

Draft Fisheries Resources Study Plan

Blue Lake Hydroelectric Project, FERC No. 2230

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INTRODUCTION

The City and Borough (“City”), is in the process of obtaining a new license for their Blue Lake hydroelectric project (“Project” FERC No. 2230). In the relicensing process, the City must make available to the Federal Energy Regulatory Commission, information on existing natural resources potentially affected by the relicensing action. The FERC will, in turn, use that information as environmental baseline in various impact evaluation and other decision documents.

As required under FERC regulations, the City has submitted a Notice of Intent (NOI) to relicense the project, distributed an Initial Consultation Document (ICD), held agency and public meetings and a site, all in November and December, 2002. In response to the meetings and the ICD, certain Alaska resource agencies submitted detailed requests for environmental studies. Though not all comments addressed studies for all resources, those pertaining to fisheries resources were received from Alaska Department of the Fish and Game (ADF&G), US Forest Service (USFS) and US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). This draft study plan has responded to those study requests, as the City has seen appropriate.

PROPOSED FISHERIES STUDIES

In general, the City proposes to survey potentially-affected fisheries in the project area to provide a current baseline for environmental analyses necessary to complete Project relicensing. Because the City is not proposing any operational or structural changes to the project, (particularly with respect to raising the dam and subsequent elevation of the reservoir) no additional aquatic areas would be affected.

The following proposed studies are also designed to help the City and consulting resource agencies identify potentials for fisheries enhancement measures as they may emerge from consultation. To the extent possible, under the above stated objective to develop the current baseline and evaluate enhancement potentials, the following proposed studies conform to study recommendations provided by ADF&G, USFS, and USFWS, and NMFS sent to the City within the 60-day comment period following agency and public meetings held on December 15, 2002.

Relicensing fisheries studies will be comprised of two primary efforts, both conducted for both Blue Lake and Sawmill Creek: 1) Literature and Information Review and 2) Field Studies, as described in detail below.

LITERATURE and AVAILABLE INFORMATION REVIEW

Fisheries researches will conduct a literature review to aid, in association with field surveys described below, in development of a complete list of fish species known or thought to use Sawmill Creek, Blue Lake and the potentially-affected areas of Sawmill Cove and Silver Bay. The City will assemble existing fisheries information in the Blue Lake and Sawmill Creek drainage pertaining to salmon, trout, char and other aquatic species. These data will be important in estimating affects to wildlife habitat due to past, current, and proposed project operation.

In addition to written material, wildlife researches will interview resource agency personnel from ADF&G, USFS, USFWS, NMFS or others and Sitka Tribe of Alaska (STA) members who might have personal knowledge of wildlife existence in the area.

Finally, fisheries researchers will establish communications protocols with resource agencies to receive all appropriate and available survey information which those agencies may have collected through resource inventories, aerial over flights, catch and harvest records and other agency-funded or otherwise enabled studies.

SAWMILL CREEK FIELD STUDIES

Sawmill Creek fisheries surveys will consist of three separate types of surveys:

- **Fish Observations;**
- **Fish Captures; and**
- **Special Studies.**

In the following each of these three main study types is described in detail:

Fish Observations

Two primary types of observations will be made:

- **Frequent general abundance (“Index”) surveys**, at a single point, to determine estimates of run-strength and timing, to be used both for general information and to determine times when the Stream Foot Surveys, described below, would best be conducted; and
- **Periodic stream foot surveys**, at various observation sites, conducted as needed to determine anadromous fish distribution and abundance throughout the potentially occupied sections of the stream.

Surveys will be conducted beginning at a time just prior to expected in-migration of the earliest anadromous species (steelhead), more intensively throughout the periods when other species enter the stream, and less intensively as spawning declines and fewer fish

are counted. This generally describes a period from mid-April through late November. The survey methods are described in detail in the following:

Index Surveys

These surveys will be made frequently, as resources permit, by a researcher qualified to distinguish and enumerate salmon, trout and char species from bankside. Index Survey observations will be made from a fixed point established to maximize visibility, ease of access and reproducibility of counts. If the Index Survey observation point(s) change, the observer will note the change, and record the new point's Global Positioning System (GPS) coordinates.

Counts may be made at fixed times or relative to tide fluctuation. Often peak counts at a fixed site are best made following a high tide.

