Chelatna Lake
Sockeye Salmon Smolt
Data Report
2010–2012

Prepared by:
CIAA Staff
2013

The Chelatna Lake Project was made possible through an Alaska Sustainable Salmon Fund grant received from the Alaska Department of Fish and Game and the National Oceanic and Atmospheric Administration, and a State of Alaska Designated Legislative Grant.

This page was intentionally left blank

DISCLAIMER

The Cook Inlet Aquaculture Association (CIAA) conducts salmon enhancement and restoration projects in Area H, Cook, Inlet and associated waters. As an integral part of these projects a variety of monitoring and evaluation studies are conducted. The following data report is a synopsis of the monitoring and evaluation studies conducted for Chelatna Lake. This Chelatna Lake Data Report encompasses data collected from the 2010–2012 sockeye salmon smolt migrations.

The purpose of the data report is to provide a vehicle to distribute the information produced by the monitoring and evaluation studies. Data collected each year are presented with a summary of the information previously collected for comparative purposes. These reports are intended to provide a general description of project activity and are not an exhaustive evaluation of any restoration or enhancement project. The information presented in this report has not undergone an extensive review. As reviews are completed, the information may be updated and presented in other reports.

The Chelatna Lake Data Report was prepared by CIAA under award of the Alaska Sustainable Salmon Fund (45918) from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, administered by the Alaska Department of Fish and Game (ADF&G). The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration, the U.S. Department of Commerce, or ADF&G.

CIAA maintains a strong policy of equal employment opportunity for all employees and applicants for employment. We hire, train, promote, and compensate employees without regard for race, color, religion, sex, sexual orientation, national origin, age, marital status, disability or citizenship, as well as other classifications protected by applicable federal, state, or local laws.

Our equal employment opportunity philosophy applies to all aspects of employment with CIAA including recruiting, hiring, training, transfer, promotion, job benefits, pay, dismissal, and educational assistance.

This page was intentionally left blank

ACKNOWLEDGEMENTS

Many individuals and agencies contributed to the success of the Chelatna Lake Project. Appreciation is extended to Cook Inlet Aquaculture Association interns, seasonal assistants, and full-time staff who invested many hours in planning and executing this project over the years. Special thanks are also extended to the Alaska Department of Fish and Game for the support they provided during this project.

This page was intentionally left blank

TABLE OF CONTENTS

This page was intentionally left blank

LIST OF FIGURES

This page was intentionally left blank

LIST OF TABLES

This page was intentionally left blank

LIST OF APPENDICES

This page was intentionally left blank

ABSTRACT

As part of the continued evaluation of lakes in the Susitna River watershed to determine the sockeye salmon (*Onchorhynchus nerka*) abundance in key salmon producing lakes with and without northern pike (*Esox lucius*), Cook Inlet Aquaculture Association and the Alaska Department of Fish and Game agreed to monitor sockeye salmon smolt migrations from Chelatna Lake. Chelatna Lake was known to have a population of northern pike.

Limnological conditions are a key component in understanding Chelatna Lake productivity and rearing conditions throughout this monitoring study. Staff collected water chemistry samples 4 times each in 2010 and 2011; and zooplankton samples 5 times each in 2010 and 2011, and twice in 2012.

During the 2010 smolt migration, staff monitored environmental conditions from 17 May through 25 August. Water levels fluctuated 1.83 feet during that time period. Stream temperatures averaged 10.0ºC (±2.43) [mean ± standard deviation] and ranged from 3.0 to 15.0ºC. Air temperatures averaged 15.0ºC (±4.61) and ranged from 5.0 to 25.0ºC. Three percent of the days were clear, 41% were partly cloudy, 28% were completely overcast, and 28% had measured rainfall. A total of 504 mm of rain fell during that period.

The smolt migration was enumerated from 17 May through 25 August. During that time, 8,180 sockeye salmon smolt were captured while migrating from Chelatna Lake. Trap efficiency data were collected on 7 occasions. With a 95% confidence, the estimated number of sockeye salmon smolt migrating from Chelatna Lake was 278,129 (±66,146).

Throughout the migration, staff collected 1,242 sockeye salmon smolt, and took scale samples, weight and measurements for fork length. One sample was unreadable for age, so a total of 1,241 samples were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (99%), followed by age-0 (0.8%) and age-2 (0.2%). The average length of the sample age-1 sockeye salmon smolt was 89.7 mm (±0.3) and the average weight was 6.31 g (±0.09). The average length of the age-2 sockeye salmon smolt was 93.5 mm (±12.7) and the average weight was 7.30 g (±2.35). The average length of the age-0 sockeye salmon smolt was 69.8 mm (±3.1) and the average weight was 3.1 g (±0.40).

During the 2011 smolt migration, staff monitored environmental conditions from 16 May through 22 August. Water levels fluctuated 3.18 feet during that time period. Stream temperatures averaged 10.0ºC (±3.46) and ranged from 2.0 to 16.0ºC. Air temperatures averaged 15.0ºC (±4.59) and ranged from 5.0 to 27.0ºC. Two percent of the days were clear, 49% were partly cloudy, 25% were completely overcast, and 24% had measured rainfall. A total of 469 mm of rain fell during that period.

The smolt migration was enumerated from 16 May through 22 August. During that time, 31,507 sockeye salmon smolt were captured while migrating from Chelatna Lake. Trap efficiency data were collected on 6 occasions. With a 95% confidence, the estimated number of sockeye smolt migrating from Chelatna Lake was 336,399 (±44,135).

Throughout the migration, staff collected 2,332 sockeye salmon smolt, took scale samples, weight and measurements for fork length. Eight samples were unreadable for age, so a total of 2,324 samples were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (87.5%), followed by age-0 (9.0%) and age-2 (3.5%). The average length of the sampled age-1 sockeye salmon smolt was 94.7 mm (±0.4) and the weight was 7.97 g (±0.12). The average length of the age-2 sockeye salmon smolt was 109.2 mm (±1.8) and the average weight was 11.90 g (±0.55). The average length of the age-0 sockeye salmon smolt was 67.7 mm (±1.4) and the average weight was 3.3 g (±0.17)

During the same time period, staff also collected 120 coho salmon smolt, took scale samples, weight and measurements for fork length. Two samples were unreadable for age, so a total of 118 samples were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (66.1%), followed by age-2 (30.5%) and age 0 (3.4%). The average length of the sampled age-1 coho salmon smolt was 107 mm (±2.7) and the average weight was 13.6 g (±0.9). The average length of the age-2 coho smolt was 131 mm (±3.9) the average weight was 23.9 g (±2.2). The average length of the age-0 coho smolt was 60 mm (±4.0) and the average weight was 1.9 g (±0.65).

During the 2012 smolt migration, staff monitored environmental conditions from 22 May through 20 August. Water levels fluctuated 1.76 feet during that time period. Stream temperatures averaged 11ºC (±2.78) and ranged from 3.5 to 16.0ºC. Air temperatures averaged 14ºC (±4.82) and ranged from 6.0 to 26.0ºC. Six percent of the days were clear, 40% were partly cloudy, 31% were overcast, and 23% had measured rainfall.

The smolt migration was enumerated from 21 May through 21 August. During that time, 10,909 sockeye salmon smolt were captured while migrating from Chelatna Lake. Trap efficiency data were collected on 7 occasions. With a 95% confidence, the estimated number of sockeye salmon smolt migrating from Chelatna Lake was 397,917 (±109,154).

Throughout the migration, staff collected 1,976 sockeye salmon smolt, took scale samples, weight and measurements for fork length. A total of 758 representative samples were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (91%), followed by age-0 (7.9%) and age-2 (1.1%). The average length of the sampled age-1 sockeye salmon smolt was 89.2 mm (±0.8) and the average weight was 6.18 g (±0.21). The average length of the age-2 sockeye salmon smolt was 107.1 mm (±6.0) and

the average weight was 10.35 g (±1.21). The average length of the age-0 sockeye salmon smolt was 67.53 mm (±1.53) and the average weight was 3.12 g (±0.23).

During the same time period, staff collected 60 coho salmon smolt, took scale samples, weight, and measurements for fork length. All were readable samples and were used for analysis. Based on the samples read, there were 4 age classes. Within the sample, age-1 was the most abundant age class (81.7%), followed by age-2 (6.7%), age-0 (5.0%) and age-3 (5.0%). The average length of the sampled age-1 coho salmon smolt was 75 mm (±2.4) and the average weight was 4.7 g (±0.37). The average length of the age-2 coho salmon smolt was 87 mm (±11.5) and the average weight was 9.2 g (±0.97). The average length of the age-0 coho salmon smolt was 64 mm (±7.7) and the average weight was 2.7 g (±0.88). The average length of the age-3 coho salmon smolt was 128 mm (±27.2) and the average weight was 16.0 g (±10.21).

This page was intentionally left blank

INTRODUCTION AND PURPOSE

To better understand the recent low adult sockeye salmon (*Onchorhynchus nerka*) returns to Upper Cook Inlet, Cook Inlet Aquaculture Association (CIAA), in cooperation with the Alaska Department of Fish and Game (ADF&G), is assessing sockeye salmon populations at several key salmon producing lakes with and without northern pike (*Esox lucius*) in the Susitna River drainage. The overall objective of this effort is to enumerate smolt and adult returns and to assess the characteristics of these populations in terms of age composition, sex, and size. Additionally, for some lake systems, CIAA and/or ADF&G are recording environmental conditions and water quality measurements as well as taking genetic samples; and performing mark-recapture studies and hydroacoustic surveys. The goal is to collect sound biological data to provide the foundation on which decisions for management and rehabilitation strategies can be made. Understanding the adult-to-juvenile relationship will allow management biologists to analyze and evaluate the production and rearing condition of each lake.

The enumeration of smolt salmon migrations from Chelatna Lake was completed all years of a three-year effort (2010–2012) to enumerate juvenile sockeye salmon migrations from the Susitna River drainage. Chelatna Lake was chosen for enumeration because it is one of the three main sockeye salmon producing lakes in the drainage, and invasive northern pike were known to be present.

This page was intentionally left blank

PROJECT AREA

Chelatna Lake is located at the base of the Alaska Range approximately 68 km northwest of Talkeetna, Alaska (Figure 1). The lake is located in T27N, R12W, Section 35. The lake lies near Denali National Park between two 1,219 m mountains and has a surface elevation of 422 m. Chelatna Lake has a surface area of 1,581 ha, and drainage area of 1,075 km^2, a euphotic volume of 155.67 x 10^6 m^3, and total volume of 9.7 x 10^8 m^3. Chelatna Lake has a maximum depth of 125 m, a mean depth of 61 m, and a 27 km shoreline included with a 2.9 ha island (Figure 2) (Spafard and Edmundson, 2000). The major tributary of Chelatna Lake is Coffee Creek. The creek is glacier fed and produces the lake's semi-glacial characteristics. The lake's discharge forms Lake Creek, which flows 71 km to the Yentna River. Typical summer flows in Lake Creek range from 300 to 900 cfs, however, spring and fall freshet flows can exceed 900 cfs. Lake Creek typically has semi-clear flow. Turbidity in the creek is dependent on regional weather patterns and their effect on glacial melt at the head of the drainage (Fandrei, 1994).

