meetings

Brad Zubeck (KHL) welcomed meeting participants and previewed the agenda for the day (Attachment 1).

Project Status Update

Brad Zubeck reviewed a series of slides (Slides 1-15, Attachment 2) updating the Technical Workgroup (TWG) on the proposed project details, the role that small hydropower could play in

the region, and provided general background information on the proposed Grant Lake and Falls Creek hydroelectric project.

Grant Creek Fish Resources

Paul McLarnon (HDR) summarized available information on Grant Creek, and reviewed general characteristics of the Fish Resources Baseline Study that was discussed at the March 24 meeting with agencies (Slides 16 – 21, Attachment 2). He also presented a diagram of five study reaches that have been used in previous studies of Grant Creek (Attachment 3) that will be re-established for use during the 2009 baseline study program.

Paul noted that Cook Inlet Aquaculture Association (CIAA) operated a weir on Grant Creek from 1985-1988, and summarized results presented on Slide 17. He asked the TWG if they knew the circumstances that led to the high sockeye counts (2181) in 1987.

- Gary Fandrei (CIAA) noted that there was high escapement in the Kenai River that could have contributed to these numbers.
- It was noted that ADFG completed a foot survey in 1984 and recorded 1600 sockeye.
- Doug Palmer (USFWS) asked if there were fisheries enhancement programs that may contributed to these numbers. Paul noted that the enhanced runs were discontinued after results indicated less than 1% total return. The USFS tracked the enhancement program.
- Gary Fandrei supplied KHL with copies of the Grant Lake Coho Stocking Program progress reports for the years 1985-87 at this meeting. He delivered the CIAA Summary Report prepared for USFS to KHL the next day. These documents will be placed in the KHL document library.

Paul McLarnon reviewed components of baseline study plans summarized in the PowerPoint slides (Attachment 2) and addressed questions and comments from the TWG.

- Doug Palmer noted that it is good that whitefish will be included in the baseline surveys, but stated that angling will not be a successful method for gathering whitefish data.
 - It was noted that whitefish are a good indicator of water quality.
 - Paul McLarnon noted that past studies used weirs to collect whitefish data, but some presence/absence data may be collected during snorkel surveys. Other methods will be considered.
 - Ron Rainey (KRSA) asked about the timing of weir data collection.
 - Brad Zubeck stated that a location for one potential weir will be investigated this field season, but weir data collection is not a part of this year's study efforts.
- Doug Palmer stated that arctic grayling are not a native species in Grant Lake, and asked about the source of the grayling. Paul McLarnon confirmed that arctic grayling were present in the system, and Gary Fandrei suggested that the source was potentially pioneers from the Crescent Lake stocking program.
- Doug Palmer stated that the revised draft of the study plan states that juvenile data would be collected through September, and that he recommends going as late as possible.
 - Paul McLarnon noted that collection will continue through at least October.

- Robert Begich (ADFG) asked if HDR field crews would be out in May to collect data on rainbow trout.
 - Paul replied that both foot surveys and electrofishing would be conducted as early as possible in May to get rainbow data.
 - Paul noted that even if rainbows are not caught during angling surveys, anglers will record if rainbows are observed.
- Paul reviewed the number of minnow traps to be set per reach (10), for at least 50 traps total. The minnow trap species observations will be verified by electrofishing the same areas after the traps are pulled.
 - Lee McKinley (ADNR) indicated that sockeyes are not vulnerable to minnow traps. Paul suggested that electroshocking would catch them if they are there.
 - Doug Palmer noted that sockeye are coming out now, and that juvenile will be missed in this baseline study.
 - Paul McLarnon acknowledged that winter surveys would be needed to record sockeye juveniles.

Tom Cappiello and Jim Ferguson from ADFG joined the meeting by phone, and asked for confirmation on the study area and the preferred project locations that were being discussed, as it is important to inform baseline study comments and questions.

- Brad Zubeck explained that at this time, Kenai Hydro, LLC has looked at five concepts, with two concepts as preferred options right now. These two options are: 1) raising Grant Lake by about nine feet, with potential fluctuations of up to 25 feet below natural lake level or 2) diverting a portion of Falls Creek to supplement flows in Grant Creek.

Grant Creek Hydrology

Jason Kent (HDR) introduced the purpose and goals of developing an instream flow study (Slides 22-26, Attachment 2). He described characteristics of the Grant Lake outlet into Grant Creek. He noted that instream flow studies are designed to quantify potential impacts of proposed projects such as impacts of flow attenuation, impacts on winter flows downstream of a powerhouse, potential temperature changes, etc. He reviewed a slide of decision points for which the TWG will be asked to provide input. One of the key decisions is to choose focal species, in order to identify information needs and to conduct impact analyses. Additionally, HDR noted that another need is to determine logical compliance points based on areas of potential change if there is flow regulation in the future.

Jason Kent reviewed the role of the TWG, and noted both HDR and Kenai Hydro, LLC appreciate the time and effort of meeting participants to help design this instream flow study. Paul stated that decisions and areas of agreement from TWG meetings will be recorded in meeting summaries. Meeting summaries will be provided to TWG members for review and comment.

Hydrology Station Locations

Paul McLarnon and Ingrid Corson (HDR) summarized existing hydrology information for Grant Creek (Slides 27-30, Attachment 2). HDR proposed at a minimum re-establishing a gage at the USGS station, and installing a station at the proposed facility location near the canyon reach.

Ingrid Corson noted that if there is not significant groundwater or tributary input between the Grant Lake outlet and the downstream USGS station location, these may be the only flows needed to determine instream flow dynamics. HDR asked the TWG for input on whether there are potential sources of accretion.

- Mike Cooney stated that there may be surface flow inputs in the canyon reach. He notices ice falls on the south side of Grant Creek in the canyon reach. Mike also pointed out the location of an intermittent stream.
 - Ingrid Corson noted the locations of where Mike Cooney indicated on the maps.
- The TWG discussed potential spawning or rearing use of the intermittent stream.
 - Mike Cooney and Paul McLarnon noted that there is possibly rearing habitat in the intermittent stream.
 - The TWG did not think there were other surface inputs into Grant Creek.
- Eric Johansen (USFS) noted that on the south side, between Vagt Lake and North Grant Lake there are large wetland areas. This series of muskegs and boggy wetlands could be a significant contributor of water to the intermittent stream.

Ingrid summarized the feedback given that there is one intermittent stream and the ice falls, and inquired whether the TWG thought there was a need for additional gages to determine the level of accretion. Ingrid asked for input about whether there were other locations needed for hydrology stations.

- Tom Cappiello asked if the location of the powerhouse was known, as a gage in this location would assist in future impact evaluation of inputs.
- Brad Zubeck explained that ground surveys are still needed to determine exact location based on available head, but that the general location is below the gorge reach.
- Doug Palmer stated that information from the USGS gage, a lower station, along with the powerhouse location would be useful.

Doug Palmer asked for a description of HDR's proposed continuous and instantaneous flow measurement methods. He also stated that for stations where only instantaneous flow would be taken, an effort should be made to record flows during a range of flows, including high, medium, and low.

- Ingrid described that intermittent stream flow could be measured using instantaneous flow measurements at designated areas by field crews during other baseline study work.
- Ingrid stated that the continuous station would include survey markers, a staff gage, and pressure transducers.
- Jason Kent noted that collecting flows may be difficult at high flows, but HDR is investigating using Doppler technology.

