

**Tustumena Lake
Sockeye Salmon Enhancement
Progress Report
2006**

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This year's operation of the Tustumena Lake Sockeye Salmon Enhancement Project was made possible through enhancement taxes paid by the commercial fishermen in Area H, Cook Inlet and associated waters and through the Southeast Sustainable Salmon Fund received from the National Oceanic and Atmospheric Administration

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DISCLAIMER

The Cook Inlet Aquaculture Association 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 purpose of these progress reports is to provide a vehicle to distribute the information produced by the monitoring and evaluation activities. 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 fisheries project. The information presented in each report has not undergone an extensive review. As reviews are completed, the information may be updated and presented in later progress reports.

The following progress report is a synopsis of the monitoring and evaluation activities conducted for the Tustumena Lake sockeye salmon project.

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ACKNOWLEDGEMENTS

The 2006 Tustumena Lake smolt migration was conducted by the Cook Inlet Aquaculture Association (CIAA). Smolt migration equipment was provided courtesy of the Alaska Department of Fish and Game, (ADF&G). CIAA interns Matt Backs and Kevin Lauscher spent many hours in the field assisting with the 2006 field activities. Their efforts are greatly appreciated. Ronald Carlson, CIAA Project Technician, and Lab Assistants, Cathy Cline and Bridget Dodson are also recognized for their assistance and hard work.

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ABSTRACT

The Alaska Department of Fish and Game (ADF&G) began the Tustumena Lake sockeye enhancement program in 1974. In 1976, the first fry resulting from egg collections were released to Tustumena Lake. During the project, eggs were collected from Bear Creek, Glacier Flats Creek, and Seepage Creek in varying combinations. As the project progressed, as many as 23.6 million eggs were collected and as many as 17.1 million fry were released into Tustumena Lake; and up to eight other lakes were stocked with fry of Tustumena origin. Currently 12 million eggs are collected from Bear Creek and 6 million are released to Tustumena Lake and 3.4 million to three lower Cook Inlet lakes.

In 1993, CIAA assumed operation of the Tustumena Lake sockeye enhancement program from ADF&G. Initially, ADF&G maintained the responsibility of conducting the Tustumena Lake limnological sampling, smolt migration and adult escapement and CIAA accepted the responsibility of enumerating the spawning population at the Bear Creek gamete collection site, collecting gametes for the enhancement program, incubating, rearing and releasing the resulting fish. In 1998, CIAA assumed the responsibility of enumerating the smolt migration and conducting the limnological sampling.

In January 2004, a ruling by the 9th Circuit Court of Appeals found that the enhancement project occurring on Tustumena Lake was a commercial enterprise and thus, violated the Wilderness Act. As a result, the United States Fish and Wildlife Service were no longer able to provide CIAA with a permit to continue operations on Tustumena Lake. The resultant fry from the 2003 egg collection were allowed to be released; however, all other activities were terminated.

This report summarizes the 2006 Tustumena Lake smolt migration. The Bear Creek adult enumeration and gamete collection activities, otolith collection activities, and the limnological sampling were terminated in 2004.

The enumeration of sockeye salmon smolts migrating from Tustumena Lake was conducted at mile 6.3 of the Kasilof River from 22 May to 26 June using a mark/recapture technique developed by ADF&G. The smolt migration totaled 2.8 million ($\pm 756,000$) fish and was composed of 90.7% ($\pm 26.3\%$) age 1 smolts and 9.3% ($\pm 3.6\%$) age 2 smolts. The age 1 smolts averaged 81.8 mm (± 0.86 mm) in length and 4.52 g (± 0.08 g) in weight; the age 2 smolts averaged 97.9 mm (± 2.26 mm) in length and 7.40 g (± 0.58 g) in weight. There were no fry released in 2005, thus smolts resulting from fry released by CIAA in 2004 made up 0.04% ($\pm 0.05\%$) of the migration.

CIAA also sampled the hatchery outfall for hatchery-reared Tustumena stock adults returning to the hatchery. There were no adult sockeye observed at the Trail Lakes Hatchery outfall in 2006.

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INTRODUCTION AND PURPOSE

In July 1993, the Alaska Department of Fish and Game (ADF&G) transferred operation of its Crooked Creek Salmon Hatchery to the Cook Inlet Aquaculture Association (CIAA). Prior to the transfer of hatchery operations to CIAA, Crooked Creek Hatchery incubated and reared sockeye (*Onchorynchus nerka*), coho (*O. kisutch*) and Chinook (*O. tshawytscha*) salmon and steelhead trout (*O. mykiss*) for release into various water bodies throughout the central and lower Cook Inlet drainage. While under CIAA management, the hatchery's stocking programs focused on sockeye salmon releases to Tustumena Lake, several lower Cook Inlet Lakes and Resurrection Bay.

In 1993, when CIAA began operating Crooked Creek Hatchery, ADF&G maintained the responsibility of monitoring the Tustumena Lake sockeye salmon smolt migration and adult escapement. CIAA accepted the responsibility of collecting the gametes (eggs and milt), incubating the eggs, rearing the fry and releasing the resulting fish to the designated water bodies.

