Fisheries Survey Annual Report

Sawmill Creek, 2001

Blue Lake Project, Federal Energy Regulatory Commission (FERC) No. 2230.

City and Borough of Sitka, Licensee

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INTRODUCTION AND BACKGROUND

The Project FERC license will expire on March 31, 2008. The City and Borough of Sitka (City) intends to obtain a new license under which to operate the project as a major electrical generation source for Sitka. Relicensing the project will require development of an environmental data base sufficient to allow FERC, as lead agency under the National Environmental Policy Act (NEPA), to adequately evaluate existing environments, potential impacts and mitigation measures associated with reauthorization of the project.

Under FERC regulations, the City will be required to consult with resource agencies to develop necessary study plans for all resources potentially affected by the relicensing. Among these resources, effects on Sawmill Creek fisheries are expected to be among the major environmental issues addressed.

The FERC regulations, relative to the license expiration date, require environmental studies to begin in 2003, after the City's submission of a Notice Of Intent (NOI) to relicense the project. Given the need for multiple draft document reviews and revisions, this would provide, at most, two full field seasons of fisheries surveys prior to the required submission of the final application to the FERC for new license in March, 2006.

The preliminary studies described in this plan are intended to supplement the fisheries survey data base prior to new license application. During 2001, the City consulted with Alaska Department of Fish and Game (ADF&G), Sitka Tribe of Alaska (STA) and US Forest Service (USFS) to develop a study plan for 2001. A

final study plan was developed and approved by the consulting parties, and implemented as the basis for the surveys described in this report.

Objectives of the proposed 2001 and 2002 Sawmill Creek surveys were to:

- Develop fish survey methods to fulfill the needs for 1) NEPA analyses in the FERC relicensing process, and 2) ongoing ADF&G stream surveys and USFS and STA information needs;
- Gather data useful to extend the information base on species composition, distribution, periodicity, stream life and habitat use; and
- Develop a protocol for sharing of fish survey manpower among the City, ADF&G, STA and USFS.

METHODS

The 2001 Sawmill Creek fish studies were based primarily on streamside or instream observations. No captures were made during this field season. Three primary types of observations were 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 surveys, described below, would best be conducted; and

- **Periodic stream foot surveys ("Stream surveys")**, at various observation sites, conducted as needed to determine anadromous fish distribution and abundance and habitat utilization throughout the potentially occupied sections of the stream.

- **Snorkel surveys**, within accessible areas in which stream hydraulic and water conditions offered suitable observation conditions.

Sampling Locations.

For the purposes of fishery studies and other references during relicensing, six stream reaches, developed according to differences in fish habitat type, stream gradient or access considerations were developed (Figure 1, Table 1.) Locations on Sawmill Creek are referenced by Stream Mile (SM), the distance upstream from Sawmill Creek's confluence with mean tidewater elevation. At this time, the reach designations are preliminary and subject to change as fisheries and other surveys provide more information on stream character.

The "Falls" referenced in the reach designations is at SM 00.78 and is a major stream feature approximately 15 feet high. The "Slot", an area in which Sawmill Creek passes through an extremely narrow canyon constriction, is located at SM 1.03, and the "Fish Valve Unit" is the installation at SM 1.91 at which minimum streamflows are released to Sawmill Creek.

The "Index Area" is the area just upstream of the bridge near the project lower powerhouse.

Figure 1. Location of stream reaches in Saw Mill Creek. See text in Table 1 for written description