- Tom Cappiello acknowledged that high flow data may be difficult, but requested that whenever safety and technology allow, flows should be recorded as the knowledge of the range of flows over the course of the year is extremely valuable.

Robert Begich recommended at least one year of continuous data at the USGS station would be needed to verify the historic rating curve, and if that checks-out, then the station could be transitioned to a staff gage. Robert, HDR, and Gary Prokosch discussed the level of resolution needed for the area between the mouth of the lake and the gorge, as it is only a half mile stretch. Robert noted that a few cross section measurements would be needed to verify that there are not significant gains or losses.

Gary Prokosch asked for confirmation of the question that the hydrology station data is meant to address for the 2009 studies. HDR confirmed his general statements that the purpose of the hydrology study is to:

- 1) Determine if there is a change in flows between the Lake and downstream end of Grant Creek – the USGS station and Outlet station seem adequate to address this question
- 2) Determine if the project would result in biologically significant changes in flows within the five study reaches – there does not seem to be enough information on the biology to identify any critical locations at this time, but the 2009 baseline study information could provide insight.

Doug Palmer asked for clarification of the distance between the USGS gage and the Lake Outlet.

- Brad Zubeck noted that Grant Creek is about 1-mile total.

Gary Fandrei (CIAA) asked if after project construction, natural flows would be allowed through the gorge reach.

- Brad Zubeck indicated that this would be determined in project design, and that flows may be supplemented as necessary.
- Gary stated that current flow information at the gorge will be critical to making seasonal flow recommendations, if there is a need to mimic these seasonal releases in the future.

Tom Cappiello stated that he is undecided on the level of detail needed for a 1-mile stretch of river, as three USGS level gage stations seems like a lot. He noted that winter flow data will be critical.

- Doug Palmer stated that pre-Project flows at the powerhouse location are critical.
- Tom Cappiello is not sure that a stage recorder is necessary, but discharge frequency throughout the year at the powerhouse location in order to correlate to other stations will be important. He recommends having flow data for just above the powerhouse location.

Tom noted that if a project is to go in, that a compliance point will be needed in the future, so that it may not be efficient to re-establish the USGS station for only one-year, as it could be needed in the future. He noted that as the process moves forward there will be many issues to consider, but a permanent station will be needed for compliance – and that this could be downstream or upstream at the Lake.

- Tom Cappiello and Gary Prokosch recommended that it is useful to set a staff gage and benchmark the instantaneous sites as well as at the continuous sites.

Jim Ferguson stated that there are options for where to measure, above or below the dam, or flow could be measured at particular fish habitats. The TWG discussed options, and determined that when more information is available, the exact location for compliance will be easier to locate. At this point, enough flow data should be collected to know whether there are gaining or losing reaches.

Ingrid noted that the baseline studies and initial hydrology station data collection will inform critical fish habitat locations, and determine whether there are reduced flow reaches.

Brad Zubeck summarized land ownership in the potential project area, noting that it is generally USFS land east of the west shore of Grant Lake, and state land from the west shore to the highway. Grant Creek is almost all on state land. HDR will secure proper permits for all hydrology station work.

The TWG agreed that for the 2009 field season, hydrology stations will be located:

- a. USGS site – continuous, benchmarked
- b. Lake outlet – continuous, benchmarked
- c. Near mouth of intermittent tributary that enters the south side of Grant Creek in study reach 3 – instantaneous, benchmarked (recordings opportunistically)
- d. Near potential powerhouse location – instantaneous, benchmarked (recordings at least once per month)

Instream Flow Study Assessment Methodologies

Jason Kent stated that HDR recommends an incremental method for the instream flow study, and reviewed characteristics for three potential assessment methods for use within the IFIM framework (Slides 31-43, Attachment 2):

1. PHABSIM
2. River2D
3. Expert Habitat Mapping

Information and time needs were discussed for each of the methods. The TWG determined that since the Expert Habitat Mapping method would require three to six field visits that will be difficult to schedule. John Morsell (NES) suggested that a variation of the method – Habitat Criteria Mapping - requires that the experts develop criteria to be applied, and the field crews then conduct the mapping.

- Gary Prokosch stated he is not familiar with the expert habitat mapping methodology and did not feel comfortable supporting this method without additional information review.
- Geo-referenced maps and imagery are needed for the expert habitat mapping method. Mike Cooney asked if this information was available for the area, and Jason Kent stated that while the information does not exist, the imagery could be collected.
- Doug Palmer asked what method was used in Cooper Creek.
 - Jason Kent stated that the difference with Cooper Creek was that the historical range of species in the creek was absent after the construction of the dam except

for Dolly Varden. The Cooper Creek TWG selected PHABSIM as the instream flow assessment methodology within the IFIM framework.

Paul McLarnon and Jason Kent described HSC site specific data that are necessary for use of either PHABSIM or River2D. HSC curves will be decided for focal species and life stages determined by the TWG. Literature values and site specific observations may be used to develop HSC. Since Grant Creek is one-mile long, there may be limited site specific observations possible for some or all focal species – as a minimum of 100 observations is suggested.

- Gary Fandrei inquired as to whether the right curve or the best curve was the goal.
 - Paul McLarnon acknowledged that the goal was to develop the most representative curve.
 - Tom Cappiello noted that even if site specific HSC curves cannot be developed, collecting some site specific habitat information is helpful for validating potential adopted curves.
 - Brad Zubeck noted that consensus of the TWG is important to determine the best curve.
- Doug Palmer asked that when crews are out doing baseline surveys, will there be an effort to measure site specific habitat characteristics.
 - Paul noted that the level of habitat information needed depended on the decision of the TWG on the instream flow assessment methodology.
 - Doug Palmer stated that perhaps there could be a hybrid approach, where spawning locations are recorded with GPS and habitat characteristics are recorded.
 - Paul noted that visual habitat surveys in May-June are included in the baseline study, but that it is difficult to record exact characteristics of species occurrences at the same time crews are in the streams conducting habitat surveys. He stated that at a minimum, high and low density fish habitat areas can be identified during habitat surveys, but the methodology is not conducive to collecting fish use information.

Jason Kent noted that the goal of the instream flow study is to provide an index of physical habitat availability at different flows, but that it does not equate to fish productivity. Jason noted that there are other limiting conditions that are not considered by modeling (e.g., temperature, disease, competition, etc).

- Mike Cooney asked whether there is a certain point/flow determination at which productivity can be assumed lost.
 - Jason Kent stated that there is no definitive number, though threshold limits can be set (e.g., 20% is not necessarily limiting, but 80% is large).
 - Gary Prokosch stated that conservative guidance can be set to inform management decisions.

- Gary Fandrei noted that with up to 2000 cfs peak flows in the historical hydrograph, there could be some limiting conditions related to flows that will need to be considered.

HDR offered to send a white paper and background information on the instream flow methodologies to the TWG.

- Jason Kent recommended the book “Instream Flows for Riverine Resource Stewardship” by the Instream Flow Council (Annear et al., 2004).
- Tom Cappiello noted that the Hydropower Reform Coalition (HRC) has a good summary document that identifies pros and cons of the different methods available on its web-site.

Jason Kent asked the group who would be available for multiple field trips in 2010 if the Expert Habitat Mapping method was selected.

