

DRAFT 2012 AQUATIC RESOURCES STUDY PLAN

Takatz Lake Hydroelectric Project (FERC No. 13234)

City and Borough of Sitka, Alaska ("City")

June, 2012

1.0 BACKGROUND

The City and Borough of Sitka Electric Department (City) holds a Preliminary Permit (Permit) from the Federal Energy Regulatory Commission (FERC, Commission) for the proposed Takatz Lake hydroelectric project (Project), FERC No. 13234-000-AK. Licensing the Project requires studies of various potentially-affected resources, including aquatic resources in several stream basins. Aquatic resources studies were conducted by the City and contractors in 2010 and 2011. These studies disclosed existing resources in the Takatz, Sadie, Baranof and Medvejie river basins. Results of those studies have been deemed sufficient to describe existing fish resources in those basins. This study plan describes additional studies in specific reaches of the Takatz Creek which remain to be done in the summer and fall of 2012.

1.1 2010 STUDY RESULTS

Based on consultation activities including an interagency meeting on May 13, 2010, a Draft Fisheries Study Plan (City, 2010) was developed for the 2010 field season. Concurrent to this initial consultation and planning, the City, under contractor Karl Wolfe, conducted studies in 2010 in all potentially-affected river basins. Those studies are documented in Wolfe, 2011. Generally, those studies documented that:

- No fish of any species were found in Upper Takatz Creek, Takatz Lake or Lower Takatz Creek upstream of a waterfall called the "Upper Falls" in Wolfe 2011;
- Only Dolly Varden char were found in Reach 2 of Lower Takatz Creek between the Upper Falls and the Lower Falls;
- There was very complex habitat in Reach 2, consisting of significant beaver activity and existence of sloughs, backwaters and wetlands fed primarily by other inflows;
- Chum and pink salmon were the only prevalent anadromous salmon species in the Takatz Drainage;
- Anadromous salmon distribution in the Takatz Drainage was limited by a stream control feature (Lower Falls) to an intertidal influenced area (Reach 1), and the majority of activity took place within a small section of that area (Reach 1-4).

- Only cutthroat trout were found in Sadie Lake, Baranof Lake, and Upper Baranof River;
- Only Dolly Varden were found in the Medvejie drainage above a stream control feature.

It was also found that the Northern Southeast Regional Aquaculture Association (NSRAA) chum salmon net pens were in the area of potential effects of the Project, relative to water temperature.

1.2 2011 STUDY RESULTS

Based on study planning activities conducted in spring of 2011, the City, under contractor Karl Wolfe, conducted studies in 2011 with an emphasis on the Takatz River Basin. Those studies are documented in Wolfe, 2011. Studies in 2011 confirmed 2010 findings and added detail to the fisheries baseline including:

- There was summer to early fall (primarily August) movement of Adult Dolly Varden in Reach 2 from slow water habitats fed by secondary inflows into Takatz Creek and ultimately the North Tributary.
- Although spawning activity was observed in all sub-areas, the majority of the spawning took place in the North Tributary.
- Limited concentrated spawning in Takatz Creek was largely limited to two areas below the North Tributary confluence and the East Tributary confluence.
- Spawning in the North Tributary and Takatz Creek took place in August and September and was concluded by late October,
- Spawning in the other Takatz secondary inflows occurred up to a month earlier or later.
- There was another movement out of the North Tributary and Takatz Creek by Dolly Varden juveniles in September and by adults by October.

1.3 2012 STUDY PLANNING

The City distributed a draft version of the 2011 fish study report on March 27, 2012. Comments on that report were received from Shawn Johnson of Alaska Department of Fish and Game (ADF&G). Mr. Johnson generally accepted all results and discussions in that report and further recommended that 2012 studies should focus on instream flow and in particular on the Dolly Varden fishery in Takatz Creek Reach 2 (Attachment I).

1.4 CONSULTATION and COMMENT

A draft version of this plan will be distributed to a recipient list with technical interest in the studies, requesting comments within a 30-day period. Comments will be addressed in development of the final study plan.