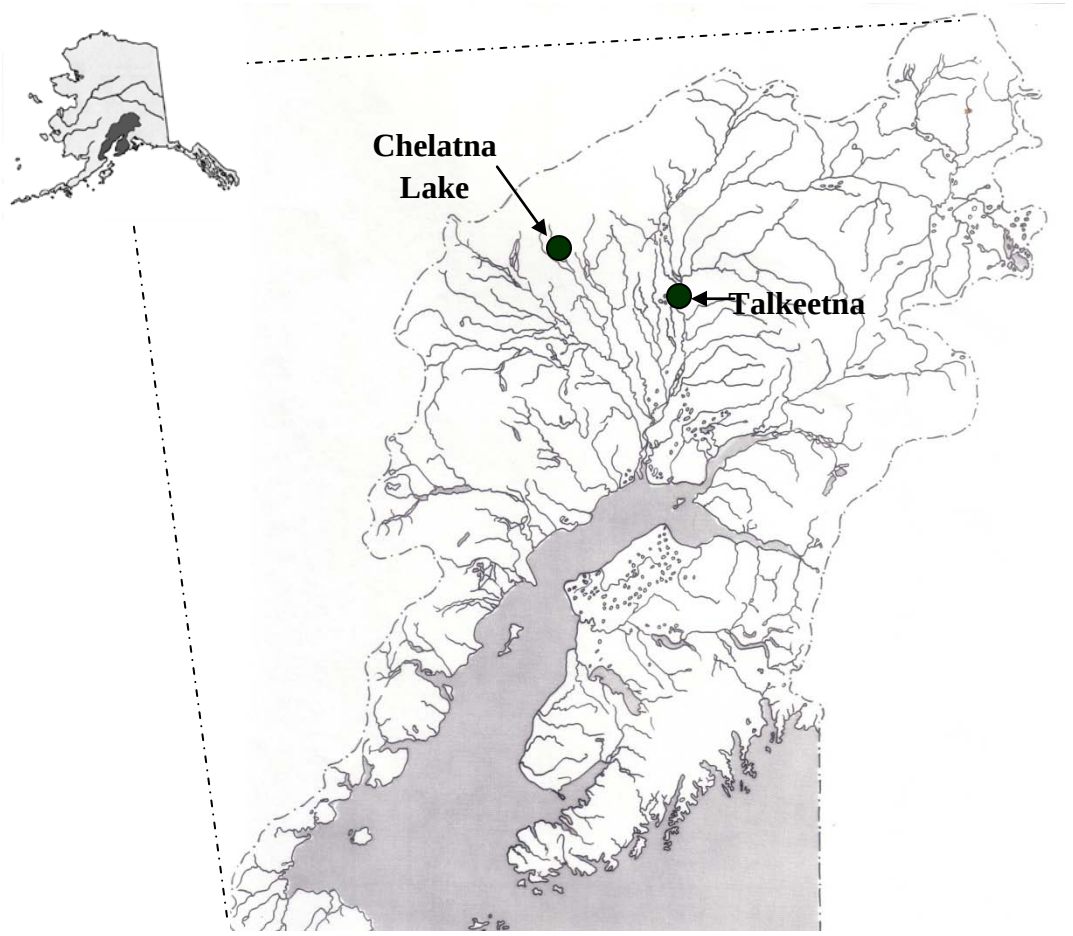


Figure 1: Chelatna Lake in relation to Cook Inlet and Alaska

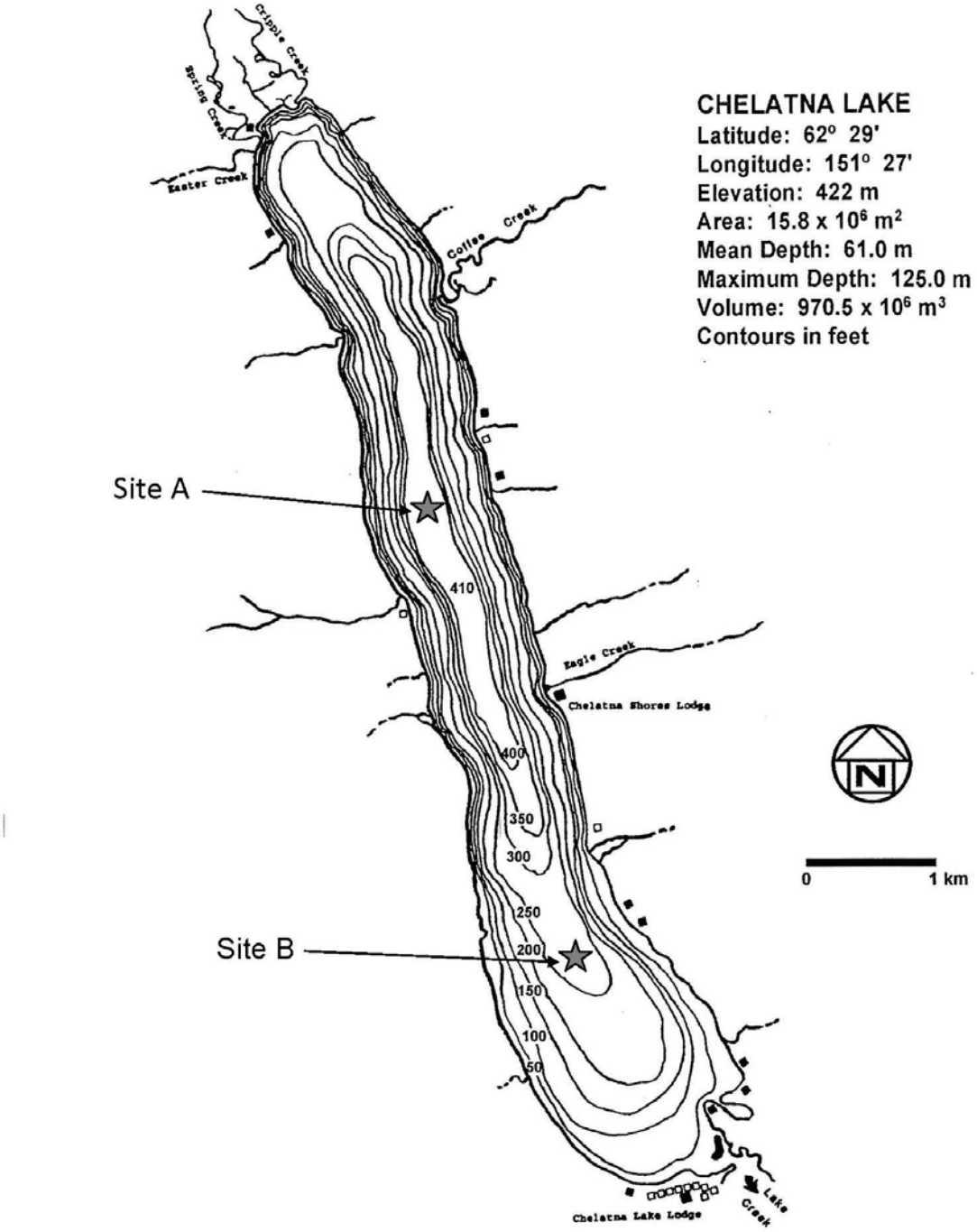


Figure 2: Bathymetric map of Chelatna Lake with limnology sampling sites

METHODS

Limnological Sampling

To assess water quality, limnological samples were collected between June and September of each year (2010, 2011, and 2012). However, in 2012 only zooplankton samples were collected and analyzed. Each sample consisted of a primary (A), and secondary (B) site (Figure 2). Measurements taken at the primary site were dissolved oxygen, temperature, light penetration profile, Secchi disk transparency, and zooplankton densities. Water samples taken at both 1 m and the hypolimnion were analyzed by ADF&G for phosphorous, carbon, chlorophyll a, phaeophytin a, nitrogen, calcium, magnesium, iron, conductivity, pH, alkalinity, turbidity, and color. The secondary site was sampled for zooplankton and Secchi disk transparency only. Sample collection and analysis procedures are described in Koenings, et al. (1987).

Environmental Conditions

To assess the environmental conditions during the sockeye salmon smolt migration at Chelatna Lake percent cloud cover was visually estimated, water level fluctuation recorded to the nearest 0.01 ft, precipitation measured to the nearest millimeter, and water and air temperatures (Celsius) were recorded at 5:00 PM daily. Standard CIAA procedures were followed for collecting these observations (CIAA, 2010, 2011, 2012).

Smolt Collection

To enumerate the smolt migration, floating and A-frame traps were temporarily placed in Lake Creek approximately 2 miles below the outlet of Chelatna Lake. The traps consisted of up to 3 inclined plane traps installed in mid-to-late May. Each trap was comprised of an inclined plane, double compartment live box, and an adjustment support. The adjustment supports were attached either to floats and anchored to the streambed or A-frames that rested on the substrate and sampled shallow reaches (up to 4 ft deep) of the stream. The inclined plane traps were stationed in the main flow of Lake Creek in order to maximize smolt capture. All smolt captured were released downstream from the traps to avoid multiple captures of the same individual.

Smolt Enumeration

Mark-recapture dye tests were conducted weekly whenever sufficient numbers of smolt were available, to determine the efficiency of the inclined plane traps. The 95% confidence level (expressed in numbers of smolt) of the estimated total smolt migration was calculated annually. Low confidence levels indicate a greater level of precision in estimating the total smolt migration. Staff attempted to use 1,000 smolt for each dye test. Dye testing still occurred in instances when fewer than 1,000 smolt were captured, but the resulting trap efficiencies had large confidence levels and care should be taken when interpreting those results. Captured smolt were marked with Bismark Brown Dye and released upstream of the traps after a short holding period for adjustment to the dye. The numbers of recaptures were counted for 3 days following release. Each trap had an efficiency value that may vary as environmental factors change during

the smolt migration. A detailed description of smolt mark/recapture procedures is available in CIAA Mark/Recapture Manual (2010).

Typically, traps are checked at least 5 times daily and all smolts enumerated. There were a number of days within all 3 years in which some hourly or daily data were not available due to either trap malfunction or flood conditions. Hours during which smolt were unable to be enumerated are represented by "ND" in the summary appendices. Daily numbers for each species captured were called into the CIAA office.

Statistical procedures for estimating the population of migrating smolts (*N*) followed the *simple stratified M-R design* for One-Site sampling experiments described by Carlson et al. (1998) where:

U = total unmarked population size;

N = total population size;

Nh = total population size in stratum h;

uh = total number of unmarked smolt captured in stratum h;

Mh = number of marked smolt released in stratum h;

mh = number of marked smolt recaptured in stratum h;

L = number of strata or periods; and

$$\hat{U} = \sum_{h=1}^{L} \hat{N}_h - M_h = \sum_{h=1}^{L} \frac{u_h\left(M_h + 1\right)}{m_h + 1}$$

The variance of the population estimate *v*(*N*) and the 95% confidence interval (*CI*) were estimated as:

$$v(\hat{N}) = \sum_{h=1}^{L} v(\hat{N}_h) = \sum_{h=1}^{L} \frac{(M_h + 1)(n_h + 1)(M_h - m_h)(n_h - m_h)}{(m_h + 1)^2 (m_h + 2)};$$

And,

$$(CI) = \hat{N} \pm 1.96\sqrt{v(\hat{N})}\,.$$

This method assumes:

- All marked fish released upstream pass the trap before the next release of marked fish;
- The probability that a dyed or unmarked fish enters the trap equals the trap efficiency for all dyed or marked fish;
- Fish are captured or not captured in the trap independently of the fate of other fish;
- All fish entering the trap are counted; and,
- Trap efficiencies do not change significantly during the mark-recapture period.

The proportions of age-1, age-2, and age-3 smolts were calculated using the data computed from the aforementioned notations and formulas with the following notations and formulas:

U_i = total unmarked population size for age class = i;

U_h = total unmarked population size for stratum = h;

U_{hi}= total unmarked population size for age class i, in stratum = h;

P_i = proportion of unmarked smolt for age class = i;

P_h = proportion of unmarked smolt for stratum = h;

P_{hi}= proportion of unmarked smolt for age class = i, in stratum = h;

a_i = total number of samples of age class = i;

The estimated number of migrating age = i smolt was calculated as:

$$U_i = \sum U_h P_{hi}$$

Proportion of age = i smolt was calculated as:

$$P_i = \frac{1}{U} \sum U_h P_{hi}$$

The variance of the proportion of age = i smolt in stratum = h was calculated as:

$$v(P_{hi}) = \frac{P_{hi}(1 - P_{hi})}{a_h - 1}$$

The variance of the number of age = i smolt in stratum = h was calculated as:

$$v(U_{hi}) = U_h^2 v(P_{hi}) + P_{hi}^{\ 2}(U_h) - v(U_h)(P_{hi})$$

Therefore, the variance of the estimated number of age = i smolt was calculated as:

$$v(U_i) = \sum v(U_{hi})$$

Confidence intervals (95%) estimates for number of age = i smolt are:

$$U_i \pm 1.96\sqrt{v(U_i)}$$

Smolt Characteristics

Age (scales), weight, and length (AWL) data were collected from a subsample of the migrating smolts. Random samples (up to n=40 for sockeye, and n=20 for coho) were collected daily. Each smolt collected for evaluation was first anesthetized with MS-222, then fork length[1] measured to the nearest millimeter and weighed to the nearest 0.1 gram. Approximately 10 scales were removed from the primary growth area[2] and mounted on a glass slide for subsequent age determination. AWL procedures are described in the Chelatna Lake Smolt Procedures Manual (2010, 2011, 2012).

[1] Fork length is defined as the length from the tip of the snout to the fork of the tail.

[2] Primary growth area is located above the lateral line on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin.

RESULTS

Limnological Sampling

Limnological conditions are a key component in understanding Chelatna Lake productivity and rearing conditions throughout this monitoring study. Water chemistry samples were collected 4 times each in 2010 and 2011. No water chemistry data were collected in 2012. A summary of limnological conditions provided by ADF&G is listed in Table 1. Zooplankton samples were collected 5 times each in 2010 and 2011, and twice in 2012. Seasonal biomass and densities are listed in Table 1. Details pertaining to species and size can be found in Appendices 15–17.

Table 1: Average open water season water quality characteristics of Chelatna Lake.

AVERAGE WATER QUALITY - 1 METER

Year	TP (ug/l)	TFP (ug/l)	FRP (ug/l)	TKN* (ug/l)	NH3+NH4NO2+NO3 (ug/l)	(ug/l)	TN:TP	RSi (ug/l)	Org C (ug/l)	Chla (ug/l)	Phaeo (ug/l)	Sp. Cond (umhos/cm)	pH (SU)	Alk (mg/l)	Turb (NTU)	Color (Pt)	Ca (mg/l)	Mg (mg/l)	Fe (ug/l)
2010	4.0	2.3	0.6	INC	11.3	237.9	132.5 :1	1649.3	93.3	0.5	0.1	27.8	6.7	9.8	0.9	3.3	3.3	0.9	38.5
2011	5.6	2.5	1.2	INC	2.8	146.3	57.8 :1	1529.0	159.0	0.5	0.2	25.8	7.6	10.5	2.0	14.3	3.9	0.8	153.8
2012	Not Sampled											Not Sampled							

AVERAGE WATER QUALITY - MIDHYPOLIMNION

Year	TP (ug/l)	TFP (ug/l)	FRP (ug/l)	TKN* (ug/l)	NH3+NH4NO2+NO3 (ug/l)	(ug/l)	TN:TP	RSi (ug/l)	Org C (ug/l)	Chla (ug/l)	Phaeo (ug/l)	Sp. Cond (umhos/cm)	pH (SU)	Alk (mg/l)	Turb (NTU)	Color (Pt)	Ca (mg/l)	Mg (mg/l)	Fe (ug/l)
2010	5.6	3.3	1.2	INC	8.8	253.2	101.0 :1	1692.6	265.1	0.4	0.2	29.0	6.7	9.9	0.6	3.3	3.4	1.1	12.8
2011	4.7	2.7	0.9	INC	4.4	166.8	79.0 :1	1592.0	158.8	0.8	0.2	26.2	6.8	9.8	2.4	7.3	3.5	0.8	100.4
2012	Not Sampled											Not Sampled							

Year	Secchi Sta	Secchi (m)	Secchi Sta	Secchi (m)	Zooplankton biomass (mg/m^2)	Zooplankton density (no/m^2)	EZD Sta	EZD (m)	EZD Sta	EZD (m)
2010	A	5.9	B	6.4	586	176,609	A	22.9	B	21.2
2011	A	3.8	B	4.0	731	192,944	A	14.8	B	22.2
2012	A	4.3	B	4.1	892	257,001	Not Sampled		Not Sampled	

ADF&G provided water quality analysis.
EZD and secchi provided by CIAA.
* - TKN was not completed due to malfunctioning equipment.

Environmental Conditions

During the 2010 smolt migration, staff monitored environmental conditions at 5:00 PM from 17 May through 25 August. Water levels fluctuated 1.83 feet during that time period. Stream temperatures averaged 10.0ºC (±2.43) [mean ± standard deviation] and ranged from 3.0 to 15.0ºC. Air temperatures averaged 15.0ºC (±4.61) and ranged from 5.0 to 25.0ºC. Three percent of the days were clear, 41% were partly cloudy, 28% were completely overcast, and 28% had measured rainfall. A total of 504 mm of rain fell during that period.

During the 2011 smolt migration, staff monitored environmental conditions at 5:00 PM from 16 May through 22 August. Water levels fluctuated 3.18 feet during that time period. Stream temperatures averaged 10.0ºC (±3.46) and ranged from 2.0 to 16.0ºC. Air temperatures averaged 15.0ºC (±4.59) and ranged from 5.0 to 27.0ºC. Two percent of the days were clear, 49% were partly cloudy, 25% were completely overcast, and 24% had measured rainfall. A total of 469 mm of rain fell during that period.

During the 2012 smolt migration, staff monitored environmental conditions at 5:00 PM from 22 May through 20 August. Water levels fluctuated 1.76 feet during that time period. Stream

temperatures averaged 11ºC (±2.78) and ranged from 3.5 to 16.0ºC. Air temperatures averaged 14ºC (±4.82) and ranged from 6.0 to 26.0ºC. Six percent of the days were clear, 40% were partly cloudy, 31% were overcast, and 23% had measured rainfall.

Smolt Enumeration and Characteristics

2010

The smolt migration was enumerated from 17 May through 25 August. During that time, 8,180 sockeye smolt were captured while migrating from Chelatna Lake. Trap efficiency data were collected on 7 occasions. However, only one mark-recapture test met the goal of 1,000 smolt released. With a 95% confidence, the estimated number of sockeye salmon smolt migrating from Chelatna Lake was 278,129 (±66,146) (Table 2). Other fish captured during that time were 4 coho salmon smolt (*O. kisutch).*

Table 2: Estimate of the total Chelatna smolt migration for 2010

Estimate of the Total Chelatna Smolt Migration for 2010										
	Sample Periods		Total Dyed Smolts Released	Total Dyed Smolts Recovered	Trap Efficiency (%)	Total Unmarked Captures	Migration Estimate of Unmarked Smolts	Variance Estimate		
No.	begin	end	M_h	m_h	e_n	u_h	U_h	$v(U_h)$	$SE(U_h)$	95% C.L.
1	17-May	26-May	0	0	ND	3	ND	ND	ND	ND
2	27-May	7-Jun	526	5	1.139%	566	49,188	346,572,196	18,616	36,488
3	8-Jun	20-Jun	141	3	2.817%	333	11,681	26,998,389	5,196	10,184
4	21-Jun	28-Jun	689	40	5.942%	1,903	31,337	22,498,656	4,743	9,297
5	29-Jun	5-Jul	760	21	2.891%	951	32,136	44,727,621	6,688	13,108
6	6-Jul	12-Jul	784	10	1.401%	1,028	72,578	438,336,014	20,936	41,035
7	13-Jul	25-Jul	1,241	95	7.729%	2,285	28,321	7,970,992	2,823	5,534
8	2-Aug	17-Aug	486	9	2.053%	1,096	52,889	251,820,352	15,869	31,103
9	18-Aug	25-Aug	0	0	ND	15	ND	ND	ND	ND
		Total	**4,627**	**183**	**3.955%**	**8,180**	**278,129**	**1,138,924,219**	**33,748**	**66,146**

ND = No Data

Throughout the migration, staff collected 1,242 sockeye salmon smolt, and took scale samples, weight and measurements for fork length. One sample was unreadable for age, so a total of 1,241 samples were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (99%), followed by age-0 (0.8%) and age-2 (0.2%). The average length of the sample age-1 sockeye salmon smolt was 89.7 mm (±0.3) and the average weight was 6.31 g (±0.09). The average length of the age-2 sockeye salmon smolt was 93.5 mm (±12.7) and the average weight was 7.30 g (±2.35). The average length of the age-0 sockeye salmon smolt was 69.8 mm (±3.1) and the average weight was 3.1 g (±0.40) (Table 3).

