NATIVE VILLAGE OF EKLUTNA
2002 EKLUTNA RIVER FISH STUDY

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Abstract/Introduction

Native Village of Eklutna personnel and residents counted salmon, and recorded observations of other fish in the lower Eklutna River and Thunderbird Creek. Salmon smolt and other small fish were trapped in the lower Eklutna River system. This is the first time systematic fish counts have been conducted in this river system, to our knowledge. Turbidity and temperature data were also collected in an effort to analyze concerns about these variables. The methods were developed to describe the pattern of salmonid utilization of the Eklutna River ecosystem, and some potentially limiting factors, for various management and river restoration purposes. One objective is to support an instream flow reservation application to Alaska Department of Natural Resources.

Methods

The lower Eklutna River system was divided into 6 "reaches", defined by our understanding of the macro-habitat characteristics of each:

Reach 1 – A large pond in the old gravel mines, on the lower Eklutna River, just above the Knik Arm, Cook Inlet tidal wetlands. This pond has river, ground water, and tidal influences.
Reach 2 – Eklutna River from the pond to the railroad bridge, crossing the old gravel mined area. (About .9 mile in length.)
Reach 3 – Eklutna River from the railroad bridge to the Old Glenn Highway. Here the river braids through a fairly undisturbed landscape dominated by young deciduous trees, although it is constrained to a single channel at the highway and railroad bridges. The substrate is compact throughout most of this reach, with little loose gravel for spawning. (About .5 mile in length.)
Reach 4 – Eklutna River from Glenn Highway to thunderbird Creek. The slope of the riverbed here is greater than the lower reaches. This reach and the next two flow between deep canyon walls. (About .6 mile in length.)
(The above 4 reaches are combined into one section for the instream flow application, because no tributaries of greater than 10% of the river discharge enter this section.)
Reach 5 – Eklutna River above the confluence with Thunderbird Creek, to an old dam which blocks fish passage further upstream. This section is very turbid after increased runoff events. (About 1 mile in length.)
Reach 6 – Thunderbird Creek from Eklutna River to Thunderbird Falls. This creek contributes more clear water to the system. (About .3 miles.)

Observations of adult salmon were conducted by walking and wading these reaches (wearing polarized sunglasses) from June 15 through August 15, 2002. Three week sampling intervals were recommended to avoid double counting individuals that remain in the system between counts, yet capture most salmon entering the system. We surveyed salmon containing reaches at

least this often. Our strategy evolved to keep an eye on the lower pond for new fish runs. Runs tended to hold in the pond, osmoregulating or awaiting good conditions to run upriver. We watched the pond and counted more frequently than three week intervals when runs spread out for spawning upriver, which is where we got our best counts. Our goal became to obtain a maximum count for each species from the entire system, over as short a time period as possible. It does not seem that many new fish entered the system after, or old fish left before these maximum counts, so we believe these maximum counts to give a good, conservative estimate of the actual numbers of each species. The exception was the maximum King count, when clear water in the lower pond facilitated a better count there, ten days after a maximum count in an upper reach. Rain quickly increased turbidity, decreasing fish visibility, which also influenced the temporal distribution of the counts.

A sample data collection sheet is attached. Sheet headings were: Observer ID, Date, Time, and Reach #. Column headings were: Column 1: Observation #, which coded for a row of data and cross referenced to placement on photo maps. Column 2: Species. Column 3: # Fish (# per observation). Column 4: # Dead. Column 5: Behavior & Other. We recorded observations of spawning and redds, numbers of salmon per group, and other comments.

Air photos of each reach being sampled were carried, labeled with Observer and Date. These were xeroxed printoffs from digital airphotos, taken Fall, 2001 for most of the lower system, and 1996 for the remainder to the lake (attached). Observation numbers, referring to a row of data on the data sheets, were recorded on these photos as near as possible to the actual site of observation.

Salmon juveniles, and other small fish were sampled on five occasions using wire mesh minnow traps, 17" long by 8.5" in maximum diameter, with cones at each end and ~ 1" openings in the cones, baited with preserved salmon eggs (under ADF&G Permit). Trapping was conducted mainly in and around the large pond, where groundwater enters the pond at its Southwest end, in the river, and in two "relict" raised ponds, left by gravel mining, to the Northwest. An airphoto map was carried to record the location of numbered trap sets. A pictorial species field identification manual (Field Identification of Coastal Juvenile Salmonids, by Pollard et al.) was carried to identify species. Two coho smolt were sacrificed and dissected to verify species identification.