The observer will note the following at each observation:

- Number of fish by species
- Time of day
- General weather condition
- Water and Air Temperatures
- Relation of observation time to tide status (this may be back-calculated using appropriate tide tables)
- 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). Notations will include locations of fish both across and up and down the channel.

Periodic Stream Foot Surveys

These surveys will be conducted about once per week, with observation intensity increasing during the collective peak of in-migration and spawning activity (August through mid-September), and decreasing as spawning for all species diminishes, probably in late September through November. Stream foot surveys will be conducted at the same sites sampled in 2001 and 2002, and reported in Wolfe, 2002 and 2003. Beginning in 2003, all Stream Survey observation locations will be identified by their GPS coordinates.

These Surveys will use essentially the same observation and data recording techniques as the Index Surveys, except the observer will note fish locations throughout various observation reaches. A base map of the stream will be annotated during each survey to show stream mile (to the nearest 0.1 mile, if possible) and specific points of observation

within the channel. Of particular importance in these surveys will be species composition, spawning activity and habitat utilization.

Stream Survey and Index Count techniques will be calibrated among various assigned observers. Estimates of fish species, numbers and locations made by one observer at a specific location and time will be made by the other assigned observers, to determine differences and “calibrate” estimation techniques.

The Stream Surveys will be conducted initially in accessible areas which appear to offer habitat for resting and spawning, and those which might serve as migration barriers at low flow. Upstream of the Falls at SM 0.85, observations will be made to determine presence of any life stage of anadromous fish, given that adults may not be able to access the reaches above the cascade every year due to varying streamflow and resulting hydraulic conditions of the cascade. Observations upstream of the cascade will be concentrated at times when stream conditions are optimal for viewing adult fish. The primary survey method upstream of the cascade will be juvenile fish collections described below.

Fish Captures

Minnow Trapping

Captures of juvenile salmonids and other species will be made using baited minnow traps placed at times and in areas selected to optimize capture efficiency for all expected species. Minnow traps will be set at locations both below and above the Falls. Exact minnow trap locations will be approved in the field jointly by the City’s fisheries survey contractor, the City and interested agency personnel. Trap locations will be noted on the Project stream map, which will be annotated for each sampling effort. If trap locations change or are added as the study progresses, the changed or new trapping sites will be noted on the map according to their GPS positions.

Minnow traps will be baited with salmon eggs and soaked overnight. Traps will be checked immediately the next day to minimize trap mortality. Trapped fish will be identified to species, measured to fork length and returned to the water immediately.

Hook and Line Captures

Hook and line fishing (“fishing”) techniques will be used to capture fish large enough to normally be caught using standard spin- and fly-fishing methods. Fishing will be done in all areas, and techniques will be varied to attract all species thought to be present.

All fishing efforts will be quantified to the extent possible, noting time and start and end, and relative casting effort. Lures and tackle will be noted for all efforts.

Fish captured by fishing will be keyed to species and any life history indicators (coloration, pre- or post-spawning, body conformation, degree of post-spawning degeneration, etc.) will be noted. Most fish will be released unharmed after efforts to handle them as gently as possible. A subsample of fish caught will be weighed to the nearest gram and measured to the nearest mm. A further subsample may be sacrificed to be used as part of a food habits analysis, if overall sampling abundance allows.

Special Studies

Evaluation of the Falls at SM 0.84

The City will evaluate the Falls in terms of its potential as a fish migration barrier. Initially, the City or its contractor(s) will use surveying techniques at the Falls to determine exact height from the water surface at the base to the water surface at the crest. Standard differential leveling technique will be used, to an accuracy of 0.1 ft., if possible. Depending on access limitations, these height measurements will be taken at three flows, one each to represent low, medium and high flow regimes as determined based on analysis of the hydrologic record for Sawmill Creek. High flows will be observable only during periods of Project spill, but should occur most years during the August-November period when coho salmon are thought to use Sawmill Creek.

At the times of the measurements, the City will also take photographs of the Falls to include all visible features, including the base, entire frontal aspect and crest. All fish seen in the pool or attempting to ascend the falls at the time of measurement or during all other fish observations in the area will be noted.

If the height of the Falls is determined to exceed the heights listed in the US Forest Service Region 10 Habitat Analysis Paper, no further study will be required. If Falls height is equivocal for any of the potentially present species, techniques described in Powers and Osborne (1985) will be employed, after coordination with agency review of the exact techniques as they will be applied on Sawmill Creek.