There were no AWL data collected on the 4 coho salmon smolt enumerated (Table 4).

Table 3: Chelatna Lake 2010–2012 sockeye salmon smolt AWL summary

	Age Class (%)						Mean length (mm)						Mean weight (g)					
Smolt Year	Age 0	95% C.I.	Age 1	95% C.I.	Age 2	95% C.I.	Age 0	SD	Age 1	SD	Age 2	SD	Age 0	SD	Age 1	SD	Age 2	SD
2010	0.8%	(±1.0%)	99.0%	(±0.0%)	0.2%	(±4.0%)	69.8	5.0	89.7	6.1	93.5	9.2	3.1	0.6	6.3	1.5	7.3	1.7
2011	9.0%	(±0.1%)	87.5%	(±0.0%)	3.5%	(±0.2%)	67.7	10.2	94.7	8.8	109.2	8.2	3.3	1.2	8.0	2.8	11.9	2.5
2012	7.9%	(±0.4%)	91.0%	(±0.0%)	1.1%	(±1.5%)	67.5	6.1	89.2	10.2	107.1	8.7	3.1	0.9	6.2	2.9	10.4	1.8
Mean	5.9%		89.3%		1.1%		67.5		89.2		107.1		3.1		6.2		10.4	

Table 4: Chelatna Lake 2010–2012 coho salmon smolt AWL summary

	Age Class (%)								Mean length (mm)								Mean weight (g)							
Smolt Year	Age 0	95% C.I.	Age 1	95% C.I.	Age 2	95% C.I.	Age 3	95% C.I.	Age 0	SD	Age 1	SD	Age 2	SD	Age 3	SD	Age 0	SD	Age 1	SD	Age 2	SD	Age 3	SD
2010	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
2011	3.4%	(±5.9%)	66.1%	(±0.4%)	30.5%	(±1.1%)			61.0	4.0	107.0	12.1	131.0	11.9			1.9	0.7	13.6	4.1	23.9	6.8		
2012	5.0%	(±10.6%)	81.7%	(±0.4%)	6.7%	(±8.0%)	5.0%	(±10.6%)	64.0	6.8	75.0	8.5	87.0	11.7	128.0	24.0	2.7	0.8	4.7	1.3	9.2	1.0	16.0	9.0
Mean	4.2%		73.9%		6.7%		5.0%		64.0		75.0		87.0		128.0		2.7		4.7		9.2		16.0	

ND = No Data

2011

The smolt migration was enumerated from 16 May through 22 August. During that time, 31,507 sockeye smolt were captured while migrating from Chelatna Lake. Trap efficiency data were collected on 6 occasions. However, only 3 mark-recapture tests met the goal of 1,000 smolt released. With a 95% confidence, the estimated number of sockeye smolt migrating from Chelatna Lake was 336,399 (±44,135) (Table 5). Other fish captured during that time were 244 coho salmon smolt, 1 Chinook salmon smolt (*O. tshawytscha*), and 5 juvenile rainbow trout (*O. mykiss*).

Table 5: Estimate of the total Chelatna smolt migration for 2011

Estimate of the Total Chelatna Smolt Migration for 2011										
	Sample Periods		Total Dyed Smolts Released	Total Dyed Smolts Recovered	Trap Efficiency (%)	Total Unmarked Captures	Migration Estimate of Unmarked Smolts	Variance Estimate		
No.	begin	end	M_h	m_h	e_n	u_h	U_h	$v(U_h)$	$SE(U_h)$	95% C.L.
1	16-May	11-Jun	255	9	3.906%	841	21,275	40,106,781	6,333	12,413
2	12-Jun	17-Jun	604	65	10.909%	9,158	83,344	93,054,358	9,646	18,907
3	18-Jun	21-Jun	1,000	203	20.380%	5,169	24,364	2,400,908	1,549	3,037
4	22-Jun	30-Jun	1,000	175	17.582%	8,435	46,974	10,495,570	3,240	6,350
5	1-Jul	25-Jul	1,000	42	4.296%	3,957	91,115	182,649,108	13,515	26,489
6	26-Jul	1-Aug	571	24	4.371%	3,055	69,327	178,348,424	13,355	26,175
7	2-Aug	22-Aug	0	0	ND	892	ND	ND	ND	ND
		Total	**4,430**	**518**	**11.693%**	**31,507**	**336,399**	**507,055,148**	**22,518**	**44,135**

ND = No Data

Throughout the migration, staff collected 2,332 sockeye salmon smolt, took scale samples, weight and measurements for fork length. Eight samples were unreadable for age, so a total of 2,324 samples were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (87.5%), followed by age-0 (9.0%) and age-2 (3.5%). The average length of the sampled age-1 sockeye salmon smolt was 94.7 mm (±0.4) and the weight was 7.97 g (±0.12). The average length of the age-2 sockeye salmon smolt was 109.2 mm (±1.8) and the average weight was 11.90 g (±0.55). The average length of the

age-0 sockeye salmon smolt was 67.7 mm (±1.4) and the average weight was 3.3 g (±0.17) (Table 3).

During the same time period, staff also collected 120 coho salmon smolt, took scale samples, weight and measurements for fork length. Two samples were unreadable for age, so a total of 118 samples were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (66.1%), followed by age-2 (30.5%) and age 0 (3.4%). The average length of the sampled age-1 coho salmon smolt was 107 mm (±2.7) and the average weight was 13.6 g (±0.9). The average length of the age-2 coho smolt was 131 mm (±3.9) the average weight was 23.9 g (±2.2). The average length of the age-0 coho smolt was 60 mm (±4.0) and the average weight was 1.9 g (±0.65) (Table 4).

2012

The smolt migration was enumerated from 21 May through 21 August. During that time, 10,909 sockeye smolt were captured while migrating from Chelatna Lake. Trap efficiency data were collected on 7 occasions. However, only 2 mark-recapture tests met the goal of 1,000 smolt released. With a 95% confidence, the estimated number of sockeye smolt migrating from Chelatna Lake was 397,917 (±109,154) (Table 6). Other fish captured during that time were 60 coho salmon smolt and 33 Chinook salmon smolt.

Table 6: Estimate of the total Chelatna smolt migration for 2012

Estimate of the Total Chelatna Smolt Migration for 2012										
Sample Periods			Total Dyed Smolts Released	Total Dyed Smolts Recovered	Trap Efficiency (%)	Total Unmarked Captures	Migration Estimate of Unmarked Smolts	Variance Estimate		
No.	begin	end	M_h	m_h	e_n	u_h	U_h	$v(U_h)$	$SE(U_h)$	95% C.L.
1	21-May	3-Jul	260	2	1.149%	775	67,165	1,122,015,684	33,497	65,653
2	4-Jul	10-Jul	244	10	4.490%	328	7,061	4,130,840	2,032	3,984
3	11-Jul	19-Jul	1,027	33	3.307%	2,651	79,127	175,346,371	13,242	25,954
4	20-Jul	26-Jul	736	33	4.613%	1,303	27,508	21,206,952	4,605	9,026
5	27-Jul	2-Aug	902	11	1.329%	1,998	149,448	1,707,144,453	41,318	80,983
6	3-Aug	7-Aug	0	0	ND	47	ND	ND	ND	ND
7	8-Aug	12-Aug	528	30	5.860%	2,782	46,945	65,610,491	8,100	15,876
8	13-Aug	20-Aug	1,560	71	4.612%	1,025	20,663	6,011,813	2,452	4,806
		Total	**5,257**	**190**	**3.614%**	**10,909**	**397,917**	**3,101,466,603**	**55,691**	**109,154**

ND = No Data

Throughout the migration, staff collected 1,976 sockeye salmon smolt, took scale samples, weight and measurements for fork length. A total of 758 representative samples (approximately 200 each from the beginning, middle, and end of the migration) were used for analysis. Based on the samples read, there were 3 age classes. Within the sample, age-1 was the most abundant age class (91%), followed by age-0 (7.9%) and age-2 (1.1%). The average length of the sampled age-1 sockeye salmon smolt was 89.2 mm (±0.8) and the average weight was 6.18 g (±0.21). The average length of the age-2 sockeye salmon smolt was 107.1 mm (±6.0) and the average weight was 10.35 g (±1.21). The average length of the age-0 sockeye salmon smolt was 67.53 mm (±1.53) and the average weight was 3.12 g (±0.23) (Table 3).

During the same time period, staff collected 60 coho salmon smolt, took scale samples, weight, and measurements for fork length. All were readable samples and were used for analysis. Based on the samples read, there were 4 age classes. Within the sample, age-1 was the most abundant age class (81.7%), followed by age-2 (6.7%), age-0 (5.0%) and age-3 (5.0%). The average length of the sampled age-1 coho salmon smolt was 75 mm (±2.4) and the average weight was 4.7 g (±0.37). The average length of the age-2 coho salmon smolt was 87 mm (±11.5) and the average weight was 9.2 g (±0.97). The average length of the age-0 coho salmon smolt was 64 mm (±7.7) and the average weight was 2.7 g (±0.88). The average length of the age-3 coho salmon smolt was 128 mm (±27.2) and the average weight was 16.0 g (±10.21) (Table 4).

This page was intentionally left blank

RECOMMENDATIONS

Chelanta Lake is one of the major sockeye salmon producers in the Susitna River drainage. Because northern pike are present in Chelatna Lake, it is important to estimate the smolt migration every five years to ensure the health of the population. The project should continue to collect data consistent with previous monitoring efforts in order to provide further comparative data.

This page was intentionally left blank

LITERATURE CITED

Carlson, S.R., Coggins, L.G., and C.O. Swanton. 1998. A Simple Stratified Design for Mark-Recapture Estimation of Salmon Smolt Runs. Alaska Fishery Research Bulletin. 5(2): 88–102.

CIAA, 2010. Chelatna Lake Smolt Procedures Manual. Cook Inlet Aquaculture Association.

CIAA, 2010. Mark/Recapture Procedures Manual. Cook Inlet Aquaculture Association.

CIAA, 2011. Chelatna Lake Smolt Procedures Manual. Cook Inlet Aquaculture Association.

CIAA, 2012. Chelatna Lake Smolt Procedures Manual. Cook Inlet Aquaculture Association.

Fandrei, Gary. 1994. Chelatna Lake Sockeye Salmon Enhancement Progress Report. Cook Inlet Aquaculture Association. 17–18.

Koenings, J.P., J.A. Edmundson, J.M. Edmundson, G.B. Kyle. 1987. Limnology Field and Laboratory Manual: Methods for Assessing Aquatic Production. Alaska Department of Fish and Game Division of Fisheries Rehabilitation, Enhancement, and Development.

Spafard, M.A., and J.A. Edmundson. 2000. A Morphometric Atlas of Alaskan Lakes: Cook Inlet, Prince William Sound, and Bristol Bay Areas. Alaska Department of Fish and Game Regional Information Report. 2A00-23: 24.

This page was intentionally left blank

APPENDICES

Appendix 1: Chelatna Lake 2010 environmental conditions

Smolt Migration

Date	Sky	Precip. (mm)	Stage* (ft)	Water Temp. (°C)	Air Temp. (°C)
17-May	1	0.0	0.00	3	15
18-May	2	0.0	0.02	4	16
19-May	4	0.0	0.15	4	19
20-May	1	10.9	0.46	5	16
21-May	2	0.0	0.46	7	19
22-May	2	0.0	0.47	8	15
23-May	3	0.0	0.50	9	16
24-May	1	0.0	0.51	9	20
25-May	3	0.0	0.58	8	21
26-May	2	0.0	0.66	9	23
27-May	5	0.0	0.80	9	17
28-May	3	2.0	0.92	7	21
29-May	3	0.0	0.99	8	24
30-May	2	0.5	1.10	8	22
31-May	3	0.3	1.09	8	22
1-Jun	5	3.6	1.11	8	10
2-Jun	3	4.1	1.12	8	21
3-Jun	5	3.8	1.13	8	9
4-Jun	5	12.2	1.11	8	6
5-Jun	4	5.3	0.98	8	15
6-Jun	2	0.0	0.82	8	20
7-Jun	3	0.0	0.74	9	18
8-Jun	5	0.8	0.70	7	9
9-Jun	4	0.3	0.62	8	12
10-Jun	4	1.0	0.60	8	10
11-Jun	4	1.5	0.53	9	18
12-Jun	4	1.3	0.47	9	10
13-Jun	4	0.3	0.39	9	13
14-Jun	5	0.8	0.35	8	11
15-Jun	5	29.2	0.58	7	6
16-Jun	5	9.1	0.67	6	5
17-Jun	5	16.3	0.76	7	9
18-Jun	5	11.7	0.73	9	10
19-Jun	4	1.3	0.68	9	15
20-Jun	3	0.3	0.65	10	19
21-Jun	3	0.0	0.60	12	23
22-Jun	4	0.0	0.60	11	17
23-Jun	2	0.0	0.56	13	25
24-Jun	2	0.0	0.58	12	21
25-Jun	2	2.5	0.60	12	17
26-Jun	4	0.0	0.58	11	13
27-Jun	4	16.3	0.60	10	12
28-Jun	3	3.8	0.60	10	16
29-Jun	4	0.0	0.61	10	13
30-Jun	4	4.6	0.66	10	14
1-Jul	3	0.0	0.62	12	19
2-Jul	4	0.8	0.58	11	17
3-Jul	4	5.1	0.54	11	14
4-Jul	4	1.8	0.47	10	10
5-Jul	5	11.7	0.60	9	10
6-Jul	3	2.0	0.70	12	11
7-Jul	3	0.0	0.68	13	20
8-Jul	2	0.0	0.65	13	22
9-Jul	2	0.0	0.56	14	21
10-Jul	5	6.4	0.56	13	13
11-Jul	4	7.4	0.65	11	11
12-Jul	3	0.0	0.61	14	22
13-Jul	5	7.9	0.59	12	13
14-Jul	5	0.0	0.58	12	15
15-Jul	3	8.6	0.52	13	14
16-Jul	3	0.3	0.46	13	22
17-Jul	4	0.0	0.40	12	13
18-Jul	5	20.8	0.44	11	11
19-Jul	5	14.7	0.56	11	11
20-Jul	5	7.6	0.58	11	10
21-Jul	4	15.2	0.68	11	14
22-Jul	3	2.0	0.64	13	15
23-Jul	4	4.6	0.62	11	13
24-Jul	5	18.8	0.80	10	7
25-Jul	5	19.8	1.52	10	9
26-Jul	5	25.4	1.76	10	10
27-Jul	3	10.7	1.82	10	15
28-Jul	5	7.6	1.64	9	10
29-Jul	5	8.1	1.50	9	12
30-Jul	3	5.1	1.32	11	18
31-Jul	3	4.3	1.22	13	18
1-Aug	4	0.8	1.04	13	16
2-Aug	3	2.8	0.89	13	17
3-Aug	3	0.3	0.76	15	22
4-Aug	5	18.5	0.85	13	14
5-Aug	3	7.6	1.02	15	17
6-Aug	4	1.5	1.00	12	13
7-Aug	4	0.3	0.92	12	11
8-Aug	4	1.8	0.88	13	11
9-Aug	4	18.3	1.04	10	11
10-Aug	5	10.4	1.42	10	10
11-Aug	5	14.7	1.74	9	10
12-Aug	5	9.7	1.72	9	10
13-Aug	4	10.2	1.69	12	16
14-Aug	5	3.8	1.54	10	16
15-Aug	5	0.5	1.38	13	18
16-Aug	4	10.4	1.31	11	10
17-Aug	4	30.5	1.82	11	12
18-Aug	2	0.8	1.83	12	15
19-Aug	2	0.0	1.60	12	18
20-Aug	2	0.0	1.36	12	20
21-Aug	3	0.3	1.12	12	15
22-Aug	3	1.0	0.90	13	18
23-Aug	2	0.0	0.72	14	20
24-Aug	2	0.0	0.59	14	21
25-Aug	2	0.0	0.44	13	20
Total		504			
Avg.		5.0	0.83	10	15
Min.		0.0	0.00	3	5
Max.		30.5	1.83	15	25

* - Does not reflect actual depth, only water level fluctuation.