- Doug Palmer and Gary Fandrei said they would not be available.
- Gary Prokosch said ADNR would defer to ADFG for the technical aspects of the instream flow study.
- Eric Johansen said he probably would be available.
- Loren Flagg said KAFC has 10 retired biologists, including some habitat biologists, and would probably be able to help out to some extent.
- No one from ADFG was able to weigh in on availability at this time.

The TWG came to agreement that given the information discussed today, HDR and KHL should go forward with PHABSIM as the preliminary preferred instream flow methodology. A final decision will be made at the next TWG meeting (May 19, 2009) after HDR sends additional information to review about River2D, Habitat Criteria Mapping, Expert Habitat Mapping, and PHABSIM.

- Tom Cappiello stated that ADFG felt it was very important that ADFG and the TWG be involved in transect selection for the instream flow study.
 - Jason Kent replied that the proposed September meeting of the TWG would be to spend one day in the office reviewing field data and selecting general study reaches, and another day in the field staking and setting study units for use in the instream flow assessment.

Focal Species/Life Stages

Paul McLarnon noted that 2009 is a pre-study year, but some effort to inform HSC site-specific needs for the 2010 instream flow study would be useful. Paul asked for feedback from the TWG on how much site specific information should be collected. The TWG discussed the value of different levels of anecdotal information. The TWG determined that collection of habitat characteristics of the minnow trap locations would not be useful, but if other electrofishing and snorkel surveys create opportunities for collecting habitat data, the TWG supported its collection.

Paul McLarnon stated that he would develop (and provide to TWG for review) criteria and definitions for substrate size and cover for approval prior to conducting the proposed habitat survey.

Paul McLarnon proposed a simple habitat use data collection effort focused on salmon species. Depth/velocity/cover/substrate of habitat will be recorded – for salmon spawning and rearing use as observed during snorkeling and electrofishing that will be conducted in each of the five identified reaches, using established transects. It was acknowledged that high flows will limit this data collection.

The TWG discussed the availability of HSC for Alaska, noting that it is limited. HDR compiled a literature review for Cooper Creek that the TWG believes to still be up to date.

- Tom Cappiello noted that perhaps two more site specific HSC have been done since the literature review was completed – one for king salmon and one for Dolly Varden.
 - HDR to update the 2003 literature review with any new information available.

Additional Comments/Questions

Tom Cappiello asked for additional detail about temperature data collection, especially for winter temperatures. He noted that in reviewing the earlier reports, potential impacts on the temperature regime in Grant Creek was noted. He recommends deploying temperature loggers at sites near pressure transducers that are mid-channel, as pressure transducers at flow gages do not always reflect fish habitat temperature conditions.

- Doug Palmer noted that it would be useful to deploy some temperature loggers in deep pools where it would be possible to collect winter data. He recommends cabling the loggers to trees so that they may be relocated and are able to over-winter in place.
- HDR stated that there are a few very deep pools in the study reaches that may be conducive to temperature measurement.

The TWG recommended that temperature data be collected at or near hydrology station and in deep pools, including:

- In addition to temperature measurements at pressure transducers installed at continuous stations, hobs are recommended in mid-channel areas near each continuous and instantaneous hydrology station.
- One or two temperature collection sites in deep pools where data could be collected throughout winter.
- If a concentrated spawning area is located and there is opportunity, an additional hobo temperature site will be established this summer; if opportunity is not readily available, the TWG can revisit this data need and potential locations in the fall.

Agreements/Decisions

1) For the 2009 season, Hydrology Stations will be located:

- USGS site – continuous, benchmarked
- Lake outlet – continuous, benchmarked

- Near Intermittent Tributary – instantaneous, benchmarked
 - Near potential powerhouse location – instantaneous, benchmarked
- 2) After the 2009 field season, modified hydrology station locations will be considered based upon habitat needs and any additional information. The level of hydrologic information will also be re-visited based on what is learned through correlation of flow between sites, and relationship of new rating curves from the USGS site to the existing rating curve. Data collection will be sufficient to record the most complete range of flows, taking into account safety and logistical challenges of winter and high flow recording.
- 3) Temperature data will be collected at or near hydrology stations:
- Three Hobo dataloggers will be installed on Grant Creek: one at the outlet of Grant Lake, one in a mid-channel pool near the potential power house location, and one in a mid-channel pool near the USGS gage and downstream of the small left-bank tributary. One datalogger will be deployed in a pool near the USGS gage on Falls Creek.
 - One to two data loggers will be set in deep pools to remain throughout winter.
 - If a concentrated spawning area is located and there is opportunity, a Hobo datalogger will be set at that location this summer; if opportunity is not readily available, the TWG can revisit this data need and potential locations in the fall.
- 4) PHABSIM was selected by the TWG as the preliminary instream flow assessment methodology, and a final decision will be made at the next TWG meeting after HDR sends additional information to review about River2D, Habitat Criteria Mapping, Expert Habitat Mapping, and PHABSIM.
- 5) HDR to revise Fish and Aquatics study plan to include initial site specific HSC data needs for salmon, and other additional study related input provided at meeting:
- Angling will likely not be useful for whitefish data collection, will focus on presence/absence data from foot surveys/snorkeling in 2009 and rely upon weir data in 2010 for more detailed whitefish data. Other sampling methods will be considered.
 - Study plan will be explicit that juvenile sampling will go as late as possible (at least through October)
 - Additional temperature data collection sites/goals as outlined above
 - Data to be collected in Falls Creek will include a gaging station and reconnaissance level foot survey and fish sampling.
 - Acknowledge that opportunistic (“unexpected”) data will be recorded that may be valuable to inform HSC development (e.g., if more spawning rainbows than expected are seen, spawn locations and habitat parameters will be noted).
 - HDR to develop (and provide to TWG for review) criteria/definitions for substrate size and cover for approval prior to conducting habitat survey
 - Depth/velocity/cover/substrate of habitat will be recorded – for salmon spawning and rearing use as observed during snorkeling and electrofishing that will be conducted in each of the 5 identified reaches, using established transects. [It was acknowledged that high flows will limit this data collection.] This collection is at a reconnaissance level to inform more formal studies in 2010 for focal species (tbd).

Action Items

- Photos of the site and presentation materials to be made available on the web-site (www.kenaihydro.com/kenai_docs).
- HDR to revise Fish and Aquatics study plan to include information outlined above. A revised study plan will be provided to the TWG.
- HDR to look up HSC information on that may be new since 2003 literature review.
- HDR to provide white paper on instream flow assessment methodologies. [Provided by Jason Kent via email on April 29, 2009.]
- Meeting Summary will be provided to TWG by May 1 for review.
- Follow-up conference call on May 19 (10 am), agenda items:
 - Confirm choice of instream flow methodology
 - Additional 2009 field study discussion, as necessary

Closing

The next meeting was proposed as a conference call on May 19 at 10 am. A meeting summary and follow-up materials discussed will be sent prior to this conference call. An office meeting on September 22nd will provide a summary of field data collected, followed by a field trip to determine habitat transect locations on September 23, 2009.

The meeting adjourned at 4:45 pm.

