

## **DRAFT AQUATIC RESOURCES STUDY PLAN**

### **Cascade Creek Hydroelectric Project (FERC No. 12495)**

#### **Cascade Creek LLC**

**January, 2010**

### **BACKGROUND**

In February, 2008, Cascade Creek Limited Liability Corporation (“CCLLC”) received a Preliminary Permit (“Permit”) for the Cascade Creek hydroelectric Project (FERC No. 12495-002, “Project”) from the Federal Energy Regulatory Commission (FERC) in Washington D.C. The Project would be located approximately 15 miles N.E. of Petersburg, Alaska, and would affect Swan Lake, Falls Lake and Cascade Creek. The Project is described in detail in Scoping Document 1 (SD1, CCLLC May, 2009) prepared by CCLLC.

Generally, the Project would consist of an intake structure and an outlet control structure at Swan Lake, a power conduit consisting of a mostly unlined 12 foot diameter tunnel and steel penstock leading to a powerhouse located at tidewater on Thomas Bay. Installed capacity of the Project would be approximately 70 megawatts (MW). The current operational proposal is to draw water from Swan Lake in such a way as to minimize unnatural lake level fluctuations, with final drawdown prescriptions determined based on further economic and environmental considerations.

During Initial Consultation and Scoping, Project Stakeholders including Alaska state and federal resource agencies indicated concern for Project effects on aquatic resources relative to Swan Lake (primarily due to seasonal drawdown), Falls Lake (due to inflow changes and effects on lake level) and Cascade Creek, due to dewatering. Other concerns included changes in lake and stream water temperature regimes and effects of construction on water quality. This draft study plan intends to respond to study requests made during the Scoping Process and is the first step in developing a final study plan approved by all consulting parties.

### **OBJECTIVES**

This study plan is designed to address baseline and impact-evaluation data needs which will allow CCLLC and Stakeholders to evaluate Project-related impacts. Objectives of the proposed 2010 studies are to provide information suitable to: 1) Establish baseline aquatic resources data in areas potentially-affected by the Project; and; 2) Evaluate the effects of Project construction and operation the Project in those areas.

## **STUDY SCOPE**

While this study plan title addresses “Aquatic Resources”, the focus of 2010 studies will be on fisheries in Swan Lake and the Cascade Creek/Falls Lake areas. Also addressed, but to a lesser extent, will be aquatic invertebrates in these water bodies.

Studies and impact evaluation in potentially-affected marine areas in Thomas Bay will be addressed in a separate “Marine Resources” study plan and subsequent analyses. Similarly, if instream flow evaluation in Cascade Creek requires studies, CCLLC will address them in a separate study planning process.

## **STUDY AREAS**

The primary water bodies to be addressed in this plan include inflow tributaries to Swan Lake, including the major inflow tributary designated “Cascade Creek” on topographic maps, but called “Upper Cascade Creek” in this and other plans to distinguish it from Cascade Creek below Swan Lake, which will be called “Lower Cascade Creek” in these plans. Upper Cascade Creek includes that waterbody from its headwaters to its confluence with Swan Lake. Lower Cascade Creek extends from the outlet of Swan lake to tidewater. Studies described in the following plan will be referenced relative to:

- Swan Lake and Inflow Tributaries;
- Upper Cascade Creek and Inflow Tributaries;
- Lower Cascade Creek; and
- Falls Lake.

Swan Lake and Tributaries studies will include Swan Lake, Upper Cascade Creek, and other selected inflow tributaries, to a distance upstream sufficient to cover all potential rainbow trout spawning in that stream. Upper Cascade Creek and Inflow tributaries studies will include upstream portions of these streams to their origins. Lower Cascade Creek studies will be done in Lower Cascade Creek from the Swan Lake outlet to tidewater, and Falls Lake studies will be directed at that small waterbody.

## **STUDY COMPONENTS**

In the following sections, we define specific studies to be done in the various study areas. These study proposals generally reflect study requests made by Alaska Department of Fish and Game in their comments on SD1. These will include:

1. Swan Lake Rainbow Trout Distribution and Abundance Surveys;
2. Swan Lake and Upper Cascade Creek Spawning, Life History and Habitat Utilization Studies,

3. Swan Lake and Falls Lake Water Temperature Studies;
4. Lower Cascade Creek and Falls Lake Fish Distribution, Abundance and Timing Surveys;
5. Aquatic macroinvertebrate studies on Upper and Lower Cascade Creeks, Swan Lake and Falls Lake.
6. Cascade Creek Habitat Quantification Study (US Forest Service Tier II) Surveys.

More detailed descriptions of these study components are in the following:

### **1. Swan Lake Rainbow Trout Distribution and Abundance Surveys**

Swan Lake is known to support a self-sustaining population of rainbow trout (*Oncorhynchus mykiss*) originally stocked in 1950 & 1951. Little is known of the spawning and rearing behavior of that population. Swan Lake Rainbow Trout Distribution and Abundance Surveys will seek to determine the relative size of the Swan Lake rainbow trout population and its general use of areas within Swan Lake during various life history stages. To determine population size, CCLLC proposes to conduct a single mark-recapture population estimate designed according to estimation methods used in other similar areas in Southeast Alaska. Generally, fish captures for these studies have been done using large hoop net type fish traps, augmented by hook and line captures done in specified lake areas.

Details of the population estimate studies will be developed and approved in close association with ADF&G specialists who have considerable recent experience with these types of studies in Southeast Alaska. The population estimate studies may, at agency request, become the object of further study planning within a “Swan Lake Aquatic Studies Work Group” to allow more extensive participation and input.