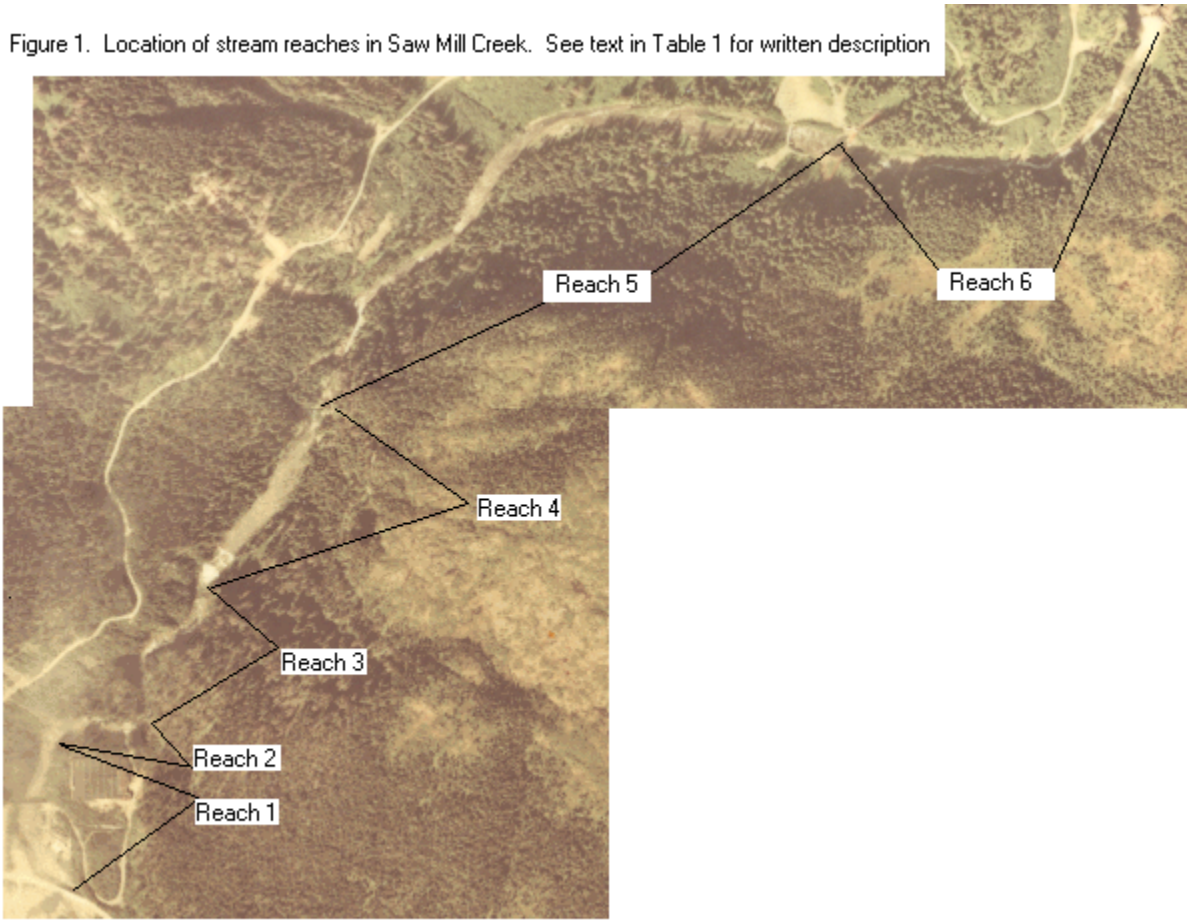

Table 1. Sawmill Creek Stream Reach numbering, from bridge near lower powerhouse upstream to base of Blue Lake Project dam.

Stream Reach and Location (Name)	Identifying Aquatic Habitats and Stream Characteristics
Reach 1. Downstream Bridge (SM .27) upstream to top of Index Area (SM .48)	Cobble substrate near the bridge changes upstream with a decrease of gradient to a large gravel riffle which is prime spawning habitat for chum salmon. Pool habitat with a sand substrate is next with a bar on the right side providing another spawning area for pinks and chums. The left side of the pool runs against a cliff, which has indentations creating eddies usable as holding areas for juvenile salmonids
Reach 2. Inlet of Index area pool to Pulp Mill Outflow (SM .58)	The gradient in this reach increases through another riffle and a glide and eddy (behind a man made concrete structure) on the right side and a glide run out on the left which drain the next long pool. Beside the eddy a lower concrete structure provides overhead cover along with flow refugia creating a small piece of juvenile habitat.
Reach 3. From top of Pulp Mill Outflow pool to base of Falls (SM 0.78)	Begins with a deep-water canyon glide with smooth fast water on top and 2 to 3 ft. boulder substrate creating holding habitat at greater depths for adult steelhead and coho. Gradient then increases with some holding/resting areas behind large boulders and/or in deep water pockets with faster water above the pool habitat. The run-out changes from cobble substrate to gravel and to sand, and in areas of slower flow and eddying action to silt and small woody debris.