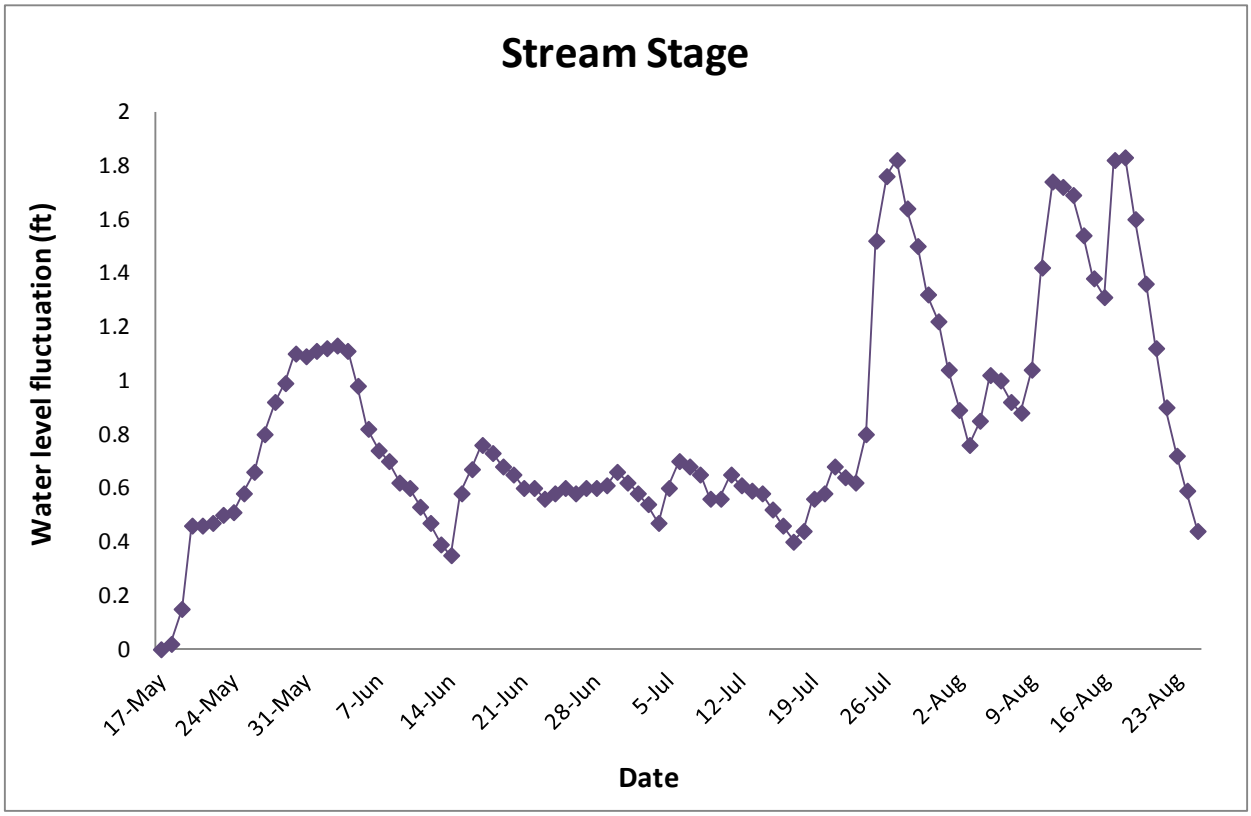
Summary of Cloud Cover - Percent of Days

	No. Days	Clear	Partly Cloudy	Overcast	Rain
Smolt	101	3%	42%	28%	28%

ND = No Data

1.0 = Clear
2.0 = Cloud Cover <50%
3.0 = Cloud Cover>50%
4.0 = Overcast
5.0 = Rain

Appendix 2: Chelatna Lake 2010 water level fluctuation



Appendix 3: Chelatna Lake 2011 environmental conditions

Smolt Migration

Date	Sky	Precip. (mm)	Stage* (ft)	Water Temp. (°C)	Air Temp. (°C)
16-May	3	0.0	0	2	13
17-May	3	0.0	0.09	2	15
18-May	2	0.0	0.20	2	19
19-May	4	0.0	0.25	2	12
20-May	3	1.0	0.33	2	6
21-May	4	0.8	0.48	2	14
22-May	3	0.3	0.43	6	14
23-May	2	1.3	0.63	7	16
24-May	3	0.0	0.67	11	18
25-May	2	0.0	0.73	12	19
26-May	3	0.0	0.78	11	21
27-May	1	0.0	0.88	9	27
28-May	2	0.0	1.03	9	22
29-May	1	0.0	1.21	9	22
30-May	2	0.0	1.38	7	24
31-May	5	0.5	1.58	5	13
1-Jun	5	1.3	1.58	4	12
2-Jun	4	0.5	1.53	5	14
3-Jun	5	5.1	1.48	5	8
4-Jun	5	11.4	1.48	5	8
5-Jun	3	12.7	1.43	7	14
6-Jun	3	0.8	1.28	8	16
7-Jun	5	0.3	1.13	7	10
8-Jun	3	0.3	1.03	8	17
9-Jun	3	0.0	0.93	7	14
10-Jun	4	0.5	0.88	8	13
11-Jun	5	0.0	0.83	7	14
12-Jun	3	0.0	0.78	7	14
13-Jun	4	0.0	0.78	7	12
14-Jun	5	5.6	0.78	7	7
15-Jun	3	8.6	0.78	8	16
16-Jun	2	0.3	0.73	8	15
17-Jun	2	0.0	0.73	10	20
18-Jun	5	0.0	0.78	13	20
19-Jun	4	2.3	0.83	11	16
20-Jun	4	16.5	0.98	7	11
21-Jun	4	0.5	0.98	8	15
22-Jun	3	0.0	0.93	9	15
23-Jun	3	0.0	0.83	10	17
24-Jun	2	0.0	0.81	12	21
25-Jun	4	8.1	0.83	12	14
26-Jun	3	0.5	0.83	11	18
27-Jun	5	5.1	0.88	11	10
28-Jun	4	3.8	0.98	12	17
29-Jun	3	0.3	0.93	13	19
30-Jun	3	0.0	0.98	13	16
1-Jul	3	0.0	0.83	11	19
2-Jul	4	3.6	0.78	11	11
3-Jul	4	31.8	0.88	11	11
4-Jul	4	16.8	1.08	10	10
5-Jul	3	0.5	1.03	13	19
6-Jul	2	0.0	0.98	14	20
7-Jul	2	0.0	0.88	14	19
8-Jul	3	0.0	0.83	12	16
9-Jul	4	0.0	0.73	11	12
10-Jul	4	0.0	0.63	12	15
11-Jul	5	2.0	0.53	12	10
12-Jul	4	10.2	0.53	13	14
13-Jul	3	1.5	0.58	14	20
14-Jul	5	1.3	0.57	14	15
15-Jul	3	3.8	0.53	16	21
16-Jul	3	0.0	0.49	15	17
17-Jul	5	7.9	0.58	13	11
18-Jul	5	20.8	0.84	12	12
19-Jul	2	0.8	0.88	14	20
20-Jul	2	0.0	0.78	14	22
21-Jul	2	0.0	0.73	16	21
22-Jul	3	0.0	0.74	16	25
23-Jul	5	6.4	0.77	13	9
24-Jul	5	17.8	0.88	13	12
25-Jul	4	10.9	1.01	13	11
26-Jul	3	0.5	1.03	13	15
27-Jul	2	0.0	0.98	15	20
28-Jul	3	0.0	0.88	15	20
29-Jul	4	0.0	0.78	15	17
30-Jul	4	0.0	0.73	15	18
31-Jul	4	4.6	0.68	14	14
1-Aug	5	20.3	0.87	11	9
2-Aug	5	35.6	2.08	10	9
3-Aug	5	13.2	2.68	10	12
4-Aug	5	20.3	2.68	11	8
5-Aug	5	12.2	3.18	10	8
6-Aug	5	12.7	2.88	10	5
7-Aug	3	33.0	2.78	10	11
8-Aug	5	5.6	2.58	10	7
9-Aug	4	35.6	2.53	10	10
10-Aug	2	0.8	2.18	11	16
11-Aug	2	0.0	1.90	12	21
12-Aug	5	0.0	1.63	12	14
13-Aug	4	1.8	1.38	11	15
14-Aug	3	0.5	1.23	12	15
15-Aug	2	1.3	1.03	13	22
16-Aug	2	0.0	0.93	13	23
17-Aug	3	12.2	0.86	13	15
18-Aug	3	12.2	0.93	12	15
19-Aug	5	6.1	0.90	11	10
20-Aug	4	11.4	0.97	11	12
21-Aug	4	2.3	1.00	11	13
22-Aug	4	2.5	0.96	10	11
Total		469			
Avg.		4.7	1.04	10	15
Min.		0.0	0.00	2	5
Max.		35.6	3.18	16	27

* - Does not reflect actual water depth, only water level fluctuation

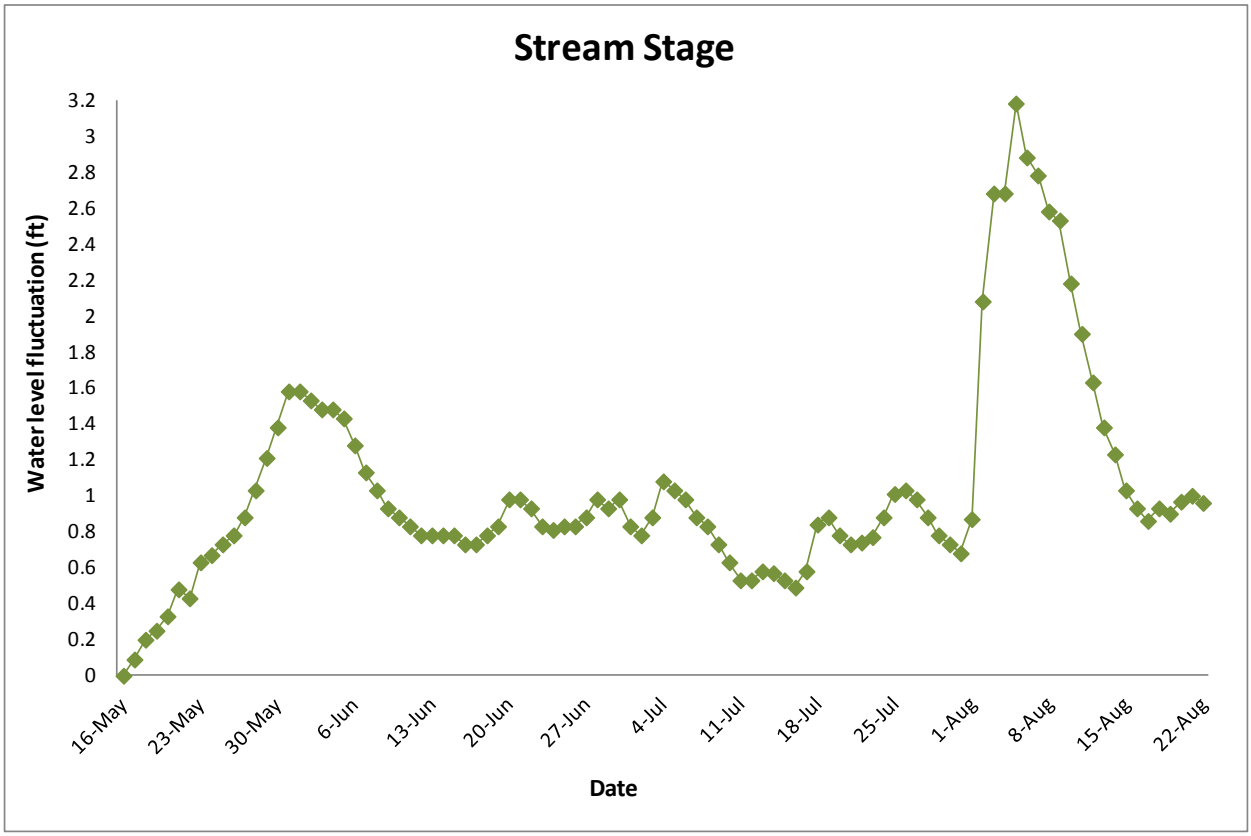
Summary of Cloud Cover - Percent of Days

	No. Days	Clear	Partly Cloudy	Overcast	Rain
Smolt	99	4%	48%	25%	24%

ND = No Data

1.0 = Clear
2.0 = Cloud Cover <50%
3.0 = Cloud Cover>50%
4.0 = Overcast
5.0 = Rain

