

DRAFT 2011 AQUATIC RESOURCES STUDY PLAN

Takatz Lake Hydroelectric Project (FERC No. 13234)

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

May, 2011

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 will proceed under steps required under various FERC regulations.

1.1 2010 STUDY RESULTS

Based on a Draft Fisheries Study Plan (City, 2010), the City, under contractor Karl Wolfe, conducted studies in 2010 in all potentially-affected river basins, that is, Takatz, Baranof, Sadie Lake and Medvejie. 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 both by Takatz Creek and other inflows;
- Only cutthroat trout were found in 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 PLANNING

The City conducted an interagency meeting on April 27, 2011, to discuss the report for 2010 fisheries studies and studies for the upcoming 2011 study season. Draft minutes of the interagency meeting were distributed on May 9, 2011.

During the April 27 meeting, attendees agreed on the following priorities for 2011 aquatic resources studies:

- Emphasis during the 2011 field season would be on the Takatz River Basin, with particular focus on Lower Takatz River Reaches 1 and 2, as described in Wolfe, 2011.
- Experimental gill netting would be conducted in Takatz Lake;
- Studies in the Baranof River and Medvejie River Basins would be considerably reduced;
- Further water temperature monitoring would be conducted in the Takatz basin including Takatz Lake, Lower Takatz River and Takatz Bay;
- A Fisheries Workgroup consisting of Karl Wolfe, Shawn Johnson, Patrick Fowler, Troy Tydingco and Roger Harding would be formed to facilitate rapid communication and decision-making during the 2011 field season.

Studies described in this draft plan are those to be conducted during 2011 only.

2.0 STUDY PROPOSALS for 2011

2.1 OBJECTIVES

The overall objective of the proposed 2011 studies is to build on data and information gathered in 2011 to provide an aquatic resources baseline and information suitable to assess Project impacts. As described above, almost all aquatic resources potentially-affected by the Project are in the lower reaches of Takatz River and consist of 1) Dolly Varden in Reach 2; and 2) chum and pink salmon in Reach 1 and Takatz Bay. Studies done in 2010 showed no fish of any species above Reach 2.

Therefore, 2011 studies will focus on these areas with the following objectives:

1. Confirm lack of fish presence in upper Takatz River basin;
2. Determine habitat types and fish habitat utilization and timing for Dolly Varden in Reach 2, Lower Takatz Creek;
3. Further document timing and abundance of chum and pink salmon in Lower Takatz Creek; and
4. Conduct water temperature studies in Takatz Lake and Takatz Bay to help determine potential effects on fish in Takatz Bay and the NSRAA net pens.

Specific study area objectives identified during the study planning process are described in more detail below.

2.2 STUDY AREAS and NOMENCLATURE

Because studies would be conducted in several different river basins, stream reaches and other aquatic habitats, researchers established the following study area breakdown and nomenclature during 2010. Generally, these areas are organized by major river basin or other drainage area, with stream reaches and other features identified within the broader areas.

2.2.1 Takatz River Basin

Study Areas in the Takatz River Basin include the following, from upstream down (Figure 1):

Upper Takatz Creek, extending from about 2.0 miles from the Takatz Lake confluence to the Creek's headwaters;

Takatz Lake, including all normally inundated lake areas; and

Lower Takatz Creek, extending from the outlet of Takatz Lake downstream to its confluence with tidewater at normal low tide. This Study Area includes Lower Takatz Creek tributaries and adjacent areas.

