

Subject: Fish, Instream Flow, Hydrology, and Water Quality Technical Work Group Study Planning Meeting	
Client: Kenai Hydro, LLC	
Project: Kenai Hydroelectric Project	Project No:
Meeting Date: March 24, 2009	In Attendance: See below
Notes by: Amanda Prevel-Ramos and Katie Hunter	

Attendees

Kenai Hydro: Brad Zubeck; **FOCL:** Mike Cooney; **KRSA:** Ron Rainey, Ricky Gease; **USFS:** Eric Johansen, Karen O’Leary; **ADF&G:** Lee McKinley, Jim Fergusson, Tom Capiello (phone); **NOAA Fisheries:** Sue Walker; **Alaska Center for the Environment:** Valerie Conner (phone); **NES:** Sally Morsell, John Morsell (both phone); **LVA:** Jenna Borovansky (phone); **USFWS:** Doug Palmer (phone); **DNR:** Gary Prokosch (phone); **HDR:** Amanda Prevel-Ramos, Isaac Watkins, Jason Kent, Paul McLarnon, Lynn Spencer

Acronyms

ADF&G	Alaska Department of Fish & Game
CIAA	Cook Inlet Aquaculture Association
CNF	Chugach National Forest
CPUE	catch per unit of effort
DNR	Alaska Department of Natural Resources
DO	Dissolved oxygen
FOCL	Friends of Cooper Landing
GPS	global positioning system
HSC	Habitat Suitability Curve
IFIM	Instream Flow Incremental Methodology
KRSA	Kenai River Sportfishing Association
LVA	Long View Associates
NES	Northern Ecol Services
NOAA	National Oceanographic and Atmospheric Administration
PHABSIM	Physical Habitat Simulation (software)
TWG	Technical Working Group
UAA	University of Alaska Anchorage
USFS	U.S. Fisheries Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
YSI	Water quality instrument from YSI, Inc.

Agenda

- Introduction
- Description of Proposed Project
- Meeting Goals and Purpose of TWG
- Description of Project Area and Previous Studies
 - Existing Information
 - Land Status
 - Grant Lake
 - Grant Creek
- Overview of 2009 Baseline Study Efforts
 - All Disciplines
 - State and Federal Permitting
- Presentation of Draft Study Plans
 - Fish
 - Instream Flow and Hydrology
 - Water Quality

Meeting Summary

Introduction and Description of Project

Brad Zubeck welcomed meeting participants and introduced Project goals. Brad described HEA's need for increased capacity, and its desire to develop renewable energy options. Kenai Hydro's goal is to minimize environmental impact of the proposed projects. He provided examples of other small hydroelectric projects (Attachment 1, Slides 3-10).

Meeting Goals and Purpose of Technical Working Group (TWG)

Paul McLarnon reviewed the meeting goals and introduced the purpose of the TWG (Attachment 1, Slides 11-12). He stated that the focus of the meeting was to discuss the draft study plans for the Grant Lake Project. He noted that this was the first meeting of the TWG, and that Kenai Hydro hopes to work with the TWG to build consensus on technical questions and gather feedback on data interpretation and analyses as the projects move forward.

Description of Project Area and Previous Studies

Paul McLarnon reviewed existing information about the Grant Lake and Falls Creek Project areas and the proposed aquatic biology baseline studies (Attachment 1, Slides 13-28; Attachment 2 – Draft Aquatic Biology Baseline Study Plan).

Participant questions and comments:

1. KRSA: How deep is the sill between lower and upper Grant Lake?
 - HDR: approximately 10 meters
2. KRSA: Are other projects off the table?
 - Kenai Hydro stated that the Crescent Lake and Ptarmigan projects are still being evaluated. Brad Zubeck noted that Grant Lake and Falls Creek are further along in the feasibility analysis phase, and that is why Kenai Hydro would like to move forward with baseline studies that will be discussed at this meeting.

3. KRSA: Are there private parcels in the Project area?
 - Meeting participants discussed that there is one private cabin at the mouth of Grant Creek, and that there may be a few private parcels near the peninsula. HDR will investigate ownership.
4. KRSA: Do fish overwinter in the creek?
 - KRSA: Baseline hydrology studies of winter flow data are important, since winter power generation, if planned, could reduce flows
 - HDR: Winter sampling is not planned for this year due to the difficulty of sampling, but winter flow studies may be considered in the formal study process next year
 - ADF&G: Gage data will provide important winter flow data
 - USFWS: Suggests that minnow trapping be extended as late as possible in the fall to determine when CPUE reaches zero
 - HDR: Sampling is planned until September, but extended sampling could be considered.
5. ADF&G: Do anglers use the area? Does it have sport fishing value?
 - HDR: Some recreational angling currently occurs, especially at the creek mouth
 - HDR: The study plan states that we will adhere to sport fishing regulations, and use different gear to increase CPUE and efficiency.
 - ADF&G: Suggest that fishing regulations do not necessarily need to be followed and that the permit can include (and the agency recommends) use of the most efficient methods regardless of regulations, as these data are important
6. ADF&G: Recommends recording spawning locations to the nearest meter during studies
 - HDR: GPS will be used to record locations to the nearest meter, if feasible
7. ADF&G: Will lengths of fish be recorded during angler surveys
 - HDR: Fish will be identified to species; spawn/post-spawn condition and size will be recorded
8. HDR: Acknowledged that foot surveys are not as accurate as weir counts and indicated that part of the 2009 task will be to determine the feasibility of a weir for the 2010 studies
 - ADF&G: Weir and foot surveys should be used together to identify redd sites. Foot surveys are needed to identify redd sites - they are not mutually exclusive sampling techniques
9. USFWS: May want to consider resistance board weir instead of picket weir because it will withstand more flow. Consider incorporating video which can help enumerate fish in spite of glacial turbidity (Funny River studies have successfully used this method).
10. KRSA: Paul Shadura was on the CIAA board at the time of weir operations and he will know where the weir was operated in the 1980s
11. FOCL: What is the accuracy of the GPS data?
 - HDR: 5-100 feet, and we will derive GPS locations from map
12. ADF&G: We hope to see a map showing the extent of spawning, rearing, and the powerhouse location.
13. KRSA: Video technology should be considered for species counts.
 - HDR: Will consider the feasibility of use of video
14. KRSA: Will there be winter surveys of the lake?
 - No, just summer surveys.
15. ADF&G: Will there be sampling the middle of the lake and will the full depth of the lake be sampled (e.g., in Russia there are examples of deep spawners)?

- HDR/NES: Deep sampling could be done. The sampling sites identified are starting points to verify fish communities reported in other studies. There will be gill nets set in the middle of Grant Lake, and they could be set at varying depths.
16. NOAA: Consider use of a deep water sonar survey.
17. NOAA: What percentage of the inflow is glacial?
- HDR: A rough estimate is 40-60%

Instream Flow Study: Grant Creek

Jason Kent introduced the use of instream flow studies as an interdisciplinary method that is used primarily as an impact analysis and is not a baseline study (Instream Flow PowerPoint presentation, Attachment 3). However, the baseline data to be collected will inform future instream flow studies. The meeting attendees discussed the two instream flow schedule options presented by HDR. Option #1 is a more typical schedule that requires TWG collaboration every couple of months in order to have the start of instream flow field data collection following breakup in 2010. Option #2 is an accelerated schedule that requires multiple TWG meetings every two weeks, plus considerable work between the bi-weekly meetings, to allow the start of instream flow field data collection following breakup in 2009. Both options include hydrology data collection in 2009.

The meeting attendees – many of them agency employees who would be on the TWG or assigning staff to the TWG – provided input on the two schedule options. The group’s general opinion is that Option #2 is very aggressive and would be tough to make work. It was mentioned that the instream flow study is an impact analysis, and the actual footprint of the project has yet to be determined. Without the knowledge of the proposed project operation, it would be difficult to set up an instream flow study that measures the impact of an unknown project design. As such, the meeting attendees suggested that instream flow data collection not begin until 2010, when the project will most likely be better defined.

The meeting attendees also agreed on a tentative date for the first Instream Flow TWG meeting – Tuesday, April 21, 2009. The group suggested that the TWG and other parties conduct a site visit in September or early October 2009. This time period was suggested to maximize the number of people that would be able to attend (summer is the field season).

18. KRSA: How are invertebrates integrated into the study?
- HDR: Habitat Suitability Criteria (HSC) can be established for invertebrates, as well as other environmental components such as recreation, birds, and many fish species.
19. ADF&G: How will geomorphological impacts of reduced flows or peak events be incorporated into the study?
- HDR: It is incorporated in the model of predicted future conditions:
 - Cut of peak flow to/by 60% will increase sedimentation
 - Vegetation grows up
 - Channel goes from 100 ft to 80 ft wide
 - Habitat modeling can show how the habitat will be impacted by changes
20. ADF&G: For a typical biologist’s schedule—summer is not a realistic time to meet
21. ADF&G: Are there any decisions related to methodology needed today that will affect the baseline data collection?
- HDR: Standard methodology is used to set up the hydrology stations; typical methods for pressure transducers with data loggers will be used and data will be downloaded on a regular basis. Data this year will be collected to establish rating curves.

22. HDR: Input is needed as soon as possible on where and how many transducers will be placed.
- Identified locations include: Outlet, Mouth, Reach near penstock end, Wherever flows will be reduced by a structure, Locate the hydrology station near historic USGS gauge to compare historic data.
 - Will continue to measure throughout the year, including winter
 - A meeting was scheduled for April 21 with the TWG. HDR will provide a map and photos/descriptions of the locations as much as possible.
23. HDR: Feedback is needed on the proposed accelerated and typical schedules.
- Agencies: Work loads are heavy, not all the agency representatives for a TWG are in the room at this meeting, TWG with the instream flow expertise needs to be assembled
 - ADF&G: Experience shows that discussions of species and lifestages can hang up the process and work plan and time is needed to discuss.
 - HDR: Jason Kent will identify proposed hydrology station locations in order to start data collection as soon as possible
 - TWG will meet in April to review these locations
 - Additional conference calls or email discussion may occur
24. NOAA: Site visits are needed, not just locations from a map.
25. ADF&G: The hydrology stations are a reasonable goal for this Spring
- If locations are chosen from a map, the map needs to be very good. Don't see why this cannot be done.
 - People/experts come along with the survey crew
 - HDR: A site visit may need to be later in the season, additional hydrology stations can be added after the site visit
26. NOAA: Which of the four proposed hydropower projects are still on the table?
- Kenai Hydro: Kenai Hydro has more confidence in the Grant Lake project, so currently moving forward to this next step of baseline studies. The other permits for Ptarmigan, Crescent, and Falls Creek are not moving at the same pace and are still in their feasibility studies. However, since the Kenai Hydro study team will be in the area, baseline studies of Falls Creek are proceeding as well to take advantage of having crews in the field.
27. ADF&G: We need to measure high flows to assure the accuracy of the rating curve.
28. HDR: The HSC/field observations can be biased toward the field conditions that exist during data collection.
29. NES: Asked agencies to consider whether site-specific HSC are necessary
- KHL: It would be good to decide ahead of time what HSC should be studied
 - KRSA: Studies should not overlook that the lake is full of macro invertebrates, which are part of the food chain and may be reduced by warmer temperatures, creating a hole in the food chain. Baseline macroinvertebrate data are needed.
 - ADF&G: PHABSIM: getting HSC in context of Grant Creek. Some in situ information will be required.
 - HDR: IFIM/Mapping method: we don't know which we will be doing, or whether HSC should be considered.
 - ADF&G: The level of detail is something to consider. We need to look at hydrology station locations relative to species locations, and lifestage periodicity tables for each species. The more detail that is provided, the less conservative flow regulation requirements from the agencies may be.

Water Quality Study Plan

HDR reviewed information in the draft water quality study plan (Attachment 1, slides 43-56; Attachment 4-Water Quality Baseline Study Plan).

30. ADF&G: Temperature regime input: It is fairly cold water, and releases in winter may be greater than normal, so investigation of this aspect should be incorporated in hydrological studies.
31. KRSA: Will the level of the lake change
 - Kenai Hydro: One of the engineering options being considered could include raising the lake level up to nine feet.
32. KRSA: Impounding water so raising water levels 9 ft. above current with a drawdown of 25 ft; is there any special sampling that needs to be done?
 - HDR: vegetation surveys will provide information around the potential fluctuation zone
 - Bathymetry/inlet streams
 - ADF&G: If rainbow trout are found in the lake, then additional information will be needed regarding spawning areas, etc.
 - KHL: Activities around the perimeter? Why only sampling in middle of lake?
 - HDR: Could have another thermistor string
 - HDR: Choice of current location was budgetary and a location that affects water quality of the creek
33. ADF&G: It will be important to review periodicity charts to determine the potential instream flow study method, and the TWG needs to consider the level of detail needed.
34. USFS: Water quality sampling in the lake should include testing for mercury
 - There are mines in the watershed that could have used mercury

Meeting Wrap Up

The group reviewed action items and next steps. KRSA recommended that more public outreach be conducted to HEA shareholders and customers in the Kenai-Soldotna area. The suggestion was also made that some meetings be held in Anchorage. Suggested contacts are:

- ADF&G Advisory Groups
- Kenai Watershed Forum
- Kenai Fish Habitat
- Kenai River Fishery Coalition
- CIAA (ownership area)
- CIRI shareholders

It was noted that the fish and aquatics and water quality study plans are the furthest along in development, but that Kenai Hydro will be examining all potential resource impacts in the FERC licensing process. This will include establishing other work groups to review study plans for:

- Recreation
- Cultural resources
- Terrestrial Resources (Wetlands, birds, wildlife, threatened and endangered species, etc)

Action Items

1. Kenai Hydro/HDR to confirm agency staff participants to develop an Instream Flow Technical Working Group

- Contact Bill McFarland: hydrologist that USFS has assigned to work on TWG to determine his availability for future TWG meetings
- Email requesting representatives to TWG
- 2. The first Instream Flow TWG meeting will be held on April 21, 2009*. The probable location for this meeting will be the HDR office in Anchorage. There will be three items on the agenda, to be developed by HDR:
 - Determine general locations of continuous hydrology stations
 - Discuss focal species and lifestages, including developing local HSC vs. using previously-developed criteria
 - Discuss instream flow study methodologies
- 3. Revised Instream flow study plan to be provided for written agency and public comment by Friday April 3, incorporating comments received today.
 - Written comments requested by April 17.
 - A revised final draft will be provided at the April 21 meeting.
- 4. Post meeting slides to the FTP site
- 5. Reconnaissance report for Grant Lake will be posted to the FTP site
- 6. HDR to contact Paul Shadura, CIAA board at time of Grant Lake weir in 1980s
- 7. Ebasco Studies will be posted to FTP– 1980s environmental studies of Grant Lake
- 8. AIEDC 1983 will be posted to FTP – 1980s environmental studies of Grant Lake
- 9. HDR to follow up with Doug Palmer/Ken Gates re: use of video technology in Grant Creek (adult escapement)
- 10. Add historical lake sample locations to study maps
- 11. HDR to look into incorporating geo referenced video in Habitat Surveys

*Sue Walker (NMFS) not available for this date.

Attachments

Attachments are available at: http://www.kenaihydro.com/kenai_docs/

Attachment 1 – PowerPoint Presentation for Project Overview, Fish Studies, and Water Quality Study

Attachment 2 – 2009 Aquatic Biology Baseline Study Plan Draft (March 2009)

Attachment 3 - PowerPoint Presentation for Instream Flow Study Discussion

Attachment 4 – 2009 Water Quality Baseline Study Plan Draft (March 2009)



**Kenai Hydro, LLC
Grant Lake Project
Technical Working Group
Meeting**

Kenai Lake Work Center

March 24, 2009

Agenda

- **Introduction**
 - Overview of project team
 - Project Purpose
- **Description of Proposed Project**
 - Overview of project
 - Status of FERC license application
- **Meeting Goals**
 - What is the purpose of a TWG
- **Description of Project Area & Previous Studies**
 - Existing information
 - Land status
 - Grant Lake
 - Grant Creek
- **Overview of 2009 Baseline Study Efforts**
 - All disciplines
 - State and Federal Permitting
- **Presentation of Draft Study Plans**
 - Fish
 - Instream Flow and Hydrology
 - Water Quality
- **Next Steps**

Project Team

- Kenai Hydro, LLC

– HEA



and WEA



- HDR Alaska, Inc.



- Long View Associates, Inc.

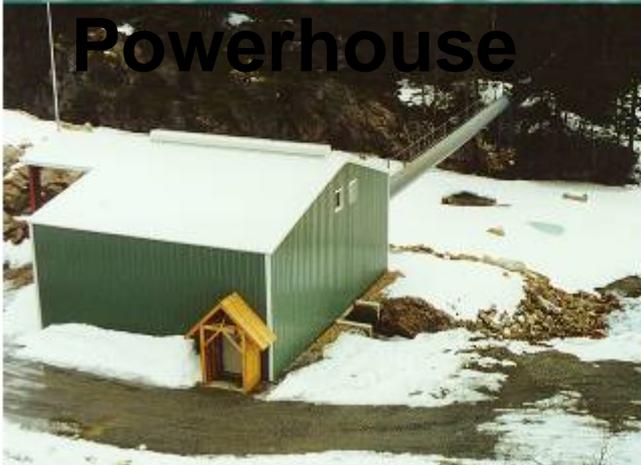
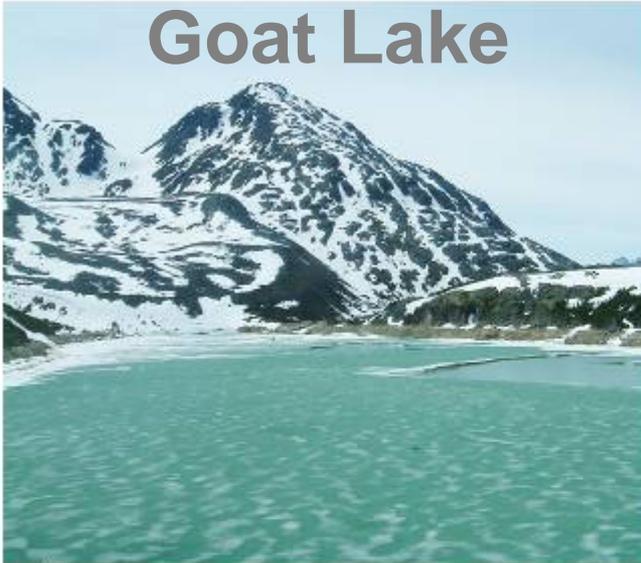
- Northern Ecological Services

HEA Need for Power

- Current CEA Contract Expires 2013
- HEA plans for “Independent Light”
- Capacity will be met by Gas Turbines
- HEA desires to add renewable generation
 - Wind and Hydro – reliable technologies
 - Renewables will displace fossil fuels and lower average energy prices

Goat Lake Hydro 4MW

Goat Lake



Powerhouse



Goat Lake Hydro (cont.)