Sawmill Creek Habitat Evaluation, USFS Region 10

The City agrees with agency reviewers that some form of stream habitat inventory would be valuable to determine restoration potentials and to serve as the basis for ongoing project evaluation after relicensing. Because of the intensive fish survey and habitat utilization information proposed above, we believe that only Tier 1 surveys would be necessary.

We propose to conduct, in association with our fisheries survey contractor, City personnel and agency personnel, yearly Tier 1 surveys of Sawmill Creek from the base of the Project dam to tidewater. Once the methods, measurement locations and criteria are

established during the first field season, we expect that agency and other personnel would not be required in subsequent years.

All work will be done according to criteria in the USFS Manual 2090.21_20 and to USFS approval. A separate Methods document will be prepared (and approved by USFS), following the first reconnaissance field trip, to describe measurement locations, criteria and site-specific methods.

Distribution of Fish near Outfall

To evaluate the potential for false attraction at the Project powerhouse outfall (known in this Plan as the “tailrace”), the fisheries foot surveys will include a routinely observed survey site suitable to observe fish distribution, abundance and behavior at and near the Project tailrace. Fish will be observed, identified (to the extent possible), enumerated and described in the tailrace channel itself and in Sawmill Creek downstream and adjacent to the tailrace channel. Researchers will note milling behavior, persistent attraction to tailrace water at the Sawmill Creek-tailrace confluence and attraction to the draft tube area. All fish will be identified to species, as viewing conditions allow.

BLUE LAKE FIELD STUDIES

The objective of Blue Lake fisheries surveys will be to develop a current baseline regarding distribution, abundance, life history and existing Project effects, primarily related to the rainbow trout population in Blue Lake. Information from this baseline will be useful in evaluating new operational alternatives during relicensing.

Blue Lake fisheries surveys will consist of four main types of studies:

- **Rainbow Trout Spawning Surveys**, to determine the timing and location of spawning near selected Blue Lake tributaries;
- **Population and Production Studies**, to determine Blue Lake rainbow trout population size;
- **Fish Food Habits Analysis**, to evaluate the organisms which comprise the food base of Blue Lake rainbow trout; and
- **Fish Entrainment Studies**, to determine the potential for fish entrainment at the Project intake site.

These study types are described in more detail in the following:

Rainbow Trout Spawning Surveys.

From an earlier study (Aram Der Hovansian, 1994) and anecdotal evidence, it is known that rainbow trout in Blue Lake probably spawn in certain lake tributaries and in lakeshore upwelling areas near certain tributary mouths. It is generally felt that spawning activities, including fish congregation at the mouths of tributaries, and spawning migrations up the tributaries begins when the tributary water temperature reaches 5 to 7 degrees Centigrade. Spawning may occur over as short a period as a few days, or may last for a few weeks, but does not extend into the summer months. It is generally thought that most of the trout spawning takes place in Blue Lake Creek, the main tributary to Blue Lake.

In the fall of 2002, the City prepared a draft Blue Lake rainbow trout spawning survey study plan (City and Borough of Sitka, 2002) which was reviewed by agencies both prior to and after distribution of the ICD and Public Meetings and Site Visit. Comments were received on this draft plan, and are incorporated in some of the Methods proposed below.

One survey proposed in the draft Plan, to evaluate a potential migration barrier on Blue Lake Creek is not included in this study plan because, based on a foot survey in November, 2002 by City personnel, it was found that the potential barrier was more than a mile upstream of the Creek's confluence with Blue Lake, well upstream of any potential zone of lake-level effect.

The City's draft proposal has two main elements: 1) **Emplacement of Thermographs**; and 2) **Direct Spawning Observations**, and 3) **Habitat Survey of Blue Lake Creek**, as described in detail in the following:

Emplacement of Thermographs

Since spawning (both upstream migration and actual spawning) is known to be tied to temperature, thermographs will be placed in selected tributaries before the spring rise in water temperature. Thermographs will be fitted with data-loggers to continuously read temperatures over the observation period. The following specifications will be agreed upon between the City and reviewing agencies:

- Brand(s) and model(s) of thermographs and data loggers;
- Recording interval; and
- Frequency of data retrieval.