### **2. Swan Lake, Upper Cascade Creek and Other Inflow Tributary Spawning, and Habitat Utilization Surveys**

In these studies, CCLLC will seek to determine spawning processes (including timing) and locations which support Swan Lake rainbow trout populations. The objective of these surveys will be to determine, as quantitatively as possible, the relative proportion of rainbow trout which spawn along the Swan Lake shoreline and those which ascend or use tributaries to spawn. Also within these studies will be habitat evaluation of the areas used for spawning.

These studies will be done using data from two primary components: 1) Swan Lake shoreline surveys and 2) Upper Cascade Creek and Inflow Tributaries foot and snorkel surveys, as described in the following:

### *Swan Lake Shoreline Surveys*

Swan Lake Shoreline Surveys will be conducted by qualified fisheries specialist(s) using both foot and boat access methods and direct observation or snorkeling to observe rainbow trout spawning in various lakeshore areas. Researchers will visit Swan Lake as early in 2010 as possible, given safety and ice considerations. Surveys will be conducted frequently during the expected spawning period (May through July) and will continue throughout the summer to include the suspected rainbow trout incubation and emergence periods. Frequency of observations will be reduced as the summer progresses and it is assured that spawning is complete.

Observations of spawning relative abundance and timing will be conducted near the mouth of Upper Cascade Creek, but also at the mouths and in the lower reaches of all inflow tributary streams which drain into Swan Lake which might support spawning of the lake's rainbow trout population.

### *Cascade Creek and Other Tributaries Surveys*

In Upper Cascade Creek, researchers will observe rainbow trout from streamside and by using snorkel surveys, as dictated by stream conditions limiting visibility and safety. Cascade Creek surveys will coincide to the extent possible with the Swan Lake shoreline surveys, particularly early in the study period when spawning timing is being observed.

## **4. Swan Lake and Falls Lake Water Temperature Studies**

To better described factors involved in spawning timing, researchers will measure water temperatures in both Swan Lake and Upper Cascade Creek. Beginning well before the expected onset of spawning (probably in March, 2010), CCLLC will emplace continuous temperature monitoring data loggers in the upper end of Swan Lake near the Upper Cascade Creek confluence. A logger will also be placed in Falls Lake.

Exact placement of these loggers will be determined based on physical characteristics of the nearby lakeshore, but at least one of the measurement locations will allow emplacement of a thermograph array to measure water temperatures at various water depths. Vertical spacing of these loggers will be determined by the physical attributes of the site. Individual loggers may also be emplaced on floats to measure surface or near-surface water temperature at various lake locations. Loggers will be set to measure at least 10 time periods per day. Another logger will be emplaced in Upper Cascade Creek well above the elevation of maximum Swan Lake level.

## **5. Lower Cascade Creek and Falls Lake Fish Distribution, Abundance and Timing Surveys**

In these two water bodies, researchers will use foot and snorkel surveys with methods similar to those described above. Survey objectives in these two water bodies will be to note overall abundance and distribution, but also to note any movement or change in abundance which might reflect fish being washed from Swan Lake into Lower Cascade Creek and subsequently downstream during high flow periods.

## **6. Aquatic macroinvertebrate studies on Upper and Lower Cascade Creeks, Swan Lake and Falls Lake**

Researchers will collect, using methods approved by consulting agencies, stream macroinvertebrates and other food items in the potentially-affected water bodies. Detailed field collection methods, sampling frequency and lab identification methods will be the subjects of a further draft study plan sent for review by consulting agencies.

## **7. Cascade Creek Habitat Quantification Study (US Forest Service Tier II) Surveys**

CCLLC will conduct a “Tier II” habitat quantification and evaluation study according to specification in USFS methods documents. Detailed methods for the Tier II studies will be described in a separate plan conducted in close association with USFS specialists.

## **Data Referencing and Cataloguing**

### ***Stream and Lake Mapping***

In both the Swan Lake Shoreline and Cascade Creek foot surveys, researchers will develop detailed maps, referenced to existing aerial photography and maps and Global Positioning System (GPS) coordinates of the various waterbodies. As studies progress, these maps will be annotated with observations and locations of both fish and habitat features.

### ***Data Recording***

Fish researchers will note:

- Location, tied to Global Positioning System (GPS) coordinates;
- Fish size and condition, estimated;
- Activity (nesting, spawning, feeding, etc.).
- Habitat type in area.

## **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 1020 weather, snow and ice conditions.

**Table 1. Proposed Schedule, 2010 Cascade Creek Project Aquatic Resources Studies.**

<b>Study Component, Location</b>	<b>Proposed 2010 Time Period</b>
Swan Lake Distribution and Abundance Surveys	May, 2010, or when ice conditions allow
Swan Lake and Upper Cascade Creek Spawning, Life History and Habitat Utilization Studies	May-early July, 2010, or when ice conditions allow
Swan Lake and Falls Lake Water Temperature Studies	May, 2010, continuously until license application
Lower Cascade Creek and Falls Lake Distribution, Abundance and Timing Surveys	May-October, 2010
Aquatic macroinvertebrate studies	July, August, 2010
Cascade Creek Habitat Quantification Study	July-August, 2010

### **REPORTING**

A draft Aquatic Resources Report documenting all 2010 data collection and analysis will be submitted for agency review as early in the fall of 2010 as possible, given the need to continue various field observations. The object is to provide sufficient review time for this subject prior to submission of the Project Draft License Application in early 2011. Review of the report should assist in determining the need and details of further studies which might be conducted in 2011.