**Pelton Turbine (in blue)
And Generator**



South Fork Hydro 2MW



Powerhouse



Impoundment,
Run of River

Kasidaya Creek Hydro 3MW

A Run-of-River Project



06/09/2007

Preliminary Permit Activities

- 3-year Term to the Permit
- Preliminary Environmental Baseline Studies to Support Future FERC License Application.



Minimize Impact to These Features

1. River Flows

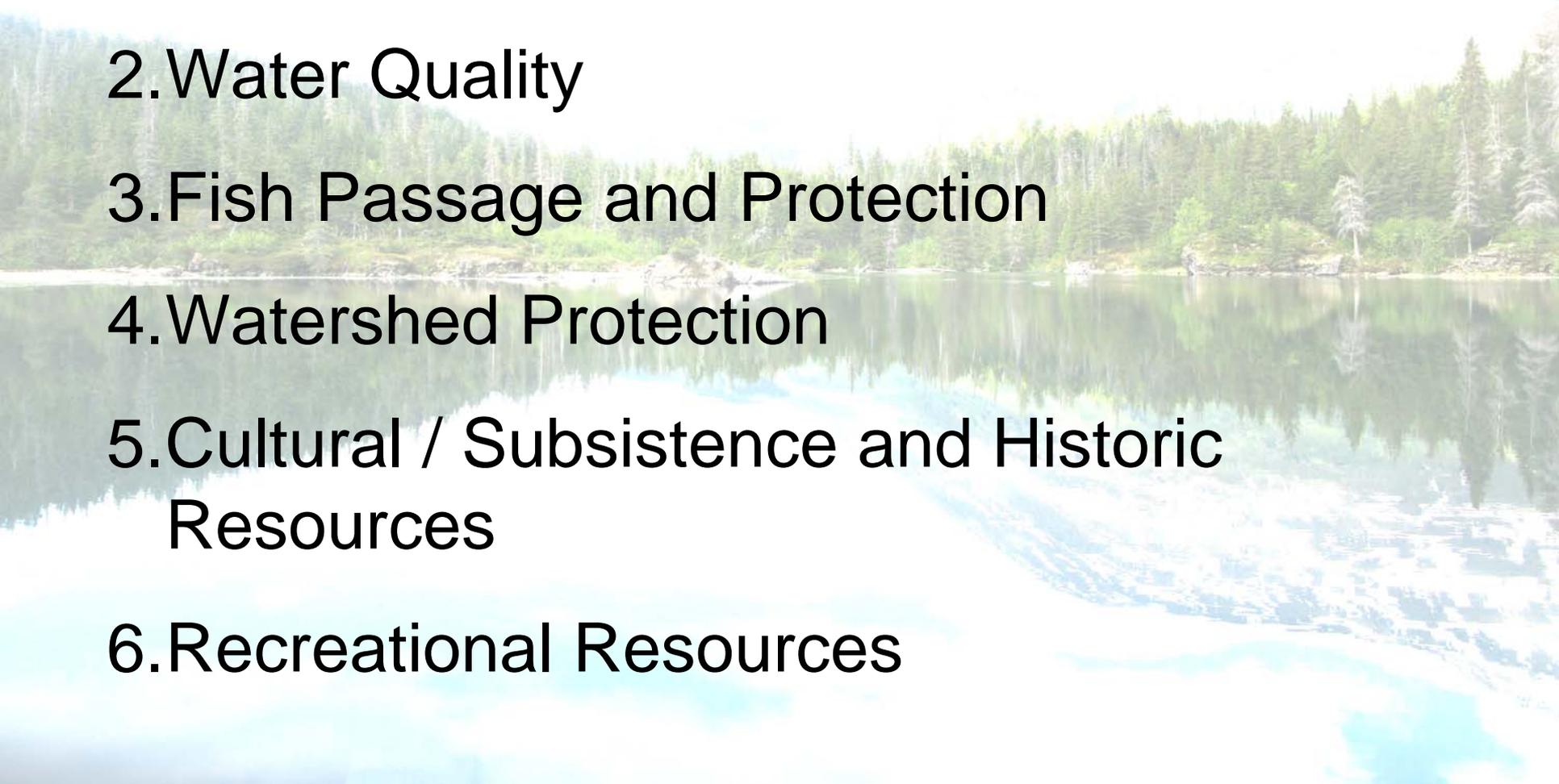
2. Water Quality

3. Fish Passage and Protection

4. Watershed Protection

5. Cultural / Subsistence and Historic Resources

6. Recreational Resources

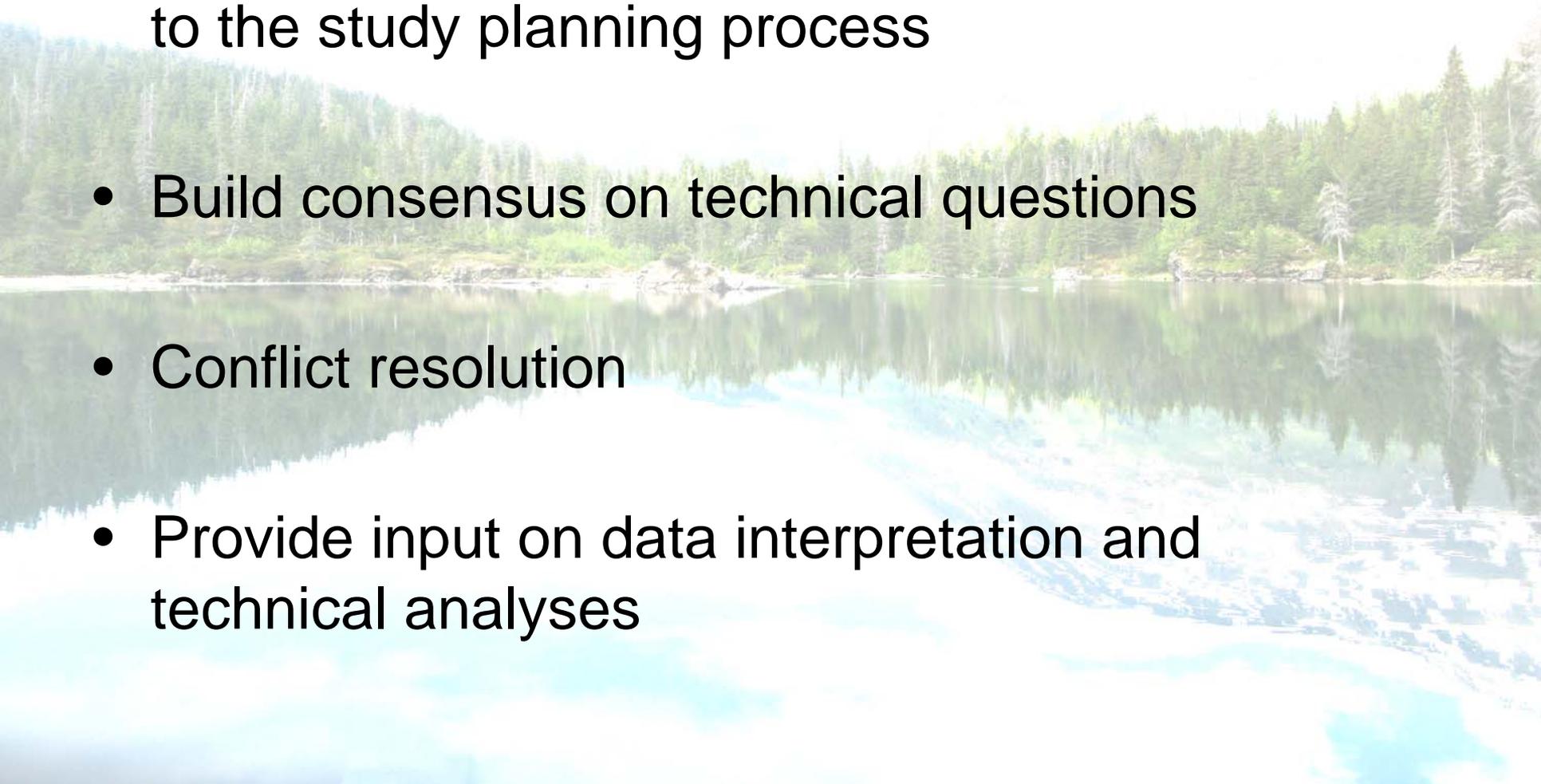


Meeting Goals

- Consult with local expertise
 - gather comments and suggestions
- Discuss technical considerations
 - study objectives, data needs, sampling design, limiting factors, data analysis
- Provide and gather input to develop study plans that will accurately document baseline conditions

Purpose of a Technical Work Group

- Help to define study objectives and provide input to the study planning process
- Build consensus on technical questions
- Conflict resolution
- Provide input on data interpretation and technical analyses



Grant Lake Project Area

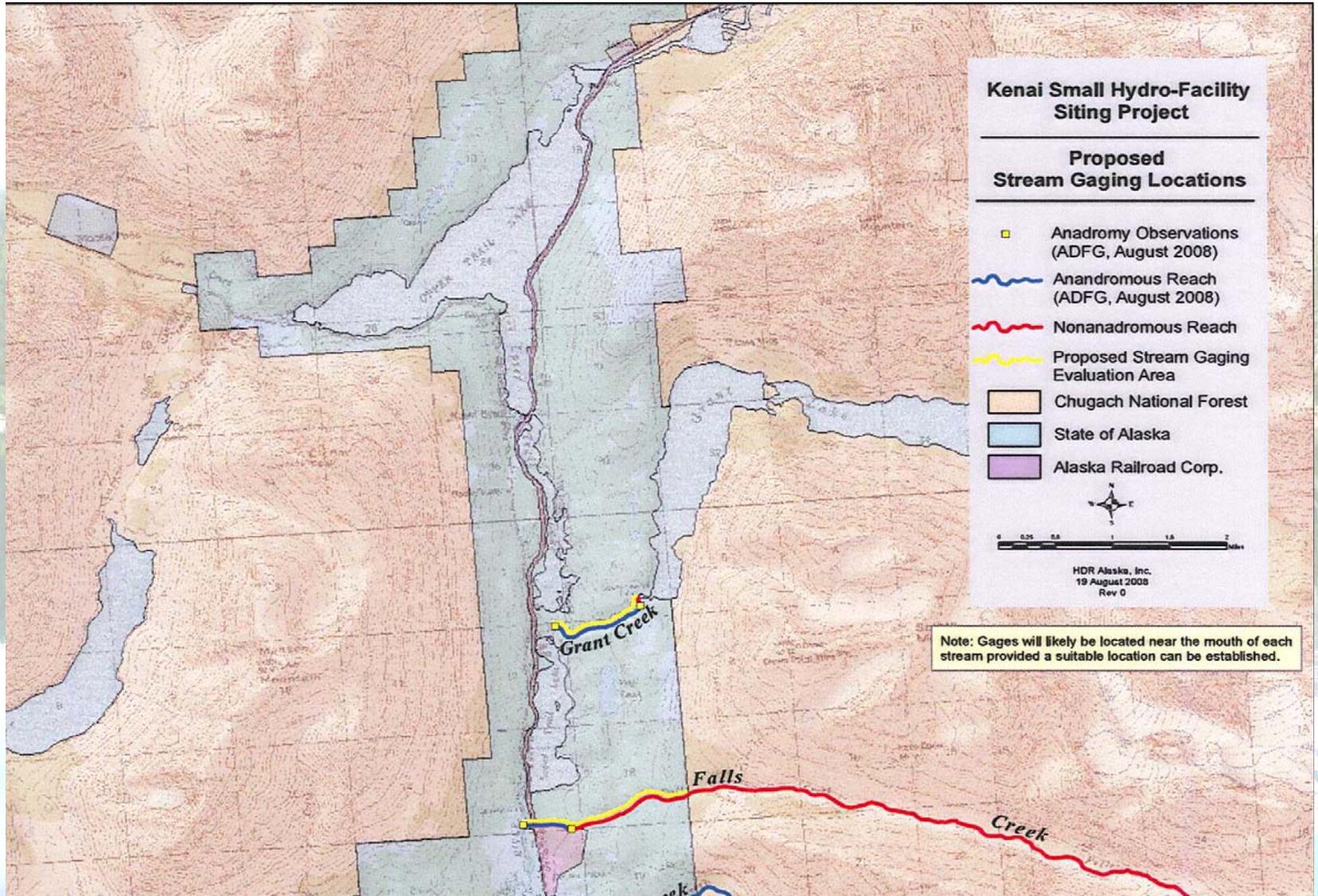
Existing Information

Appendix 1. List of recent studies on Grant Creek and Lake.

Date	Agency	Activity
1948-1958	USGS	Monthly stream discharge measurements
1950-1974	USGS	Water quality and stream sediment
7/15/1960	USFWS	Water analysis in Grant Creek
7/59-1961	USFWS	Minnow trapping in Grant Creek
4/1980	CH2M Hill	Hydropower Feasibility
1981-1984	ADF&G/USFS	Limnology
1981-1982	Ebasco	Biol. Studies -Hydropower feasibility
1982	ADF&G	Collected coho eggs in Quartz Creek
1982-1983	ADF&G	Incubated coho eggs at Trail Lks Hat.
6/1983	ADF&G	Released 517,904 coho fingerlings
6/83-9/83	USFS *	Monitored downstream migration of fry
5/84-10/84	USFS	Same as above + smolt + in lake growth
5/31/84	ADF&G	Released 698,596 coho fingerlings
5/84-9/12/84	USFS	Smolt + fry + in-lake coho monitoring
6/26/85	ADF&G	Released 494,666 coho fingerlings
6/85-8/85	USFS	Smolt + fry + in-lake coho monitoring
8/85-10/85	CIAA	Adult coho salmon monitoring
5/86-7/86	USFS	Smolt + fry + in-lake coho monitoring
6/30/86	ADF&G	Released 230,152 coho fingerlings
8/86-10/86	CIAA	Adult coho salmon monitoring
5/87-7/87	USFS	Smolt + fry monitoring
8/87-10/87	CIAA	Adult coho salmon monitoring
8/88-10/88	CIAA	Adult coho salmon monitoring

* USFS/ADF&G collected 9 limnology samples at 4 stations
6/29/83 to 9/25/85

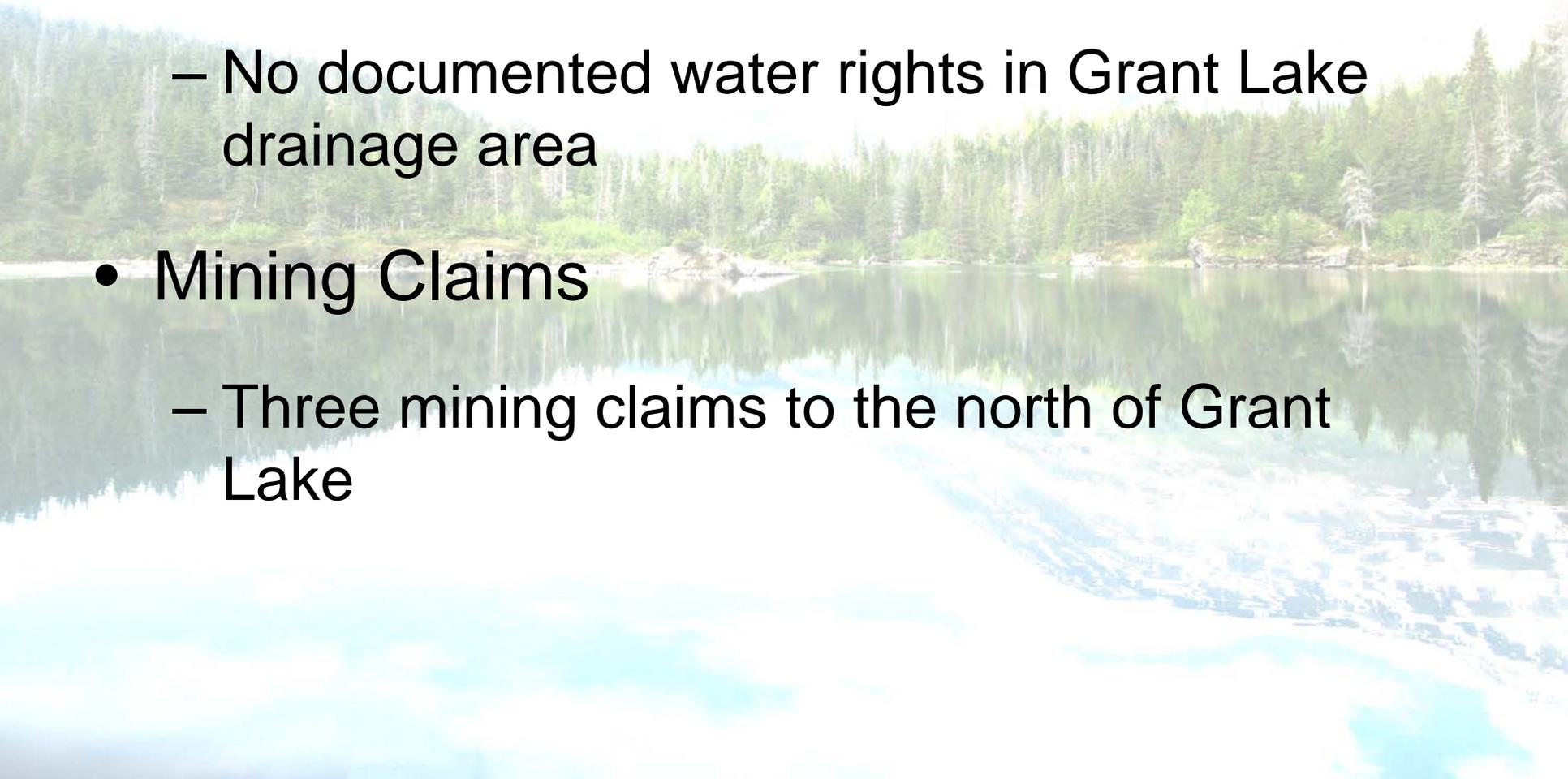
Grant Lake Project Area Land Status



Grant Lake

Land Status, Mining Claims, and Water Rights

- Water Rights
 - No documented water rights in Grant Lake drainage area
- Mining Claims
 - Three mining claims to the north of Grant Lake