Generally, thermographs will be emplaced during fall, 2002, during or after a joint City-agency reconnaissance visit to determine the most likely tributaries to survey.

Direct Spawning Observations

The City will conduct at least two site visits during the expected spawning period to attempt to directly observe spawning. Qualified observer(s) will observe likely spawning

areas in both Blue Lake Creek and other selected tributaries. After initial site visits, observers will have prepared stream or tributary maps on which they will locate all observed fish, documenting:

- Whether they exhibit spawning behavior;
- Stream or tributary location relative to documented habitat types; and
- Estimated size.

Weather, safety factors and access difficulties due to snow may limit time spent during the spawning period, but it is the City's intent to observe the various spawning tributaries (with emphasis on Blue Lake Creek) as often as practicable each spring.

Habitat Survey of Blue Lake Creek.

A base map of Blue Lake Creek showing the accurate course and dimensions of the stream, with subsequent marking of stream habitat types (according to USFS habitat mapping guidelines) and specific habitat features will be developed. This map will be used to document fish location and activity throughout the relicensing studies and to determine the potential for fish spawning and rearing above and below migration barriers.

Blue Lake Population and Production Studies.

Documenting the population characteristics of Blue Lake fisheries will involve several sampling techniques with different objectives. The primary objectives will be to determine:

- **Blue Lake fish species composition;**
- **Relative abundance of the various fish species;**
- **Spatial and temporal use of various lake areas and habitats.**

Methods used to address these three objectives are described in the following:

Blue Lake Fish Species Composition

Fish species composition will be determined using at least three different capture methods:

- Fish Trapping
- Hook and line captures
- Observations near tributary mouths and other lakeshore areas.

Fish Trapping

Fish trapping will be the primary means of fish capture in Blue Lake. Traps of various sizes will be used, including minnow traps to capture fry and juveniles, and larger hoop traps to capture larger juveniles and adults. All trap locations will be recorded as GPS coordinates and depths taken from an electronic depth finder.

Traps will be set at various depths and in various lake habitats. Generally, traps will be soaked for 24 hours, or another time period determined to be most effective in capturing fish. All effort will be quantified and standardized to the extent possible to assure comparability among trap data.

To the extent possible, trapping will be done using the same methods as those described in Aram Der Hovanisian (1994), a report which presents recent Blue Lake rainbow trout population estimates based on agency-accepted estimation techniques. Frequency of fish trapping is discussed in the later section on population estimation.

Hook and Line Captures.

Hook and line captures will be used to sample areas not easily accessed by gill nets or foot surveys. The City's contractors may interview local fishers knowledgeable of fishing techniques which have been successful in Blue Lake. All hook and line fishing effort will be quantified according to start and end time, casting frequency, depths fished, lures and other tackle used, and other factors, as deemed appropriate. Various techniques will be used, including use of downriggers to sample deep water areas. Downrigger fishing will be quantified according to duration, depth, direction and location. To the extent possible, hook and line capture locations will be defined by GPS coordinates.

Hook and line captures will be made at various times of the year to help determine fish movements. Researchers using hook and line techniques will also note all fish which may have been marked during the population studies described below. Because this fishing method depends to some extent on fish feeding, catch per unit effort will be annotated relative to an assessment of whether fish were more or less actively feeding. Early and late season efforts are likely to be less successful. As with gill netting, hook and line fishing efforts will be coordinated with the spawning surveys to avoid interference with fish access to spawning tributaries.

Observations Near Tributary Mouths And Other Lakeshore Areas.

These observations will be an extension of the fish spawning observations, which will probably end before early summer each year. As deemed effective, researchers may survey both tributaries and lake areas near the tributaries.

Food Habits Analysis

Food habits may be determined by either stomach pumping, to assure lower mortality, or through dissection of certain fish retained for voucher. Food organisms will be retained in preservative and identified to the lowest possible taxonomic level given the level of decomposition.

Prior to any fish collections, the City's contractor will obtain a scientific collection permit from ADF&G which covers all accepted capture techniques, fish numbers and dispositions.

Fish Population or Relative Abundance Estimates.

A mark-recapture population estimation study will be conducted in Blue Lake. Fish population estimation data will be available from the trapping and marking procedures described above. The population estimates will be useful in evaluating alternative mitigation or enhancement measures, by demonstrating benefits in terms of fish population increases. Generally, data for the population estimation will be drawn from the fish trapping and hook and line captures described above.