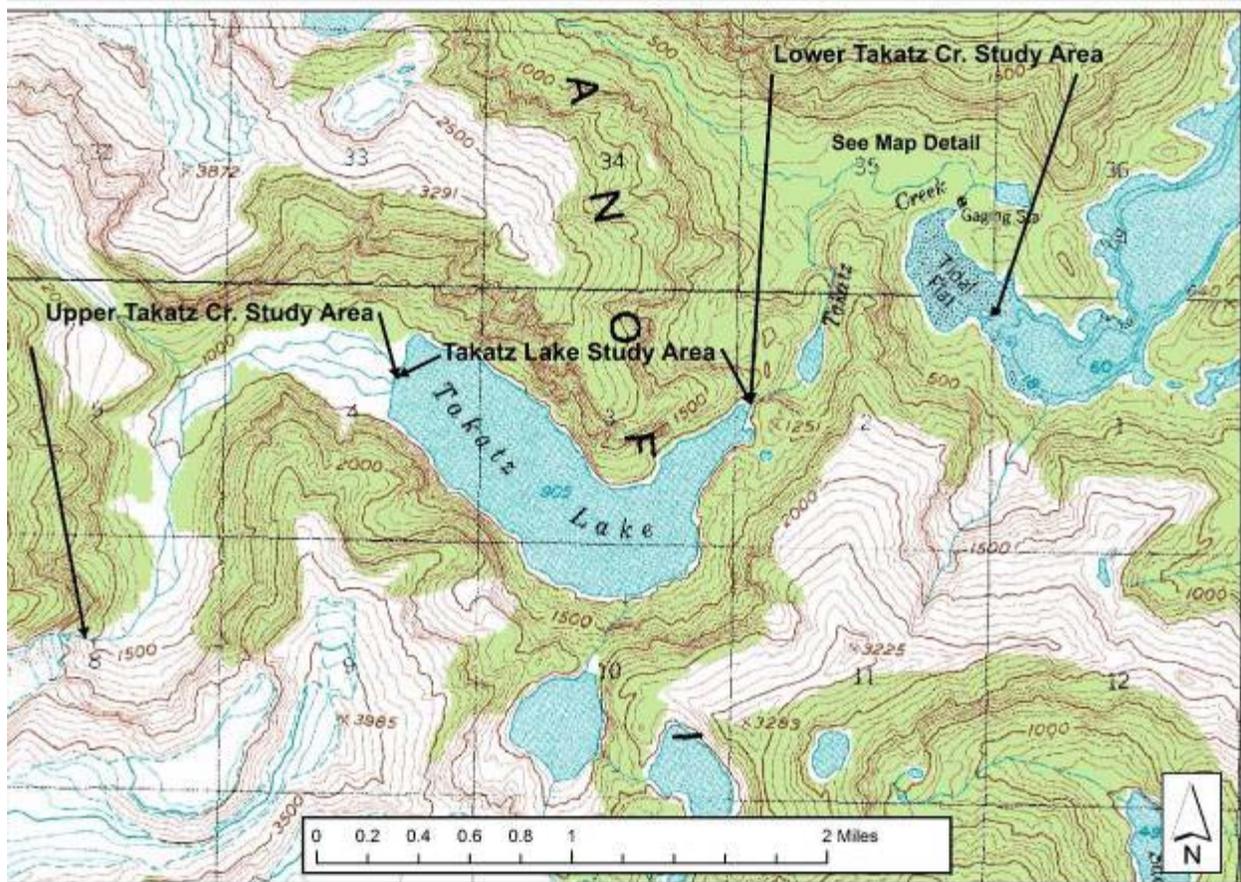


Figure 1. Major Takatz River Basin Study Areas

2.2.2 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 entering 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 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 entering 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).

3.0 STUDY METHODS

Study methods will be generally the same as those described for 2010 fish surveys. Methods are generally broken down into four major categories,

1. Fish observations, including stream foot surveys and snorkel surveys;
2. Fish captures, including hoop traps, minnow traps, rod and reel and gill netting;
3. Habitat analysis, including channel typing and water temperature; and
4. Instream flow analysis

These methods are described generally in the following text. More detailed descriptions may be found in Appendix I.

4.0 PROPOSED STUDIES by RIVER BASIN and STUDY REACH

4.1 TAKATZ BASIN

4.1.1 Upper Takatz Creek, Takatz Lake, Lower Takatz Creek Reach 3

The objective of surveys in The Upper Takatz Creek, Takatz Lake, and Lower Takatz Creek Reach 3 Study Areas (all areas above the Upper Falls) will be to continue to examine for fish presence or absence. Work in these three areas will begin in mid- to late July or as soon as conditions (primarily ice out) allow researchers to access them.

Gill Netting

Due to the lack of captures utilizing baited hoop and minnow traps only a variable mesh gill net will be set in Takatz Lake. Gill Netting will take place as soon as ice- out conditions allow safe access to Takatz Lake which is likely sometime in July. Exact locations and methods will be developed in coordination with ADF&G staff and permitting authorities.

Habitat Studies

Until fish are deemed present in these areas, habitat studies will be limited to channel class revisions as well as ground and Lidar truthing of these channel classes.