2.0 STUDY PROPOSALS for 2012

2.1 STUDY AREAS and NOMENCLATURE

All studies in 2012 will be conducted in Lower Takatz Creek, extending from Stream Mile (SM) 2.17 downstream to SM 0.0. This Study Area includes Lower Takatz Creek tributaries and adjacent areas. Study areas in Lower Takatz Creek are described below:

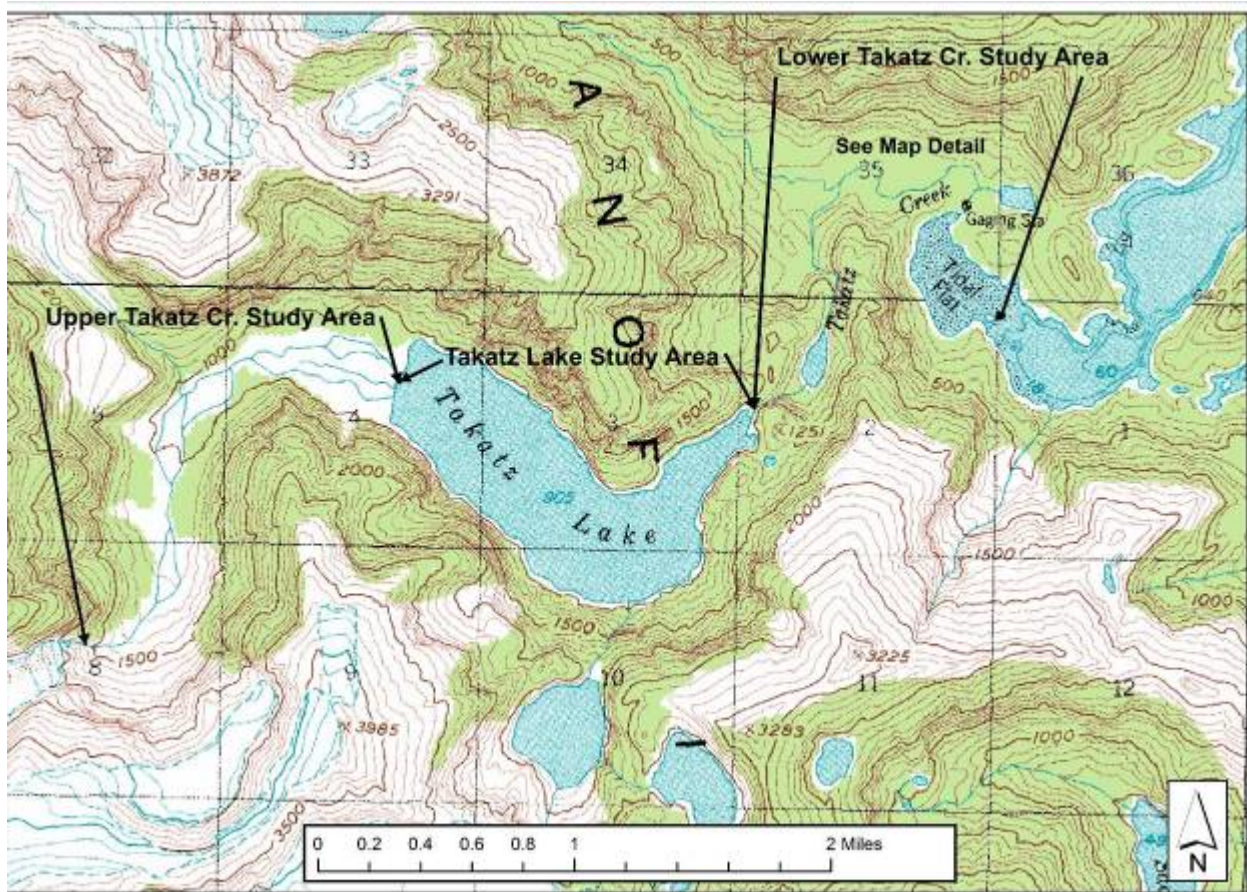


Figure 1. Major Takatz River Basin Study Areas

2.1.2 Lower Takatz Creek Study Areas

Lower Takatz Creek, from the outlet of Takatz Lake to the upstream limit of tidewater is divided into three Study Reaches as described in the following:

Reach 3 extends from the outlet of Takatz Lake approximately 1.04 miles downstream to the Upper Falls (see Figure 2 below);

Reach 2 continues from the downstream end of Reach 3, 1.13 miles to the base of the Lower Falls in Takatz Bay (Figure 2). Reach 2 is further subdivided into five Sub-Reaches, (numbered 1 through 5) of the main channel, based on differences in stream characteristics and habitat type (Figure 2).