Attachments

- Attachment 1: Agenda
- Attachment 2: 04-21-09 PowerPoint Presentation
- Attachment 3: Diagram with Proposed Study Reaches

Attachment 1: Agenda

Kenai Hydro, LLC
Grant Creek/Falls Creek Instream Flow
Technical Work Group Meeting #1

Tuesday, April 21
Challenger Learning Center
Kenai, AK

Dial-in number 1-888-387-8686
Passcode 5899115#

DRAFT AGENDA

Time	Topic
10:00 AM	Welcome / TWG member introductions
10:20 AM	Project Overview <ul style="list-style-type: none"> • Project status (Brad Zubeck, KHL) • Fish Resources (Paul McLarnon, HDR Alaska) • Hydrology (Jason Kent and Ingrid Corson, HDR Alaska)
11:00 AM	Group discussion – determine locations of hydrology stations in Grant Creek and Falls Creek (Kent/Corson) <ul style="list-style-type: none"> • Group discussion • Summarize points of consent
12:00 Noon	Lunch Break
12:45 PM	Initial Discussion of Instream Flow Study Methodology (Kent) <ul style="list-style-type: none"> • Overview of instream flow studies • PHABSIM-type methodology • River2D-type methodology • Expert Habitat Mapping/Demonstration Flow Assessment • Group discussion of assessment methodologies • Summarize points of consent
2:00 PM	Initial discussion of focal species and lifestages (Kent/McLarnon) <ul style="list-style-type: none"> • Biological information needed by instream flow study methodologies • Level of effort for site-specific data collection • Availability of regional data • Group discussion of focal species and lifestages • Summarize points of consent
3:30 PM	Develop action items and agenda for next TWG meeting
3:45 PM	Schedule next TWG meetings <ul style="list-style-type: none"> • Tentative date – Tuesday, May 19, 2009 • Tentative field trip – September 22-23, 2009
4:00 PM	Adjourn

Attachment 2: 04-21-09 TWG PowerPoint Presentation

Kenai Hydro, LLC Grant Lake Project Technical Working Group Meeting

Kenai Lake Work Center

March 24, 2009

Agenda

Time	Topic
10:00 AM	Welcome / TWG member introductions
10:20 AM	Project Overview <ul style="list-style-type: none">• Project status (Brad Zubeck, KHL)• Fish Resources (Paul McLarnon, HDR Alaska)• Hydrology (Jason Kent and Ingrid Corson, HDR Alaska)
11:00 AM	Group discussion – determine locations of hydrology stations in Grant Creek and Falls Creek (Kent/Corson)
12:00 Noon	Lunch Break
12:45 PM	Initial Discussion of Instream Flow Study Methodology (Kent)
2:00 PM	Initial discussion of focal species and lifestages (Kent/McLarnon)
3:30 PM	Develop action items and agenda for next TWG meeting
3:45 PM	Schedule next TWG meetings
4:00 PM	Adjourn

Project Team

- Kenai Hydro, LLC

– HEA  Homer Electric Association, Inc. and WEA  Wind Energy ALASKA

- HDR Alaska, Inc. 

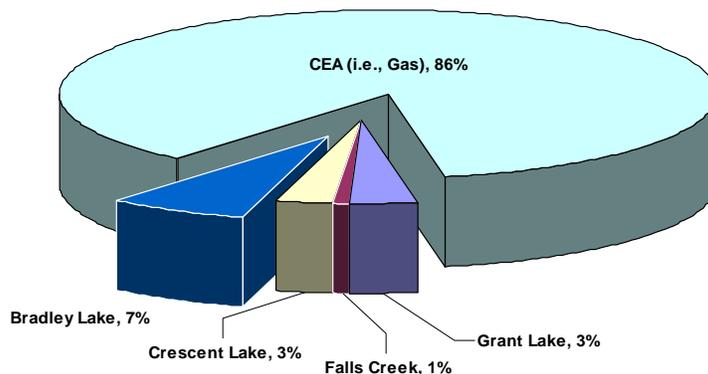
- Long View Associates, Inc.
 - Northern Ecological Services

HEA Need for Power

- Current CEA Contract Expires 2013
- HEA plans for “Independent Light”
- ~70-MW New Capacity Needed by 2014
- HEA desires to add renewable generation
 - Wind and Hydro – reliable technologies
 - Renewables will displace fossil fuels
 - Stabilize energy prices, near & long term

Why bother with Small Hydro?

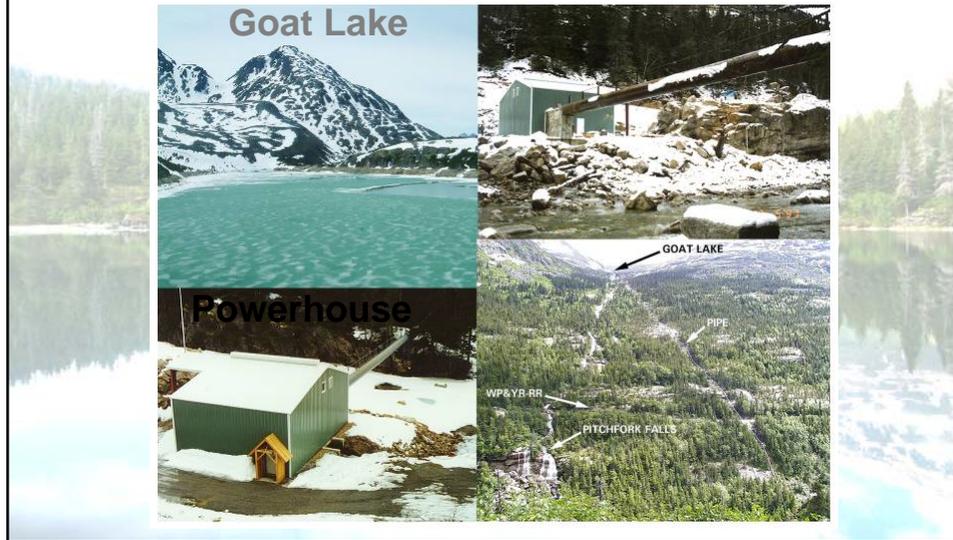
Hypothetical 2008 Energy Blend with Small Hydro



Why bother with Small Hydro?

- With Storage
 - Allows HEA to “shave peaks”- avoids starting additional units & premium priced power
 - Dispatchable, HEA can integrate other renewables, such as wind
- With Run-of-River
 - Environmental Benefits – Energy produced displaces fossil fuels & associated emissions.
- Strategic Solutions – When debt is retired, it is the cheapest power available (< \$0.05/kWh).

Goat Lake Hydro 4MW



Goat Lake Hydro (cont.)