Appendix 4: Chelatna Lake 2011 water level fluctuation



Appendix 5: Chelatna Lake 2012 environmental conditions

Smolt Migration

Date	Sky	Precip. (mm)	Stage (ft)	Water Temp. (°C)	Air Temp. (°C)
22-May	4	0.0	0.00	5	10
23-May	1	0.0	0.11	7	17
24-May	5	2.3	0.24	6	7
25-May	3	8.1	0.46	4	12
26-May	4	0.1	0.49	11	15
27-May	4	0.0	0.47	7	8
28-May	2	3.6	0.49	8	12
29-May	2	2.2	0.44	6	8
30-May	3	1.0	0.40	10	15
31-May	4	1.2	0.31	7	9
1-Jun	2	0.0	0.26	7	15
2-Jun	2	0.0	0.23	8	20
3-Jun	4	0.0	0.23	9	16
4-Jun	4	5.1	0.37	5	8
5-Jun	2	5.8	0.43	7	13
6-Jun	4	0.0	0.39	8	10
7-Jun	3	22.9	0.48	11	24
8-Jun	6	4.3	0.59	6	10
9-Jun	4	14.0	0.94	7	12
10-Jun	4	0.4	0.96	9	17
11-Jun	4	3.3	1.01	8	13
12-Jun	5	4.6	0.95	6	6
13-Jun	5	5.3	0.94	6	6
14-Jun	2	0.0	0.82	6	9
15-Jun	2	0.0	0.73	8	14
16-Jun	3	0.0	0.69	9	11
17-Jun	2	0.0	0.63	10	17
18-Jun	3	0.0	0.63	11	23
19-Jun	2	1.3	1.02	11	11
20-Jun	3	0.8	0.81	11	16
21-Jun	3	0.0	0.91	10	22
22-Jun	2	0.0	0.92	12	25
23-Jun	3	0.0	0.97	13	25
24-Jun	5	12.7	1.02	11	11
25-Jun	4	9.1	1.16	10	13
26-Jun	5	6.1	1.15	9	11
27-Jun	4	1.0	1.01	11	15
28-Jun	4	5.1	0.81	9	11
29-Jun	2	0.0	0.69	11	21
30-Jun	5	1.3	0.61	12	13
1-Jul	4	8.6	0.43	13	18
2-Jul	4	0.0	0.43	12	14
3-Jul	4	0.5	0.39	10	11
4-Jul	3	11.7	0.45	9	12
5-Jul	3	3.1	0.39	11	18
6-Jul	2	1.8	0.31	14	26
7-Jul	4	3.1	0.25	12	16
8-Jul	4	15.2	0.45	10	9
9-Jul	3	2.0	0.37	11	16
10-Jul	4	0.0	0.35	12	12
11-Jul	4	0.0	0.25	10	12
12-Jul	4	2.8	0.21	11	12
13-Jul	4	1.5	0.19	11	13
14-Jul	5	5.6	0.17	11	11
15-Jul	5	6.6	0.19	12	11
16-Jul	5	0.5	0.19	12	12
17-Jul	1	0.0	0.15	14	22
18-Jul	1	0.0	0.11	15	24
19-Jul	2	0.0	0.09	15	21
20-Jul	5	0.3	0.07	14	14
21-Jul	5	26.7	0.31	11	12
22-Jul	5	15.2	0.47	11	11
23-Jul	4	10.2	0.69	12	11
24-Jul	4	0.0	0.83	12	14
25-Jul	2	0.0	0.75	14	19
26-Jul	2	0.0	0.62	13	16
27-Jul	1	0.0	0.58	14	17
28-Jul	3	0.0	0.49	12	15
29-Jul	4	0.5	0.41	11	13
30-Jul	5	31.8	0.61	12	10
31-Jul	3	2.0	0.59	13	15
1-Aug	5	12.7	0.61	11	8
2-Aug	5	17.3	1.11	11	13
3-Aug	4	5.6	1.51	11	11
4-Aug	5	20.8	1.61	11	8
5-Aug	4	1.3	1.43	10	10
6-Aug	3	0.0	1.23	10	18
7-Aug	5	1.3	1.09	12	11
8-Aug	1	0.0	0.71	15	18
9-Aug	3	0.3	0.66	15	21
10-Aug	3	0.0	0.53	14	20
11-Aug	2	0.0	0.43	15	21
12-Aug	2	0.0	0.35	14	19
13-Aug	2	0.0	0.21	16	22
14-Aug	2	0.0	0.11	15	20
15-Aug	4	0.0	0.03	14	16
16-Aug	3	4.3	-0.03	15	14
17-Aug	5	1.8	-0.09	13	10
18-Aug	5	1.8	-0.15	11	8
19-Aug	5	33.0	0.29	9	8
20-Aug	5	20.8	1.01	10	11
Total		392			
Avg.		4.3	0.55	11	14
Min.		0.0	-0.15	4	6
Max.		33.0	1.61	16	26

* - Does not reflect actual depth, only water level fluctuation.

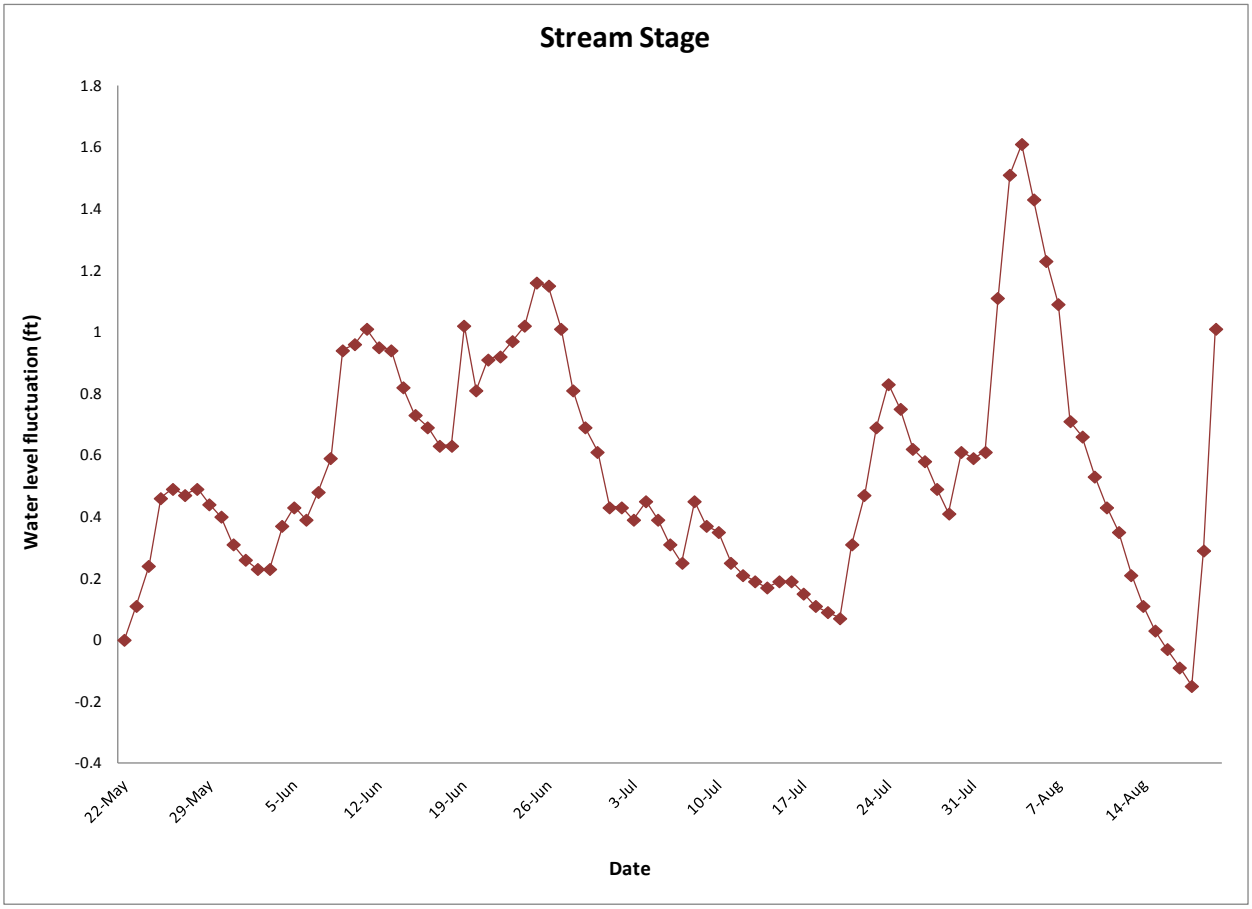
Summary of Cloud Cover - Percent of Days

	No. Days	Clear	Partly Cloudy	Overcast	Rain
Smolt	91	5%	40%	31%	23%

ND = No Data

1.0 = Clear
2.0 = Cloud Cover <50%
3.0 = Cloud Cover>50%
4.0 = Overcast
5.0 = Rain

Appendix 6: Chelatna Lake 2012 water level fluctuation



Appendix 7: 2010 Chelatna Lake daily smolt migration

	Sockeye				Coho			King		Pink		Chum		Rainbow	
Date	Daily	Mort.	Total	Trap	Daily	Mort.	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total
17-May	0	0	0	ND	0	0	0	0	0	0	0	0	0	0	0
18-May	1	0	1	ND	0	0	0	0	0	0	0	0	0	0	0
19-May	0	0	1	ND	1	0	1	0	0	0	0	0	0	0	0
20-May	2	0	3	ND	1	0	2	0	0	0	0	0	0	0	0
21-May	ND	0	3	ND	ND	0	2	ND	0	ND	0	ND	0	ND	0
22-May	ND	0	3	ND	ND	0	2	ND	0	ND	0	ND	0	ND	0
23-May	ND	0	3	ND	ND	0	2	ND	0	ND	0	ND	0	ND	0
24-May	ND	0	3	ND	ND	0	2	ND	0	ND	0	ND	0	ND	0
25-May	ND	0	3	ND	ND	0	2	ND	0	ND	0	ND	0	ND	0
26-May	ND	0	3	ND	ND	0	2	ND	0	ND	0	ND	0	ND	0
27-May	1	0	4	1.52%	0	0	2	0	0	0	0	0	0	0	0
28-May	1	0	5	1.52%	0	0	2	0	0	0	0	0	0	0	0
29-May	9	0	14	1.52%	0	0	2	0	0	0	0	0	0	0	0
30-May	531	0	545	1.52%	0	0	2	0	0	0	0	0	0	0	0
31-May	8	0	553	1.52%	0	0	2	0	0	0	0	0	0	0	0
1-Jun	1	0	554	1.52%	0	0	2	0	0	0	0	0	0	0	0
2-Jun	12	0	566	1.52%	0	0	2	0	0	0	0	0	0	0	0
3-Jun	0	0	566	1.52%	0	0	2	0	0	0	0	0	0	0	0
4-Jun	0	0	566	1.52%	0	0	2	0	0	0	0	0	0	0	0
5-Jun	1	0	567	1.52%	0	0	2	0	0	0	0	0	0	0	0
6-Jun	0	0	567	1.52%	0	0	2	0	0	0	0	0	0	0	0
7-Jun	2	0	569	1.52%	0	0	2	0	0	0	0	0	0	0	0
8-Jun	0	0	569	2.13%	0	0	2	0	0	0	0	0	0	0	0
9-Jun	0	0	569	2.13%	0	0	2	0	0	0	0	0	0	0	0
10-Jun	0	0	569	2.13%	0	0	2	0	0	0	0	0	0	0	0
11-Jun	1	0	570	2.13%	0	0	2	0	0	0	0	0	0	0	0
12-Jun	0	0	570	2.13%	0	0	2	0	0	0	0	0	0	0	0
13-Jun	0	0	570	2.13%	0	0	2	0	0	0	0	0	0	0	0
14-Jun	141	0	711	2.13%	0	0	2	0	0	0	0	0	0	0	0
15-Jun	0	0	711	2.13%	0	0	2	0	0	0	0	0	0	0	0
16-Jun	0	0	711	2.13%	0	0	2	0	0	0	0	0	0	0	0
17-Jun	0	0	711	2.13%	0	0	2	0	0	0	0	0	0	0	0
18-Jun	31	0	742	2.13%	0	0	2	0	0	0	0	0	0	0	0
19-Jun	23	0	765	2.13%	0	0	2	0	0	0	0	0	0	0	0
20-Jun	137	0	902	2.13%	0	0	2	0	0	0	0	0	0	0	0
21-Jun	0	0	902	5.85%	0	0	2	0	0	0	0	0	0	0	0
22-Jun	260	0	1,162	5.85%	0	0	2	0	0	0	0	0	0	0	0
23-Jun	78	0	1,240	5.85%	0	0	2	0	0	0	0	0	0	0	0
24-Jun	1,150	0	2,390	5.85%	1	0	3	0	0	0	0	0	0	0	0
25-Jun	306	0	2,696	5.85%	0	0	3	0	0	0	0	0	0	0	0
26-Jun	74	0	2,770	5.85%	0	0	3	0	0	0	0	0	0	0	0
27-Jun	0	0	2,770	5.85%	0	0	3	0	0	0	0	0	0	0	0
28-Jun	35	0	2,805	5.85%	0	0	3	0	0	0	0	0	0	0	0
29-Jun	31	0	2,836	2.76%	0	0	3	0	0	0	0	0	0	0	0
30-Jun	16	0	2,852	2.76%	0	0	3	0	0	0	0	0	0	0	0
1-Jul	715	0	3,567	2.76%	0	0	3	0	0	0	0	0	0	0	0
2-Jul	70	0	3,637	2.76%	0	0	3	0	0	0	0	0	0	0	0
3-Jul	116	0	3,753	2.76%	0	0	3	0	0	0	0	0	0	0	0
4-Jul	0	0	3,753	2.76%	0	0	3	0	0	0	0	0	0	0	0
5-Jul	3	0	3,756	2.76%	0	0	3	0	0	0	0	0	0	0	0
6-Jul	0	0	3,756	1.28%	0	0	3	0	0	0	0	0	0	0	0
7-Jul	528	0	4,284	1.28%	0	0	3	0	0	0	0	0	0	0	0
8-Jul	299	0	4,583	1.28%	0	0	3	0	0	0	0	0	0	0	0
9-Jul	1	0	4,584	1.28%	0	0	3	0	0	0	0	0	0	0	0
10-Jul	0	0	4,584	1.28%	0	0	3	0	0	0	0	0	0	0	0
11-Jul	26	0	4,610	1.28%	0	0	3	0	0	0	0	0	0	0	0
12-Jul	174	0	4,784	1.28%	0	0	3	0	0	0	0	0	0	0	0
13-Jul	6	0	4,790	7.78%	0	0	3	0	0	0	0	0	0	0	0
14-Jul	99	0	4,889	7.78%	0	0	3	0	0	0	0	0	0	0	0
15-Jul	1,258	0	6,147	7.78%	0	0	3	0	0	0	0	0	0	0	0
16-Jul	337	21	6,484	7.78%	0	0	3	0	0	0	0	0	0	0	0