Also within the limits of Reach 2 are several distinct aquatic habitat features (see Figure 2), including:

- **Lower and Upper Falls.** Two major waterfalls occur in Reach 2, the Lower Falls, located at SM .73, and the Upper Falls and at SM 1.86, (Figure 2). Both of these features represent barriers to upstream fish passage.
- **Major Inflow Tributaries.** Two significant freestone tributaries enter Reach 2 these are: 1) the North Tributary, entering at about SM 1.79 as well as SM 1.68; and 2) the East Tributary consisting of a pond and outlet stream which enters at SM 0.83;
- **Beaver Areas.** Bordering Reach 2 to the north were two areas of intensive beaver activity, denoted Lower Beaver Areas and Upper Beaver Area. The Lower Beaver Area entered at SM .98 and SM 1.12 and the Upper Beaver Area entered at SM 1.51 and SM 1.57 (See Figure 2). These beaver complexes are minor spring-fed tributaries of Lower Takatz Creek.
- **The Oxbow Area.** The Oxbow Muskeg is a minor tributary area adjacent to Lower Takatz Creek that enters at SM 1.34. The Oxbow Channel is a side channel that communicating hydraulically with Reach 2 and extended downstream from SM 1.73 to SM 1.43; and
- **The Upper Falls Backwater.** A backwater pond with a small spring fed inflow tributary entered at about SM 1.82.

Reach 1 extends from the downstream end of Reach 2 to the normal low tide mark in Takatz Bay. Like Reach 2, Reach 1 is further subdivided into five Sub-Reaches, (numbered 1 through 5) of the main channel, based on differences in stream characteristics, tidal influence, and habitat type (See Figure 2).