4.1.2 Reach 2

The primary objective for Reach 2 and adjacent areas of Lower Takatz Creek will be to continue to examine Dolly Varden fish abundance, timing, and habitat usage throughout the season.

Stream Surveys

Stream surveys will be conducted as needed throughout the study period primarily when conditions preclude snorkel observations, in conjunction with salmon surveys and during periods of intense in-stream activity such as insect hatches.

Snorkel Surveys

In order to gather data on juvenile and adult rearing at least three complete snorkel surveys encompassing Reach 2 and adjacent sub areas will be conducted in 2011. The first of these will be conducted in June, the second will correspond as close as possible to trapping in 2011 taking place in late July or early August with warming water temperatures. The third rearing survey will take place in early fall as temperatures cool. Researchers will utilize snorkel techniques to a greater extent as conditions warrant and allow in the fall in relation to locating and characterizing Dolly Varden spawning areas. During spawning surveys additional data will be recorded if possible including redd counts, fish and redd locations, redd depth and number of spawners per redd.

Trapping

At least one trapping event will occur in Reach 2 and adjacent areas during mid to late summer when main stem water temperatures begin to approach 8-9° C. During this period Dolly Varden are more likely to be dispersed into potentially flow affected areas. Objectives during trapping will be to;

- Continue to examine for other fish species;
- Continue to gather relative abundance, length, and life stage data by habitat and area; and,
- Check for possible snorkeling sampling bias.

Focused trapping will take place in the fall in order to examine for sexual maturity. Sexual maturity will be examined using methods adapted from Schwanke and Hubert, 2003. Fish will be examined for color, sex, reproductive products, ovipositor extension, kype, abdomen development, and abdomen hardness characteristics. Based on these characteristics, fish will be assigned to one of the five following sexual maturity categories: immature, pre spawn, mature, post spawn, or unknown. All fish with any indication of gravidity or any amount of viable gametes will be labeled as mature. All characteristics as well as maturity category and sample number, will be recorded on custom “dura paper” sheets.

To estimate length at maturity, lengths of pre-spawn, mature and post-spawn fish will be combined and noted as fish which have reached sexual maturity. Fish labeled as unknown will be discarded from the analysis. Minimum length, maximum length and standard deviation of lengths will be determined for both immature and mature fish.

To estimate run timing, percentages of pre, post, and ripe fish will be evaluated relative to the time periods in which they were seen in the stream.

Rod and Reel

Rod and reel techniques will be limited in Reach 2 in 2011 but may be utilized in order to supplement trapping in order to examine physical conditions of Dolly Varden in relation to spawning activities.

Sampling in these areas will begin in June and will continue through fall in relation to probable Dolly Varden spawning. During these surveys researchers will continue to look for other species including anadromous salmonids.

Habitat Surveys

Additional habitat measurements in relation to rearing activities will include LWD counts using USDA protocols (USDA 2001), undercut bank location, length, and depth (Platts et.al. 1987), and dominant substrate. Additional habitat measurements at confirmed spawning areas will include meso and microhabitats, and detailed substrate analysis calculated from at least 100 individual random samples using a USGS Gravelometer (US_SAH-97).

Instream Flow Surveys and Analysis

At the April 27 meeting, there was considerable discussion about ways to evaluate changes in streamflow, particularly in Reach 2 of Lower Takatz Creek. This reach is characterized by main channel braids and side channels and inflow from tributaries, muskeg and beaver areas. While it was generally conceded that use of highly quantitative methods such as Instream Flow Incremental Methodology (IFIM) would be difficult to apply, the exact methods for instream flow analysis were not determined. The City proposed that members of the Fisheries Work Group in addition to the City's fisheries contractor (Karl Wolfe) visit Reach 2 in 2011 to observe the hydrography of the Reach and determine how to address instream flow issues there.

It is generally agreed that one of the issues for Dolly Varden in the reach would be fish passage to spawning and rearing areas. Because this is likely to be a low flow issue, we believe that the Reach 2 survey(s) would best be conducted during the fall low flow period. This is also the normal spawning period for Dolly Varden. Finally, in most years, spring and summer runoff raises river levels and increase turbidity such that June and July and probably August will not be good times for this field trip.

Details for this study component will be developed in a separate study plan prepared in coordination between the Fisheries Work Group and the City during spring and summer, 2011.