We also walked the Eklutna River between the dams, observing and taking four rolls of photographs of the habitat, especially attending to sources of turbidity, and sampled for fish with minnow traps.

Temperature and turbidity were also sampled, on a semi-weekly basis, from Eklutna River and Thunderbird Creek, just above their confluence, and Eklutna River below the confluence at the Old Glenn Highway Bridge.

Analysis

The fish count data are presented in summary tables. In the 2002 Eklutna River Fish Counts set, each table represents a time-limited survey effort (to avoid double-counting), and presents numbers of each salmon species adults by reach. Zeros indicate a reach was surveyed, but no salmon observed, while blank squares indicate no survey of a reach. The first summary table in this set presents total numbers of each species counted over the whole project by reach. Some

fish were likely counted more than once for this analysis, but the numbers per reach provide a use weighting. The Maximum Counts for Each Species column shows the maximum number of each species observed over a time limited period, with double counts unlikely.

Periodicity tables, showing presence/absence of species by age classes and months in the system below the confluence with Thunderbird Creek are required for in-stream flow reservation application. These were constructed from the Fish Count tables and Minnow Trapping Report, and incorporating best professional judgment of Alaska Department of Fish and Game, Sport Fish Biologists, using comparison to analogous streams (thanks to Dan Bosch). (The reach numbering system on the Periodicity Tables is altered, with reach 1 being Eklutna River above the confluence with Thunderbird Creek, reach 2, Thunderbird Creek to the Falls, and reach 3 being Eklutna River below Thunderbird Creek (including reaches 1,2,3,& 4 from the Fish Counts tables).

Turbidity, in NTUs was read from water samples using an ESD Model 800 Turbidity Meter, according to procedures outlined in the Operator's Manual. This is a "…true nepthelometer, measuring the amount of light scattered at a right angle from a beam of light passing through the test sample."

Results and Discussion

Maximum salmon counts over limited time periods, designed to avoid double counting, found 1,051 Chum on 8/28, 131 Coho on 10/14, 36 Kings between 7/4 and 7/12, 42 Pink, and 2 Red Salmon. This provides a good, if conservative estimate of the number of each species which return to spawn in the system. From a management perspective, it appears that the Chum run is very strong and arguably under utilized by humans. King, pink, and silver run strengths are less robust. King Salmon in particular are at low numbers and we have requested ADF&G to rescind the fishing season for them (without success). NVE is investigating options to encourage and protect Kings and Coho in the system. Two Red Salmon do not constitute a viable population. Perhaps they were "lost" from another system, or may be a relict from historic runs before the dams on the Eklutna River. A dwarf Kokenai stock holds on, isolated in Eklutna Lake.

Total number of each species observed at each reach, cumulative over all counts, illustrates the importance of each reach for the different species. All species held in the large pond in the lower Eklutna River, perhaps to osmoregulate and rest till conditions, such as a rain event favored a run upriver to spawn. Some spawning occurred in the river below the pond, as it enters the Knik Arm wetlands, and some of each species remained in this section for the duration of their spawning season. A substantial number of Chums spawned in the river above the pond, in reach 2, although this reach was little utilized by other species this year. All species tended to move quickly through reach 3 where the riverbed was compact, with little free spawning gravel. Most of the spawning occurred above the Glenn Highway, in reaches 4, 5, and to a lesser extent 6 (Thunderbird Creek). More King Salmon were observed to spawn in Thunderbird Creek in 2001.