In November 1996, CIAA terminated operations at Crooked Creek Hatchery, suspended stocking activities at five lower Cook Inlet Lakes, and transferred the remaining stocking programs to its Trail Lakes and Eklutna hatcheries.

In 1997, the Bear Creek gamete collection procedure and the Tustumena Lake fry stocking program were reviewed by the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service recommended several changes to these activities, which have been incorporated into the program.

In 1998, operations at Eklutna Hatchery were suspended, and the hatchery's Tustumena Lake egg incubation and fry rearing activities were transferred to Trail Lakes Hatchery. During 1998, CIAA also assumed the responsibility of conducting the limnological sampling; and, thus became responsible for conducting all project activities, except the adult escapement monitoring, which is conducted by ADF&G. Under the this program, approximately twelve million eggs are

collected to provide six million fry for rearing in Tustumena Lake and approximately 3.5 million for rearing in three Lower Cook Inlet lakes.

The Wilderness Society and the Alaska Center for the Environment (ACE) brought suit against the U.S. Fish and Wildlife service challenging the issuance of a permit for the Tustumena enhancement project. After years of litigation, the 9th Circuit Court of Appeals ruled, in January 2004, that the enhancement project occurring on Tustumena Lake was a commercial enterprise and thus, violated the Wilderness Act. As a result, the United States Fish and Wildlife Service were no longer able to provide CIAA with a permit to continue operations on Tustumena Lake. The resultant fry from the 2003 egg collection were allowed to be released; however, all other activities were suspended.

This report summarizes the 2006 the Kasilof River smolt enumeration. The Tustumena Lake adult sockeye migration was completed by ADF&G and is reported by ADF&G.

PROJECT AREA

Tustumena Lake is located on the Kenai Peninsula in South-central Alaska (Figure 1). It is the largest lake on the Kenai Peninsula and the fifth largest lake in the State of Alaska. It is a glacial lake with a surface area of 294.5 km². The mean depth is 24 m, and the maximum depth is 320 m. The lake is fed by several clear-water streams and two glacial streams, which originate in the Harding Icefield (Kyle, 1992).

Tustumena Lake is oligotrophic with mean open-water season total phosphorus, total Kjeldahl nitrogen and chlorophyll *a* concentrations of 3.7 µ/L, 155 µ/L, and 0.45 µ/L, respectively. The lake is turbid with glacial silt and light penetration is limited to the upper two meters (Kyle, 1992).

The zooplankton community consists of two copepods, *Diaptomus pribilofensis* and *Cyclops columbianus*. All five species of Pacific salmon, *O. nerka*, *O. keta*, *O. gorbuscha*, *O. tshawytscha*, and *O. kisutch*, are found in the Tustumena Lake system; however, it is mainly sockeye that utilize the limnetic area of the lake. Resident fish species include rainbow trout (*O. mykiss*), lake trout (*Salvelinus namaycush*), Dolly Varden char (*S. malma*), threespine stickleback (*Gasterosteus aculeatus*), coastrange and slimy sculpin (*Cottus aleuticus* and *C. cognatus*) and round whitefish (*Prosopium cylindraceum*) (Kyle, 1992)

The Kasilof River, which flows 17.4 miles to Cook Inlet, forms the outlet. The smolt migration and the enumeration of the adult escapement occur in the Kasilof River.

Bear Creek, a tributary of Tustumena Lake (Figure 1), is the site of the fry release and gamete collection. It is a moderately sized stream approximately 16 miles long with an average gradient of 185 feet/mile. The stream lies northeast of the lake and begins in the Kenai Mountains above tree line at an elevation of approximately 3,100 feet. The upper section of the creek flows with an average gradient of 260 feet/mile for 4.25 miles. At the tree line it enters a narrow canyon. The canyon dominates the middle section of the stream as it flows for the next 8.25 miles with an

average gradient of 180 feet/mile. As the stream leaves the canyon, the gradient over the lower 3.75 miles decreases to approximately 105 feet/mile. The former fry release and gamete collection site is located in the lower section of Bear Creek approximately 150 meters upstream of its confluence with Tustumena Lake.