Reach 4. From top of Falls to Slot (SM 1.03)	Old log bridge creates two large holding/resting eddies at top of Falls. This is followed by riffle habitat with larger eddies created by numerous boulders. The upstream right side has a classic run-out while the left side is a deep-water run with broken rock (2-3 ft) structure creating numerous feeding and resting areas for salmonids. A large indentation on the left side of the pool not only has a sand silt substrate with a large accumulation of small woody debris in the deposition area, but also contains an adjacent area of large woody debris (LWD) in deep water.
Reach 5. From Slot to fish valve unit (SM 1.91)	From the top of the Slot the canyon widens and turns a slight corner into a series of small pools, runs, and eddies. Because the of the high gradient within these lower areas, the majority of the holding water appears to be low in the water column amongst stream bottom irregularities. At the slide area at SM 1.13 the valley floor widens substantially and an intermittent first order spring creek offers prime resident salmonid habitat. The main creek goes from pocket water to a tail out pool and run. On the upstream left an oxbow creates another intermittent channel that flows only at the highest flows. The gradient increases with two sections of pocket water with an eddy corner between. This corner contains LWD against the bank and would be considered a prime lie for resident fish. Above this, a riffle leads to the campground bridge tail out, eddies (behind bridge structures) and runs. The entrance to the ox-bow is located here on the upstream left bar. From the bridge to the fish valve unit the stream has been straightened and channelized.

Reach 6. From fish valve unit to base of Project dam (SM 2.31)	The area from the fish valve unit to the Project dam consists primarily of deep pools connected by cascades and pocket water. The area has numerous boulders and much of the bed rock is exposed. In all but the deepest areas the substrate is primarily bed rock, cobble, or rock. These areas receive most of the flow from the Beaver lake outflow falls at stream mile 2.12. Above this the only flowing water when the dam isn't spilling or discharging is the plunge pool directly below the dam.

Detailed maps of each reach were developed as the sampling season progressed. These maps are used in this report as a basis for fish location and aquatic and riparian habitat descriptions. Details will be added to these maps in future reports as features change, and as more data are collected.

B. Sampling Dates.

Generally, fish observations began on September 8, 2001 and continued through November 27, 2001. Sampling dates for the various observation techniques varied, as shown in Table 1.

Table 2. Dates of sampling by various observation techniques, Sawmill Creek Fisheries Surveys, 2001.

Index Surveys (All Index Surveys were conducted in Reach 1).

Sept. 8, 2001
Sept. 17, 2001
Sept. 21, 2001
Sept. 25, 2001
Sept. 27, 2001
Sept. 29, 2001
Oct. 6, 2001
Oct 14,2001
Oct. 20, 2001
Oct. 28, 2001

Stream Surveys.

Date	Survey Areas	Survey type
Sep. 21.	To tail-out of outflow pool	foot
Oct. 6.	To tail-out of outflow pool	foot
Oct. 20.	To tail-out of outflow pool	foot
Oct. 28.	Falls downstream to Index Site bridge	snorkel
Nov. 5.	" "	snorkel
Nov 27.	" "	foot
Nov 29.	" "	foot
Dec 6.	" "	foot
Dec 12.	" "	foot

Index Surveys.

All Index Surveys were done within Reach 1. The observer noted the following on each survey date:

- Number of fish by species
- Time of day
- General weather condition
- Water and Air Temperatures
- Relation of observation time to tide status
- 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 included locations of fish both across and up and down the channel.

Stream Surveys.

Stream Survey observation techniques and data recording were essentially the same as for the Index Surveys, except the observer noted fish locations throughout

various stream reaches. As with Index Surveys, a base map of the stream was annotated during each survey to show stream mile (to the nearest 0.01 mile, if possible) and specific points of observation within the channel. Notes were made of species composition, spawning activity and habitat conditions and utilization. Various stream habitats where characterized and defined according to the guidelines in Appendix I.

The Stream Foot Surveys were conducted initially in accessible areas offering resting and spawning habitat, and those which might serve as migration barriers at low flow.

Upstream of the Falls at SM 0.78, observations were made to determine presence of any life stage of anadromous fish. Observations upstream of the Falls were made when stream conditions were optimal for viewing adult fish.

Snorkeling

Due to the secretive nature of Coho and Steelhead, snorkel surveys have historically been used in conjunction with other methods Southeast Alaska in order to ensure more accurate enumeration. Snorkeling was used to attempt to answer two questions: 1) were fish being missed in areas of limited or no visibility during foot surveys, and 2) were there fish holding above the Falls in likely holding areas inaccessible due to topography and deep water.
A dry suit, gloves, mask, and snorkel were utilized without fins. All areas including woody and rock structure of pools and runs where checked by a combination of down stream floating, usage of back currents, holding in the current and wading where water was too shallow or turbulent to swim.