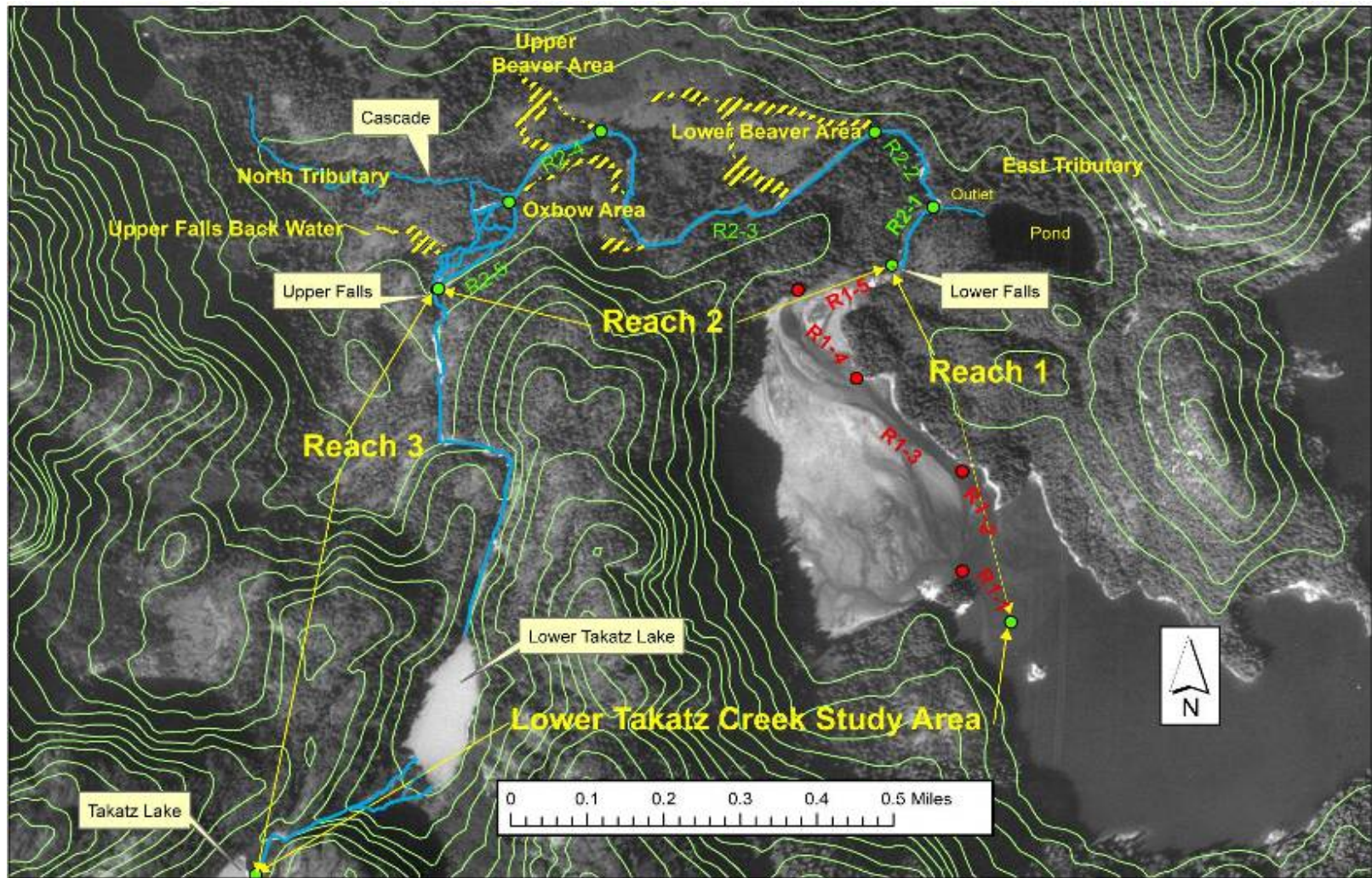


Figure 2. Lower Takatz Creek Study Area detail with reach and sub-reach breaks indicated by dots

2.2 2012 STUDY OBJECTIVES

The primary objective of the proposed 2012 studies will be to determine baseline fish population characteristics in Reaches 1 and 2 on Lower Takatz River. Essentially, based on earlier studies, the only significant affected species in Reach 1 are small populations of pink and chum salmon and the only fish species found in Reach 2 is Dolly Varden char. The detailed objectives will be to determine: 1) hydrologic variability in the affected reach(s); fish distribution, relative abundance and periodicity; and 3) likely responses of fish populations to changes in instream flow which might result from various project operations.

As in 2011 studies in drainage basins other than Takatz will be limited and consist primarily of temperature monitoring timed to coincide with timing for optimal fish observation such as spawning.

3.0 STUDY METHODS

Study methods will differ among four primary efforts:

1. Fish observations in Reaches 1 and 2, including stream foot surveys and snorkel surveys;
2. Streamflow measurements in the North Tributary to determine annual flow magnitude and variation;
3. Instream flow analysis; and
4. Water temperature monitoring

3.1 Fish observations in Reaches 1 and 2

Fish observations in these reaches will be done using the same methods as were used during the 2010 and 2011 surveys (Appendix I). Foot surveys will proceed along the bank(s) of Takatz Creek in accessible areas and all fish observed will be identified, to the extent possible given water conditions, and recorded in field notebooks. Because of the generally small sizes of fish populations in these reaches, it is unlikely that these observations will be quantitative in terms of overall fish populations, but they will be of value when compared to similar survey results from earlier study efforts.

3.2 Fish captures

No fish captures are proposed for 2012.

3.3 Streamflow measurements in the North Tributary

The North Tributary is the principle inflow tributary to Reach 2. It contributes a sizeable percentage of Lower Takatz Creek streamflow during certain months. If for whatever reason there was no flow from upstream reaches of Takatz Creek, the North Tributary would be the sole source of water in Lower Takatz Creek between its confluence and the inflow of the East Tributary at SM .83.