The population estimation program for Blue Lake will be based on a multi-year mark-recapture process including all pre-licensing years (2003-2008) and an expected number of post-relicensing monitoring years, usually at least five. Because of the large number of capture and marking years, these surveys should result in excellent population estimation and trend data for Blue Lake.

During the first population estimation field season, two mark-recapture efforts will be made. During both efforts, all fish trapped or captured will be marked, using tags or marks approved by ADF&G, and returned to the lake. This will initiate the estimation with a good population of marked fish for later recapture.

Throughout the population estimation studies, fish captures will be documented in such a way as to evaluate the assumptions of any population estimation techniques which might be used. Currently, and based on the Aram Der Hovanisian survey discussed above, it is expected that, using the two-event data from the first year, and one-event data from subsequent years, we may use the Peterson, Schnabel or Jolly-Seber estimation techniques, as appropriate.

Exact trapping, marking, recapture, recording and population estimation techniques and methods will be the subject of an additional document, prepared either jointly by the City and ADF&G, or by the City with ADF&G approval. Results of each years' capture and marking will be reviewed in an annual meeting, and the Methods document revised according to experience the previous year.

Fish Entrainment Surveys

The city will evaluate the potential for fish entrainment (approach velocity, depth, and presence of fish) at the project intake using methods suggested in FERC guidelines for entrainment sampling and reporting protocols (FERC 1995). Specific details, such as design of sampling equipment, sampling schedules, etc. will be coordinated with consulting fish and wildlife agencies.

Because of access and safety considerations at the Project intake, it is not currently possible to propose fish exact techniques to determine the potential for entrainment. Based on review of available techniques, we plan to further discuss the following, as possible elements of the fish entrainment study:

- Scuba diving, to directly observe fish in the intake area;
- Fish trapping, as part of the populations and production studies, to further document fish existence in the intake area;
- Hydroacoustic techniques, to continuously monitor fish presence and numbers at the face of the intake.

DATA MANAGEMENT

Observers will retain and copy all field notes from both the daily and weekly surveys, and distribute the copies to all other observers from USFS, the City and ADF&G. The City will be primary record keeper and information center.

REPORTING

After the 2001 and 2002 observation seasons, the City, with assistance from ADF&G and USFS will prepare summary reports for the foregoing anadromous fish season. These will be informal reports distributed to other interested agencies, both state and Federal. Format of the reports will be consistent with the City's need to prepare sections of draft NEPA documents and to make available all resource-related reports required by the FERC during later relicensing stages.

Reports will have the following sections:

- **Introduction.** This section should be brief, describing need for surveys within the context of FERC relicensing and data needs of the participating agencies;
- **Methods.** In this section, the author(s) will describe observation methods, including sites, dates, observations recorded (fish numbers and species,

weather, water clarity, etc, as described above) identification keys used and other items;

- **Results.** Authors will describe the results of the daily and weekly observations and other recorded data. Stream maps will be used to the extent possible to identify fish locations from the weekly surveys, noting habitat utilization and life history activities.
- **Discussion.** This section may be brief in these pre-consultation studies, and limited to general discussions of species present, timing and habitat utilization, as they relate to other streams and systems in Southeast Alaska, and to any previous data collected on Sawmill Creek. More intensive interpretation of these data in terms of species importance, impacts and mitigation measures will be done as part of development of the relicensing NEPA documents.
- **Recommendations.** This section will focus on evaluation of previous years' studies and ways in which they might be improved. In successive years, this section will be used to evaluate effectiveness of changes and the extent to which proposals have been achieved.

ANNUAL MEETING

An annual meeting will be held each year following review of the annual Blue Lake and Sawmill Creek reports. The objective of the meeting will be to discuss results of the previous years' surveys and revise the survey methods to address problems encountered. After the report review and meeting, the City will provide draft meeting minutes for review, and, following finalization of the minutes, the Study Plans for both the Blue Lake and Sawmill Creek fisheries surveys will be revised, if necessary.

REFERENCE

Aram Der Hovanisian, John. 1994. Stock assessment of rainbow trout in a southeast Alaska impoundment. Master's thesis, University of Alaska, Fairbanks. 164 pp.