	Sockeye				Coho			King		Pink		Chum		Rainbow	
Date	Daily	Mort	Total	Trap	Daily	Mort	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total
17-Jul	162	0	6,646	7.78%	0	0	3	0	0	0	0	0	0	0	0
18-Jul	4	0	6,650	7.78%	0	0	3	0	0	0	0	0	0	0	0
19-Jul	1	0	6,651	7.78%	0	0	3	0	0	0	0	0	0	0	0
20-Jul	0	0	6,651	7.78%	0	0	3	0	0	0	0	0	0	0	0
21-Jul	0	0	6,651	7.78%	0	0	3	0	0	0	0	0	0	0	0
22-Jul	109	0	6,760	7.78%	0	0	3	0	0	0	0	0	0	0	0
23-Jul	281	0	7,041	7.78%	0	0	3	0	0	0	0	0	0	0	0
24-Jul	0	0	7,041	7.78%	0	0	3	0	0	0	0	0	0	0	0
25-Jul	28	0	7,069	7.78%	1	0	4	0	0	0	0	0	0	0	0
26-Jul	ND	0	7,069	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
27-Jul	ND	0	7,069	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
28-Jul	ND	0	7,069	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
29-Jul	ND	0	7,069	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
30-Jul	ND	0	7,069	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
31-Jul	ND	0	7,069	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
1-Aug	ND	0	7,069	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
2-Aug	ND	0	7,069	1.85%	ND	0	4	ND	0	ND	0	ND	0	ND	0
3-Aug	ND	0	7,069	1.85%	ND	0	4	ND	0	ND	0	ND	0	ND	0
4-Aug	186	0	7,255	1.85%	0	0	4	0	0	0	0	0	0	0	0
5-Aug	213	0	7,468	1.85%	0	0	4	0	0	0	0	0	0	0	0
6-Aug	99	0	7,567	1.85%	0	0	4	0	0	0	0	0	0	0	0
7-Aug	117	0	7,684	1.85%	0	0	4	0	0	0	0	0	0	0	0
8-Aug	174	0	7,858	1.85%	0	0	4	0	0	0	0	0	0	0	0
9-Aug	9	0	7,867	1.85%	0	0	4	0	0	0	0	0	0	0	0
10-Aug	11	0	7,878	1.85%	0	0	4	0	0	0	0	0	0	0	0
11-Aug	10	0	7,888	1.85%	0	0	4	0	0	0	0	0	0	0	0
12-Aug	ND	0	7,888	1.85%	ND	0	4	ND	0	ND	0	ND	0	ND	0
13-Aug	ND	0	7,888	1.85%	ND	0	4	ND	0	ND	0	ND	0	ND	0
14-Aug	ND	0	7,888	1.85%	ND	0	4	ND	0	ND	0	ND	0	ND	0
15-Aug	254	0	8,142	1.85%	0	0	4	0	0	0	0	0	0	0	0
16-Aug	21	0	8,163	1.85%	0	0	4	0	0	0	0	0	0	0	0
17-Aug	2	0	8,165	1.85%	0	0	4	0	0	0	0	0	0	0	0
18-Aug	ND	0	8,165	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
19-Aug	ND	0	8,165	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
20-Aug	ND	0	8,165	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
21-Aug	ND	0	8,165	ND	ND	0	4	ND	0	ND	0	ND	0	ND	0
22-Aug	1	0	8,166	ND	0	0	4	0	0	0	0	0	0	0	0
23-Aug	13	0	8,179	ND	0	0	4	0	0	0	0	0	0	0	0
24-Aug	0	0	8,179	ND	0	0	4	0	0	0	0	0	0	0	0
25-Aug	1	0	8,180	ND	0	0	4	0	0	0	0	0	0	0	0
Total	8,180	21	8,201	3.96%	4	0	4		0		0		0		0

Appendix 8: Chelatna Lake 2010 smolt hourly log

Hourly Log - Sockeye Enumeration

	AM						PM												AM					
	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	1:00	2:00	3:00	4:00	5:00
5/17/2010															0				0				0	
5/18/2010							1					0						0				0		
5/19/2010						0						0					0					0		
5/20/2010							2			0		0												
5/21/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/22/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/23/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/24/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/25/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/26/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/27/2010															0				1			0		
5/28/2010							0					0				0			0			1		
5/29/2010							0					1				0			0			8		
5/30/2010							527					0				1			1			2		
5/31/2010							0					4				0			0			4		
6/1/2010								0								0			0			1		
6/2/2010							0					0				0				0		12		
6/3/2010							0					0				0			0			0		
6/4/2010							0					0				0			0			0		
6/5/2010							0					0				0			0			1		
6/6/2010							0					0				0			0			0		
6/7/2010							0					0				0			0			2		
6/8/2010							0					0				0			0			0		
6/9/2010							0									0			0			0		
6/10/2010							0					0				0			0			0		
6/11/2010									0			1				0			0			0		
6/12/2010						0						0				0			0			0		
6/13/2010					0			0				0				0			0			0		
6/14/2010						0						0				141			0			0		
6/15/2010								0				0				0			0			0		
6/16/2010					0							0				0			0			0		
6/17/2010							0					0				0			0			0		
6/18/2010							0					0				0			37			0		
6/19/2010						0						23				0			0			0		
6/20/2010						80						0				0			0			57		
6/21/2010							0					0				0			0			0		
6/22/2010							115					55				0			1			89		
6/23/2010						0						0				40			0			38		
6/24/2010							522					0				0			0	297		338		
6/25/2010							0					0				0			260			46		
6/26/2010							0					0				73			1			0		
6/27/2010						0						0				0			0			0		
6/28/2010					0							0				0			35			0		
6/29/2010					0							0				31			0			0		
6/30/2010							0					0				16			0			0		
7/1/2010						304						0				22			0			389		
7/2/2010				15			0					30				0			0			25		
7/3/2010					110							0				0			2			4		
7/4/2010						0						0				0			0			0		
7/5/2010						1						0				2			0			0		
7/6/2010					0							0				0			0			0		
7/7/2010						391						0				0			1			136		
7/8/2010							261					0				2	4		0			32		
7/9/2010						0						1				0			0			0		
7/10/2010						0						0				0			0			0		
7/11/2010						26						0				0			0			0		
7/12/2010						103						0				0			50			21		
7/13/2010				4								2				0			0			0		
7/14/2010									56			1				11				31				
7/15/2010					63							0				88					610		497	
7/16/2010							155					0				0			24	31			127	
7/17/2010					143							0					0			19			0	
7/18/2010					0							4				0			0				0	
7/19/2010					0							1					0				0			
7/20/2010					0							0				0							0	
7/21/2010						0						0					0					0		
7/22/2010					0							0				41			0				68	
7/23/2010			0				0					61				120			0			0		
7/24/2010					0							0				0			0			0		
7/25/2010				0			0					28					0					0		
7/26/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/27/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/28/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/29/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/30/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/31/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/1/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/2/2010													0				0						0	
8/3/2010							0					0						0						0
8/4/2010							0					0				186			0					0
8/5/2010					156							43					14						0	
8/6/2010					0					81						18						0		
8/7/2010		0			115					2					0				0				0	
8/8/2010				0								174				0			0				0	
8/9/2010					0							0				0			9				0	
8/10/2010				11			0							0					0					0
8/11/2010				10				0					0											
8/12/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/13/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/14/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/15/2010							0					0					192			62				
8/16/2010							21					0				0				0				
8/17/2010					2				0															
8/18/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/19/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/20/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/21/2010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/22/2010						0						0				1			0			0		
8/23/2010					13				0						0							0		
8/24/2010					0						0								0			0		
8/25/2010				0																				

Appendix 9: 2011 Chelatna Lake daily smolt migration

	Sockeye				Coho		King		Pink		Chum		Rainbow	
Date	Daily	Mort.	Total	Trap	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total
16-May	0	0	0	3.5%	0	0	0	0	0	0	0	0	2	2
17-May	3	0	3	3.5%	0	0	0	0	0	0	0	0	0	2
18-May	2	0	5	3.5%	2	2	0	0	0	0	0	0	2	4
19-May	1	0	6	3.5%	4	6	0	0	0	0	0	0	0	4
20-May	0	0	6	3.5%	1	7	0	0	0	0	0	0	0	4
21-May	1	0	7	3.5%	2	9	1	1	0	0	0	0	0	4
22-May	18	0	25	3.5%	0	9	0	1	0	0	0	0	0	4
23-May	6	0	31	3.5%	0	9	0	1	0	0	0	0	0	4
24-May	8	0	39	3.5%	0	9	0	1	0	0	0	0	0	4
25-May	23	0	62	3.5%	1	10	0	1	0	0	0	0	0	4
26-May	20	0	82	3.5%	0	10	0	1	0	0	0	0	0	4
27-May	18	0	100	3.5%	0	10	0	1	0	0	0	0	0	4
28-May	26	0	126	3.5%	0	10	0	1	0	0	0	0	0	4
29-May	6	0	132	3.5%	0	10	0	1	0	0	0	0	0	4
30-May	10	0	142	3.5%	0	10	0	1	0	0	0	0	0	4
31-May	4	0	146	3.5%	0	10	0	1	0	0	0	0	0	4
1-Jun	8	0	154	3.5%	0	10	0	1	0	0	0	0	0	4
2-Jun	18	0	172	3.5%	0	10	0	1	0	0	0	0	0	4
3-Jun	3	0	175	3.5%	0	10	0	1	0	0	0	0	0	4
4-Jun	0	0	175	3.5%	0	10	0	1	0	0	0	0	0	4
5-Jun	10	0	185	3.5%	0	10	0	1	0	0	0	0	0	4
6-Jun	30	0	215	3.5%	4	14	0	1	0	0	0	0	0	4
7-Jun	128	0	343	3.5%	0	14	0	1	0	0	0	0	0	4
8-Jun	111	0	454	3.5%	2	16	0	1	0	0	0	0	0	4
9-Jun	202	0	656	3.5%	0	16	0	1	0	0	0	0	0	4
10-Jun	89	23	745	3.5%	0	16	0	1	0	0	0	0	0	4
11-Jun	96	0	841	3.5%	4	20	0	1	0	0	0	0	0	4
12-Jun	1,014	0	1,855	10.8%	6	26	0	1	0	0	0	0	0	4
13-Jun	137	0	1,992	10.8%	20	46	0	1	0	0	0	0	0	4
14-Jun	448	0	2,440	10.8%	26	72	0	1	0	0	0	0	0	4
15-Jun	1,769	7	4,209	10.8%	6	78	0	1	0	0	0	0	0	4
16-Jun	3,399	0	7,608	10.8%	65	143	0	1	0	0	0	0	0	4
17-Jun	2,391	0	9,999	10.8%	11	154	0	1	0	0	0	0	0	4
18-Jun	1,326	0	11,325	20.2%	12	166	0	1	0	0	0	0	0	4
19-Jun	1,109	0	12,434	20.2%	11	177	0	1	0	0	0	0	0	4
20-Jun	352	0	12,786	20.2%	5	182	0	1	0	0	0	0	0	4
21-Jun	2,382	0	15,168	20.2%	16	198	0	1	0	0	0	0	0	4
22-Jun	2,050	0	17,218	20.2%	1	199	0	1	0	0	0	0	0	4
23-Jun	2,739	0	19,957	20.2%	1	200	0	1	0	0	0	0	0	4
24-Jun	2,854	0	22,811	20.2%	2	202	0	1	0	0	0	0	0	4
25-Jun	408	0	23,219	20.2%	1	203	0	1	0	0	0	0	0	4
26-Jun	143	0	23,362	20.2%	1	204	0	1	0	0	0	0	0	4
27-Jun	47	0	23,409	20.2%	3	207	0	1	0	0	0	0	0	4
28-Jun	70	0	23,479	20.2%	0	207	0	1	0	0	0	0	0	4
29-Jun	81	0	23,560	20.2%	0	207	0	1	0	0	0	0	0	4
30-Jun	43	0	23,603	20.2%	0	207	0	1	0	0	0	0	0	4

	Sockeye				Coho		King		Pink		Chum		Rainbow	
Date	Daily	Mort.	Total	Trap	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total
1-Jul	87	0	23,690	4.2%	1	208	0	1	0	0	0	0	0	4
2-Jul	8	0	23,698	4.2%	1	209	0	1	0	0	0	0	0	4
3-Jul	1	0	23,699	4.2%	0	209	0	1	0	0	0	0	0	4
4-Jul	260	0	23,959	4.2%	1	210	0	1	0	0	0	0	0	4
5-Jul	399	0	24,358	4.2%	1	211	0	1	0	0	0	0	0	4
6-Jul	279	0	24,637	4.2%	0	211	0	1	0	0	0	0	0	4
7-Jul	74	0	24,711	4.2%	0	211	0	1	0	0	0	0	0	4
8-Jul	38	0	24,749	4.2%	0	211	0	1	0	0	0	0	0	4
9-Jul	24	0	24,773	4.2%	2	213	0	1	0	0	0	0	0	4
10-Jul	19	0	24,792	4.2%	1	214	0	1	0	0	0	0	0	4
11-Jul	9	0	24,801	4.2%	5	219	0	1	0	0	0	0	0	4
12-Jul	2	0	24,803	4.2%	0	219	0	1	0	0	0	0	0	4
13-Jul	514	0	25,317	4.2%	2	221	0	1	0	0	0	0	0	4
14-Jul	538	0	25,855	4.2%	1	222	0	1	0	0	0	0	0	4
15-Jul	225	0	26,080	4.2%	3	225	0	1	0	0	0	0	0	4
16-Jul	150	0	26,230	4.2%	0	225	0	1	0	0	0	0	0	4
17-Jul	7	0	26,237	4.2%	0	225	0	1	0	0	0	0	0	4
18-Jul	89	0	26,326	4.2%	1	226	0	1	0	0	0	0	0	4
19-Jul	252	0	26,578	4.2%	0	226	0	1	0	0	0	0	0	4
20-Jul	340	0	26,918	4.2%	0	226	0	1	0	0	0	0	0	4
21-Jul	216	0	27,134	4.2%	0	226	0	1	0	0	0	0	0	4
22-Jul	234	0	27,368	4.2%	0	226	0	1	0	0	0	0	0	4
23-Jul	78	0	27,446	4.2%	0	226	0	1	0	0	0	0	0	4
24-Jul	67	0	27,513	4.2%	0	226	0	1	0	0	0	0	0	4
25-Jul	47	0	27,560	4.2%	2	228	0	1	0	0	0	0	0	4
26-Jul	716	0	28,276	4.2%	2	230	0	1	0	0	0	0	0	4
27-Jul	396	0	28,672	4.2%	1	231	0	1	0	0	0	0	1	5
28-Jul	429	0	29,101	4.2%	0	231	0	1	0	0	0	0	0	5
29-Jul	345	0	29,446	4.2%	0	231	0	1	0	0	0	0	0	5
30-Jul	348	0	29,794	4.2%	0	231	0	1	0	0	0	0	0	5
31-Jul	447	0	30,241	4.2%	0	231	0	1	0	0	0	0	0	5
1-Aug	374	0	30,615	4.2%	6	237	0	1	0	0	0	0	0	5
2-Aug	34	0	30,649	ND	0	237	0	1	0	0	0	0	0	5
3-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
4-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
5-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
6-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
7-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
8-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
9-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
10-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
11-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
12-Aug	ND	0	30,649	ND	ND	237	ND	1	ND	0	ND	0	ND	5
13-Aug	92	0	30,741	ND	4	241	0	1	0	0	0	0	0	5
14-Aug	69	0	30,810	ND	0	241	0	1	0	0	0	0	0	5
15-Aug	287	0	31,097	ND	1	242	0	1	0	0	0	0	0	5
16-Aug	166	0	31,263	ND	0	242	0	1	0	0	0	0	0	5
17-Aug	111	0	31,374	ND	0	242	0	1	0	0	0	0	0	5
18-Aug	13	0	31,387	ND	0	242	0	1	0	0	0	0	0	5
19-Aug	26	0	31,413	ND	2	244	0	1	0	0	0	0	0	5
20-Aug	39	0	31,452	ND	0	244	0	1	0	0	0	0	0	5
21-Aug	50	0	31,502	ND	0	244	0	1	0	0	0	0	0	5
22-Aug	5	0	31,507	ND	0	244	0	1	0	0	0	0	0	5
Total	31,507	30	31,537		244		1		0		0		5	