Data Management and Reporting.

Observers retained and copied all field notes from Index and Stream Surveys. Copies were distributed to USFS, the City and ADF&G.

RESULTS

General. Sawmill Creek surveys in 2001 resulted in observation of four species of Pacific salmon. These were:

Pink Salmon (*Onchorynchus gorbuscha)*;
Chum salmon *(O. keta);*
Coho Salmon *(O. kisutch); and*

King salmon *(O. tshawytscha).*

These species were found at all observation locations below the Falls at SM 0.78. No salmon of any species or life stage was observed upstream of the Falls at SM 0.78.

Index Surveys.

General. Index surveys showed that pink salmon were the most abundant species of salmon at the Index Site in 2001, followed by coho and chum salmon as observed through Index counts in Reach 1. King salmon represented only a fraction of the total fish counts (Table 2).

Table 3. Numbers of salmon by species observed at Index Site, Sept. 8-Oct. 28, 2001.

Date	Pink	Chum	Coho	King
Sept. 8,2001	825	20	0	2
Sept. 17,2001	165	30	0	0
Sept. 21,2001	211	55	0	0
Sept. 25,2001	166	61	1	0
Sept. 27,2001	152	60	2	0
Sept. 29,2001	13	27	0	0
Oct. 6,2001	35	10	6	0
Oct 14,2001	16	6	2	0
Oct. 20,2001	0	0	0	0
Oct. 28,2001	0	0	0	0

Pink Salmon. On September 8 (the first day of sampling) 825 pinks were observed at the Index site (Table 3, Figure 2). On Sept. 17, 165 pinks were counted and this number increased slightly to 211 pinks by Sept. 21. After September 21, pink numbers slowly tapered off, and the most dramatic decrease occurred during the first week of October. No pinks were observed at the Index site after October 14. The pink run was at its peak or descending when sampling started on September 8.

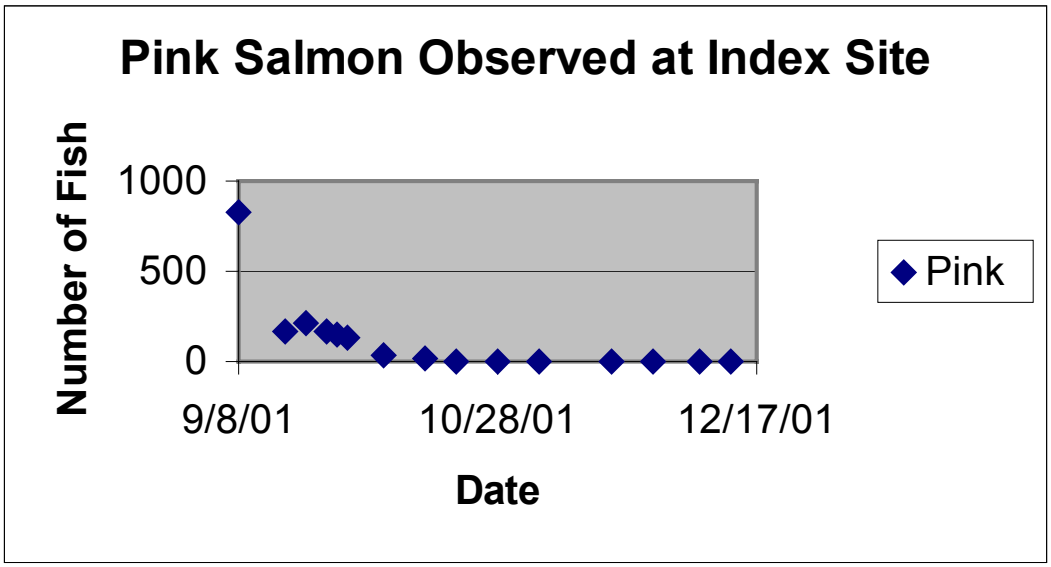

Figure 2. Pink salmon counts at Index Site, September 8-October 28, 2001.

Chum salmon. Twenty chum salmon were present when Index sampling began on September 8 (Table 2, Figure 3). Fish numbers increased throughout September with a peak of 61 fish on September 25. After this peak, chum numbers rapidly decreased in the Index area with the last six being observed on October 14th.