Chum Salmon were found in all the reaches. Overcrowding may have led to their presence in sub-optimal spawning habitats, such as reach 3. They were the only species observed to spawn in appreciable numbers in reach 2, where several active large communal redds were observed not too far above the pond. They utilized reaches 4 and 5 (Eklutna River below and above the confluence with Thunderbird Creek) most heavily for spawning. The most heavily used section of reach 4 in the Eklutna, was the stretch below the confluence with Thunderbird, and Chums

seemed to gravitate to the turbid water coming from the Eklutna, in this stretch. Surprisingly, Chum used the river reach (5) above Thunderbird Creek most heavily. Agency Biologists who observed this reach after a rain event had earlier opined that the turbidity would be too high to allow salmon to live and reproduce in this reach. The turbidity is certainly excessive at times, and fish are often seen "gulping air" during such events. The sediment load over spawning gravels is also speculated to be a problem. This may be alleviated by spawning at the head of drop pools, where upwelling may help clean and oxygenate the gravels. Also, communal spawning may play a role. Up to 80 Chums were observed spawning in a single pool, and smaller groupings were prevalent. This may provide a communal cleaning of the sediments, at least while the adults remain, and turbidity loads are much lower throughout the winter.

The importance of this reach 5 to Chum and Coho argues for the value of opening access to spawning habitat above the old, decommissioned dam atop this reach, via removal of that dam. (Kings were not seen in this reach, possibly due to low flows, nor were Pinks seen there.) Most of the salmon that spawned in reach 5 ended up eaten by bears. Tracks of many individuals and age classes of both Black and Brown Bears were common among the partially eaten Chum carcasses in reach 5. There is little human presence in this canyon during the spawning season, so this is a good place to sustain bear populations.

Coho presented an interesting temporal pattern. A small early run was detected by fishing in the river below the pond about the time that the first chums were arriving. Four bright Coho were caught there on 7/26/02. No more Coho were detected in the system until 9/04/02, and this later run was already reddening in color when first seen in the ponds. One hypothesis is that the Coho wait out in the Inlet, to enter the system after the large numbers of Chum have dwindled. The Chum muddy the waters quite a bit, and Coho generally prefer a more dispersed spatial distribution. Our actual counts are probably very conservative estimates of the maximum number of Chums which held in the lower pond at one time, likely making it undesirable for Coho to enter. This leads to speculation that decreasing the Chum population might increase Coho.

The Coho smolt population, with three year age classes represented (as determined by measurements, interpreted by Dan Bosh, ADFG Sport Fish Biologist), seems to be very robust. Thirty Coho smolt could be consistently caught in minnow traps set for only five or ten minutes in parts of the lower pond. They were most abundant in the Southeast end of the pond, where groundwater enters the pond from a biologically productive, groundwater marsh. Their great abundance engenders the hypothesis that some of these silver smolt may have been spawned in nearby river systems. King Salmon smolt were also caught in these areas, but were less abundant. Chum fry were seen and netted for ID on 5/22/02, before outmigrating. Three Spine Sticklebacks were numerous in the minnow trap sets. Stickleback Biologists say they provide a good food source for salmon smolt, and salmon from systems with sticklebacks tend to be larger. We were concerned that some of the relict ponds to the Northeast of the large pond, fill with water during high tides and river events, then slowly dwindle, posing a danger to trapped smolt. Some smolt were trapped in these ponds, but sticklebacks were far more numerous there, somewhat alleviating our concern.

The first King Salmon were seen in the system on 6/11/02. The first Kings are already reported at the lower pond, in 2003 on 5/14. The first Chum seen were on 7/24, and Coho on 7/24, although the main Coho run started on 9/04. The first Pinks were seen on 7/26.

A few other species observed include: Dolly Varden are common throughout the system. We also trapped them easily above the lower dam. Therefore, they must be reproducing there, because no fish can upstream past the lower dam, and water has only been released from Eklutna Lake once since 1990, in 1996. A few rainbow trout were observed or caught in reaches 3, 4, and 5. One small (16") Burbot was caught in a minnow trap in the lower pond, and another was seen "gulping air" during high turbidity in reach 5 of the Eklutna above T Bird. Three Spine Sticklebacks were abundant around the lower river ponds. Small sculpin (~6") were caught or observed in reaches 1, 3, and 5.

The turbidity data indicate the current range of turbidity conditions in the system, and will be useful in assessing the effects of various proposed habitat restoration projects. There are no Alaska State standards setting turbidity limits for fish health. Turbidity is obviously a problem in the system, occurring at levels which can suffocate fish causing silt build up on the substrate spawning gravels. The Eklutna River above Thunderbird Creek (termed Eklutna Creek in the 2002 Eklutna Turbidity Data Chart attached) contributes the vast majority of the turbidity. The majority of this silt comes from a tributary creek, which flows through silt cliffs and enters the river about 2 straight line miles from The Eklutna Lake Dam, and a few smaller ones nearby downstream (see Chugach State Park map). The river ran clear before this silt creek, and the next major creek downriver was also clear. All the water is taken from Eklutna Lake for power generation and Anchorage water supply. This deprives the Eklutna River of from 90 to 95% of its natural flow. The turbidity contributed by this silt creek would probably not be a problem with natural dilution and flushing flows from the Lake.