4.1.3 Reach 1

The focus for Reach 1 in Lower Takatz Creek Study Area the will be anadromous fish distribution, abundance and timing surveys. Based on 2010 studies, work in Reach 1 will focus on chum and pink salmon spawning. Foot surveys will begin in July and continue through October. After fish are observed entering the Reach, surveys will be performed during low tides. Frequency of surveys will be as close to weekly as possible in order to compare statistical weeks and if necessary interpolation may be utilized to estimate periods not surveyed. Fish activity, stage of spawning, and dead counts will again be noted.

4.2 SMALL TAKATZ BAY DRAINAGES

Due to the small amount of fish found in them and lesser likelihood of impacts using best management practices (BMP), work in the Small Takatz Bay drainages will be limited. If time and conditions allow two stream surveys responding to likely peak escapement timing for chum and pink salmon respectively will be performed.

4.3 SADIE LAKE BASIN

Like other transmission line drainages and basins many impacts will be negated by utilizing Best Management Practices (BMP's) during construction. All potential impacts would also be to resident fish above the lake outlet particularly in relation to spawning activities. Work in the Sadie Lake drainage in 2011 will be focused around temperature monitoring with stream surveys and associated protocols being conducted while servicing temperature loggers. In addition USDA channel classes will be reviewed and updated to current classifications.

4.4 BARANOF BASIN

The current Alternative Transmission Routing bypasses any potential anadromous impacts. As with Sadie Lake, impacts will be negated by the utilization of BMP's. As in the Sadie Lake drainage work will be focused around temperature monitoring with stream surveys and associated protocols being conducted while servicing temperature loggers. As safety and time constraints allow a stream survey will be conducted in the upper reaches of Upper Baranof River to attempt to determine limits of fish distribution as well as identify any likely key critical fish habitat areas. As with the other drainages USDA channel classes will be reviewed and updated to current classifications.

4.5 MEDVEJIE RIVER BASIN

Since in most years anadromous species are primarily controlled by hatchery operations, like the Baranof River and Sadie Lake Basins 2011, studies in the Medvejie River Basin will focus on resident species. Work will be focused around temperature monitoring with stream surveys and associated protocols being conducted while servicing

temperature loggers. Also, as with the other drainages, USDA channel classes will be reviewed and updated to current classifications and truthed where deemed necessary.

5.0 SCHEDULE

Studies described in this report will be conducted according to the schedule proposed in Table 1. Specific schedule items are subject to comment by reviewing agencies and are further subject to change based on 2011 weather, snow and ice conditions as well as any additional species or life stages encountered.

Table 1. Proposed Schedule, 2011 Takatz Lake Project Aquatic Resources Studies.

Study Component, Location	Proposed 2011 Time Period	Frequency/ Detailed Period
Takatz Basin Resident Reach 2 Fisheries Baseline Distribution, Relative Abundance, and Habitat Utilization Surveys	June-October 2011, Three major periods for Reach 2;	1) June snorkel/habitat, 2) Late July/early August snorkel/trap/habitat, 3) September/October snorkel/habitat,
Upper Takatz Creek, Takatz Lake, Top of Reach 3 Presence or Absence	After ice out in Takatz Lake	July, exact set duration to be determined
Takatz Basin Anadromous Fish Distribution, Abundance, Habitat and Timing Surveys	July- October 2011,	As close to weekly as possible particularly during peak spawning periods.
Small Takatz Bay Drainages	August and Early September 2011	Two surveys at peak escapement periods as conditions and time permit
Water Temperature Studies	Continuously until license application	
Sadie, Baranof, and Medvejie studies	During temperature logger data retrieval	

REPORTING

A draft Aquatic Resources Report documenting current 2011 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 2012.

6.0 LITERATURE CITED

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APPENDIX I

DETAILED FISH and TEMPERATURE SURVEY METHODS

Following are descriptions of methods to be employed in various locations during the 2011 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 2011 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 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).

As described below 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.

Capture Techniques

Fish Capture Data Recording and Mapping

All fish captured will be measured for fork length to the nearest mm and released immediately after recovery in the area of capture. No anesthetics will be used during this study.

Location, catch, habitat descriptions, and the number of gear units (rod and reel, soak time and trap hours) for each gear type will be recorded on trap catch forms. Location will also be recorded on maps as well. Pictures taken at trap sights for later referrals will be linked by photograph number to location and waypoint. Sample number, lengths, gear type, and trap and/or set number for captured fish will be recorded by date and location. Other comments including but not limited to mortality status, scars, physical condition, evidence of sexual maturity, etc. will also be recorded.