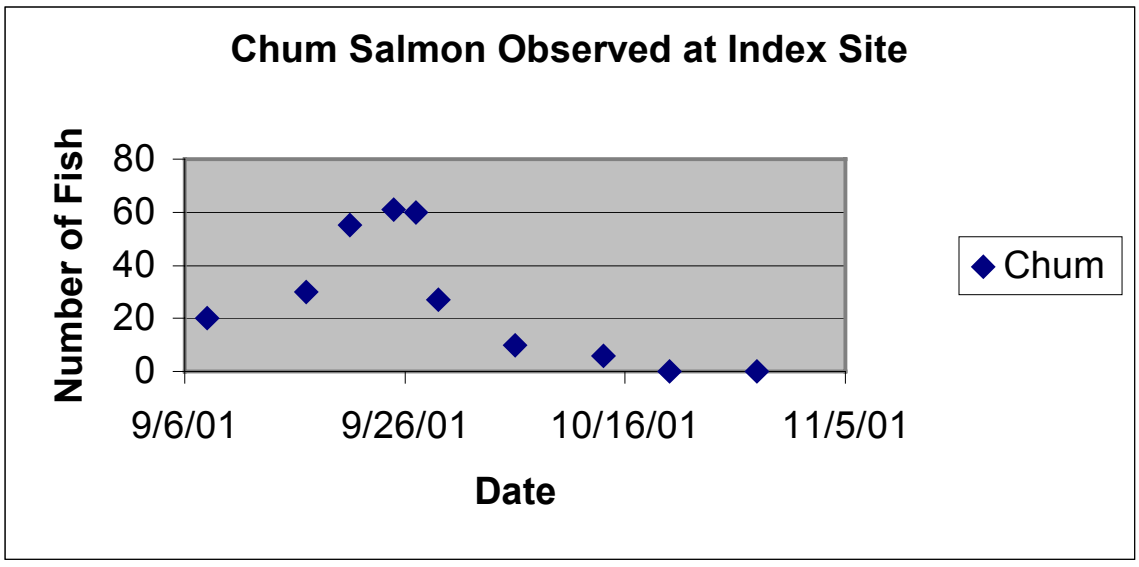

Figure 3. Chum salmon counts at Index Site, September 8-October 28, 2001.

Coho Salmon. The first Coho of the 2001 run was observed at the Index site on Sept 25 (Table 2, Figure 4 .) Subsequent to this two fish were spotted on September 27, none on September 29, and then 6 on October 6. After October 6, only two fish where spotted on October 14, with the rest of the Index Surveys having no sightings.

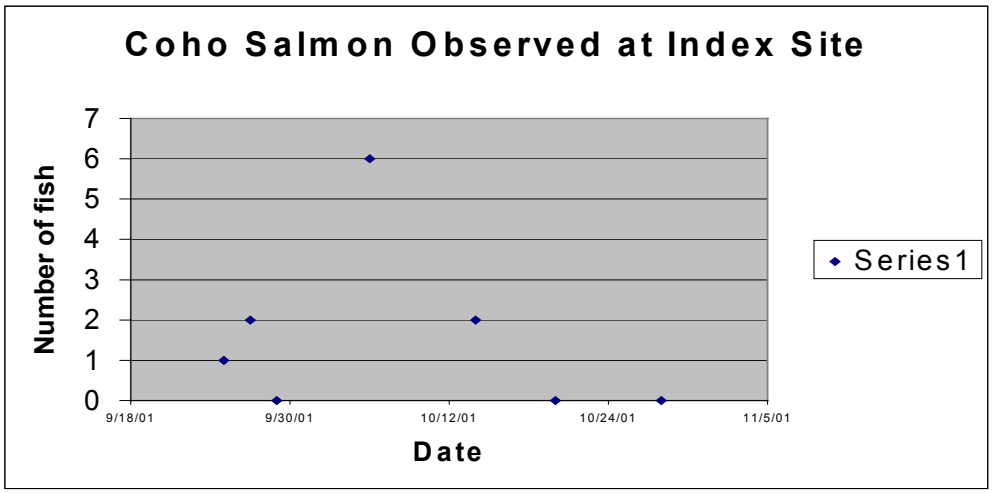

Figure 4. Coho salmon counts at Index Site, September 8-October 28, 2001.

King Salmon. Only two spawned-out king salmon were observed on September 8, with no others being observed after this date.

Stream Surveys.

Table 4. Numbers of salmon by species observed during Stream Surveys, Sept. 8-Oct. 28, 2001.