South Fork Hydro 2MW



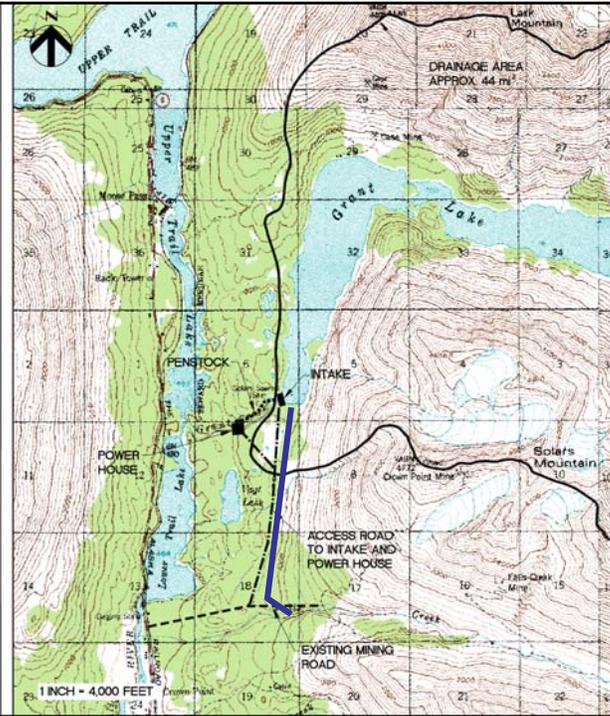
Kasidaya Creek Hydro 3MW

A Run-of-River Project

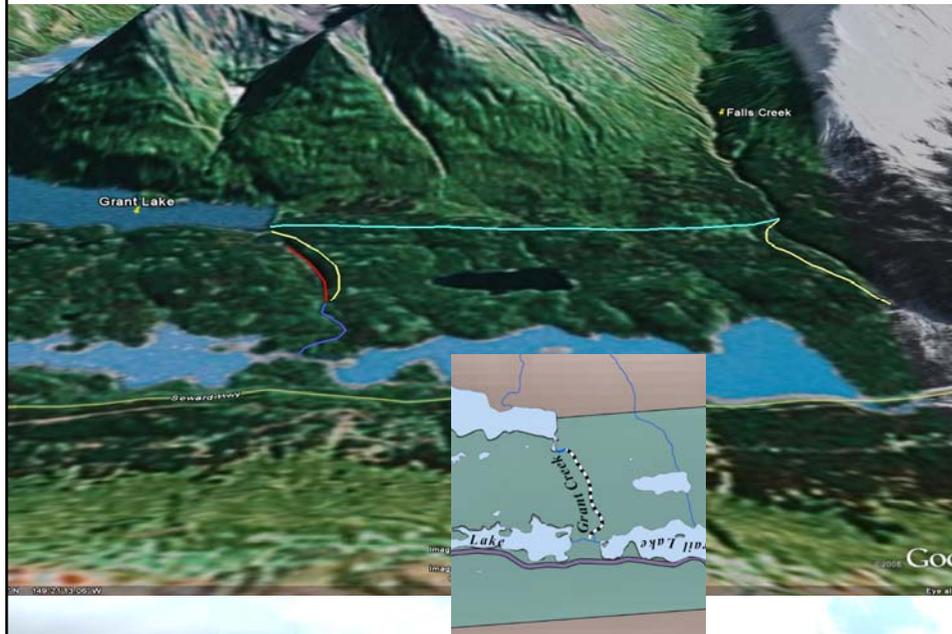


Grant Lake/Falls Creek Site

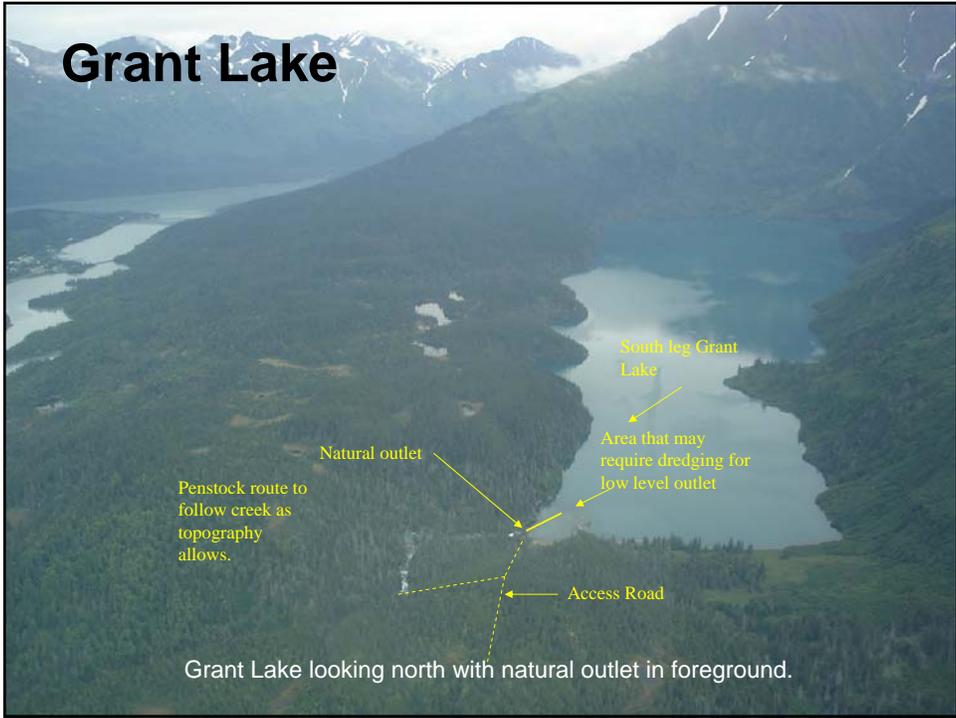
- 4.7 MW
- 19.0 GWh
- ~\$26.3M
- 38,200AF Storage