Grant Lake

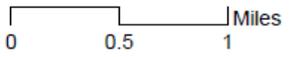
Water Rights and Mineral Claims

LAND STATUS Water Rights & Mineral Estate

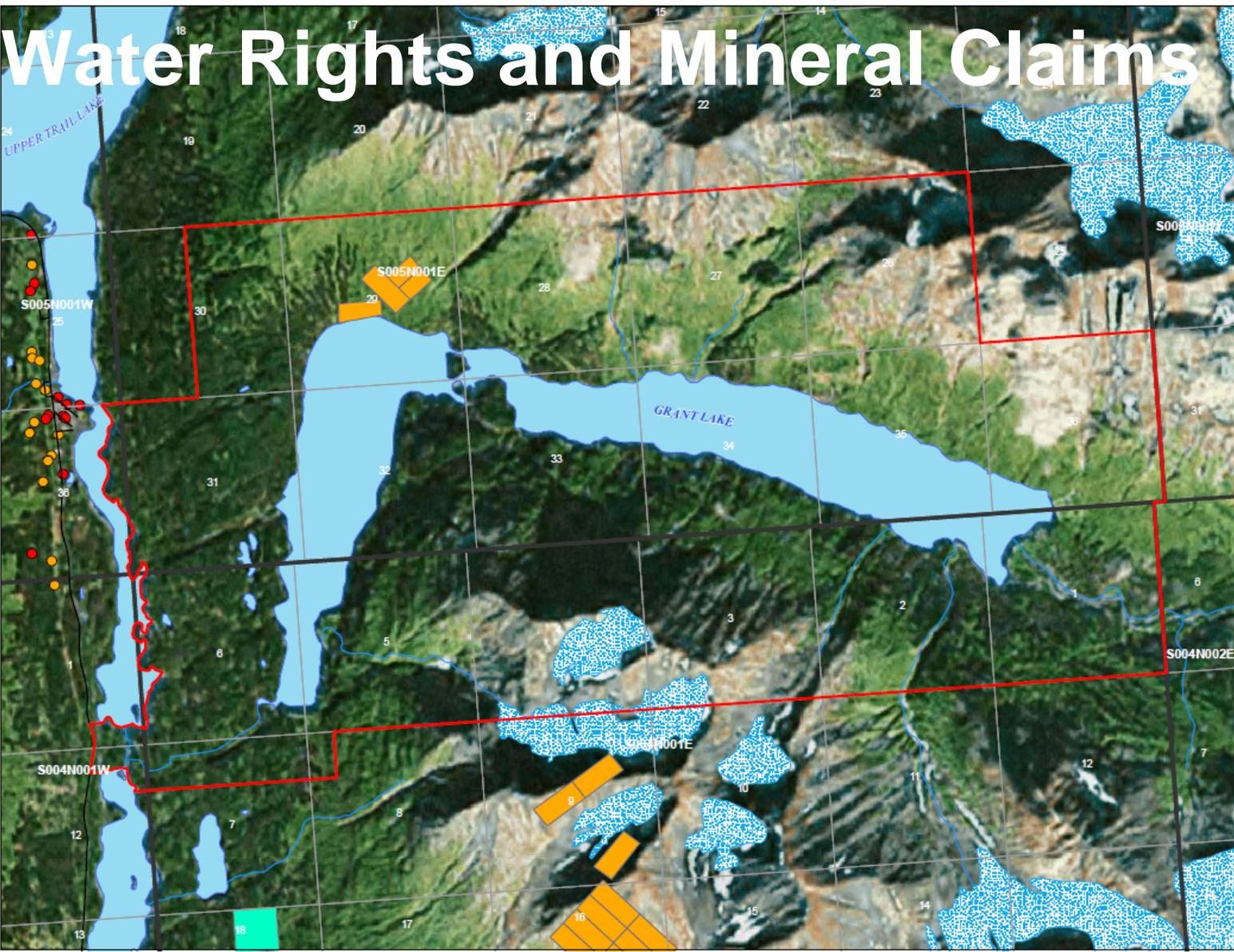
Project Area 1
Grant Lake Area
Kenai Peninsula Borough, Alaska

- Legend**
-  Project Area 1
 -  Federal Mining Claim
 -  State Mining Claim
 -  Surface Water Right
 -  Subsurface Water Right
 -  Lake/Pond
 -  Ice Mass

Project Area 1 (~10,800 acres)

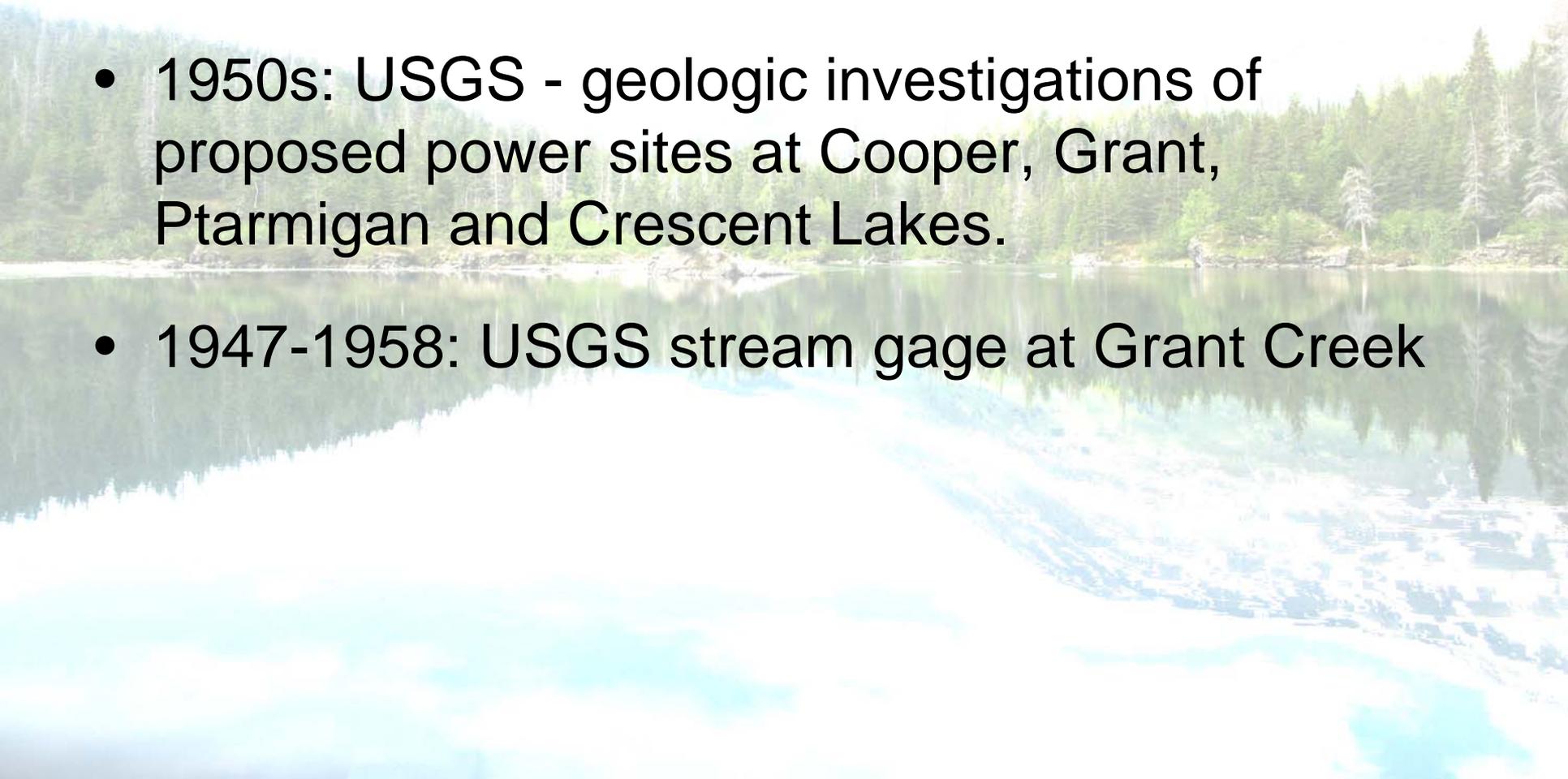


Date: 22 December 2008
 Author: HDR Engineering
 Sources: ADNDR, KPB, GINA



Grant Lake Background

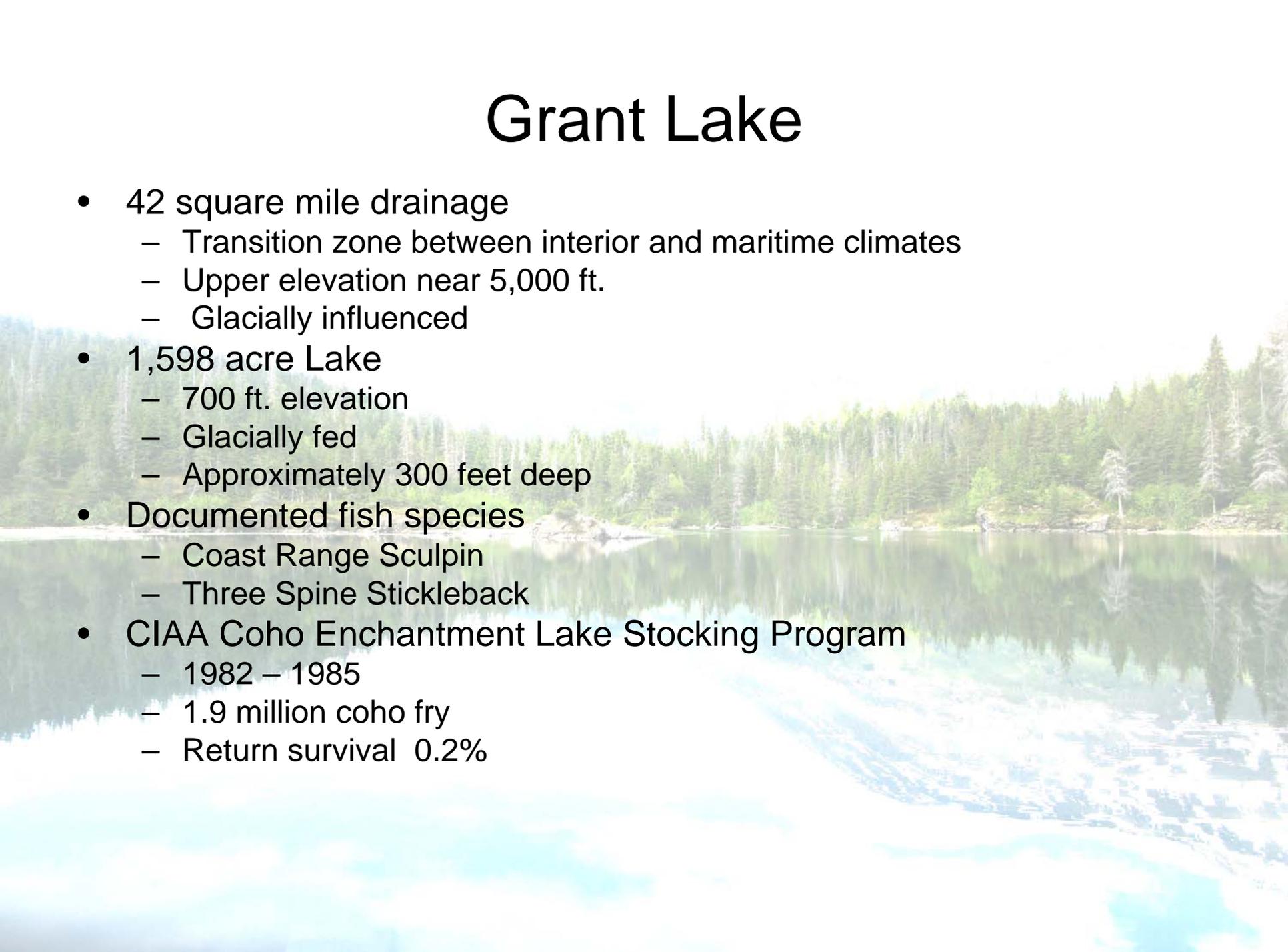
- 1954: R.W. Beck and Associates - preliminary investigation for hydro power.
- 1950s: USGS - geologic investigations of proposed power sites at Cooper, Grant, Ptarmigan and Crescent Lakes.
- 1947-1958: USGS stream gage at Grant Creek



Grant Lake Background

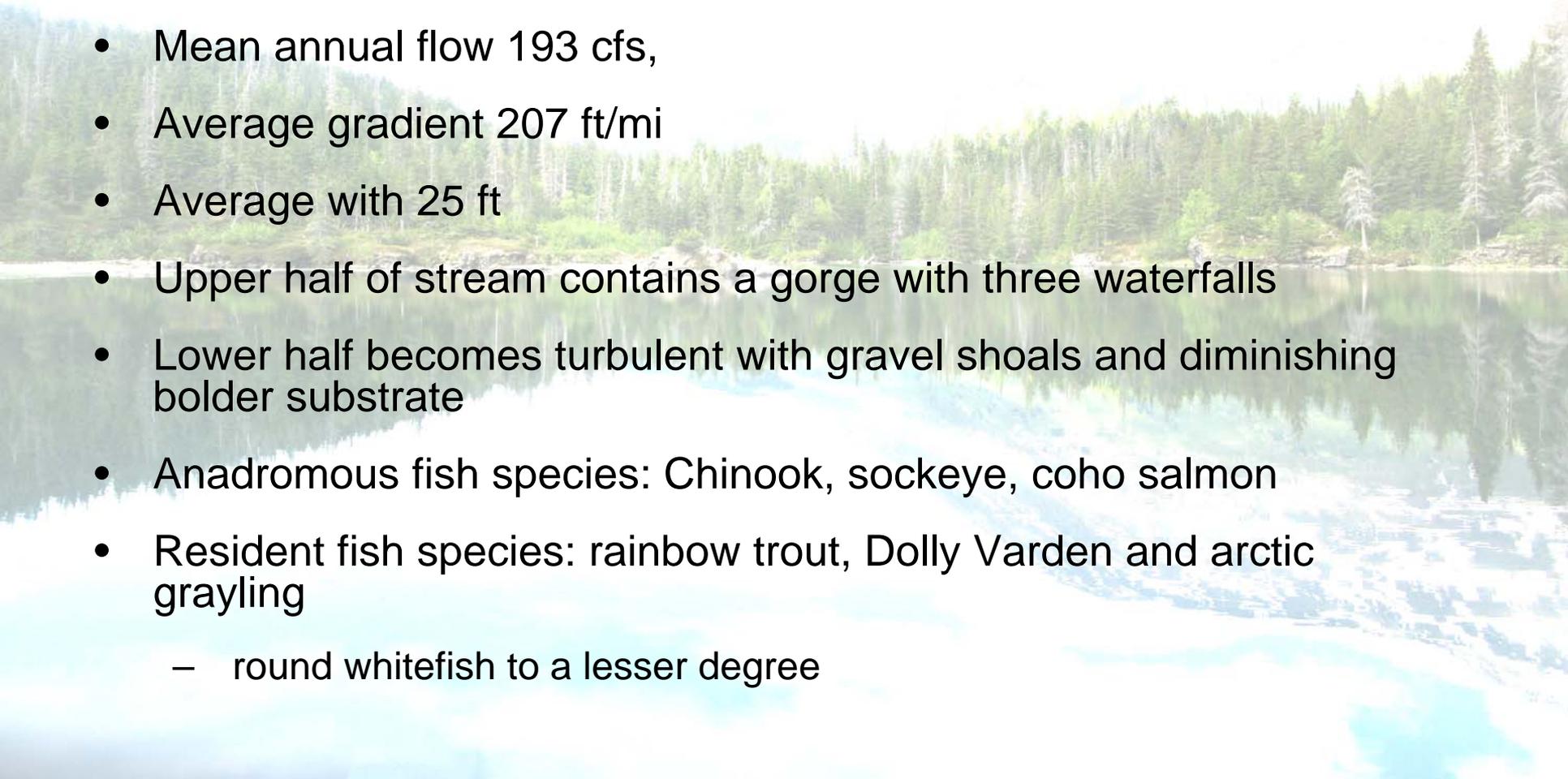
- 1984: Ebasco Services, Inc. - comprehensive evaluation for Alaska Power Authority (now AEA, Alaska Energy Authority):
 - Water use and quality
 - Aquatic, botanical and wildlife resources
 - Historical and cultural resources
 - Socioeconomic impacts
 - Geological and soil resources
 - Recreational and aesthetic resources
 - Land use
 - Developed 6 alternatives for power generation.
 - Preferred alternative for power generation - 7 MW project
 - lake tap intake, west shore of Grant Lake
 - powerhouse at the narrows of Trail Lake
 - tailrace to Grant Lake
 - Other alternatives - Falls Creek diversion to Grant Lake

Grant Lake

- 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%
- 

Grant Creek

- 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 boulder substrate
- Anadromous fish species: Chinook, sockeye, coho salmon
- Resident fish species: rainbow trout, Dolly Varden and arctic grayling
 - round whitefish to a lesser degree



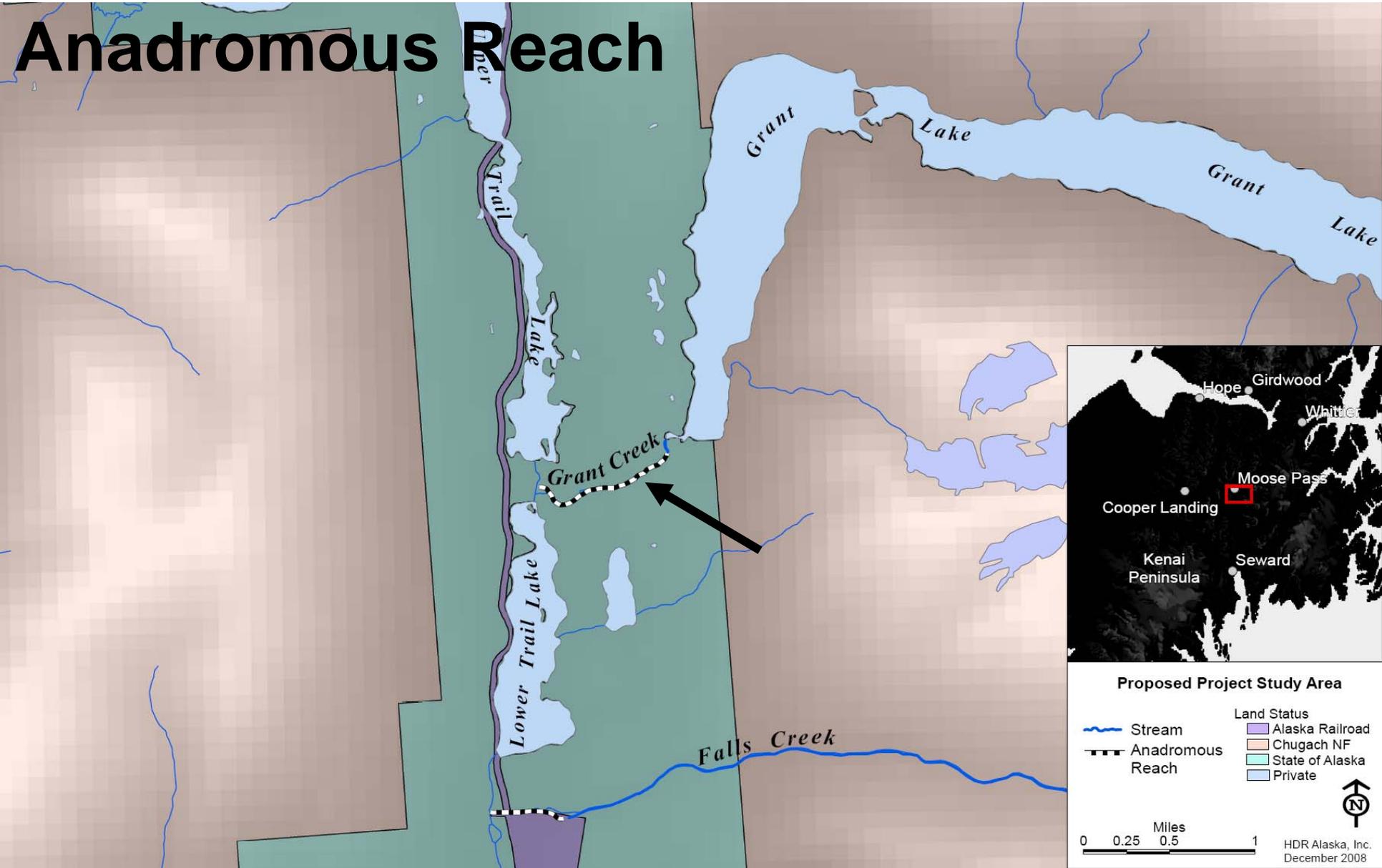
Grant Creek Salmon Escapement

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 Lake

Anadromous Reach



Proposed Project Study Area

Stream	Land Status
Anadromous Reach	Alaska Railroad
	Chugach NF
	State of Alaska
	Private

Miles
0 0.25 0.5 1

HDR Alaska, Inc.
December 2008

Grant Lake

Falls Creek Valley



Natural outlet
and Intake



South leg Grant Lake

Grant Lake looking south towards natural outlet.
Proposed intake at the natural outlet.