Date	Area Surveyed	Type	Pink	Chum	Coho	King
21-Sep	To tail out of outflow pool (Reach 1)	Foot	189	9	0	0
6-Oct	To tail out of outflow pool	Foot	2	3	5	0
20-Oct	To tail out of outflow pool	Foot	0	0	0	0
28-Oct	Falls to Index bridge (Reach 4)	Snorkel	0	0	5	0
5-Nov	“ ”	Snorkel	0	0	5	0
27-Nov	“ ”	Foot	0	0	9	0

29-Nov "	"	Foot	0	0	10	0
6-Dec "	"	Foot	0	0	9	0
12-Dec "	"	Foot	0	0	2	0

Snorkel surveys were conducted late in the sampling season because stream discharge had been high throughout the late summer and early fall months due to releases from Blue Lake dam. Snorkel surveys were done only in the Index Survey area, as were all other surveys done after October 28th, due to access difficulties resulting from snowfall in the upstream areas.

Pink Salmon. Pink salmon were observed during two subsequent foot surveys to the tail out of the outflow pool (Table 3, Figure 5). On September 21, 189 pinks were counted to this point and on October 6 only two pinks were observed. Pinks held in all areas, but active spawning was concentrated in tail outs and submerged bars adjacent to deeper flows.

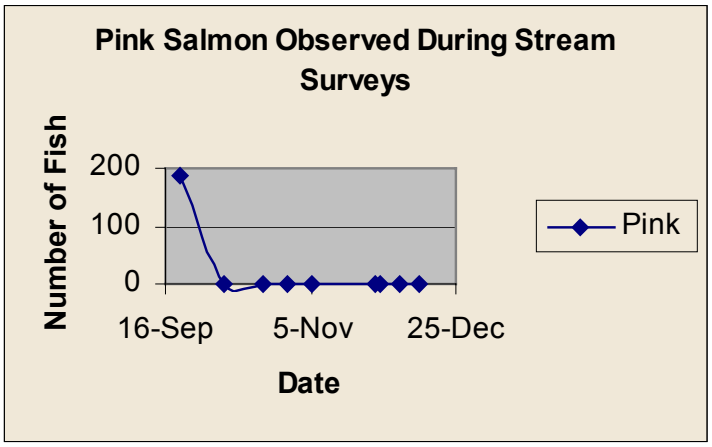

Figure 5. Pink salmon Observed during Stream Surveys, September 21-December 12, 2001.

Chum salmon. Chum salmon were observed during two separate foot surveys to the tail out of the out flow pool (Table 3, Figure 6). Nine chums were observed on September 21, with six located in the right hand shallow areas of the concrete pool run and three in the tail out of the outflow pool. Three chums were observed on October 6; Two at the concrete pool and one at the outflow pool tail out.

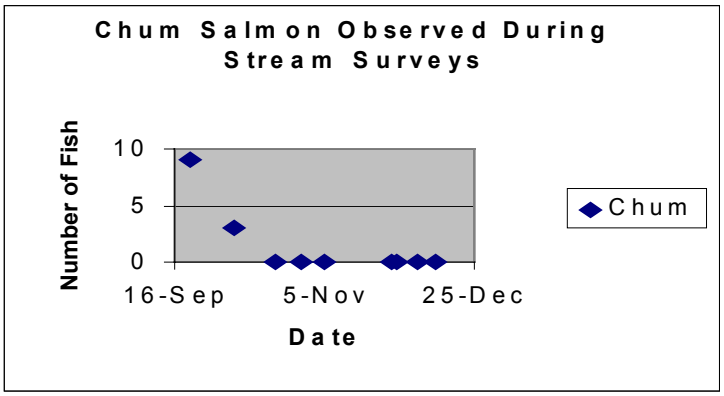

Figure 6. Chum salmon observed during Stream Surveys, September 21-December 12, 2001.

Coho Salmon. On October 6th five coho besides the six included in the Index count were spotted (Table 3, Figure 7). Three fresh fish in the eddy behind the angled concrete structure and two already turned females in the tail out of the pulp mill outflow pool (Map II) which at the time was the farthest possible point of access. No fish were observed during the next foot survey on October 20th. A snorkel survey was conducted on October 28th to confirm fish presence or absence.