There is a USGS gage located at the outlet of Takatz Lake which continuously monitors streamflow emanating from the lake. Between that gage and SM .83, there are no other gages, reducing confidence in estimation of streamflow in the Reaches 2 and 1. Because Reach 2 streamflow may be a critical factor in determining project effects on fish populations, we propose to install a continuous monitoring gage on the North Tributary just upstream from its confluence with Takatz Creek in Reach 2.

Exact location, equipment and measurement frequency at this gage site will be determined and approved by consulting resource agencies prior to the onset of sampling in 2012. At this time, it can be said that the gage transducer will be emplaced in a protected location or within a protection device (stilling well, PVC pipe) and the gage height will be surveyed relative to a fixed bench mark onshore. A staff gage will also be emplaced and surveyed to the same point. At least three discharges will be measured using either conventional current meters (Price AA or pygmy meters) or Doppler profiler, depending on channel characteristics and approval of consulting agencies. Stage (water surface elevation) will be recorded at the time of each discharge measurement.

From the three (or more) stage-discharge measurements, a rating curve may be developed from which streamflow may be interpolated and extrapolated and then compared with continuous measurements from the gage to determine streamflow variation during the monitoring period. To determine longer-term streamflow variation over seasons and years, we may be able to compare the North Tributary gage data with data from longer term continuous gaging nearby, through a process of streamflow synthesis. Analytic methods for rating curve and synthesis will be approved by consulting resource agency specialists.

3.4 Instream Flow Analysis

Exact methods for instream flow analysis will be worked out among consulting agencies and the City/contractors, known collectively as the Fisheries Work Group. Those experienced with Reach 2 believe that lower stream flow levels in the reach may likely result primarily in fish passage effects. Because of the broad, shallow nature of several particular habitat areas contained within in the reach, it is thought that reduced flow might result in areas too shallow to allow fish to pass.

Passage related impacts can be evaluated using a cross-section approach in which transects are measured across the stream to represent the bottom profile, relative to the water surface. Using hydraulic modeling, and by measuring the transects at the lowest

observable level in a year, researchers can determine how much of the representative transect might be suitable for passage by fish of varying sizes.

If evaluation of the habitat indicates that not only passage but also habitat for various life stages such as spawning or rearing might be affected, a more complex method, such as Instream Flow Incremental Methodology could be used. However, time and effort gathering data and in the modeling analysis might be excessive relative to the benefit gained. As with the passage method described above, the fisheries work group will negotiate the best method or combination of methods to use for this analysis.

3.5 Water temperature monitoring

Water temperature monitoring will be conducted according to methods described in Appendix I.

5.0 SCHEDULE

Studies described in this plan will be conducted according to the schedule proposed in Table 1. Specific schedule items are subject to comment by the Fisheries Work Group and are further subject to change based on weather or other factors.

Table 1. Proposed Schedule, 2012 Takatz Lake Project Aquatic Resources Studies.

Study Component, Location	Proposed 2012 Time Period	Frequency/ Detailed Period
Fish Observations	July to October	Three survey periods to coincide with peak spawn/movement of species. July/August, September, October
Streamflow Monitoring	August through December	Continuous
Instream Flow Studies	August through December	Field work to take place from August through October depending on flows.

REPORTING

A draft Aquatic Resources Report documenting current 2012 data collection and analysis will be submitted for agency review as early in the winter of 2012 as possible, given the need to continue various field observations.

Review of the report should assist in determining the need and details of further studies which might be conducted in 2013.

6.0 LITERATURE CITED

- City and Borough of Sitka Electric Department (City), 2010. Draft Aquatic Resources Study Plan, Takatz Lake Hydroelectric Project, FERC No. 13234. 12 pp.
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ATTACHMENT I

ADF&G COMMENTS on 2011 DRAFT FISHERIES STUDY

Good Afternoon Christopher,

ADF&G has reviewed the Draft Fisheries Investigation Report 2011 for the Takatz Lake Hydroelectric Project (FERC No. 13234). This report provides a good description of the potentially affected fishery resources in the Takatz, Sadie, Baranof, and Medvejie river basins. In particular, it provides a comprehensive look at the complex life history and seasonal movements of Dolly Varden in Takatz Creek and its inflow habitats.