Grant Lake/Falls Creek



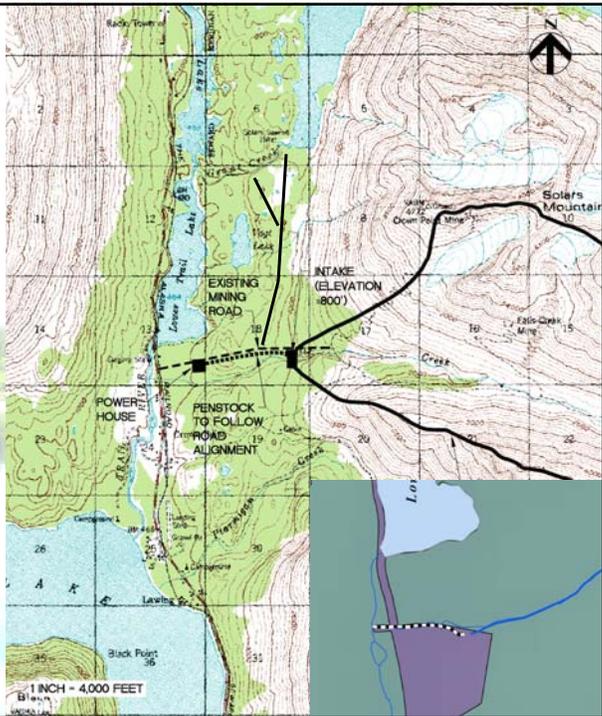
Grant Lake

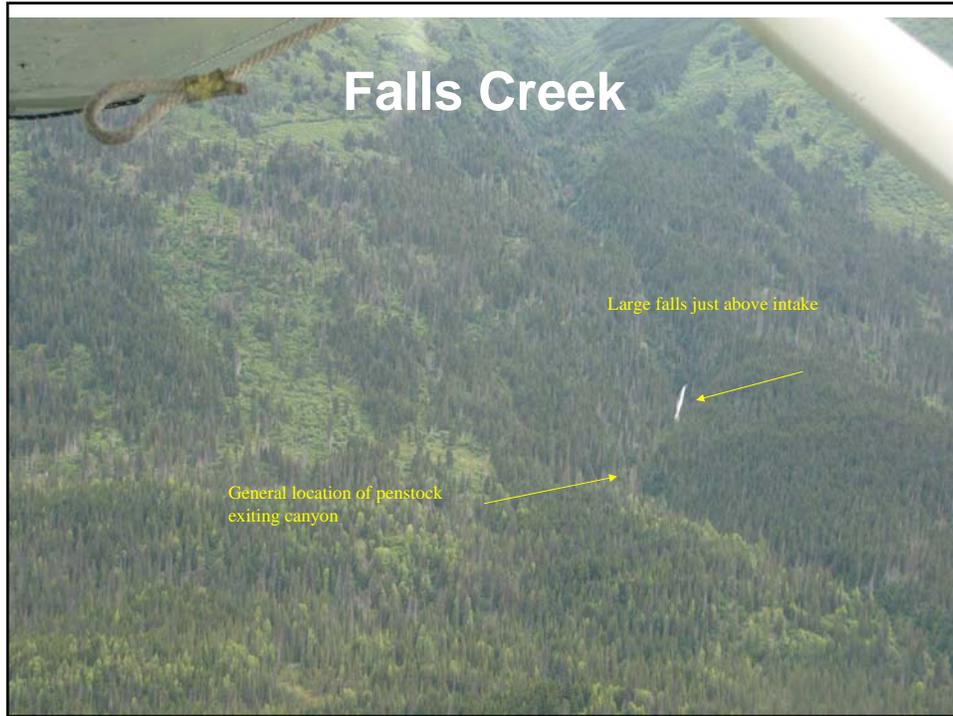


Grant Lake looking north with natural outlet in foreground.

Falls Creek Site

- 1.8 MW
- 3.8 GWh
- ~\$17.3M
- No Storage
- Operates May to October





Grant Creek Overview

- Only outlet to Grant Lake
- Approximately one mile long
- Drains into the narrows between Upper and Lower Trail Lakes.
- Mean annual flow 193 cfs,
- Average gradient 207 ft/mi
- Average width 25 ft
- Upper half of stream contains a gorge with three waterfalls
- Lower half becomes turbulent with gravel shoals and diminishing bolder substrate
- Anadromous fish species: Chinook, sockeye, coho salmon
- Resident fish species: rainbow trout, Dolly Varden and arctic grayling
 - round whitefish to a lesser degree

Grant Creek Overview

Grant Creek Salmon Escapement CIAA Weir 1985 - 1988

Year	Sockeye	Chinook	Coho (wild pop.)	Pink	Chum
1985	400	53	301	3	1
1986	675	46	178	3	1
1987	2181	34	312	4	1
1988	551	33	55	8	0

Grant Creek Overview

- 42 square mile drainage
 - Transition zone between interior and maritime climates
 - Upper elevation near 5,000 ft.
 - Glacially influenced
- 1,598 acre Lake
 - 700 ft. elevation
 - Glacially fed
 - Approximately 300 feet deep
- Documented fish species
 - Coast Range Sculpin
 - Three Spine Stickleback
- CIAA Coho Enchantment Lake Stocking Program
 - 1982 – 1985
 - 1.9 million coho fry
 - Return survival 0.2%

Fish Resources Baseline Study Overview

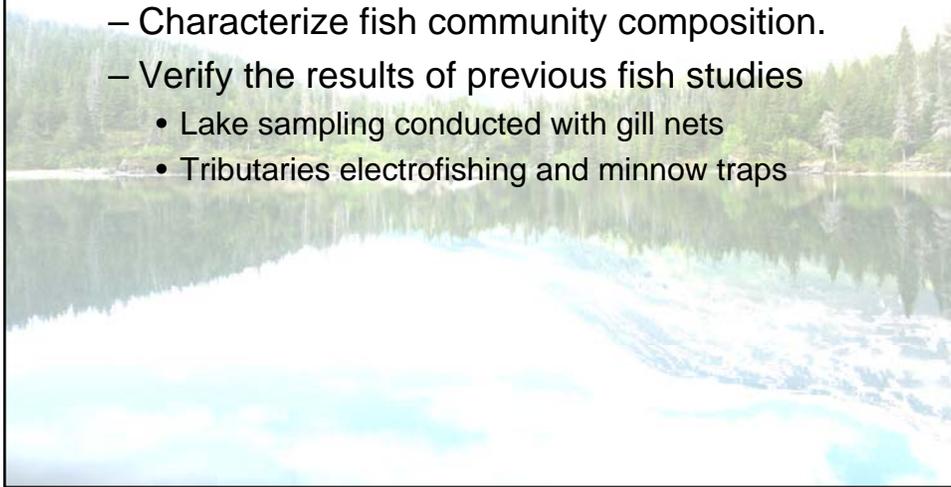
- Aquatic Habitat Survey
 - GPS-based, habitat survey will be conducted to quantify aquatic habitats.
 - U.S. Forest Service FSH 2090-Aquatic Habitat Management Handbook
- Rearing Fish Use
 - Minnow traps
 - Sample Frequency - twice each month June through September
 - CPUE will be determined if there are statistically significant differences between study areas.

Fish Resources Baseline Study Overview

- Adult Migratory Fish – Salmon
 - Foot surveys will be used to estimate adult salmon abundance
 - All active channels will be surveyed
 - Sample Frequency Every 10 Days
 - Evaluate differences in salmon abundance between reaches
- Adult Migratory Fish – Trout, Dolly Varden, Grayling and Whitefish
 - Angling stations will be established within each study area
 - Timed to coincide with the probable spawning times (Spring and Fall)
 - CPUE will be determined if there are statistically significant differences between study areas.

Fish Resources Baseline Study Overview

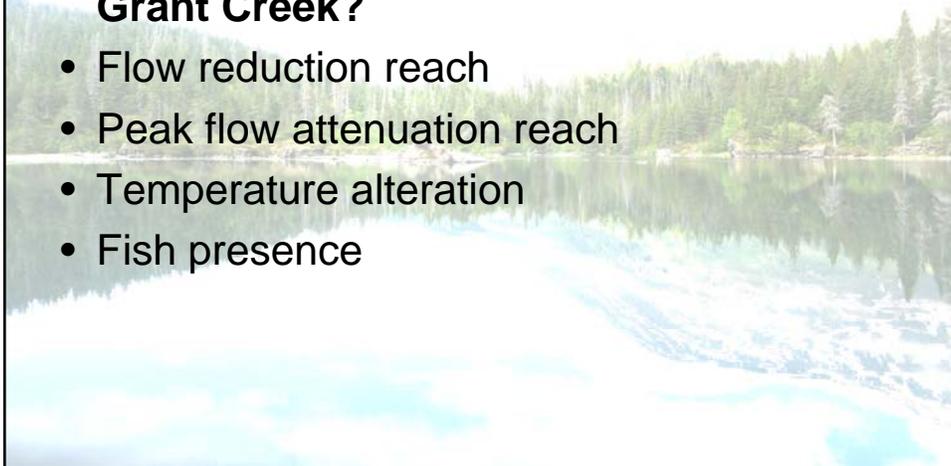
- Grant Lake Study Objectives
 - Characterize fish community composition.
 - Verify the results of previous fish studies
 - Lake sampling conducted with gill nets
 - Tributaries electrofishing and minnow traps



Instream Flow Study Grant Creek

Why is an instream flow study needed on Grant Creek?

- Flow reduction reach
- Peak flow attenuation reach
- Temperature alteration
- Fish presence



Instream Flow Study Grant Creek

What is learned in an instream flow study?