Grant Lake

An aerial photograph of the Grant Lake drainage basin. The image shows a large, irregularly shaped lake system with a vibrant turquoise color. The lake is surrounded by dense, dark green coniferous forests. In the background, rugged mountains rise, some with patches of snow and partially shrouded in mist or low clouds. The sky is overcast and grey. A yellow arrow points to a smaller, more distant lake within the basin.

East leg Grant Lake

Grant Lake drainage basin.

Grant Lake



South leg Grant Lake

Area that may require dredging for low level outlet

Natural outlet

Penstock route to follow creek as topography allows.

Access Road

Grant Lake looking north with natural outlet in foreground.

Falls Creek Background

Potential project site would be located on Falls Creek, near Lower Trail Lake

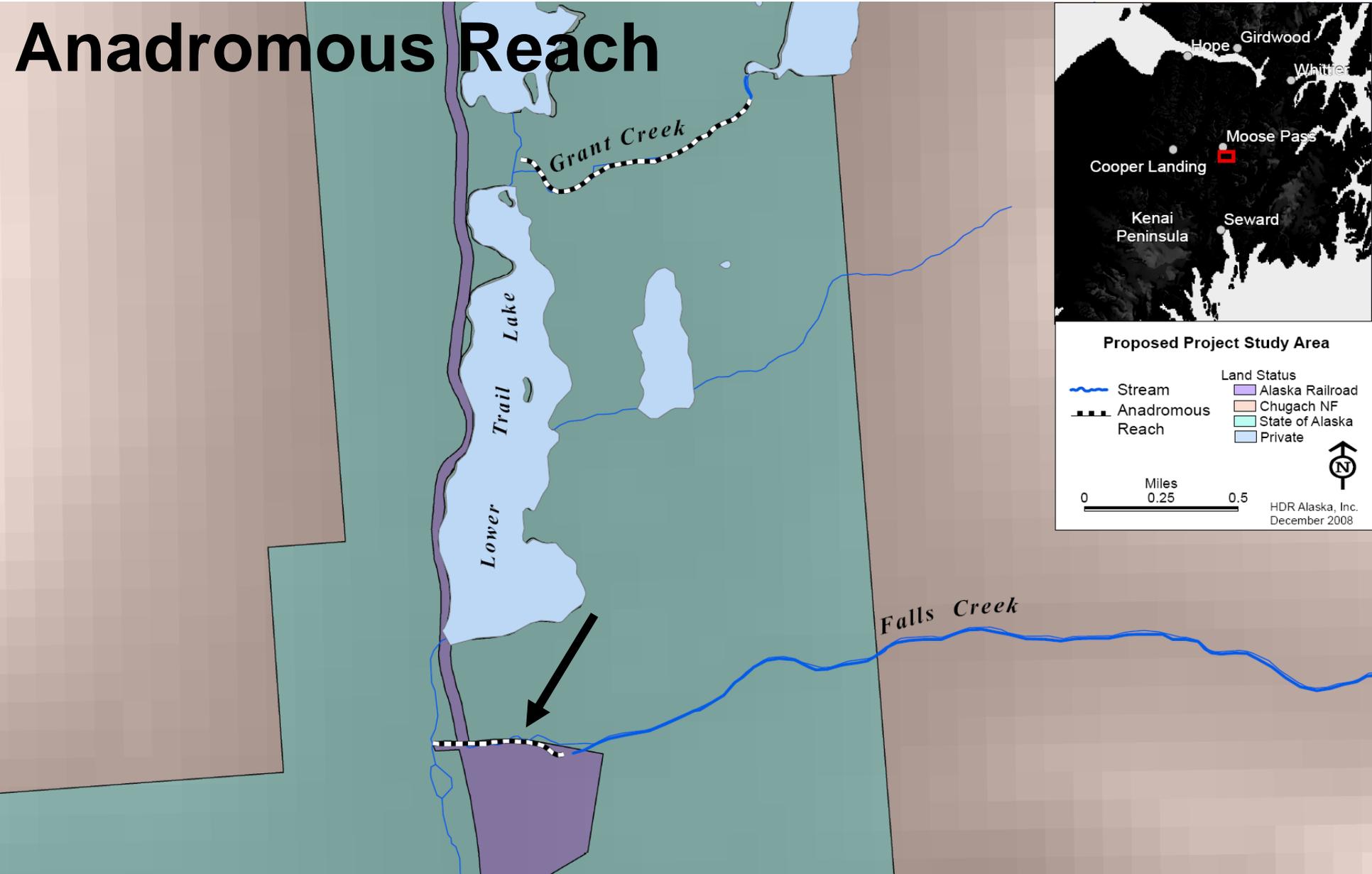
- 1984: Ebasco Services Inc. completed evaluation of hydrology, geotechnical, environmental impacts
 - Developed 6 alternatives for power generation.
 - Falls Creek diversion studied as a Grant Lake Hydroelectric Project alternative
 - Falls Creek intake located at 1,450 ft elevation (now considered unfeasible)
 - Environmental Studies of water use and quality, aquatic, botanical and wildlife resources, historical and archeological resources, aesthetic resources, and land use

Falls Creek Fish Species

- **Falls Creek lower reach (lower 0.4 mi)**
 - Juvenile Chinook present
 - No documented fish spawning
 - Likely that Dolly Varden also occupy Falls Creek - overall abundance and distribution is not well documented

Falls Creek

Anadromous Reach



Overview of 2009 Baseline Study Efforts

- Fish
- Instream Flow and Hydrology
- Water Quality
- Birds and Terrestrial Wildlife
- Wetlands and Terrestrial Vegetation
- Cultural, Historic and Subsistence Resources
- Visual and Recreational Resources

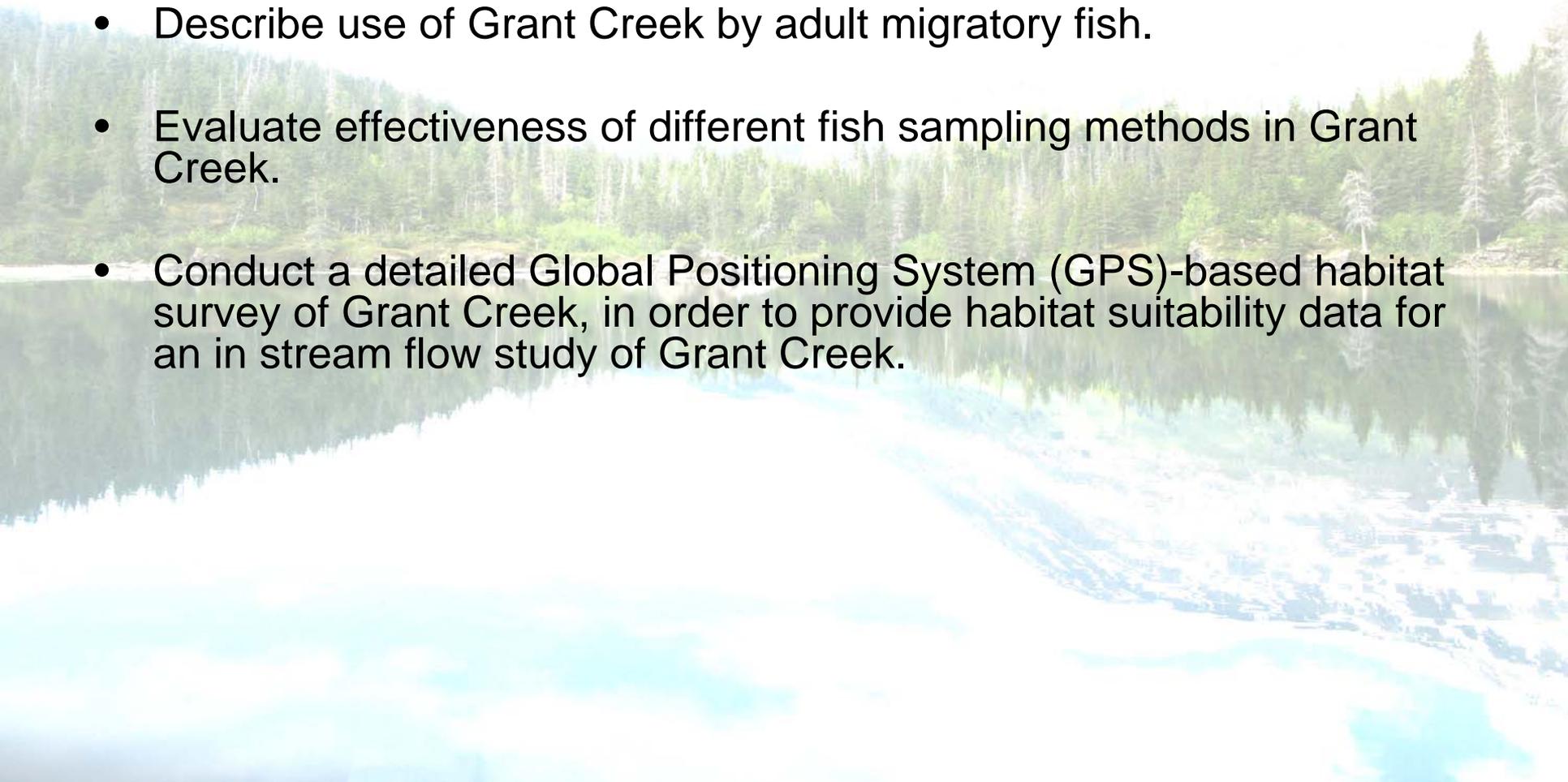
Permitting Requirements for Baseline Data Collection

- ADNR Land Use Permit
- ADF&G Fish Resources
- USFS Special Use Permit



Grant Creek Study Objectives

- Characterize resident and rearing fish use of Grant Creek.
- Describe use of Grant Creek by adult migratory fish.
- Evaluate effectiveness of different fish sampling methods in Grant Creek.
- Conduct a detailed Global Positioning System (GPS)-based habitat survey of Grant Creek, in order to provide habitat suitability data for an in stream flow study of Grant Creek.

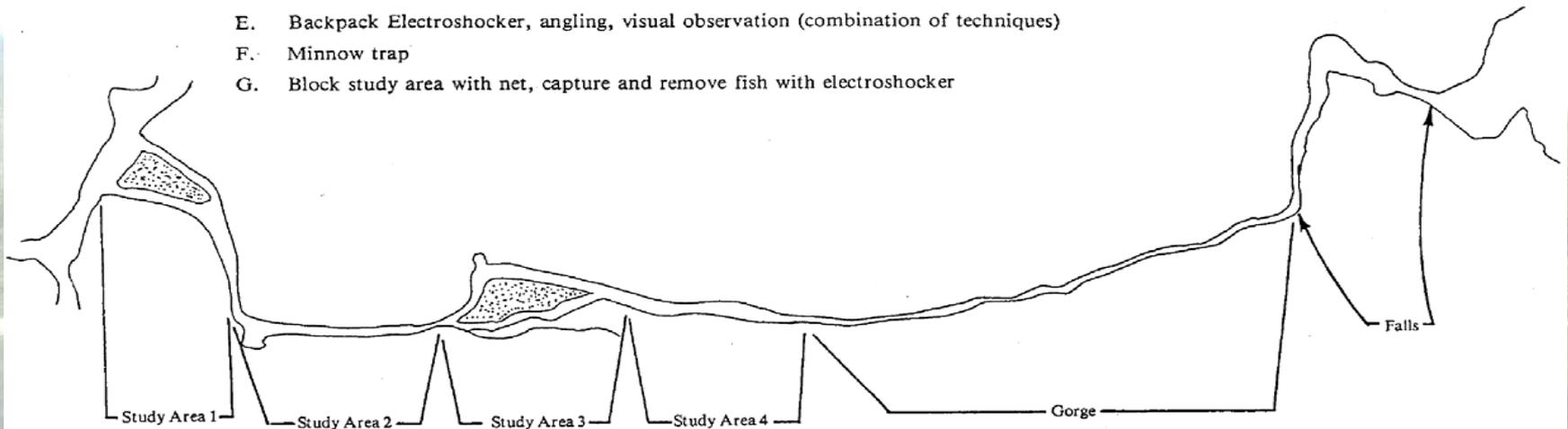


Sampling Approach

- Grand Creek is somewhat turbid, shallow with high velocity flows;
 - Previous investigators attempted to enumerate fish in Grant Creek unsuccessfully using electrofishing and block and removal techniques
- Resident and rearing fish under 200 mm in length have been sampled successfully with minnow traps in Grant Creek (AEIDC 1983, USFWS 1961)
- Angling surveys may be an effective method of sampling migratory salmonids larger than 200 mm (i.e. adult Dolly Varden and rainbow trout; Bartlett and Hansen 2000, Larson 1998, Bradley 1990).
- CIAA successfully operated a picket weir 1983 - 1986
- Visual foot surveys counts for estimation of adult salmon abundance

Study Areas

- E. Backpack Electroshocker, angling, visual observation (combination of techniques)
- F. Minnow trap
- G. Block study area with net, capture and remove fish with electroshocker



Rearing Fish Use

- Sample sites will be established within each study area, marked using GPS, staked, and flagged for future identification.
- Each study area will be uniformly sampled using baited $\frac{1}{4}$ inch mesh minnow traps to determine catch per unit effort (CPUE)
- Electro fishing will be used to confirm minnow traps capture results
- Sample Frequency = twice each month June through September
- CPUE will be determined by dividing the catch (number of fish caught) by the effort (fishing time).
- Kruskal-Wallis test (a nonparametric ANOVA) will be used to determine if there are statistically significant differences in CPUE between study areas.
 - If a significant result arises, Mann Whitney U tests will then be used to determine which study areas are statistically significantly different from each other.

Adult Migratory Fish – Trout, Dolly Varden, Grayling and Whitefish

- Angling Surveys

- Angling stations will be established within each study area
- Timed to coincide with the probable spawning times (Spring and Fall)
 - Will continue through the summer to characterize overall resident fish use of the creek
 - Sample frequency two sampling events each month minimum
 - may need greater effort in during spring and fall spawning events (i.e. weekly)
 - Dolly Varden may require snorkel surveys if angling is not successful

- CPUE will be determined by dividing the catch (number of fish caught) by the effort (fishing time)

- Evaluate statistical differences in CPUE between study areas

Adult Migratory Fish – Salmon

- Foot surveys will be used to estimate adult salmon abundance
 - Survey crew on each bank
 - All active channels
 - Spawning out live fish and carcasses will be counted and tallied by study area
- Sample Frequency Every 10 Days
- Evaluate statistical differences in salmon abundance between reaches
- AUC estimated will be calculated if possible

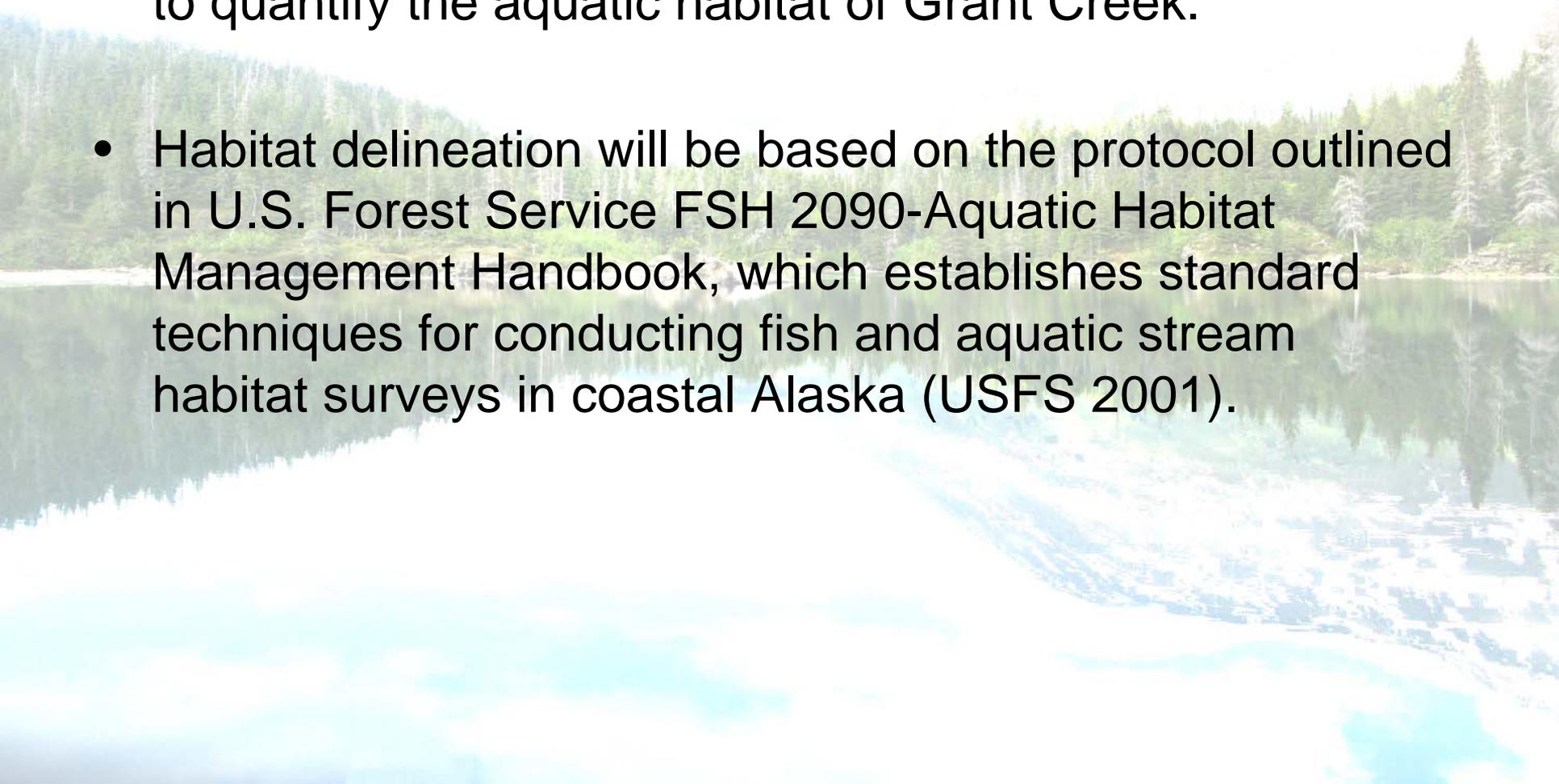
Weir Site Reconnaissance

- Two or three locations near the mouth of the creek
- An attempt will be made to find the weir location operated by CIAA in the 1980s.
 - Channel geometry
 - Bed width
 - Wet width at low and high flow conditions
 - Stream bank conditions – stability, erosional features, undercut bank, vegetation
 - Substrate
 - Thalweg velocity measurements at low and high flow conditions
 - Fish use of the area – bank orientation, holding or moving upstream, active spawning, overall abundance; and
 - Photographs