Way points will be downloaded using Expert GPS software and linked to photographs using the same software. Data will be entered into an Excel spreadsheet in the office, and checked against the original maps and field forms and analyzed for comparison to observation surveys in the same areas. Catch per unit effort (CPUE) will be determined using the means of ratios approach in order to examine possible factors effecting daily catch rates as well as the total ratio approach for the entire event (Neilsen and Johnson 1982). Length-frequency plots will be developed for the various study areas and dates to examine size classes and develop baseline information.

Gill Netting

Gill net sampling, if used, will take place in Takatz Lake only. Exact net depth, length, and mesh size and type will be determined in coordination with ADF&G staff. All sinking gillnet sets will be retrieved with a soak time of less than an hour and floating sets will be closely observed. In order to reduce potential mortality the gill net(s) will;

- Be set by skiff in areas free of obstructions,
- Be closely tended by qualified fish biologists,
- Be recovered by at least two personnel and retrieved from the deep end in order to limit snagging and;

- All fish captured will be carefully removed from the mesh in order to reduce mortality.

Trapping

Bait for hoop traps and minnow traps will consist of sterilized salmon eggs or those disinfected in beta dine solution. All traps will be marked with individual trap numbers for that day to allow for later analysis and to ensure all traps are retrieved at the end of the sampling period.

Hoop traps will be 1.4 m long and consist of four 0.6-m-diameter steel hoops with 9-cm throats attached to the first and third hoops. Knotless nylon netting with a mesh size of 1 cm will cover the hoop traps. Traps will be supported horizontally with at least two aluminum bars and willow or alder saplings may be used in conjunction with these due to the necessity of keeping the outside mesh open near current. Minnow traps will consist of either ¼ or 1/8 inch wire mesh and will be 9 in. in diameter and 17 ½ in. long with two 1 in. entrances. Due to the necessity of sinking traps in specific locations cobble sized anchors may be utilized. Traps will be connected to floats or anchored to shore or other immobile objects, depending on location and other environmental conditions.

Rod and Reel Sampling

Hook and line fishing will be conducted using light spin and fly-fishing tackle with tackle choice being determined by fish location, feeding activity, or habitat type sampled. Spin fishing will be conducted by casting small (size 10-6 hooks) spoons, spinners, jigs and other lures. Fly-fishing will utilize size 22-8 hooks on both wet and dry flies.

To more accurately quantify rod and reel fishing effort, the following protocols will be observed:

- Time will be recorded at the beginning and end of the rod and reel sampling sessions;
- After moving between areas and not fishing, a new sampling session will be initiated;
- All tackle will be prepared and checked before the start of sampling;
- Tackle will be kept in well sorted in clear plastic boxes and spares (lures, flies, leaders, etc.) will be kept rigged outside the box to minimize time when lures are lost;
- Snagged lures will be broken off and no attempts were made to retrieve lost lures until after the sampling period had ended;
- Fish captured will be kept in coolers or five gallon buckets until after sampling for that time period is completed;
- During any extended delays such as backlashes etc. the clock will be stopped and fishing effort suspended until the matter is resolved.

- Sampling sessions will be assigned consecutive numbers and location, number of fish captured, and any comments will be noted for each numbered session on a trap catch form.

Habitat Surveys

During all observation and capture surveys habitat type will be recorded as well as any distinct habitat features (i.e., presence of large woody debris (LWD), undercuts etc.) using USFS habitat codes (USFS 2001). Using global positioning system (GPS) coordinates and survey techniques this information will be referenced to existing aerial photography and maps and for later analysis. All information will be added to stream base maps. USFS channel class types will be revised to current classifications and previously unknown channels added and classified and nonexistent channels deleted were applicable for addition to a GIS layer (USFS 2010). Additional habitat survey measurements will be done in the Lower Takatz study area and are described in later sections.

For surveys of all study areas, researchers will develop detailed maps of the various water bodies. All streams potentially affected by proposed project activities, including those along access roads, transmission line corridors, and construction sites will be mapped with stream class and channel type according to the Tongass Stream Survey Protocol as outlined in the Aquatic Management Handbook (USFS 2001) and updated to more recent channel class designations.

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 2011 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 all 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.