- Availability of habitat as a function of flow
- Specific to species/lifestage
- Integrate with measured hydrograph
- Ability to assess multiple flow scenarios
- With this information, multidisciplinary group can make ***estimate potential*** impacts on fish populations

Instream Flow Decision Points

- Study Planning
 - ID potential impacts
 - ID temporal and spatial boundaries
 - ID focal species and lifestages
 - Select study methodologies
 - ID / design baseline data collection
 - Develop Work Plan Document
- Study Implementation
 - Establish hydrology stations
 - Water temperature
 - Stream habitat mapping
 - Fish presence / HSC
 - Physical microhabitat data collection per selected instream flow methodology

Instream Flow Decision Points

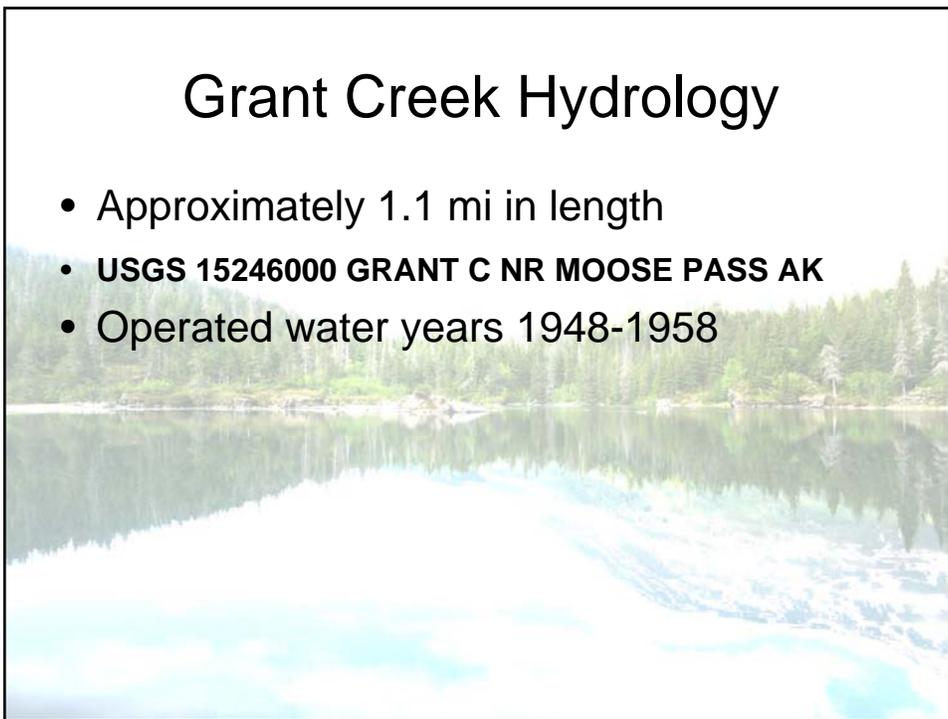
- Study analysis / synthesis
 - Data reduction & model calibration
 - Model simulation
 - Existing condition
 - Sensitivity analysis of several possible flow regimes
 - Synthesis with other studies
- Problem Resolution
 - Tool for additional model scenarios
 - Negotiated solution

Instream Flow & Hydrology

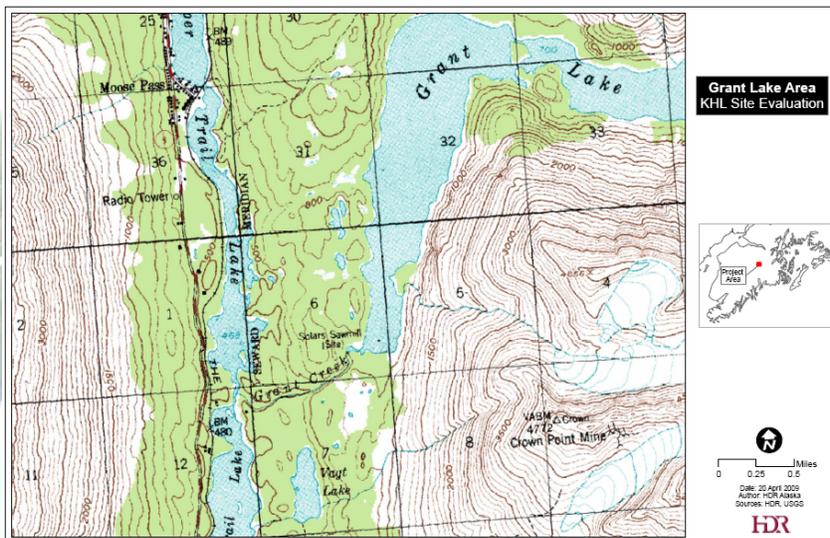
- Hydrology as baseline hydrograph
- Hydrology stations at management points
- Temperature measurements at hydrology stations
- Used as calibration for instantaneous measurements
- Time series

Grant Creek Hydrology

- Approximately 1.1 mi in length
- USGS 15246000 GRANT C NR MOOSE PASS AK
- Operated water years 1948-1958

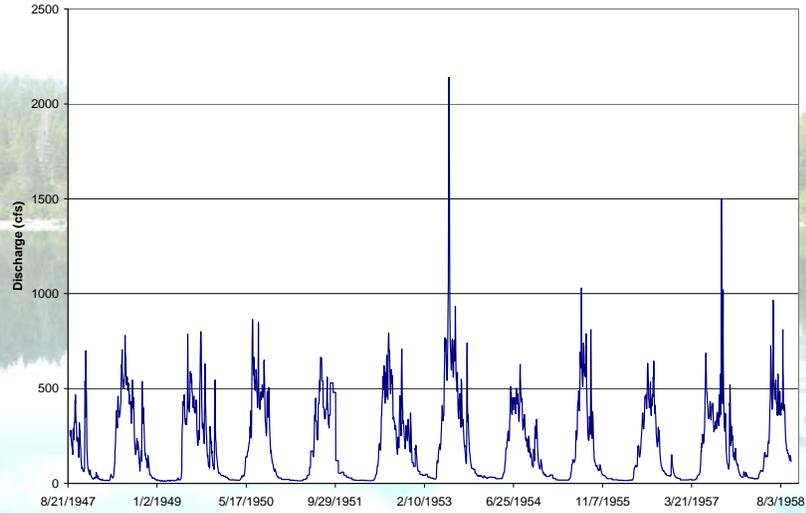


Grant Creek Hydrology



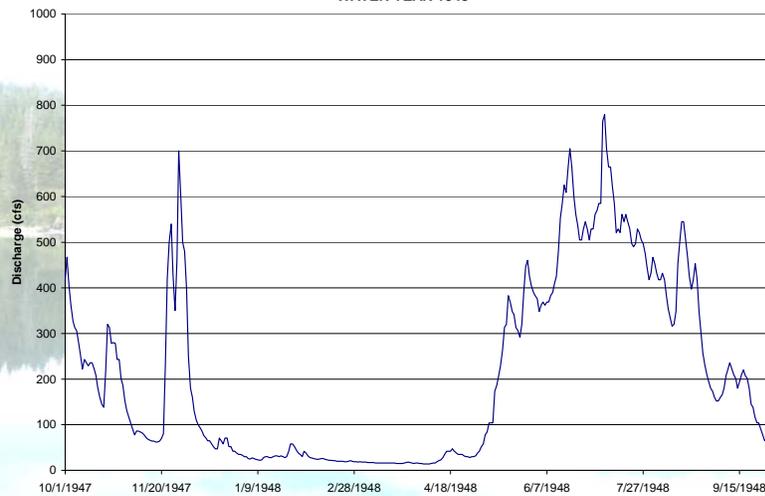
Grant Creek Hydrology

USGS 15246000 GRANT C NR MOOSE PASS AK
WATER YEARS 1948-1958



Grant Creek Hydrology

USGS 15246000 GRANT C NR MOOSE PASS AK
WATER YEAR 1948



Instream Flow Assessment Methodologies

What are typical instream flow methodologies?