Grant Creek

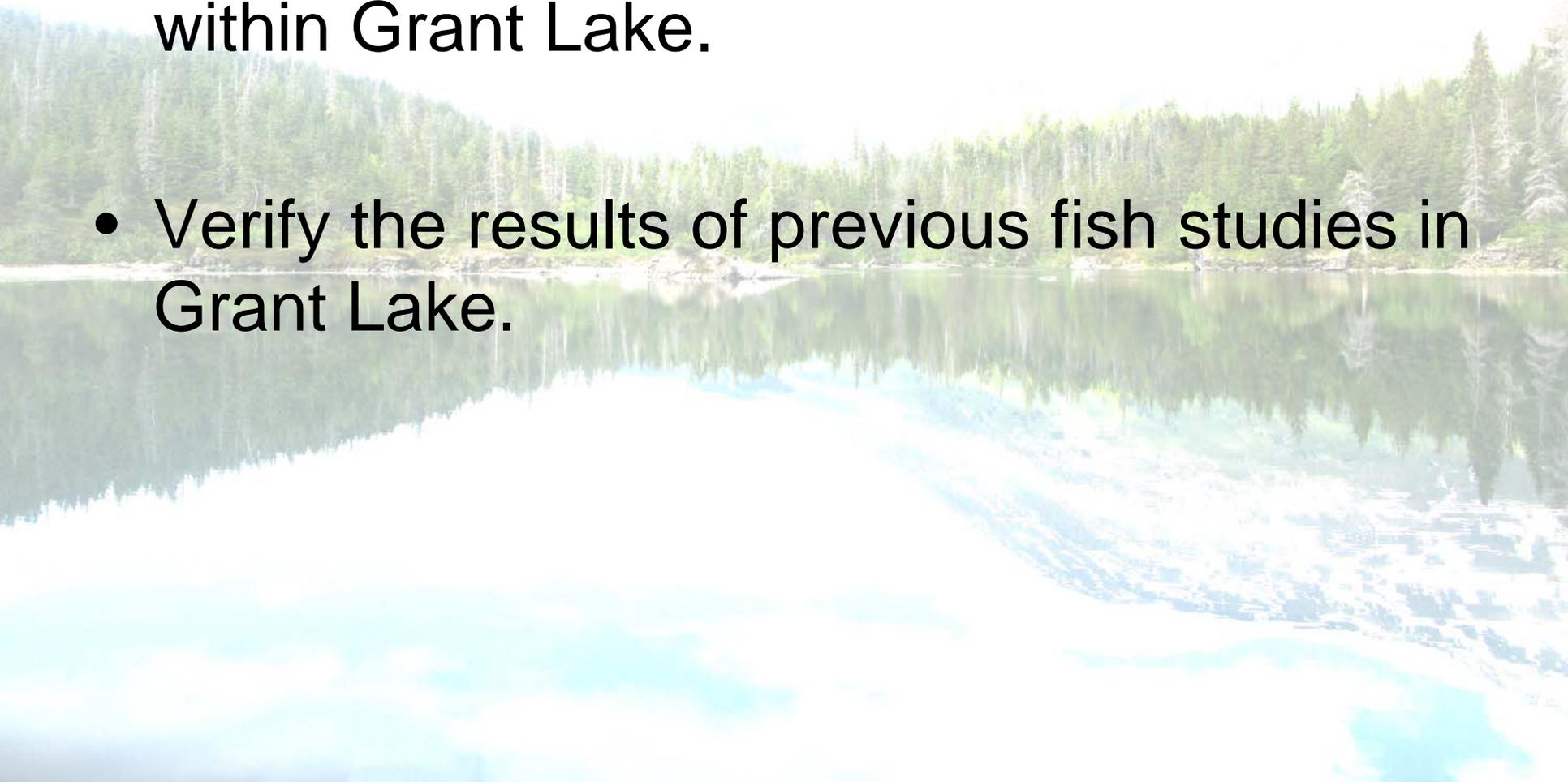
Aquatic Habitat Survey

- A detailed, GPS-based, habitat survey will be conducted to quantify the aquatic habitat of Grant Creek.
- Habitat delineation will be based on the protocol outlined in U.S. Forest Service FSH 2090-Aquatic Habitat Management Handbook, which establishes standard techniques for conducting fish and aquatic stream habitat surveys in coastal Alaska (USFS 2001).



Grant Lake Study Objectives

- Characterize fish community composition within Grant Lake.
- Verify the results of previous fish studies in Grant Lake.



Study Design

- Historical sampling efforts in Grant Lake have employed baited minnow traps and variable mesh gill nets.
- The 2009 Grant Lake fish characterization baseline study will employ these same methods and also include beach seining in the lake and electrofishing in lake tributaries.

Potential Sample Locations



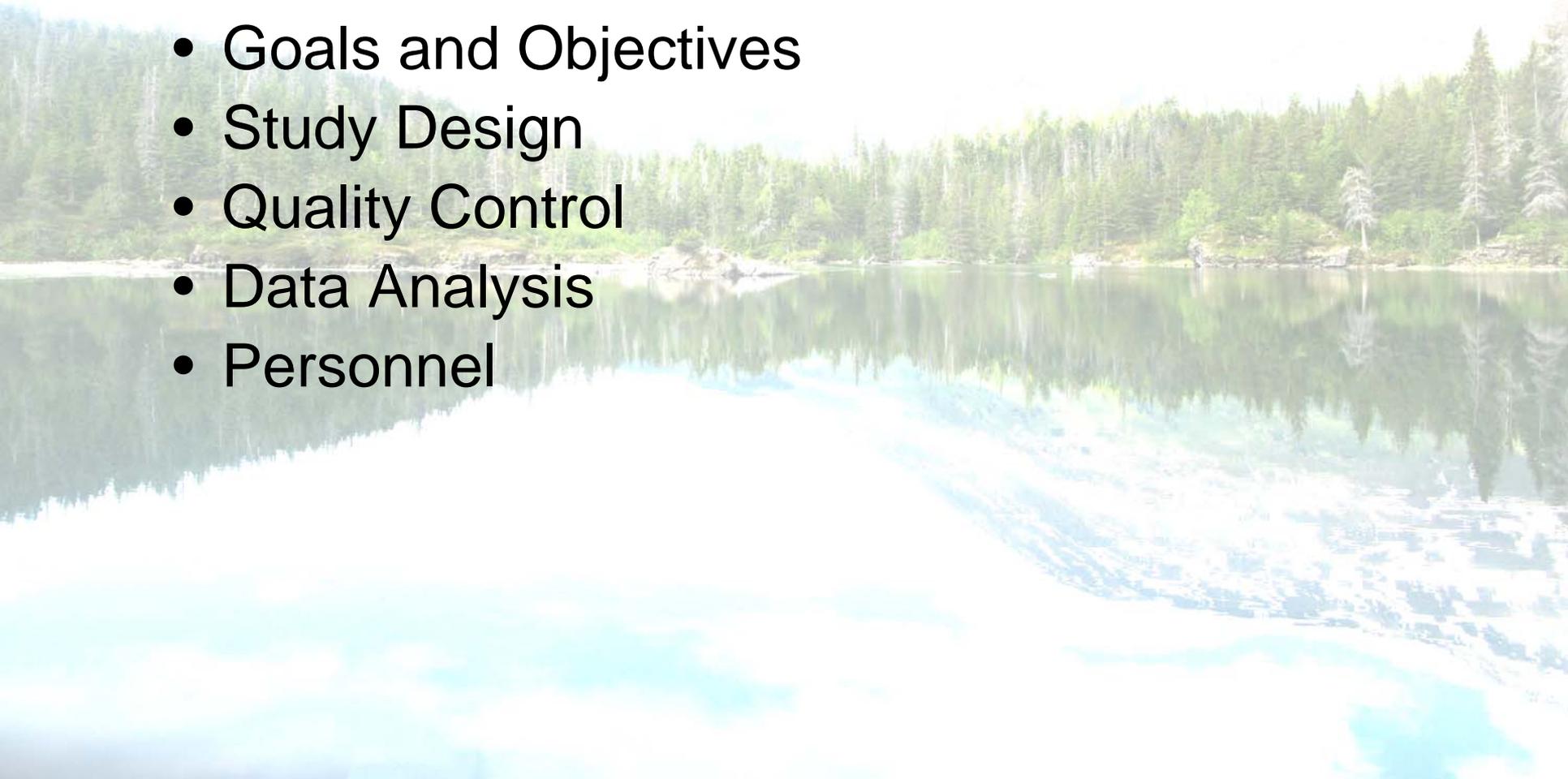
■ Cabin or associated building

Grant Lake Fish Sampling

- Two separate sampling efforts
 - June shortly after ice-out before significant glacial melting activity
 - Late summer (August – September).
- Sensitive or high value fish habitats, will be identified and characterized based on depth, substrate, vegetative cover, turbidity and any fish capture results.
- Data analysis will consist of a characterization sensitive or high value fish habitats based on CPUE, fish presence / absence documentation, a list of species captured and their relative abundance.

Water Quality: Grant Lake and Grant Creek

- Previous Studies
- Goals and Objectives
- Study Design
- Quality Control
- Data Analysis
- Personnel



Previous Studies

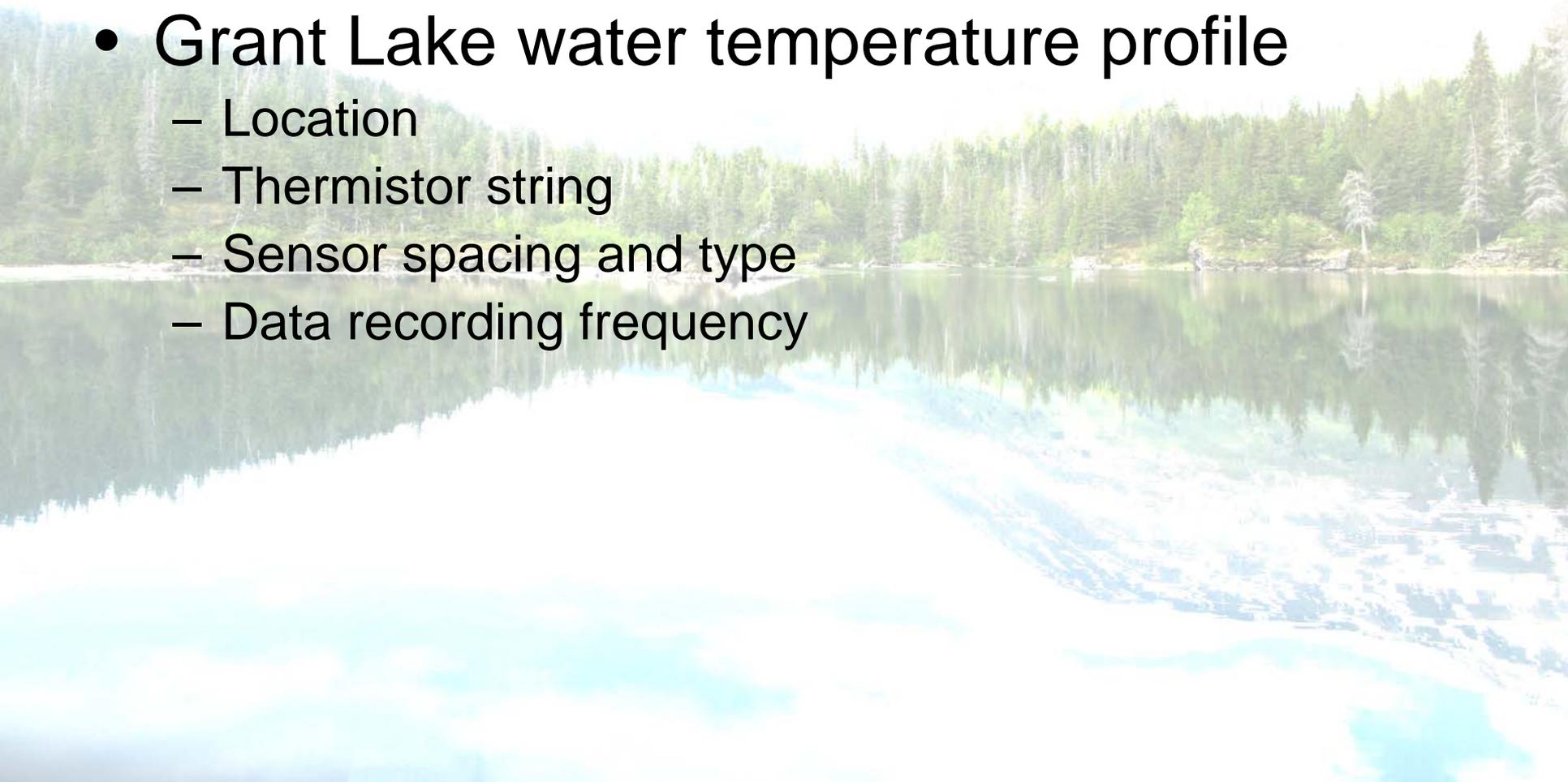
- Grant Lake water quality & temperature models 1960 and 1981-82 (AEIDC 1983)
- Grant Lake limnology – 1983 (Marcuson 1989)
- Grant Lake water quality and zooplankton (Marcuson 1989)
- Grant Creek water chemistry and physical data 1950-1960 (Still 1976, 1980; USFWS 1961)
- Grant Lake zooplankton 1981-82 (ADF&G, USFS)
- Benthic macroinvertebrates & periphyton 1983 (APA 1984)

Goals and Objectives

- Water temperature profile near proposed intake in Grant Lake
- Baseline water quality information in Grant Lake
- Baseline water quality information in Grant Creek
- Baseline information on zooplankton and phytoplankton in Grant Lake
- Baseline information on macroinvertebrates and periphyton in Grant Creek
- Build upon data collected in previous studies

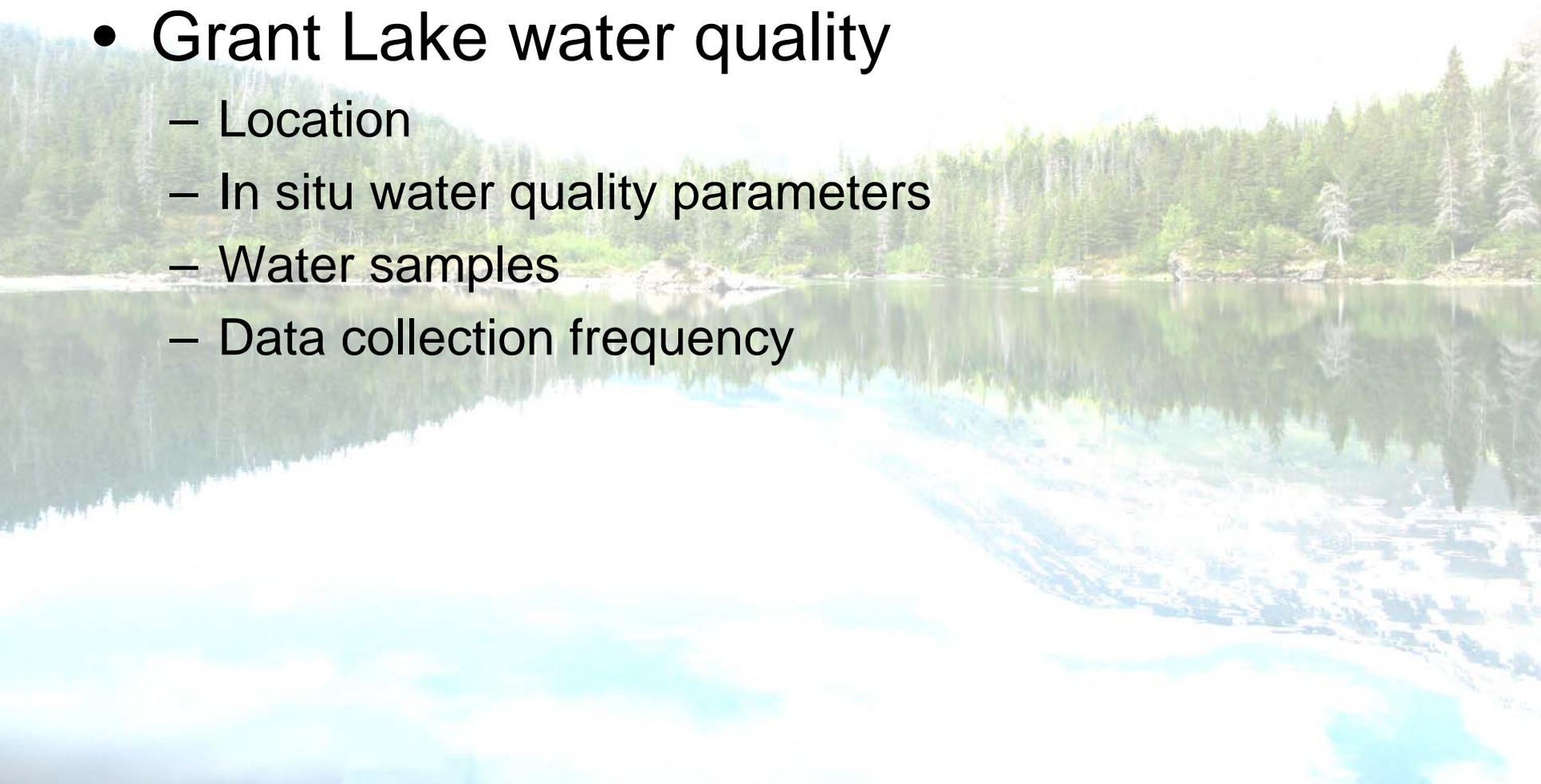
Study Design

- Grant Lake water temperature profile
 - Location
 - Thermistor string
 - Sensor spacing and type
 - Data recording frequency