Temperature could also be a problem, related to low flows in the Eklutna River above thunderbird Creek. Under Alaska State Standards, stream temperature is not to exceed 13 degrees Celsius for spawning, eggs, and fry. The Water Temperature Data presented show that 13 and 12 degrees were each reached once. Thirteen may be exceeded at times.

2002 EKLUTNA RIVER FISH COUNTS

Native Village of Eklutna - Marc Lamoreaux, Land and Environment Director

Reach 1 - Large pond in old gravel mines, on lower Eklutna River, just above tidal wetlands.
Reach 2 - River from ponds to Railroad Bridge (through old gravel mines).
Reach 3 - Railroad Bridge to Old Glenn Highway. Braided River through young trees.
Reach 4 - Eklutna River from Glenn Highway to Thunderbird Creek.
Reach 5 - Eklutna River above Thunderbird Creek.
Reach 6 - Thunderbird Creek from Eklutna River to Thunderbird Falls.

Total Numbers of each species (including dead) per reach (adding all counts)

Reach	1	2	3	4	5	6	Totals
Chum	462	83	45	602	917	81	2190
Coho	103	0	0	119	43	20	285
Kings	31	0	0	2	0	1	34
Pinks	36	3	10	59	0	4	112
Reds	0	0	0	2	0	0	2
Totals	632	86	55	784	960	106	2623

06/15/02

Reach	1	2	3	4	5	6	Totals
Chum	0	0	0	0	0	0	0
Coho	0	0	0	0	0	0	0
Kings	0	0	0	0	0	0	0
Pinks	0	0	0	0	0	0	0
Reds	0	0	0	0	0	0	0
							0

Comments - Full systsem survey done. Villager (Lee) reports first Kings seen in lower river ponds on 6/11. These are turbid.

06/19/02

Reach	1	2	3	4	5	6	Totals
Chum	0						0
Coho	0						0
Kings	6						6
Pinks	0						0
Reds	0						0
							6

Comments - These are observations of jumping Kings. Water is still too murky for an accurate count. The rest of the River was not surveyed systematically.
Experienced villager (Guy) estimates a dozen Kings, in the 40 lb. Range are holding in the pond.
Guy reports sighting of King above RR Bridge on 6/22/02

07/03/02 - 07/04/02

Reach	1	2	3	4	5	6	Totals
Chum	0	0	0	0	0	0	0
Coho	0	0	0	0	0	0	0
Kings	5	0	0	21	0	1	27
Pinks	0	0	0	0	0	0	0
Reds	0	0	0	0	0	0	0
							27

Comments - This is the most comprehensive count of Kings.
The pond observations are of King breaches.
We also walked down the river toward the Inlet from the ponds and found 0 salmon there.
We also surveyed the River from the highway to the ponds and found 0, although some could have been unseen in deeper holes.

07/09/02 - 07/12/02

Reach	1	2	3	4	5	6	Totals
Chum	0						0
Coho	0						0
Kings	14						14
Pinks	0						0
Reds	0						0
							14

Comments - Water low and clear 7/12, when 12 seen. All Kings were really red. There was another report of 6 Kings in the pond and 2 caught illegally there on 7/9. The additional 9 (14+2-5) might be added to the 27 above for a **max observed total of 36 Kings in the system.**

07/22/02

Comment - No new fish (Silvers or Chum) in the ponds - Just a few dead Kings.

07/24/02

Comment - Small school of Chum and 4 Kings, maybe a few Silvers in ponds -
Very low visibility.

07/24/02

Reach	1	2	3	4	5	6	Totals
Chum	12						12
Coho							0
Kings	4						4
Pinks							0
Reds							0
							16

Comments - Not complete survey

07/26/02

Reach	1	2	3	4	5	6	Totals
Chum	96						96
Coho	4						4
Kings	0						0
Pinks	5						5
Reds	0						0
							105

Comments - Not complete survey
Number of Coho uncertain. They are deeper in holes. Caught two just below pond. - bright.