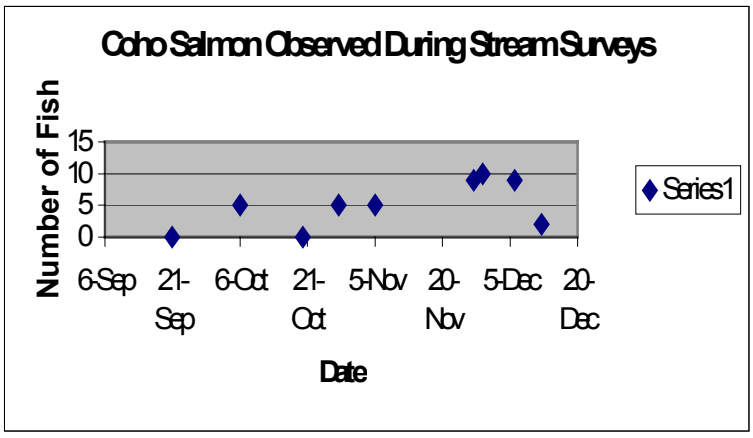

Figure 7. Coho salmon Observed during Stream Surveys, September 21-December 12, 2001.

On October 28th a flow of 76 cfs allowed the first access to the Falls area and 5 coho were spotted; four darker fish at the Falls pool in front of the log (Map II) and one semi dark at the Pulp Mill outflow pool in the left upstream eddy. The

four fish at the Falls pool were also observable by foot from the ledge above, while the forth was not viewable until being disturbed by throwing a rock. On November 5th two coho were observed at the Falls log, two in the left eddy at the Pulp mill outflow pipe pool, and one other downstream under the log in the long pool. From November 27th on, the only coho observed were at the Falls pool log. These fish slowly turned until they appeared spawned out and then slowly disappeared.

King salmon No king salmon were observed during the stream surveys.

DISCUSSION

Overall Salmonid Species Representation. Sawmill Creek fish surveys during 2001 resulted in observations of four species of Pacific salmon: pink, chum, coho and king. No steelhead (Onchorynchus mykiss) were seen at any sampling site. Further, no anadromous fish were observed upstream of the Falls at SM 0.78. These two results differ from information in the Alaska Department of Fish and Game (ADF&G) Catalogue and Atlas of anadromous fish distribution in Alaska (ADF&G 1993a and b). These publications indicates that these four salmon species plus steelhead (Onchorynchus mykiss) are found in Sawmill Creek to the base of Blue Lake dam (ADF&G 1993a and b).

The absence of steelhead in any 2001 survey area is almost certainly the result of sampling during the summer and fall months before this species noramlly enters the stream. Steelhead typically begin entering Sawmill Creek in March and have completed spawning by early summer. Fisheries surveys will begin in Sawmill Creek in early spring of 2002, and we expect to find steelhead at that time.

The absence of salmon or steelhead upstream of the Falls at SM 0.78 was not a supprise, given the severity of the drops at the falls, and the availability of spawning habitat in lower reaches. However, because the Atlas notes presence of all anadromous species to the base of the Blue Lake dam, further sampling will be necessary to provide meaningful comparisons with statements in the Atlas.

In the following discussions of the various Sawmill Creek salmon species, it is important to note that numbers of fish counted at the Index Site and upstream are meant to determine run timing through relative abundance estimates. These run timing and relative abundance values will then be compared between and among successive study years. The numbers are not intended to be population estimates, and are not be compared with ADF&G Sawmill Creek escapement counts, which estimate the entire number of fish escaping to Sawmill Creek at the time of the

survey. Index counts will be compared year-to-year, and may be compared to ADF&G escapement counts to determine if relationships exist. Sawmill creek is not a primary ADF&G escapement stream and observations are limited.

We also caution against comparing our study results with escapement or population estimates done by either ADF&G or others on other streams in Southeast Alaska or elsewhere.

Pink Salmon.

Because the numbers of pink salmon observed at the Index site were high on the initial September 8 observation date and then fell off rapidly, it is assumed that the run was either at or after its peak at that time. No inferences may be made, based on our data, as to the time of initial Pink salmon inmigration.

Pink salmon numbers in this survey may be low (relative to overall Sawmill Creek pink salmon escapement numbers) because the lowest observation point (the Index Site) was upstream of fish which may have been spawning in the intertidal zone. Pink salmon in southeast Alaska often spawn in the brackish water areas at stream-salt water confluences, sometimes in greater numbers than in the stream itself (Jones 1978). Although no Stream surveys were conducted upstream of the Index site during the early pink salmon run decline, the fact that no fish or spawned out carcasses were seen upstream may indicate that pink salmon spawning is limited to Sawmill Creek's lower reaches.