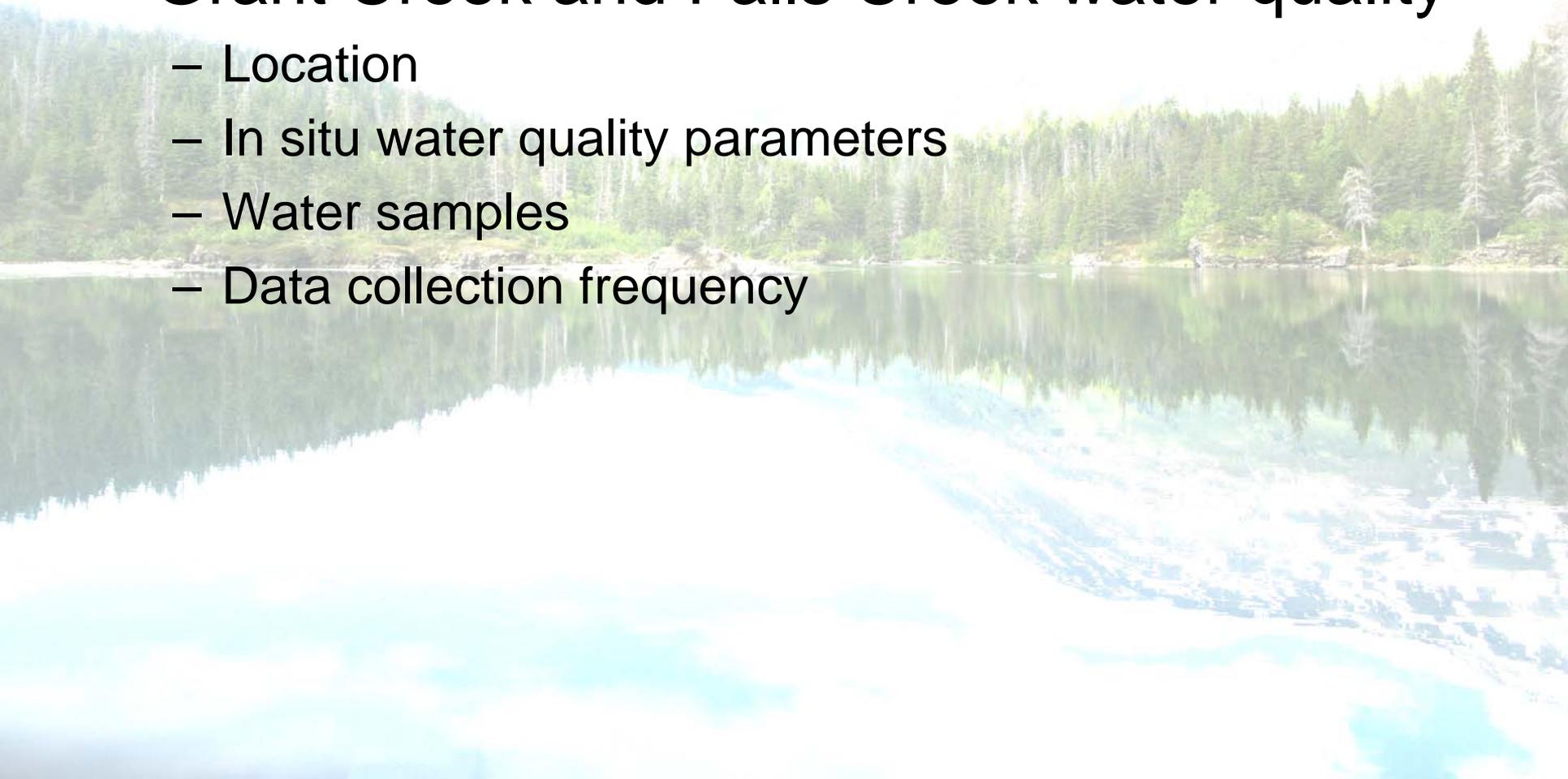
Study Design cont.

- Grant Lake water quality
 - Location
 - In situ water quality parameters
 - Water samples
 - Data collection frequency



Study Design cont.

- Grant Creek and Falls Creek water quality
 - Location
 - In situ water quality parameters
 - Water samples
 - Data collection frequency



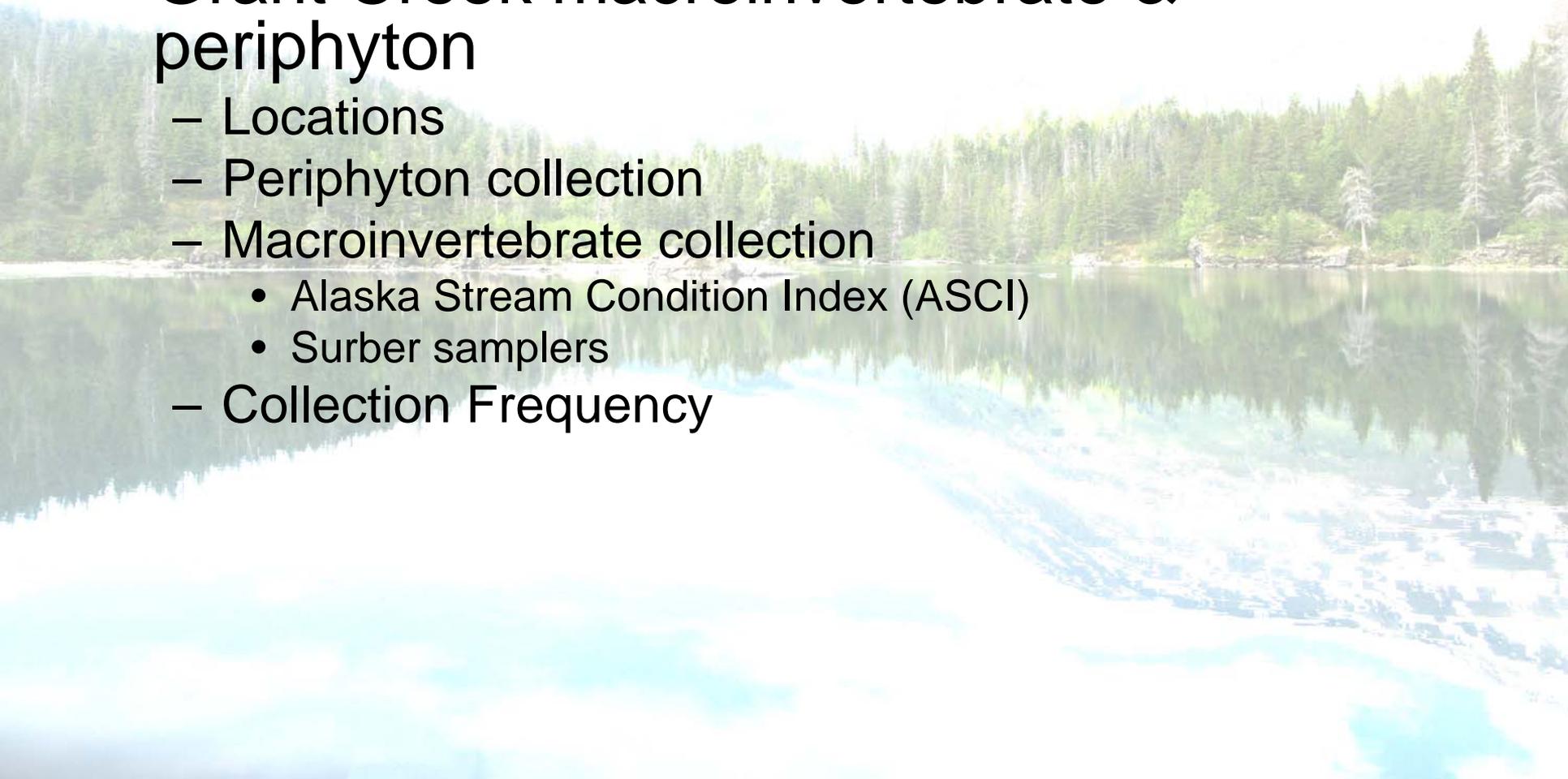
Study Design cont.

- Grant Lake zooplankton & phytoplankton
 - Location
 - Zooplankton collection
 - Phytoplankton collection
 - Collection frequency



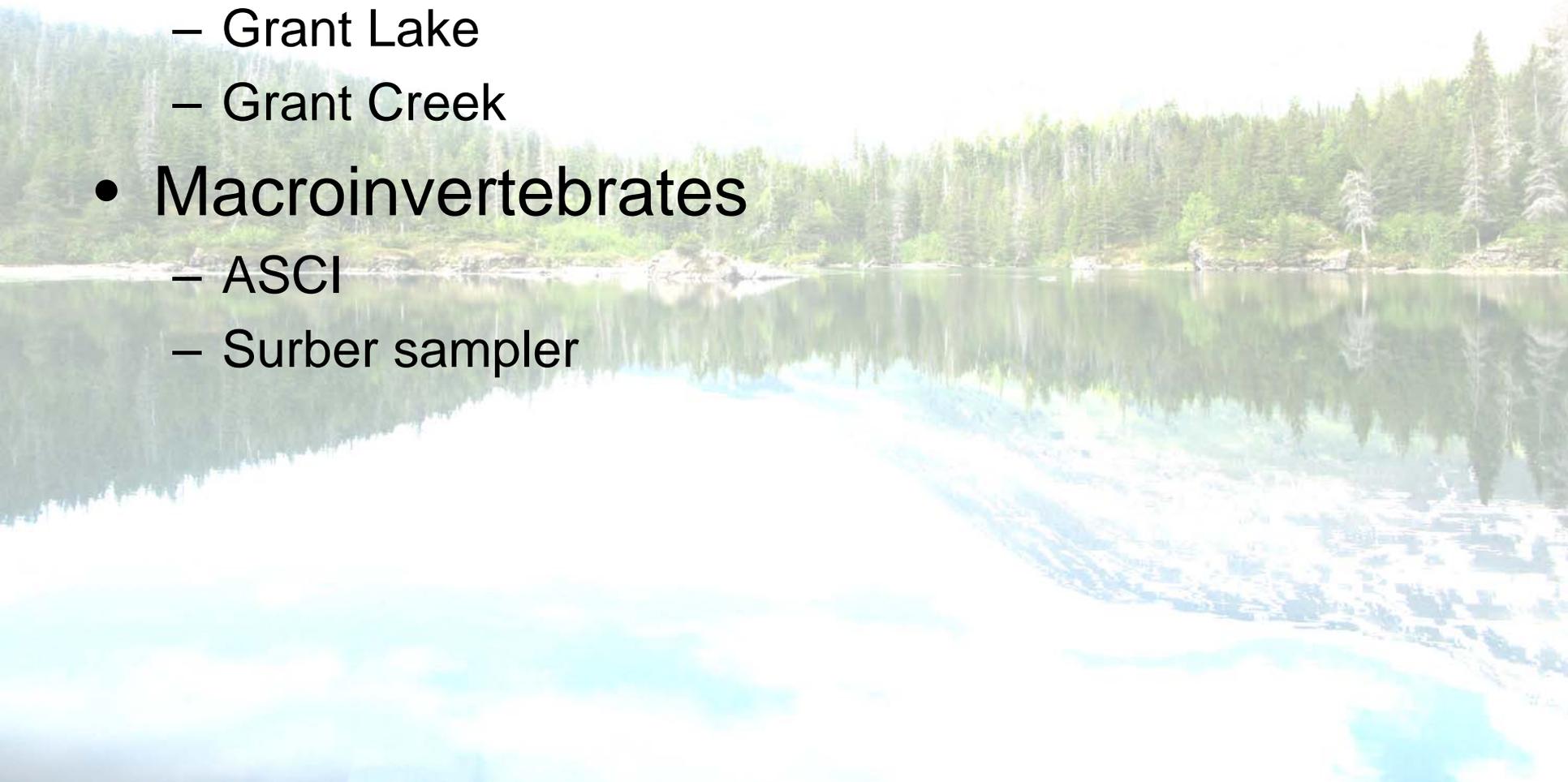
Study Design cont.

- Grant Creek macroinvertebrate & periphyton
 - Locations
 - Periphyton collection
 - Macroinvertebrate collection
 - Alaska Stream Condition Index (ASCI)
 - Surber samplers
 - Collection Frequency



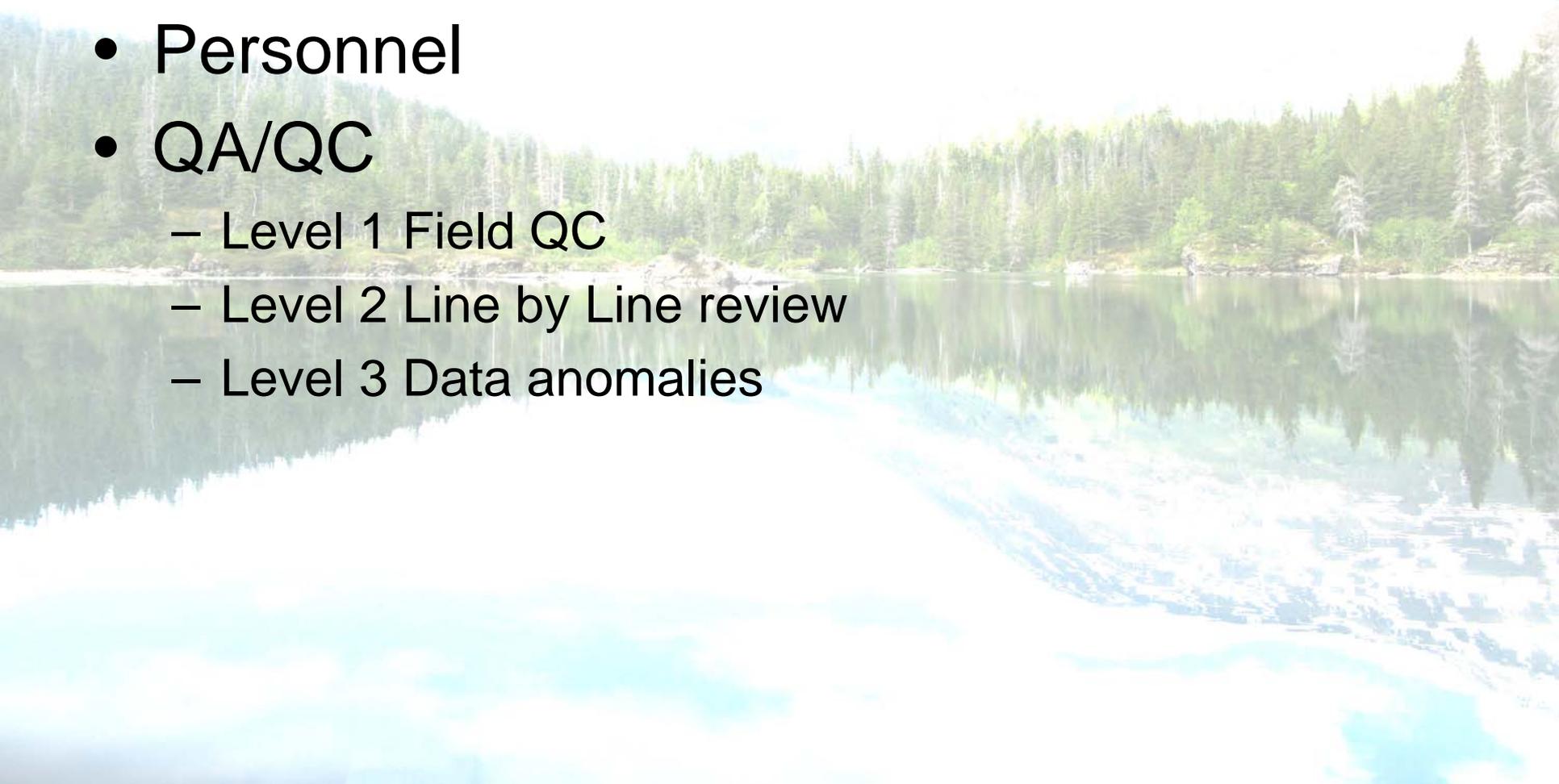
Quality Control

- Water quality
 - Grant Lake
 - Grant Creek
- Macroinvertebrates
 - ASCI
 - Surber sampler



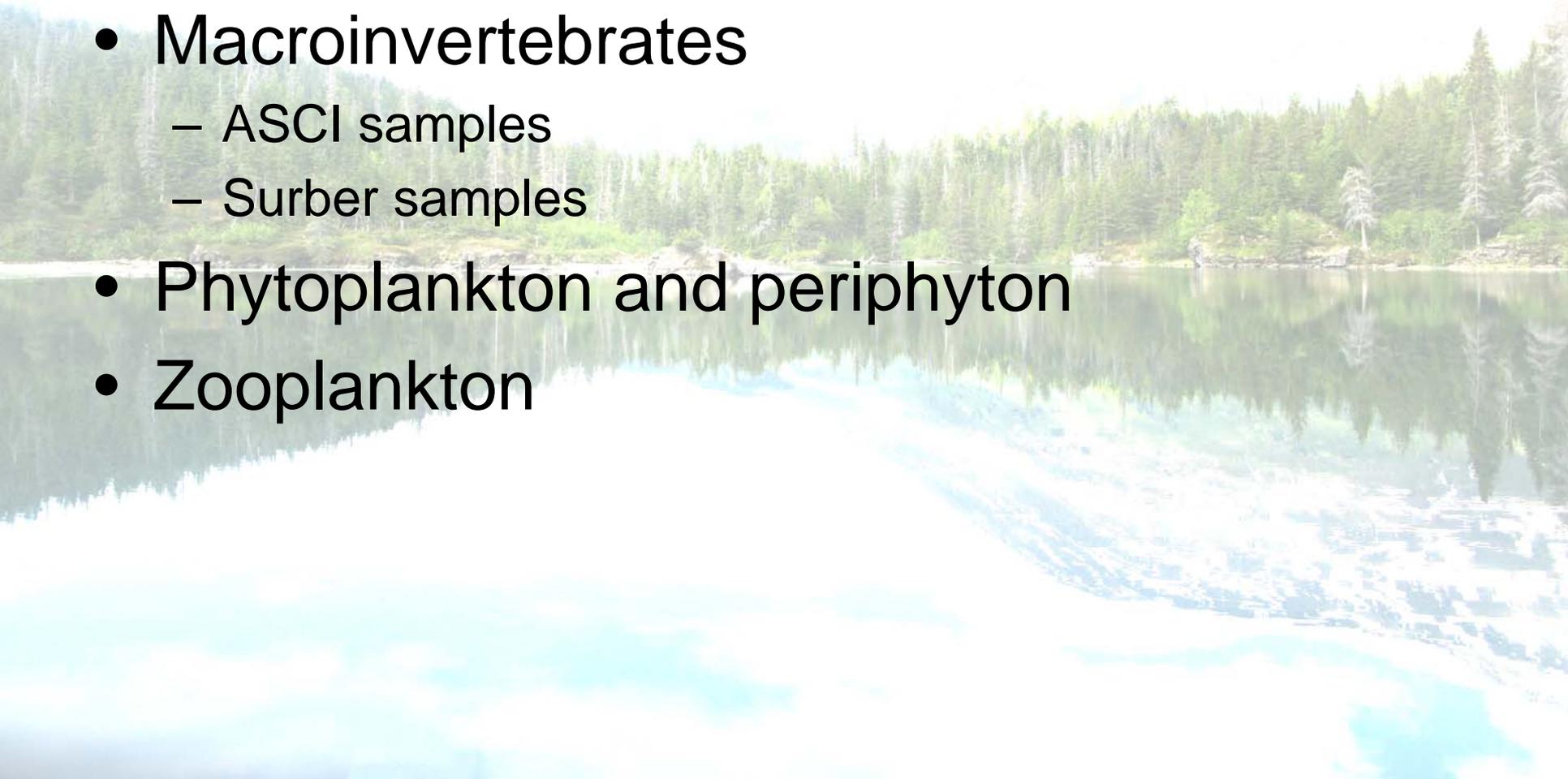
Quality Control cont.