Appendix 10: Chelatna Lake 2011 smolt hourly log

Hourly Log - Sockeye Enumeration

	AM						PM												AM					
	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	1:00	2:00	3:00	4:00	5:00
5/16/2011												0					0			0				0
5/17/2011								2				0			0		0		0					
5/18/2011						0				0				0			0		2		0			0
5/19/2011																			0		0			1
5/20/2011																			0		0			0
5/21/2011																			0		0			1
5/22/2011																			2		1			15
5/23/2011								1				0				0			0		0			5
5/24/2011									5			0				0			0		1			2
5/25/2011								3				0				0			1					19
5/26/2011								17				0				0			0		1			2
5/27/2011							0					0				0			1		0			17
5/28/2011																			0		16			10
5/29/2011																			0		0			4
5/30/2011								0											0		0			
5/31/2011												2						0			0			2
6/1/2011												0				0			0		1			7
6/2/2011											0					0			0					18
6/3/2011												2			1				0		0			0
6/4/2011					0									0			0		0		0			0
6/5/2011												2				0			0		0			8
6/6/2011												0				0			0		0			30
6/7/2011												107				2			0		2			17
6/8/2011									75			0				1			0		3			32
6/9/2011												51				49			0		2			102
6/10/2011												79				3			0		1			6
6/11/2011												41				0			4		4			47
6/12/2011											519					2			9		34			450
6/13/2011												43				0			0		50			44
6/14/2011												119				1			0		41			278
6/15/2011												29				0			0		3			1740
6/16/2011	208											130				24			1	77				2959
6/17/2011												1				1			72			318		1999
6/18/2011												7				511			19			426		363
6/19/2011												87				113			77			670		162
6/20/2011												106				6			6			37		197
6/21/2011												51				0			11			1487		833
6/22/2011												50				0			14			692		1294
6/23/2011												48				8			55			1407		1221
6/24/2011												40				15			540			775		1484
6/25/2011												1				0			0			155		252
6/26/2011												8				13			0			6		116
6/27/2011												0				0			0			1		46
6/28/2011												11				2			9			13		35
6/29/2011												1				0			0			51		29
6/30/2011												17				8			0			18		0
7/1/2011												0				0			0			0		87
7/2/2011												0				5			0			3		0
7/3/2011												0				1			0			0		0
7/4/2011												3				0			0			18		239
7/5/2011												0				0			1					398
7/6/2011												211							1					67
7/7/2011												0							0					74
7/8/2011												0							1					37
7/9/2011												4							0					20
7/10/2011												0							0					19
7/11/2011												0												9
7/12/2011												0												2
7/13/2011														0										514
7/14/2011														68										470
7/15/2011															1									224
7/16/2011														0										150
7/17/2011														2										5
7/18/2011														1										88
7/19/2011															0									252
7/20/2011															50									290
7/21/2011														0										216
7/22/2011															1									233
7/23/2011														0										78
7/24/2011															7									60
7/25/2011														5	42									
7/26/2011																10								706
7/27/2011													30											366
7/28/2011																0								429
7/29/2011																5								340
7/30/2011															17									321
7/31/2011															73									374
8/1/2011															83									291
8/2/2011														18										16
8/3/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/4/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/5/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/6/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/7/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/8/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/9/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/10/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/11/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/12/2011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8/13/2011																								92
8/14/2011														23										46
8/15/2011														0										287
8/16/2011															9									157
8/17/2011															1									110
8/18/2011															0									
8/19/2011														6										20
8/20/2011														2										37
8/21/2011														1										49
8/22/2011										5														

Appendix 11: 2012 Chelatna Lake daily smolt migration

	Sockeye			Coho		King		Pink		Chum		Rainbow		Longnose Sucker	
Date	Daily	Total	Efficiency	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total
21-May	0	0	1%	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	1%	0	0	0	0	0	0	0	0	0	0	0	0
23-May	7	7	1%	0	0	0	0	0	0	0	0	0	0	0	0
24-May	0	7	1%	1	1	0	0	0	0	0	0	0	0	0	0
25-May	6	13	1%	0	1	0	0	0	0	0	0	0	0	0	0
26-May	9	22	1%	0	1	0	0	0	0	0	0	0	0	0	0
27-May	29	51	1%	1	2	0	0	0	0	0	0	0	0	0	0
28-May	52	103	1%	0	2	0	0	0	0	0	0	0	0	0	0
29-May	30	133	1%	0	2	0	0	0	0	0	0	0	0	0	0
30-May	54	187	1%	1	3	0	0	0	0	0	0	0	0	0	0
31-May	32	219	1%	1	4	0	0	0	0	0	0	0	0	0	0
1-Jun	56	275	1%	1	5	0	0	0	0	0	0	0	0	0	0
2-Jun	28	303	1%	0	5	0	0	0	0	0	0	0	0	0	0
3-Jun	159	462	1%	0	5	0	0	0	0	0	0	0	0	0	0
4-Jun	6	468	1%	2	7	0	0	0	0	0	0	0	0	0	0
5-Jun	22	490	1%	0	7	0	0	0	0	0	0	0	0	0	0
6-Jun	36	526	1%	2	9	0	0	0	0	0	0	0	0	0	0
7-Jun	1	527	1%	0	9	4	4	0	0	0	0	0	0	0	0
8-Jun	21	548	1%	0	9	0	4	0	0	0	0	0	0	0	0
9-Jun	0	548	1%	0	9	0	4	0	0	0	0	0	0	0	0
10-Jun	0	548	1%	0	9	0	4	0	0	0	0	0	0	0	0
11-Jun	1	549	1%	1	10	0	4	0	0	0	0	0	0	0	0
12-Jun	0	549	1%	0	10	0	4	0	0	0	0	0	0	0	0
13-Jun	0	549	1%	0	10	0	4	0	0	0	0	0	0	0	0
14-Jun	57	606	1%	0	10	0	4	0	0	0	0	0	0	0	0
15-Jun	7	613	1%	2	12	24	28	0	0	0	0	0	0	0	0
16-Jun	24	637	1%	0	12	0	28	0	0	0	0	0	0	0	0
17-Jun	5	642	1%	0	12	1	29	0	0	0	0	0	0	0	0
18-Jun	4	646	1%	0	12	4	33	0	0	0	0	0	0	0	0
19-Jun	16	662	1%	0	12	0	33	0	0	0	0	0	0	0	0
20-Jun	2	664	1%	1	13	0	33	0	0	0	0	0	0	0	0
21-Jun	19	683	1%	0	13	0	33	0	0	0	0	0	0	0	0
22-Jun	0	683	1%	0	13	0	33	0	0	0	0	0	0	0	0
23-Jun	0	683	1%	0	13	0	33	0	0	0	0	0	0	0	0
24-Jun	0	683	1%	0	13	0	33	0	0	0	0	0	0	0	0
25-Jun	1	684	1%	0	13	0	33	0	0	0	0	0	0	0	0
26-Jun	2	686	1%	0	13	0	33	0	0	0	0	0	0	0	0
27-Jun	1	687	1%	0	13	0	33	0	0	0	0	0	0	0	0
28-Jun	0	687	1%	0	13	0	33	0	0	0	0	0	0	0	0
29-Jun	0	687	1%	0	13	0	33	0	0	0	0	0	0	0	0
30-Jun	72	759	1%	0	13	0	33	0	0	0	0	0	0	0	0

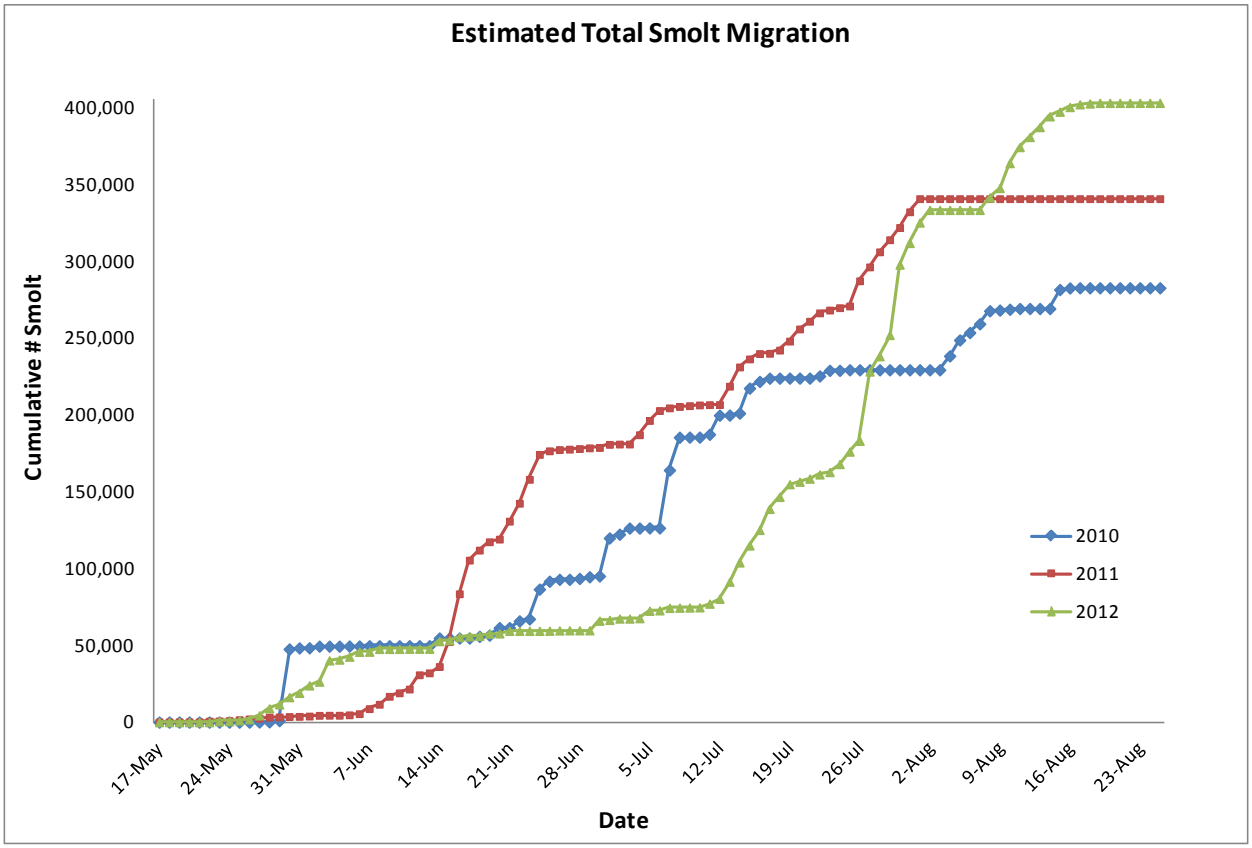
	Sockeye			Coho		King		Pink		Chum		Rainbow		Longnose sucker	
Date	Daily	Total	Efficiency	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total
1-Jul	6	765	1%	0	13	0	33	0	0	0	0	0	0	0	0
2-Jul	10	775	1%	1	14	0	33	0	0	0	0	0	0	0	0
3-Jul	0	775	1%	0	14	0	33	0	0	0	0	0	0	0	0
4-Jul	11	786	4%	0	14	0	33	0	0	0	0	0	0	0	0
5-Jul	216	1002	4%	0	14	0	33	0	0	0	0	0	0	0	0
6-Jul	13	1015	4%	0	14	0	33	0	0	0	0	0	0	0	0
7-Jul	71	1086	4%	0	14	0	33	0	0	0	0	0	0	0	0
8-Jul	7	1093	4%	0	14	0	33	0	0	0	0	0	0	0	0
9-Jul	5	1098	4%	1	15	0	33	0	0	0	0	0	0	0	0
10-Jul	5	1103	4%	0	15	0	33	0	0	0	0	0	0	0	0
11-Jul	79	1182	3%	0	15	0	33	0	0	0	0	0	0	0	0
12-Jul	105	1287	3%	0	15	0	33	0	0	0	0	0	0	0	0
13-Jul	368	1655	3%	1	16	0	33	0	0	0	0	0	0	0	0
14-Jul	415	2070	3%	2	18	0	33	0	0	0	0	0	0	0	0
15-Jul	365	2435	3%	0	18	0	33	0	0	0	0	0	0	0	0
16-Jul	335	2770	3%	0	18	0	33	0	0	0	0	0	0	0	0
17-Jul	452	3222	3%	0	18	0	33	0	0	0	0	0	0	0	0
18-Jul	259	3481	3%	1	19	0	33	0	0	0	0	0	0	0	0
19-Jul	273	3754	3%	0	19	0	33	0	0	0	0	0	0	0	0
20-Jul	75	3829	4%	0	19	0	33	0	0	0	0	0	0	0	0
21-Jul	92	3921	4%	5	24	0	33	0	0	0	0	0	0	0	0
22-Jul	127	4048	4%	0	24	0	33	0	0	0	0	0	0	0	0
23-Jul	71	4119	4%	6	30	0	33	0	0	0	0	0	0	0	0
24-Jul	241	4360	4%	0	30	0	33	0	0	0	0	0	0	0	0
25-Jul	373	4733	4%	0	30	0	33	0	0	0	0	0	0	0	0
26-Jul	324	5057	4%	0	30	0	33	0	0	0	0	0	0	0	0
27-Jul	600	5657	1%	0	30	0	33	0	0	0	0	0	0	0	0
28-Jul	132	5789	1%	0	30	0	33	0	0	0	0	0	0	0	0
29-Jul	184	5973	1%	1	31	0	33	0	0	0	0	0	0	0	0
30-Jul	609	6582	1%	0	31	0	33	0	0	0	0	0	0	0	0
31-Jul	187	6769	1%	0	31	0	33	0	0	0	0	0	0	0	0
1-Aug	177	6946	1%	0	31	0	33	0	0	0	0	0	0	0	0
2-Aug	109	7055	1%	0	31	0	33	0	0	0	0	0	0	0	0
3-Aug	0	7055	ND	0	31	0	33	0	0	0	0	0	0	0	0
4-Aug	21	7076	ND	0	31	0	33	0	0	0	0	0	0	0	0
5-Aug	9	7085	ND	0	31	0	33	0	0	0	0	0	0	0	0
6-Aug	6	7091	ND	0	31	0	33	0	0	0	0	0	0	0	0
7-Aug	11	7102	ND	0	31	0	33	0	0	0	0	0	0	0	0
8-Aug	472	7574	6%	0	31	0	33	0	0	0	0	0	0	0	0
9-Aug	363	7937	6%	0	31	0	33	0	0	0	0	0	0	0	0
10-Aug	951	8888	6%	6	37	0	33	0	0	0	0	0	0	0	0
11-Aug	611	9499	6%	2	39	0	33	0	0	0	0	0	0	0	0
12-Aug	385	9884	6%	5	44	0	33	0	0	0	0	0	0	0	0
13-Aug	298	10182	6%	3	47	0	33	0	0	0	0	0	0	0	0
14-Aug	323	10505	6%	1	48	0	33	0	0	0	0	0	0	0	0
15-Aug	138	10643	6%	2	50	0	33	0	0	0	0	0	0	0	0
16-Aug	141	10784	6%	2	52	0	33	0	0	0	0	0	0	0	0
17-Aug	81	10865	6%	2	54	0	33	0	0	0	0	0	0	0	0
18-Aug	24	10889	6%	3	57	0	33	0	0	0	0	0	0	0	0
19-Aug	19	10908	6%	3	60	0	33	0	0	0	0	0	0	0	0
20-Aug	1	10909	6%	0	60	0	33	0	0	0	0	0	0	0	0
21-Aug	0	10909	ND	0	60	0	33	0	0	0	0	0	0	0	0
Total	10,909			60		33		0		0		0		0	