Chum Salmon. The chum run in Sawmill Creek is composed of both a late and early runs. We were too late to observe the early run peak, but the late run was in the stream on September 8th, when sampling began, and peaked around the 26th of September with 61 fish in the Index Site (table 1, Figure 3 ,). Comparing the Stream Survey data to that of the Index surveys, it appears that at this escapement the chum utilize the Index area for most of their spawning (Tables 1,2). However, areas upstream of the pulp mill pool tail out were inaccessible at the time and areas below the Index site were not surveyed making this observation inconclusive.

Coho Salmon. Coho salmon numbers observed at the Index and Stream survey sites were quite small. The observation of only five fish during what is normally their prime inmigration time is unusual.

The first Coho of the 2001 run was observed at the Index site on Sept 25 (table 1.) Subsequent to this two fish were spotted on September 27, none on September 29,

and then 6 on October 6. The last coho salmon observations were the two fish on October 14; no further coho sighting were noted. It would appear from Index surveys alone that a peak in upstream migration occurred around the sixth of October.

Index and Stream surveys taken together indicate a slowly growing coho population in Sawmill Creek, with peak stream numbers occurring as late as November. Because coho have long stream lives, however, the peak numbers probably don't indicate exact run timing, as they would for pink and chum salmon. Further, the fact that the proportion of coho upstream increased with time might indicate that this species might prefer upstream spawning locations.

King Salmon. The relative lack of King salmon observations and the fact that the two fish seen in September were spawned out, indicate that their inmigration period occurs earlier in the summer months. The nearby Medeveje hatchery king salmon run generally occurs between early June and late August. Surveys in 2002 will begin earlier in the year to better assess run timing for all Sawmill Creek species.

Stream Surveys upstream of the Falls.

Stream surveys upstream of the Falls turned up no signs of adult anadromous fish. Our plan is to continue the upstream surveys in future years to determine the role of the Falls as a potential barrier to upstream fish migration, and to more accurately determine the overall composition of the resident and/or anadromous fish populations in the area.

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Integrated Fisheries Data Base. ADF&G

APPENDIX I

Stream Habitat Characterization Terms and Definitions.

Riffles. Fast, shallow white water. The rocky bottom draws feeding trout when larval insects are active. Otherwise, riffles are usually too shallow and exposed for the trout to stay in for long. Big rocks or deeper holes in a riffle create "pocket water" where fish can shelter for extended periods.

Undercut Banks. Places where the current angles into and cuts under the stream bank, creating a sheltered hollow beneath. These areas offer shelter, cover, and food.

Eddies. Slow or even reverse-current pools formed in faster current by protruding rocks, points, or sharp bends in the river. The longer the point or sharper the bend, the larger the eddy. Eddies are also commonly found downstream of bridge pilings, islands, and tributary inlets. They provide an energy efficient and protected spot for fish.

Pools. Deep, slow-moving areas with a slick surface. Fish rest in the slower water below, protected by the depth.

Runs. Deep moving water with small, smooth waves. Fish may be holding in ledges along the side, or in slower pockets created by submerged structure on the bottom. As in eddies they wait in these slower water spots to escape the adjacent swift current.

Stone Bottoms. Gravel or cobbled bottoms can support a heavier population of insects than sand or silt, and in turn are more likely to attract feeding fish.

Submerged Rocks and Logs. Underwater objects create small, relatively calm eddies where fish can rest and watch for food. These eddies can be upstream as well as downstream of the obstacle. Look for "boils" in the water where the current is deflected up off of submerged rocks or other objects several feet upstream.

Current Seam. A line between slow and faster water, such as the edge of a run where it angles into a pool. Resident fish hang in the slow water, darting out to grab food coming down in the faster current. Anadromous fish hold and rest here while actively migrating..

Large Woody Debris. Downed trees and rootwads in slower moving areas create holding and feeding areas for juvenile salmonids; especially in winter if other back water habitat is lacking, When submerged in the current they scour out a pocket into the gravel beneath. These can be holding areas for anadromous fish, but are more important as energy economic areas for resident fish.

Tail out. The narrowing tail-end of a pool. The funneling effect brings drifting food to waiting trout. Pink, chum, coho and steelhead are found holding and spawning in tail outs.

Plunge Pools. These are deep eddies scoured into the river bed below waterfalls. The fish have excellent cover and let the current deliver food to them.

Overhanging Brush. Brush provides shade and overhead protection.