Still needed are instream flow studies to assess potential changes in fish habitat and fish passage conditions within Takatz Creek and its inflow habitats due to changes in hydrology from proposed project operations. We have been in contact with Karl Wolfe and understand he is currently evaluating methods to address these instream flow issues during the 2012 field season. We look forward to working with you on this endeavor.

If you have any questions, please let me know.

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APPENDIX I

FISH OBSERVATION and TEMPERATURE SURVEY METHODS

Following are descriptions of methods to be employed in various locations during the 2012 field surveys.

Fish Observation Surveys

Stream Surveys

Stream surveys will be conducted as needed throughout all representative habitats and reaches to determine fish distribution, abundance, and habitat utilization throughout the potentially occupied sections of the stream. Polarized glasses will be used to reduce water surface glare during all foot surveys. Timing of Stream Surveys in 2012 will vary depending on drainage due to differences in focus, species present and logistical issues such as ice.

Snorkel Surveys

Snorkel surveys will be done to evaluate occurrence and habitat use of juvenile and adult cutthroat and Dolly Varden and will be conducted within accessible areas in which stream hydraulics offer suitable observation conditions. Snorkel surveys will be conducted in both upstream and downstream directions depending on environmental factors and all likely holding areas will be visually inspected. (Northcote and Wilkie 1963, Thurow R.F. 1994). Wherever stream conditions allow, surveys will be conducted upstream to minimize fish disturbance. Observations will be initially recorded on a wrist mounted slate with a 100 mm scale in order to reduce disturbance and to allow for optic magnification due to the dive mask (Goldstein 1978, Gardiner 1984). Fish lengths will be recorded in 20 mm bin increments. Immediately after, observations and other relevant data will be recorded on a standardized field form and efforts quantified by recording start and stop locations using GPS coordinate. During these surveys data will also be noted on detailed aerial photographs and/or maps of the various study areas.

Fish Observation Data Recording and Mapping

For all observation techniques, data will be entered into an Excel spreadsheet in the office, and checked against the original aerial photos, maps and field forms.

During each field survey, the observer will note the following;

- Number of fish by species
- GPS location for comparison to observation surveys in the same areas
- Time of day (Stop and Start times)
- General weather condition
- Water temperature

- Relation of observation time to tide status (Reach 1 in Lower Takatz)
- Water transparency
- Activity (actively moving upstream, milling, exhibiting spawning behavior, etc.)
- Location of fish in the stream (i.e., are they concentrated in a pool or run, or are they spread evenly throughout the stream).

A base map of the stream will be annotated during each survey to show specific points of observation within the channel. Notes will be made of species composition, fish activity, and habitat conditions and utilization.

Water Temperature Studies

Water temperature will be measured in all basins using both continuous and grab-sample measurement techniques.

Continuous Temperature Monitoring

Continuous temperature monitoring will be conducted using Optic StowAway temperature loggers (Model 3, Version 5) manufactured by Onset Computer Corporation. Loggers will be set to measure at least 10 time periods per day.

In the Upper Takatz Creek, Takatz Lake and Sadie Lake Study Areas, continuous temperature monitoring in 2010 was centered on lake outflow temperatures. In 2012 a thermograph array to measure water temperatures at various water depths will be added near the proposed intake in Takatz Lake in order to examine potential temperature regime changes in Takatz Bay.

In the Lower Takatz River study area, temperature loggers were placed in sub-study areas and tributaries.

In the Baranof River Basin, temperature loggers were placed in all tributary inflows, the lower reaches of Upper Baranof River, the west end of Baranof Lake and in the Lower Baranof River.

In the Medvejie River Basin, loggers were placed in the Upper Medvejie River, near the outflow of Medvejie Lake, and in areas adjacent to the two water intakes for Medvejie Hatchery.

To better described factors involved timing of various fish life history stages, researchers will continue to measure water temperatures in various potentially-affected water bodies.

Grab-Sample Temperature Measurement

Grab sample temperature measurements will be taken using Enviro-Safe Armor Case thermometers capable of reading temperatures between -5 and +50 C. Grab sample measurements will be taken regularly during all surveys.