- Standard-setting methods
- Incremental methods (IFIM)
 1. PHABSIM
 2. River2D
 3. Expert Habitat Mapping

PHABSIM Overview

- Suite of models that combine stream hydraulics with fish biological parameters to create an index of habitat available to a species or lifestage in a reach of stream.
- Hydraulic modeling, HSC curve building, and habitat simulation components
- U.S. Fish and Wildlife Service, Instream Flow Group (Ft. Collins, CO), 1984.

PHABSIM Hydraulic Modeling

- Cross-sections define micro- and mesohabitats
- At least 3 measured water surface elevations (at different flows) and one velocity profile for each cross-section
- Match predicted water surface elevations and velocities using one or more approaches – IFG4, MANSQ, WSP

PHABSIM Suitability Criteria

- Species- and lifestage-specific “preferences” for depth, velocity, substrate, and/or cover are entered here
- These “preference” curves, AKA Habitat Suitability Criteria (HSC), from measured or literature data.

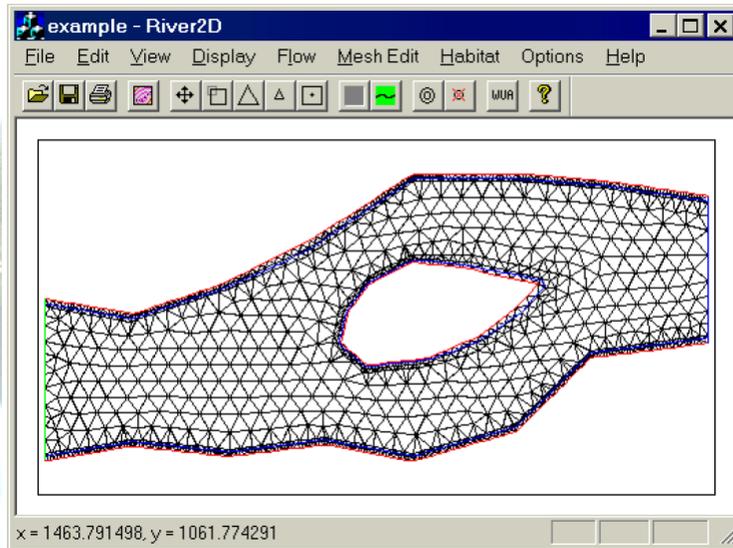
PHABSIM – Habitat Modeling

- Combines hydraulic and biological parameters to develop a measure of available habitat as a function of discharge
- Output is Weighted Usable Area (WUA)
- WUA is post-processed into a Habitat Time Series by applying measured flows to a temporal scale

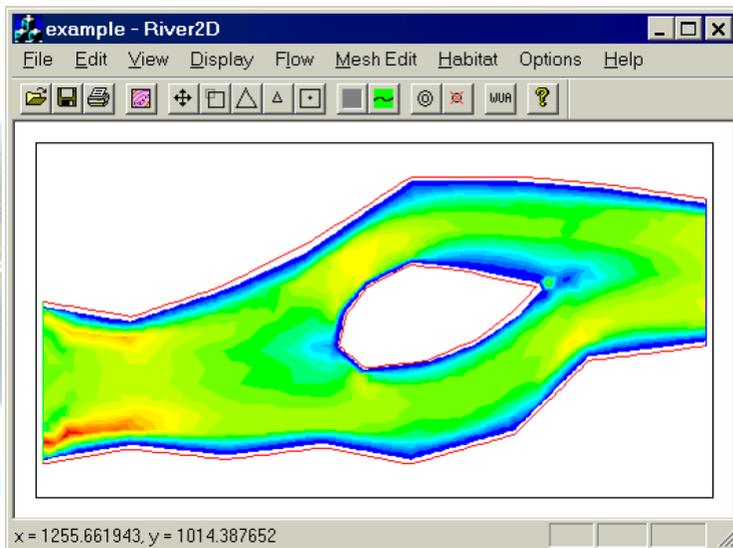
River2D Overview

- Same as PHABSIM except for two-dimensional hydraulic model
- Data collection includes stream bathymetry using x,y,z coordinates
- Independent observations to validate model predictions
- HSC required, and habitat modeling is identical to PHABSIM

River2D Overview



River2D Overview



Expert Habitat Mapping

- Expert judgment and direct observation of habitat during several flows
- “Patches” of habitat are delineated visually by consensus during field observations
- Tools include field computer with low-level aerial photographs rectified into GIS files

Expert Habitat Mapping

- Observation team includes several stakeholders with knowledge of fish habitat utilization
- Dependence on judgment is unavoidable; but procedures control subjectivity and uncertainty
- Multiple flow observations required

Instream Flow Assessment Methodologies

What are typical instream flow methodologies?

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Instream Flow & Fish Resources

- Reaches/units of habitat use
- Periodicity/run timing
- Baseline population
- Habitat Suitability Criteria
 - Regional/literature/other studies
 - Site-specific

Example – Rainbow Trout Life History Use of Grant Creek

	J	F	M	A	M	J	J	A	S	O	N	D
Spawning				○			○					
Incubation				■								
Juvenile Rearing	■											
Adult Rearing												

1. Start field work

3. Start collecting HSC data

2. Determine presence/absence

Attachment 3: Diagram with Proposed Study Reaches

*Grant Lake Proposed Hydroelectric Project
Draft Aquatic Biology Baseline Study Plan*

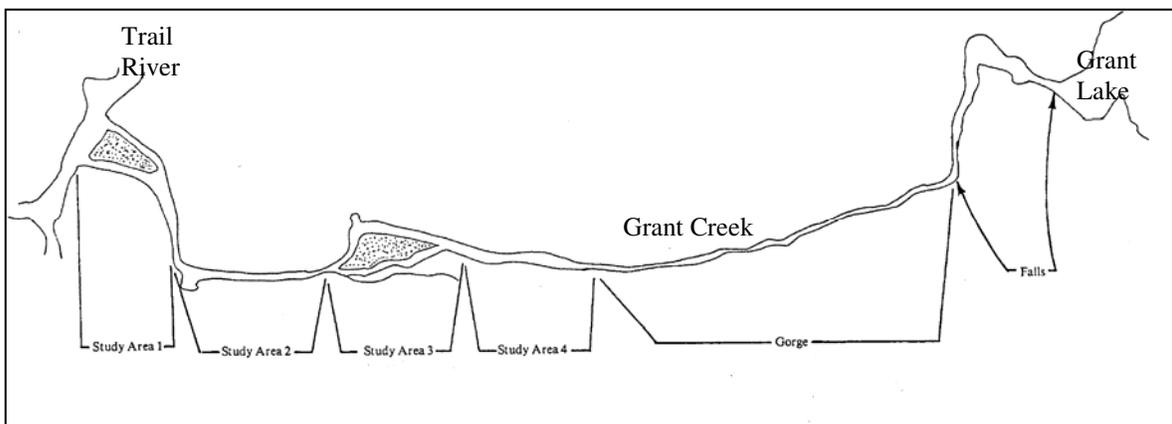


Figure 3. Stream reaches of Grant Creek (AEIDC 1983).