07/31/02

Reach	1	2	3	4	5	6	Totals
Chum	280						280
Coho	0						0
Kings	2						2
Pinks	27						27
Reds	0						0
							309

Comments - Somewhat muddy. A few counted as Chums could be Coho.
Old dead King is 56" long.

2002 Maximum Counts
For Each Species

1051
131
36
42
2
1262

2002 Estimated Total Number Per Species

Chum	1,100
Coho	131
Kings	36
Pinks	45
Reds	2
Totals	1,314

2003 EKLUTNA RIVER FISH COUNTS

Native Village of Eklutna - Marc Lamoreaux, Land and Environment Director

Reach 1 - Large pond in old gravel mines, on lower Eklutna River, just above tidal wetlands.
Reach 2 - River from ponds to Railroad Bridge (through old gravel mines).
Reach 3 - Railroad Bridge to Old Glenn Highway. Braided River through young trees.
Reach 4 - Eklutna River from Glenn Highway to Thunderbird Creek.
Reach 5 - Eklutna River above Thunderbird Creek.
Reach 6 - Thunderbird Creek from Eklutna River to Thunderbird Falls.

7/7/2003

Reach	1	2	3	4	5	6	Totals
Chum		0	0	0	0	0	
Coho		0	0	0	0	0	
Kings		4	0	24	0	1	29
Pinks		0	0	0	0	0	
Reds		0	0	0	0	0	
							29

7/12/2003

Reach	1	2	3	4	5	6	Totals
Chum				0	0	0	
Coho				0	0	0	
Kings				3	0	0	3
Pinks				0	0	0	
Reds				0	0	0	
							3

seen Dogs & Silver swimming to pond 8-2-03	

8/1/2003

Reach	1	2	3	4	5	6	Totals
Chum		0	0	0	0	0	
Coho		0	0	0	0	0	
Kings		14	0	0	0	0	14
Pinks		0	0	0	0	0	
Reds		6	0	0	0	0	6
							20

8/22/2003

Reach	1	2	3	4	5	6	Totals
Chum	2	0	10	199/13D	15/29D	4	230/42D
Coho	1	0	0	15	1/1D	1	18/1D
Kings	0	0	0	0	0	0	
Pinks	0	0	1	15	1	1	18
Reds	0	0	1	17	1/1D	1	21
							274/43D

8/29/2003

Reach	1	2	3	4	5	6	Totals
Chum		1	0	8	0	0	9
Coho		0	0	0	0	0	

Kings		0	0	0	0	0	
Pinks		0	0	0	0	0	
Reds		0	0	5	0	0	5
							14

9/5/2003

Reach	1	2	3	4	5	6	Totals
Chum							0
Coho							0
Kings		No Fish					0
Pinks							0
Reds							0
							0

9/12/2003

Reach	1	2	3	4	5	6	Totals
Chum		0	0	0	0	0	
Coho		0	0	0	0	0	
Kings		0	0	0	0	0	
Pinks		0	0	0	0	0	
Reds		0	0	0	0	0	
							0

10/6/2003

Reach	1	2	3	4	5	6	Totals
Chum				0	0	0	
Coho				32	1	0	32
Kings				0	0	0	
Pinks				0	0	0	
Reds				0	0	0	
				0	0	0	32

10/10/2003

Reach	1	2	3	4	5	6	Totals
Chum				0	0	0	
Coho				39	0	0	39
Kings				0	0	0	
Pinks				0	0	0	
Reds				0	0	0	
Totals				0	0	0	39

10/19/2003

Reach	1	2	3	4	5	6	Totals
Chum				0	0	0	
Coho				17	0	0	17
Kings				0	0	0	
Pinks				0	0	0	
Reds				0	0	0	
Totals				0	0	0	17

2003 Maximum Count Of Each Species **2003 Estimated Total Number Per Species**

Chum	272
Coho	39
Kings	29
Pinks	18
Reds	21
Totals	379

Chum	275
Coho	60
Kings	44
Pinks	18
Reds	21
Totals	418

2002 + 2003 Mean Total # per Species

Chum	688
Coho	88
Kings	40
Pinks	32
Reds	12
Totals	860