Appendix 12: Chelatna Lake 2012 smolt hourly log

Hourly Log - Sockeye Enumeration

	AM						PM												AM					
	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00	1:00	2:00	3:00	4:00	5:00
5/22/2012													0		0				0	0				0
5/23/2012					1		0				0								0		1	2	3	0
5/24/2012														0			0			0				0
5/25/2012									0								0				3	3	0	
5/26/2012							0					0					0		0			9		
5/27/2012											3				0					2			24	
5/28/2012										1						0								52
5/29/2012																					4			26
5/30/2012																		0			13			41
5/31/2012																				10		22		0
6/1/2012																				0		40		16
6/2/2012																				0		12		16
6/3/2012																								159
6/4/2012																		0	0	1	1	2	2	0
6/5/2012																		0		0		18		4
6/6/2012																		1		21		6		9
6/7/2012																				0		1		0
6/8/2012																		0			18			3
6/9/2012						0											0		0					0
6/10/2012																					0			0
6/11/2012	0															0								1
6/12/2012																	0							0
6/13/2012																	0							0
6/14/2012																					54			3
6/15/2012																					5			2
6/16/2012																				9				13
6/17/2012																			0					5
6/18/2012																		0						4
6/19/2012																	0				12			4
6/20/2012											0			0				0				2		0
6/21/2012												0					0		0					19
6/22/2012														0				0			0			0
6/23/2012												0						0			0			0
6/24/2012																		0			0			0
6/25/2012														1			0		0				0	
6/26/2012												0					0		0		0			2
6/27/2012												0					0		0		0			1
6/28/2012													0				0			0				0
6/29/2012												0					0				0			0
6/30/2012												0								63				9
7/1/2012												0		0							1			5
7/2/2012												0		0						0		5		5
7/3/2012																	0				0			0
7/4/2012								0				0									11			
7/5/2012											0				0					78				138
7/6/2012												0				0					0			13
7/7/2012											0				0					38				33
7/8/2012												0					0			0				7
7/9/2012												0					5							0
7/10/2012											0						0							5
7/11/2012																0								79
7/12/2012															0									105
7/13/2012																0								368
7/14/2012																0								415
7/15/2012																0								365
7/16/2012																	0							335
7/17/2012																	12							440
7/18/2012																0								259
7/19/2012																0								273
7/20/2012												0				0								75
7/21/2012												0				0								92
7/22/2012																0								127
7/23/2012																0								71
7/24/2012															0									241
7/25/2012																0								373
7/26/2012															0									324
7/27/2012																0								600
7/28/2012																0								132
7/29/2012																0								184
7/30/2012															0									609
7/31/2012														0										187
8/1/2012																0								177
8/2/2012																0								109
8/3/2012															0									0
8/4/2012															0									21
8/5/2012															0									9
8/6/2012															0									6
8/7/2012																0								11
8/8/2012								0								0								472
8/9/2012															0									363
8/10/2012																0								951
8/11/2012																0								611
8/12/2012															0									385
8/13/2012														0										298
8/14/2012														0										323
8/15/2012															0									138
8/16/2012															0									141
8/17/2012																0								81
8/18/2012														0										24
8/19/2012														0										19
8/20/2012																								1
8/21/2012						0																		

Appendix 13: Chelatna Lake estimated total sockeye salmon smolt migration 2010–2012



Appendix 14: Chelatna macrozooplankton summary 2010

Macrozooplankton Body Size (mm)

Date:	2-Jun	18-Jun	5-Jul	1-Aug	1-Sep	Seasonal Means: Mean Length (mm)	Weighted Length (mm)	Biomass (mg/m^2)	Weighted Biomass (mg/m^2)
Ergasilus									
Ovig Ergasilus									
Epischura									
Ovig Epischura									
Diaptomus	0.63	0.76	0.98	1.18	1.2	0.95	0.91	348	310
Ovig Diaptomus				1.27		1.27	1.27	3	3
Cyclops	0.96	1.01	0.95	0.85	0.86	0.93	0.92	280	274
Ovig. Cyclops	1.21	1.29	1.18	1.25	1.26	1.24	1.25	17	17
Bosmina	0.76	0.53	0.34	0.44	0.5	0.51	0.49	3	2
Ovig. Bosmina									
Daphnia l.	0.61	0.76	0.89	0.86	0.99	0.82	0.93	18	23
Ovig. Daphnia l.	1.18	1.24	1.22	1.06	1.21	1.18	1.21	7	7
Daphnia g.									
Ovig Daphnia g.									
Holopedium									
Chydorinae									
Ovig Chydorinae									
Copepod Nauplii									
						TOTAL:		676	636

Macrozooplankton Density (No/m^2)

Date:	2-Jun	18-Jun	5-Jul	1-Aug	1-Sep	Seasonal Mean (No/m^2)
Ergasilus						
Ovig Ergasilus						
Epischura						
Ovig Epischura						
Diaptomus	892	205,223	195,669	62,675	3,693	93,630
Ovig Diaptomus				382		382
Cyclops	74,650	91,338	57,325	72,803	162,761	91,775
Ovig. Cyclops	255	573	1,146	2,866	9,934	2,955
Bosmina	127	764	191	1,146	2,802	1,006
Ovig. Bosmina						
Daphnia l.	764	1,911	2,675	6,688	17,193	5,846
Ovig. Daphnia l.	127	382	573	191	3,821	1,019
Daphnia g.						
Ovig Daphnia g.						
Holopedium						
Chydorinae						
Ovig Chydorinae						
Copepod Nauplii						
					Total:	196,614

Chelatna Lake Site A 2010

Macrozooplankton Body Size (mm)

Date:	2-Jun	18-Jun	5-Jul	1-Aug	1-Sep	Seasonal Means: Mean Length (mm)	Weighted Length (mm)	Biomass (mg/m^2)	Weighted Biomass (mg/m^2)
Ergasilus									
Ovig Ergasilus									
Epischura									
Ovig Epischura									
Diaptomus	0.59	0.76	1	1.17	1.19	0.94	0.99	209	243
Ovig Diaptomus				1.2	1.14	1.17	1.20	3	4
Cyclops	0.92	0.93	0.89	0.9	0.85	0.90	0.89	261	257
Ovig. Cyclops		1.36	1.22	1.25	1.24	1.27	1.24	16	15
Bosmina				0.52	0.51	0.52	0.51	4	4
Ovig. Bosmina					0.62	0.62	0.62	0	0
Daphnia l.	0.83	0.86	0.86	0.89	0.94	0.88	0.90	8	9
Ovig. Daphnia l.		1.06	1.44		1.13	1.21	1.17	3	3
Daphnia g.									
Ovig Daphnia g.									
Holopedium									
Chydorinae									
Ovig Chydorinae									
Copepod Nauplii									
						Total:		505	535

Macrozooplankton Density (No/m^2)

Date:	2-Jun	18-Jun	5-Jul	1-Aug	1-Sep	Seasonal Mean (No/m^2)
Ergasilus						
Ovig Ergasilus						
Epischura						
Ovig Epischura						
Diaptomus	1,911	62,675	140,446	81,019	1,630	57,536
Ovig Diaptomus				955	82	519
Cyclops	84,650	56,369	90,764	91,146	133,591	91,304
Ovig. Cyclops		191	2,866	3,248	4,320	2,656
Bosmina				955	2,282	1,619
Ovig. Bosmina					82	82
Daphnia l.	573	1,529	2,484	2,102	5,624	2,462
Ovig. Daphnia l.		191	191		897	426
Daphnia g.						
Ovig Daphnia g.						
Holopedium						
Chydorinae						
Ovig Chydorinae						
Copepod Nauplii						
					Total:	156,604

Chelatna Lake Site B 2010

Average Weighted Biomass: 586 (mg/m^2)
Average Seasonal Density: 176,609 (No/m^2)

Appendix 15: Chelatna macrozooplankton summary 2011

Macrozooplankton Body Size (mm)

Date:	15-Jun	14-Jul	12-Aug	1-Sep	3-Sep	Mean Length (mm)	Weighted Length (mm)	Biomass (mg/m^2)	Weighted Biomass (mg/m^2)
Ergasilus									
Ovig Ergasilus									
Epischura									
Ovig Epischura									
Diaptomus	0.60	1.18	1.27	1.33	1.32	1.14	1.09	201	178
Ovig Diaptomus				1.37		1.37	1.37	40	40
Cyclops	1.00	0.96	0.96	0.87	1.05	0.97	0.93	457	424
Ovig. Cyclops	1.31	1.29	1.39	1.24	1.36	1.32	1.27	21	19
Bosmina	0.61	0.46	0.53	0.49	0.54	0.53	0.52	26	25
Ovig. Bosmina				0.61	0.61	0.61	0.61	5	5
Daphnia l.	0.77	0.85	0.97	0.95	1.04	0.92	0.99	91	107
Ovig. Daphnia l.		1.16		1.28	0.91	1.12	1.24	16	20
Daphnia g.									
Ovig Daphnia g.									
Holopedium									
Chydorinae									
Ovig Chydorinae									
Copepod Nauplii									
							TOTAL:	857	819

Seasonal Means

Macrozooplankton Density (No/m^2)

Date:	15-Jun	14-Jul	12-Aug	1-Sep	3-Sep	Seasonal Mean (No/m^2)
Ergasilus						
Ovig Ergasilus						
Epischura						
Ovig Epischura						
Diaptomus	39,554	55,796	19,745	28,120	18,344	32,312
Ovig Diaptomus				3,872		3,872
Cyclops	32,293	143,439	110,828	299,542	94,204	136,061
Ovig. Cyclops	382	4,331	637	10,188	764	3,260
Bosmina	573	3,822	5,414	17,524	22,930	10,053
Ovig. Bosmina				1,834	764	1,299
Daphnia l.	382	3,057	35,987	33,826	45,860	23,822
Ovig. Daphnia l.		1,019		6,724	573	2,772
Daphnia g.						
Ovig Daphnia g.						
Holopedium						
Chydorinae						
Ovig Chydorinae						
Copepod Nauplii						
					Total:	213,451

Chelatna Lake Site A 2011

Macrozooplankton Body Size (mm)

Date:	15-Jun	14-Jul	12-Aug	1-Sep	3-Sep	Mean Length (mm)	Weighted Length (mm)	Biomass (mg/m^2)	Weighted Biomass (mg/m^2)
Ergasilus									
Ovig Ergasilus									
Epischura					1.44	1.44	1.44	5	5
Ovig Epischura									
Diaptomus	0.64		1.25	1.33	1.29	1.13	1.21	135	167
Ovig Diaptomus				1.30		1.30	1.30	17	17
Cyclops	0.82	0.98	0.99	0.86	0.99	0.93	0.92	396	389
Ovig. Cyclops		1.19	1.29	1.30	1.32	1.28	1.29	11	11
Bosmina	0.49	0.42	0.50	0.50	0.46	0.47	0.50	11	12
Ovig. Bosmina				0.61		0.61	0.61	2	2
Daphnia l.	0.75	0.73	0.87	0.97	0.86	0.84	0.89	35	40
Ovig. Daphnia l.									
Daphnia g.									
Ovig Daphnia g.									
Holopedium									
Chydorinae									
Ovig Chydorinae									
Copepod Nauplii									
							Total:	611	642

Seasonal Means

Macrozooplankton Density (No/m^2)

Date:	15-Jun	14-Jul	12-Aug	1-Sep	3-Sep	Seasonal Mean (No/m^2)
Ergasilus						
Ovig Ergasilus						
Epischura					382	382
Ovig Epischura						
Diaptomus	12,062	21,401	20,637	43,199	14,904	22,441
Ovig Diaptomus				1,834		1,834
Cyclops	14,451	140,892	123,567	315,639	51,210	129,152
Ovig. Cyclops		510	510	4,890	1,146	1,764
Bosmina	358	510	7,389	15,894	1,720	5,174
Ovig. Bosmina				611		611
Daphnia l.	1,791	3,057	17,070	18,951	14,522	11,078
Ovig. Daphnia l.						
Daphnia g.						
Ovig Daphnia g.						
Holopedium						
Chydorinae						
Ovig Chydorinae						
Copepod Nauplii						
					Total:	172,436

Chelatna Lake Site B 2011

Average Weighted Biomass: 731 (mg/m^2)
Average Seasonal Density: 192,944 (No/m^2)

Appendix 16: Chelatna macrozooplankton summary 2012

Macrozooplankton Body Size (mm)

Date:	30-Jun	28-Aug	Seasonal Means: Mean Length (mm)	Weighted Length (mm)	Biomass (mg/m²)	Weighted Biomass (mg/m²)
Ergasilus						
Ovig Ergasilus						
Epischura						
Ovig Epischura						
Diaptomus	1.00	1.22	1.11	1.03	290	234
Ovig Diaptomus	1.24	1.27	1.26	1.27	6	6
Cyclops	0.90	0.86	0.88	0.89	422	433
Ovig. Cyclops	1.22	1.18	1.20	1.19	29	28
Bosmina	0.54	0.54	0.54	0.54	43	43
Ovig. Bosmina		0.56	0.56	0.56	0	0
Daphnia l.	1.14	0.86	1.00	0.86	132	96
Ovig. Daphnia l.	1.38	1.15	1.27	1.15	34	28
Daphnia g.						
Ovig Daphnia g.						
Holopedium						
Chydorinae						
Ovig Chydorinae						
Copepod Nauplii						
				TOTAL:	956	868

Macrozooplankton Density (No/m²)

Date:	30-Jun	28-Aug		Seasonal Mean (No/m²)
Ergasilus				
Ovig Ergasilus				
Epischura				
Ovig Epischura				
Diaptomus	86,752	13,602		50,177
Ovig Diaptomus	191	1,223		707
Cyclops	232,739	75,802		154,271
Ovig. Cyclops	1,911	8,864		5,388
Bosmina	1,529	29,343		15,436
Ovig. Bosmina		153		153
Daphnia l.	382	57,157		28,770
Ovig. Daphnia l.	191	8,711		4,451
Daphnia g.				
Ovig Daphnia g.				
Holopedium				
Chydorinae				
Ovig Chydorinae				
Copepod Nauplii				
			Total:	259,352

Chelatna Lake Site A 2012

Macrozooplankton Body Size (mm)

Date:	30-Jun	28-Aug	Seasonal Means: Mean Length (mm)	Weighted Length (mm)	Biomass (mg/m²)	Weighted Biomass (mg/m²)
Ergasilus						
Ovig Ergasilus						
Epischura						
Ovig Epischura						
Diaptomus	1.03	1.22	1.13	1.04	392	318
Ovig Diaptomus		1.18	1.18	1.18	6	6
Cyclops	0.91	0.91	0.91	0.91	455	455
Ovig. Cyclops	1.22	1.27	1.25	1.26	40	41
Bosmina	0.76	0.47	0.62	0.48	19	11
Ovig. Bosmina		0.57	0.57	0.57	1	1
Daphnia l.	0.88	0.93	0.91	0.92	77	80
Ovig. Daphnia l.	1.20	1.06	1.13	1.11	1	1
Daphnia g.						
Ovig Daphnia g.						
Holopedium						
Chydorinae						
Ovig Chydorinae						
Copepod Nauplii						
				Total:	992	915

Macrozooplankton Density (No/m²)

Date:	30-Jun	28-Aug		Seasonal Mean (No/m²)
Ergasilus				
Ovig Ergasilus				
Epischura				
Ovig Epischura				
Diaptomus	120,573	10,087		65,330
Ovig Diaptomus		917		917
Cyclops	187,070	122,415		154,743
Ovig. Cyclops	3,057	10,851		6,954
Bosmina	191	10,392		5,292
Ovig. Bosmina		458		458
Daphnia l.	4,586	36,831		20,709
Ovig. Daphnia l.	191	306		249
Daphnia g.				
Ovig Daphnia g.				
Holopedium				
Chydorinae				
Ovig Chydorinae				
Copepod Nauplii				
			Total:	254,650

Chelatna Lake Site B 2012

Average Weighted Biomass: 892(mg/m²)
Average Seasonal Density: 257,001 (No/m²)