- Zooplankton & phytoplankton
- Personnel
- QA/QC
 - Level 1 Field QC
 - Level 2 Line by Line review
 - Level 3 Data anomalies



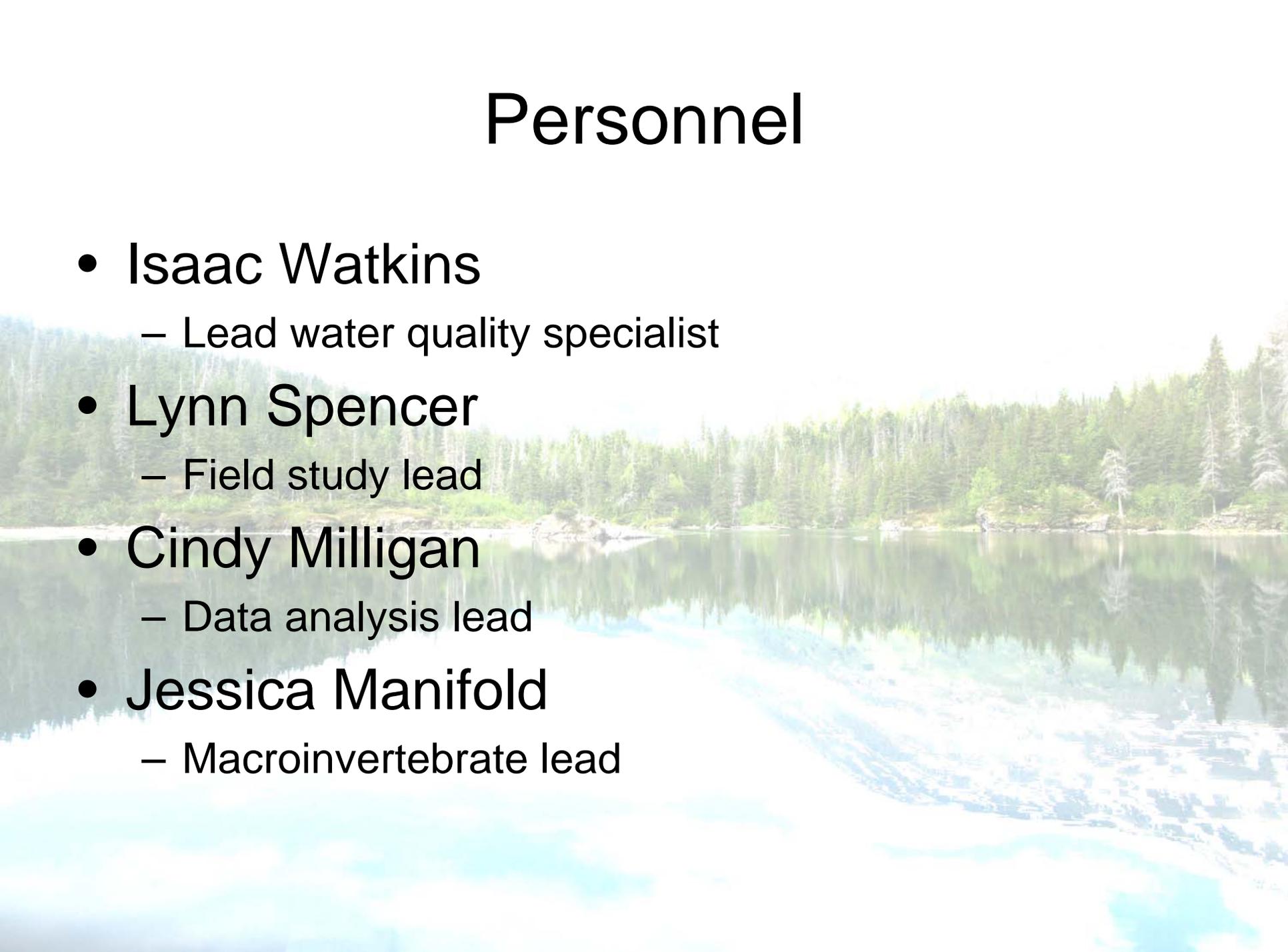
Data Analysis

- Water quality and in situ parameters
- Macroinvertebrates
 - ASCI samples
 - Surber samples
- Phytoplankton and periphyton
- Zooplankton



Personnel

- Isaac Watkins
 - Lead water quality specialist
- Lynn Spencer
 - Field study lead
- Cindy Milligan
 - Data analysis lead
- Jessica Manifold
 - Macroinvertebrate lead

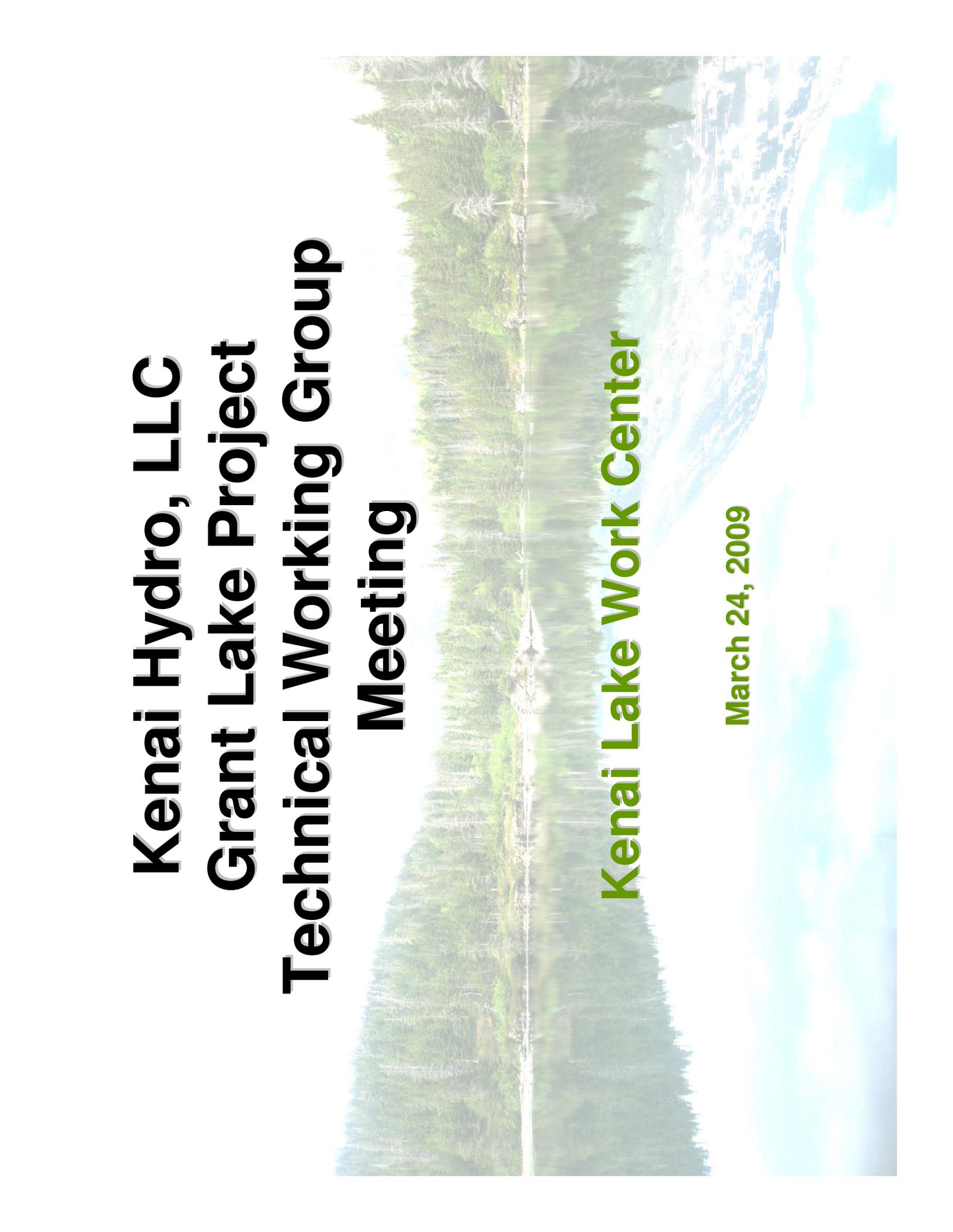


Questions?



Next Steps





Kenai Hydro, LLC Grant Lake Project Technical Working Group Meeting

Kenai Lake Work Center

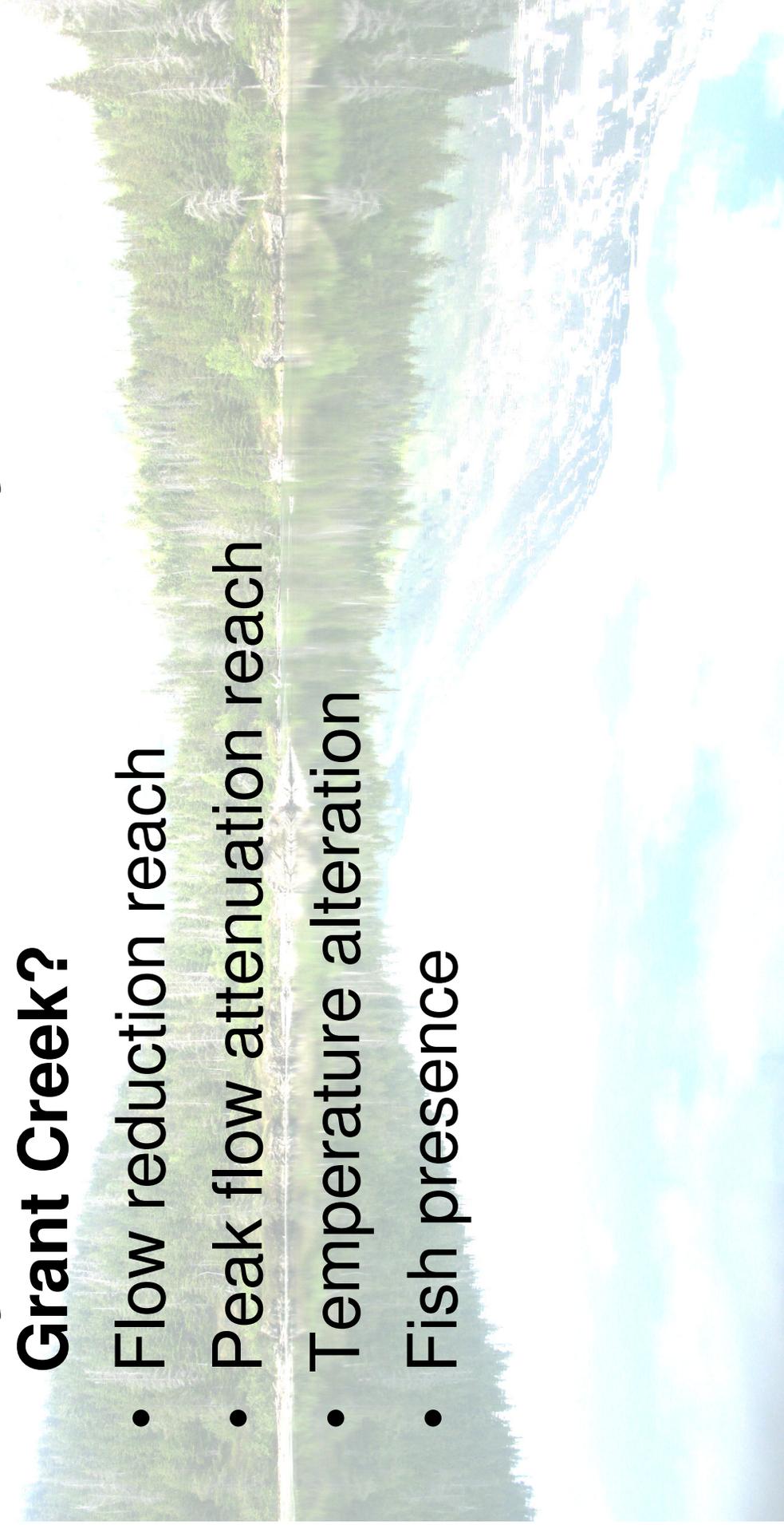
March 24, 2009

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, cont'd

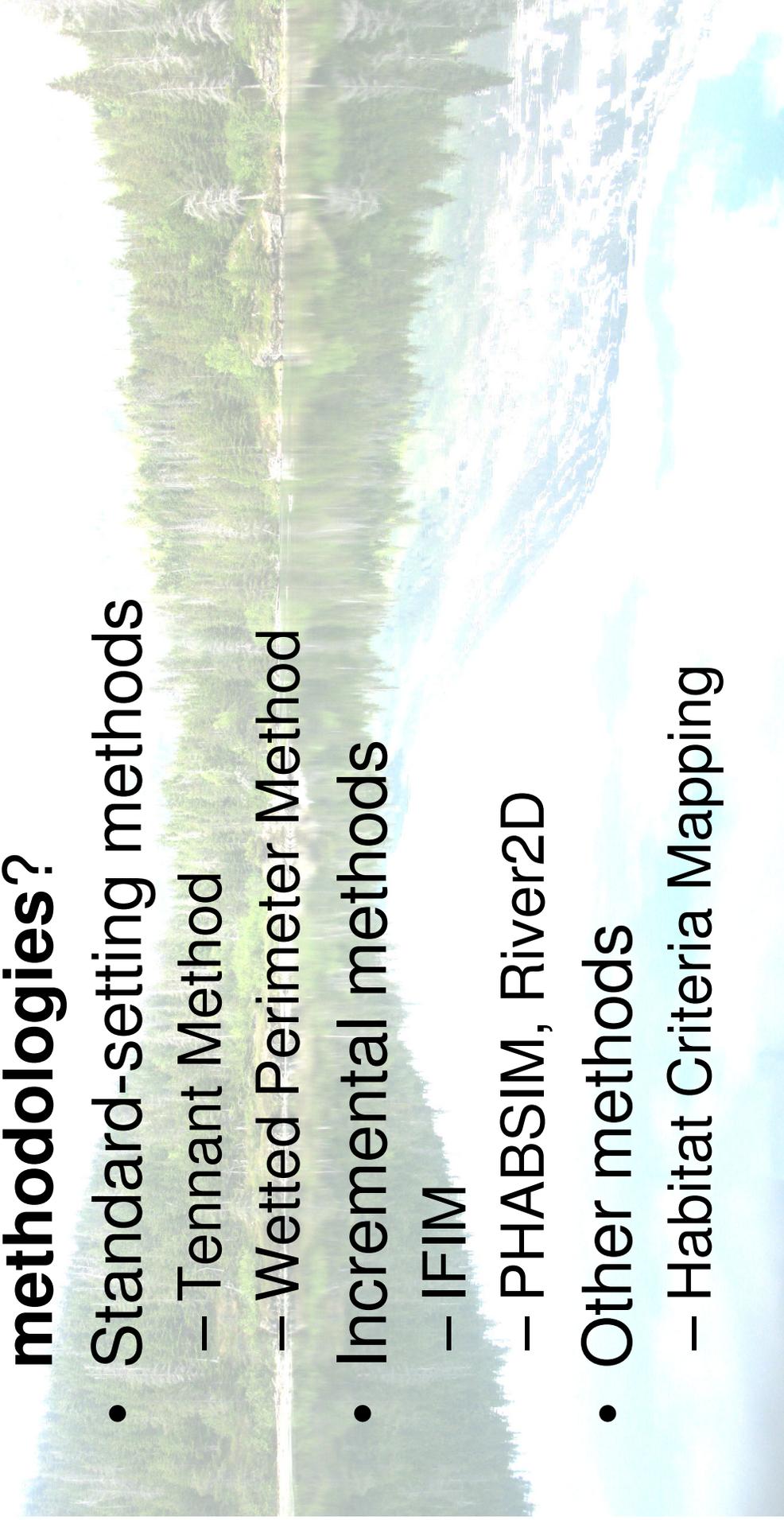
What is learned in an instream flow study?

- 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, cont'd

What are typical instream flow methodologies?

- Standard-setting methods
 - Tennant Method
 - Wetted Perimeter Method
- Incremental methods
 - IFIM
 - PHABSIM, River2D
- Other methods
 - Habitat Criteria Mapping

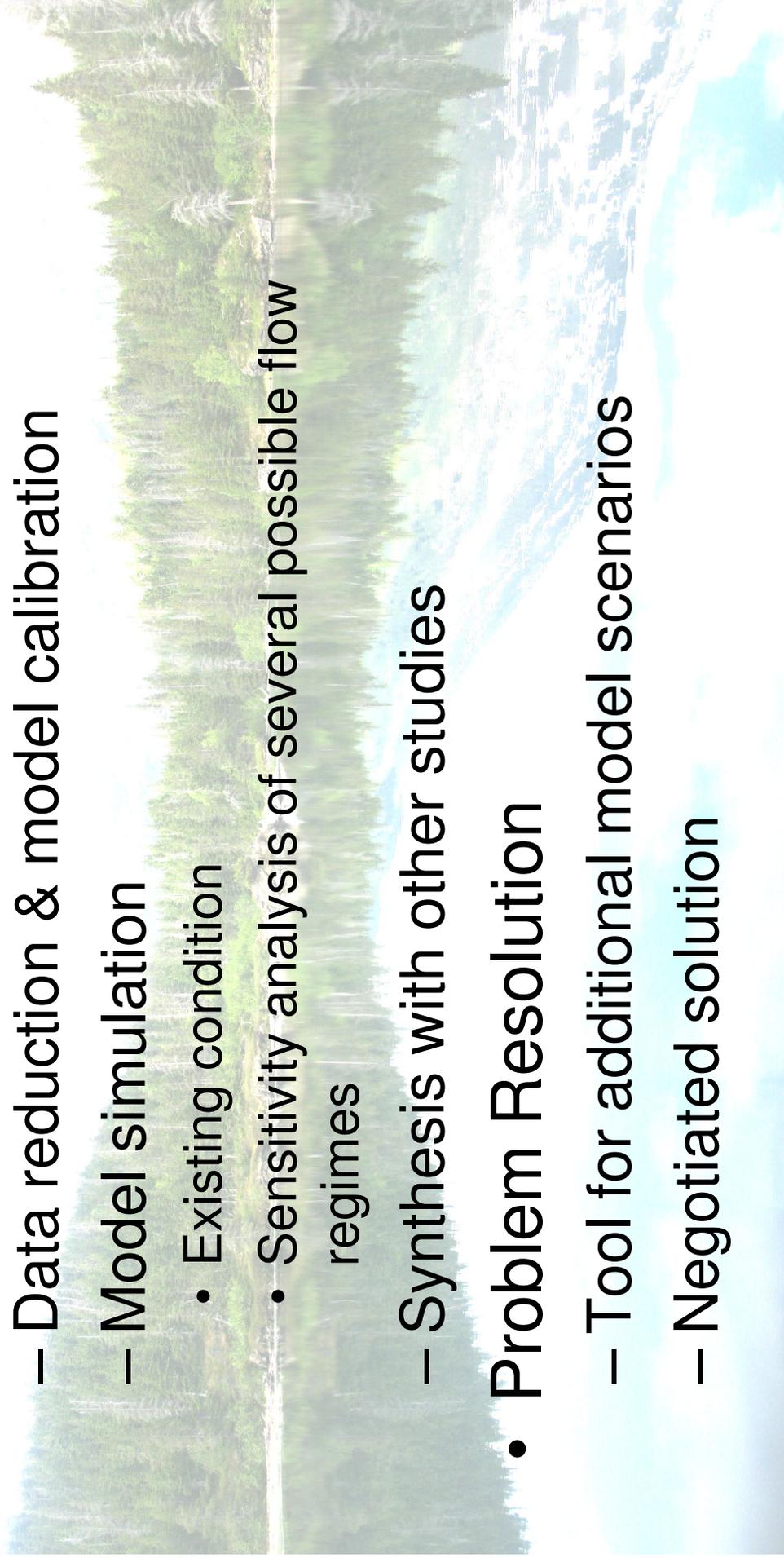


Instream Flow Decision Points

- 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

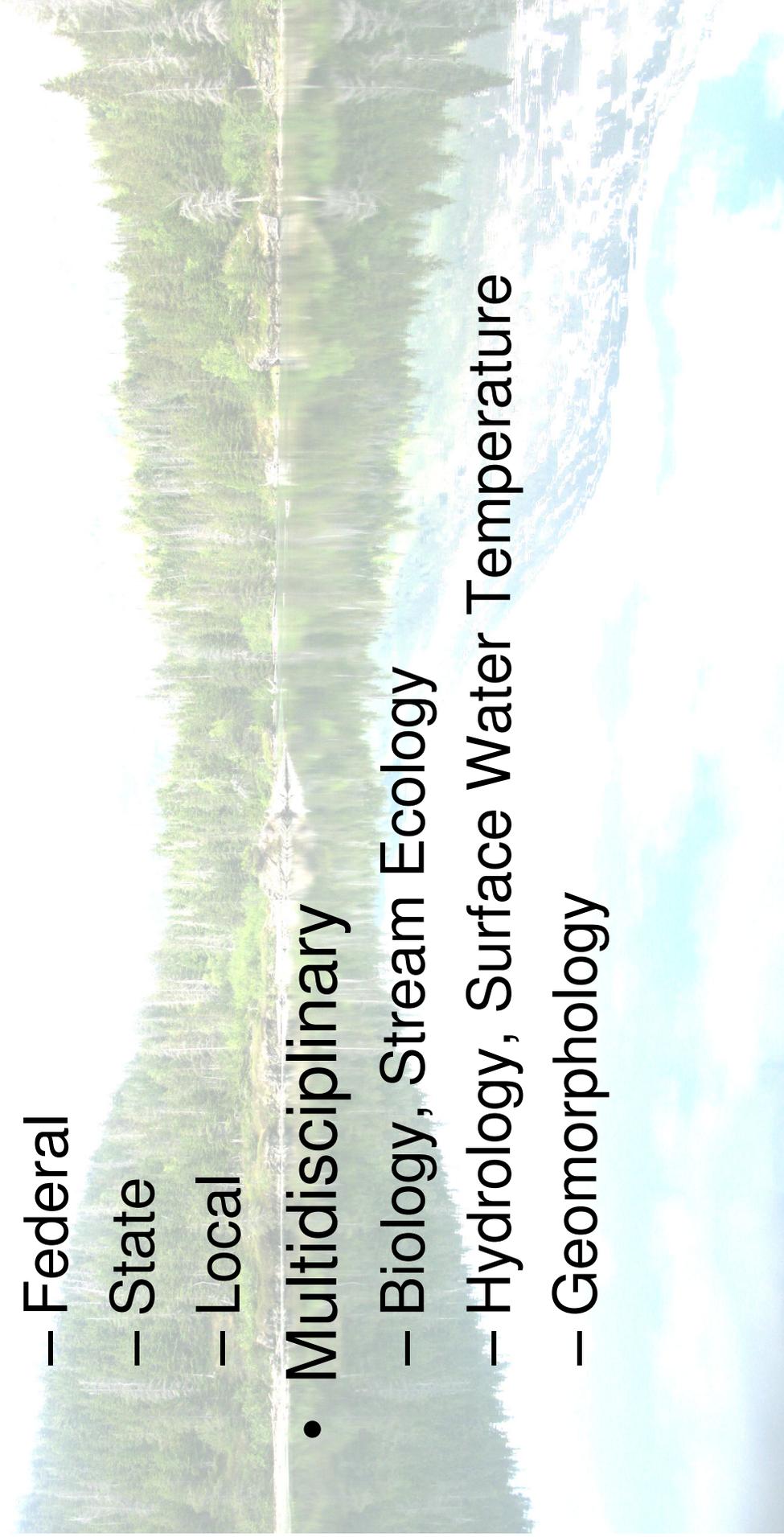
Instream Flow Decision Points, Cont'd

- 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 Technical Working Group

- Multiple stakeholders
 - Federal
 - State
 - Local
- Multidisciplinary
 - Biology, Stream Ecology
 - Hydrology, Surface Water Temperature
 - Geomorphology



2 Potential Project Schedules

“Typical” Schedule

- TWG Meeting #1 – 5/11/09
- TWG Meeting #2 – 6/15/09
- TWG Meeting #3 – 7/20/09
- TWG Meeting #4 – 8/17/09
- Draft Work Plan 9/14/09
- Final Work Plan 11/16/09
- Field Work
 - Hydrology stations 2009
 - Field work – breakup 2010

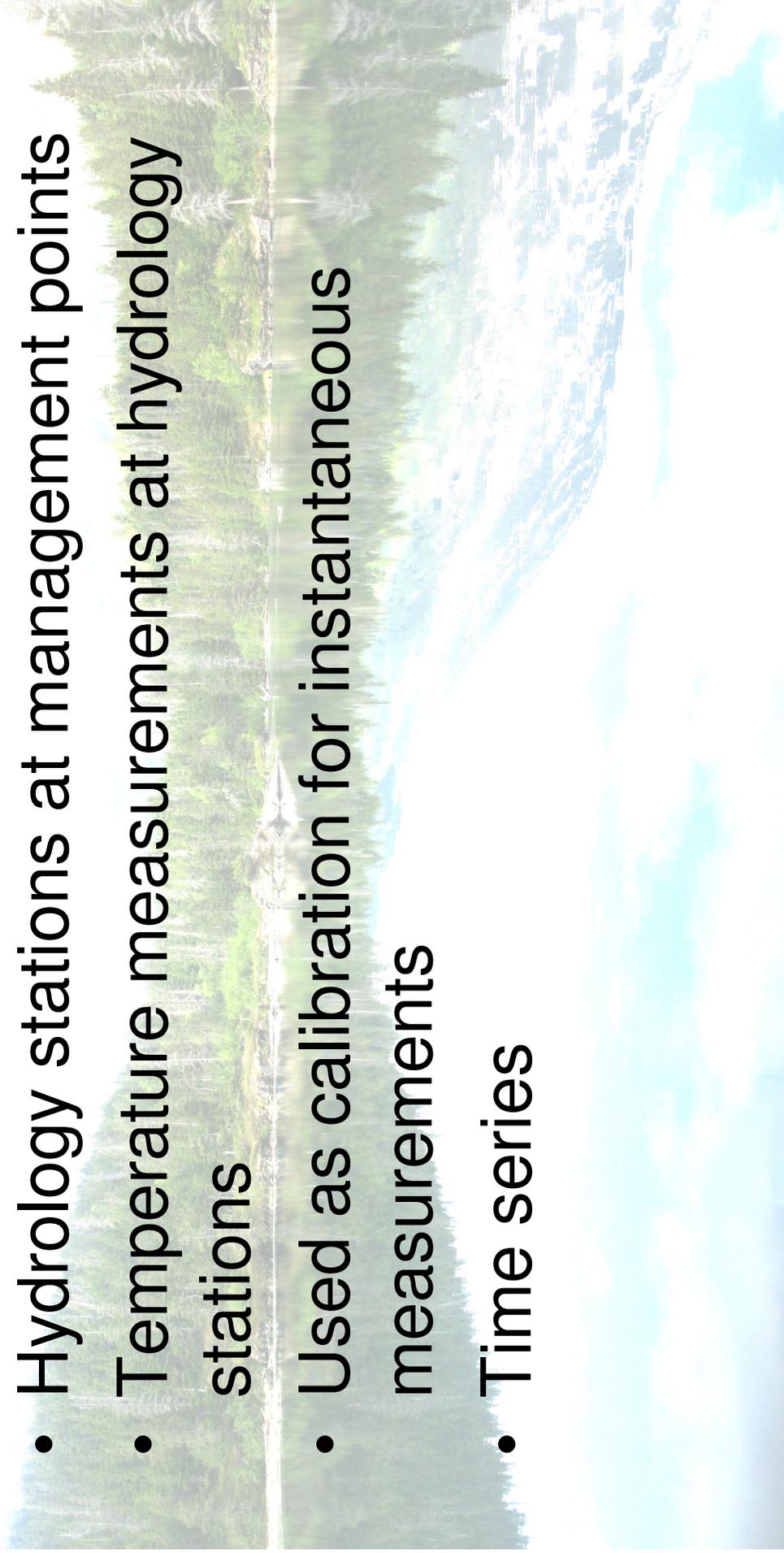
Accelerated Schedule

- TWG Meeting #1 – 4/6/09
- TWG Meeting #2 – 4/20/09
- TWG Meeting #3 – 5/4/09
- TWG Meeting #4 – 5/8/09
- Draft Work Plan 5/8/09
- Final Work Plan 5/22/09
- Field Work – begin May ‘09

All dates are approximate

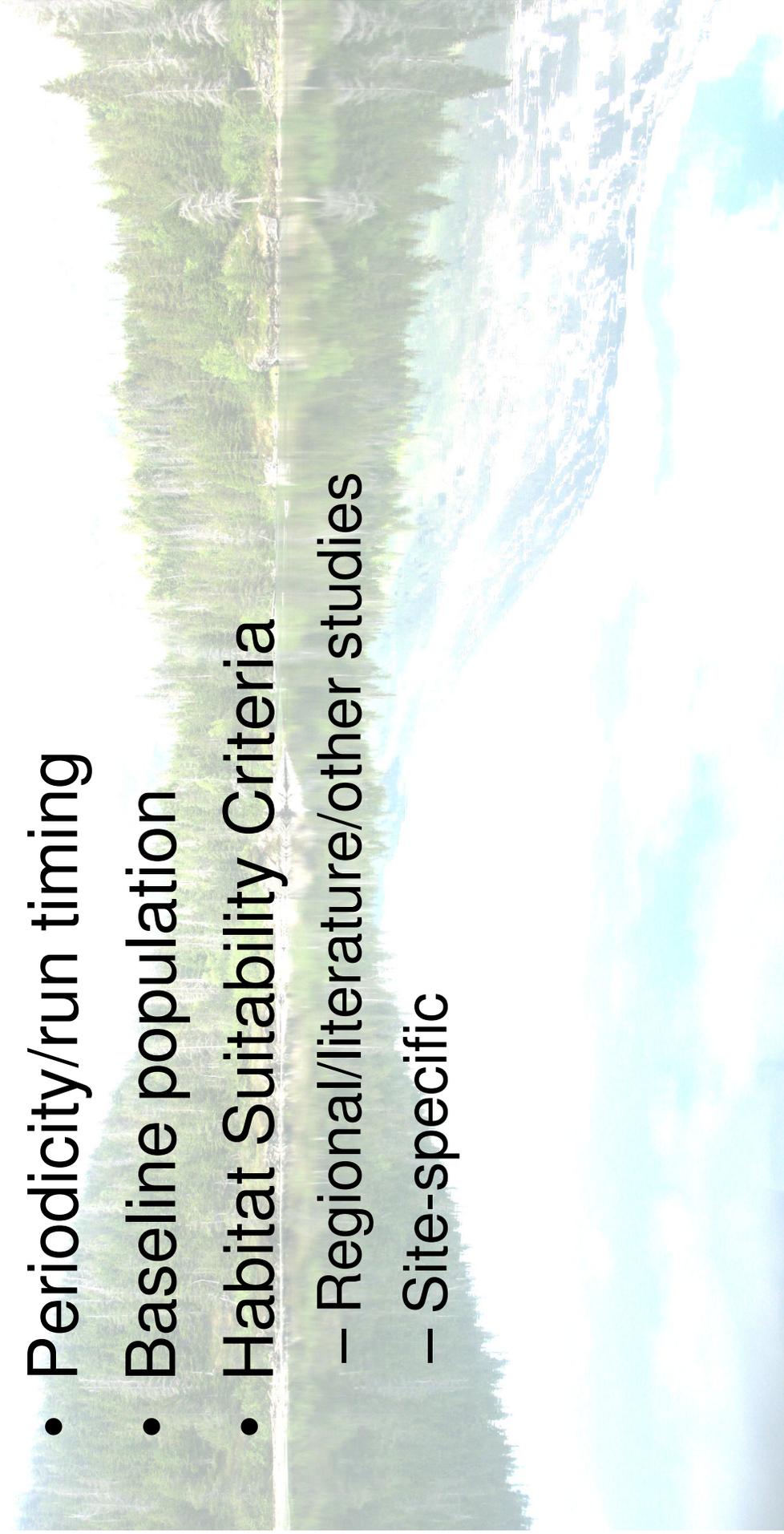
Instream Flow & Hydrology

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



Instream Flow & Fish Resources

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



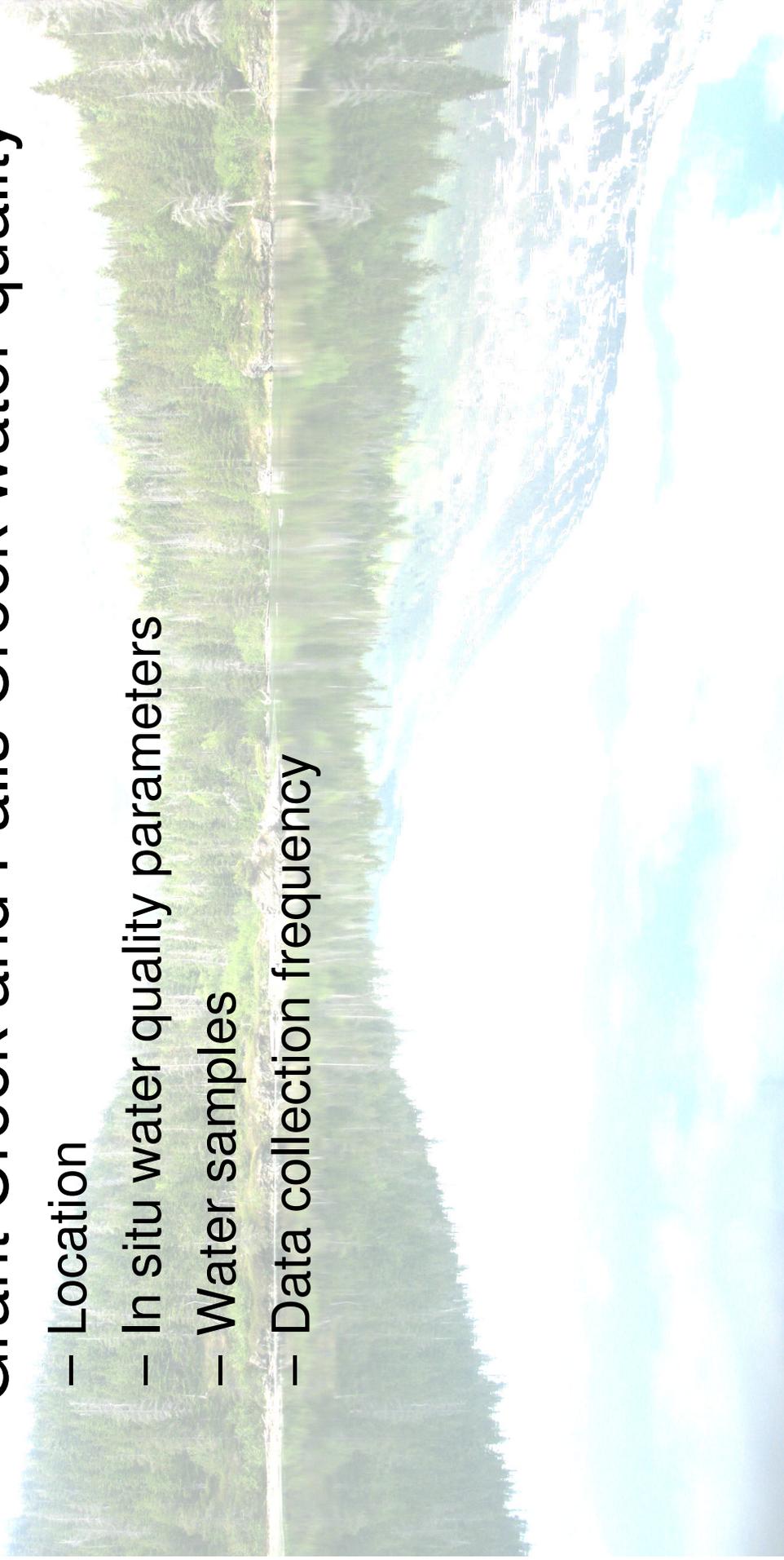
Instream Flow Next Steps

- Technical Work Group
- Definition of the “project”
- Start work on decision points



Study Design cont.

- Grant Creek and Falls Creek water quality
 - Location
 - In situ water quality parameters
 - Water samples
 - Data collection frequency



Questions?