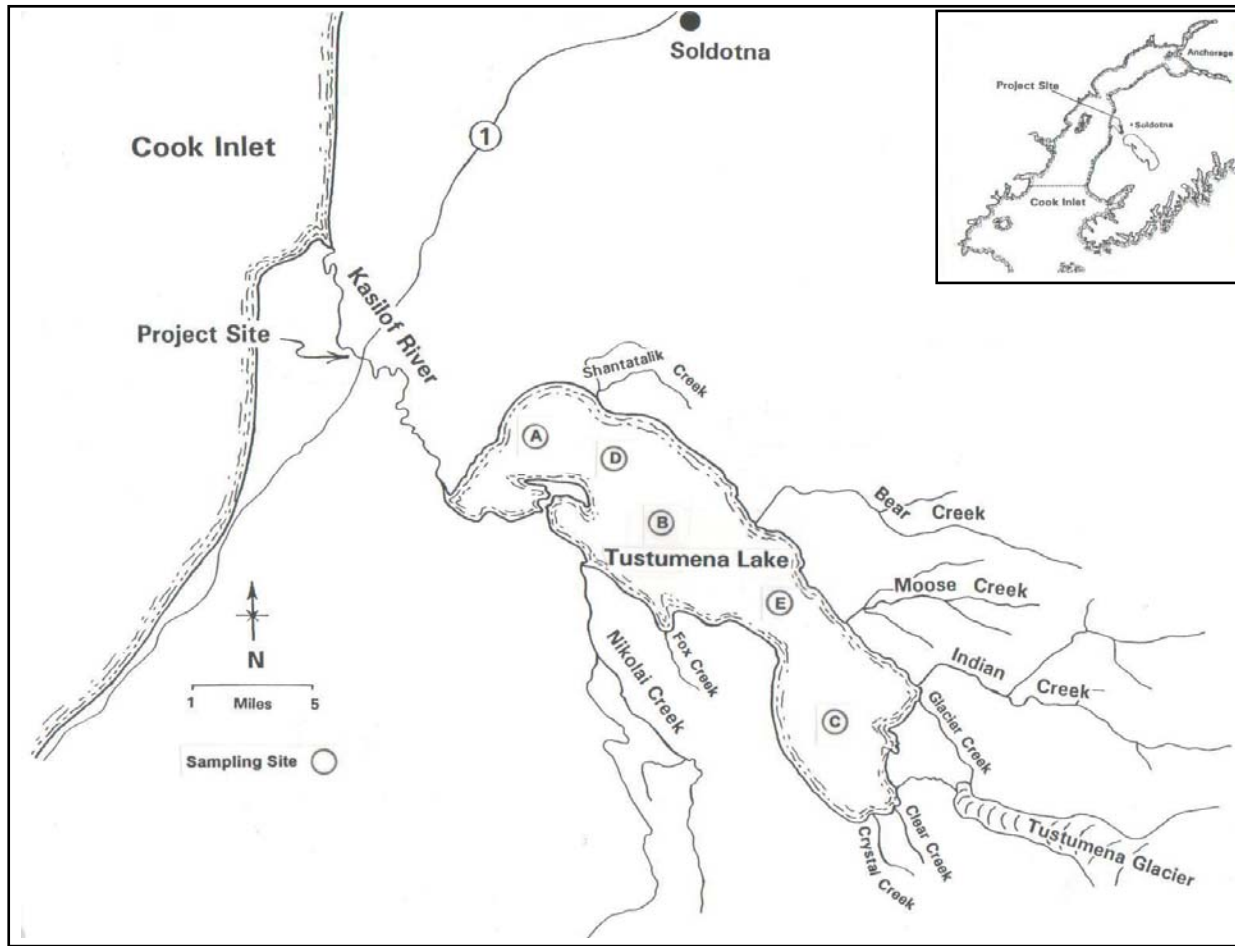


Figure 1. Area Map Tustumena Lake and the Kaslof River, near Soldotna, Alaska.

METHODS

CIAA's 2006 Tustumena Lake fishery enhancement activities involved the enumeration of the Kasilof River smolt migration. The procedures used to enumerate the smolt migration are described below. In general, all procedures follow ADF&G recommendations.

Smolt Enumeration

This was the ninth year CIAA was responsible for enumerating the smolt migration from Tustumena Lake. The smolt migration was estimated by enumerating a known proportion of the migration following procedures developed by ADF&G. The following is a general description of the procedures.

One inclined-plane smolt trap (Todd 1994) was placed in the Kasilof River near river mile 6.3 to capture a portion of the migrating smolts. The trap was operated from 22 May through 26 June 2006. It consisted of an inclined plane lead, a live box, and a floating support structure; and measured 1.5 m in width, 1 m in height, and 3.8 m in length.

Each day, the number of smolts captured by the trap was determined by individually counting and releasing each fish; or, when the daily smolt numbers exceeded 15,000 fish, the number of smolts captured was estimated using a biomass technique. To estimate the number of smolts captured by the biomass technique, the average weight of a sample of at least 50 smolts caught that day was divided into the total weight of all smolts captured (Todd and Kyle, 1996). Debris accumulating in the trap was also removed when the trap was checked for fish.

The total number of sockeye smolts migrating from Tustumena Lake was estimated using weekly trap capture efficiencies determined by the recapture of marked fish. For the mark-and-recapture procedure, each week approximately 1,000 sockeye smolts were dyed¹ and released

¹ Fish were marked by placing them in a Bismark Brown Y dye bath (1.0g dye dissolved in 30 liters water) for 30 minutes before being reintroduced into the river.

upstream near river mile 7.1. The number of smolts recaptured was then used to estimate the proportion of migrating smolts captured (the trap capture efficiency) and the total smolt migration.

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;
 N_h = total population size in stratum h ;
 u_h = total number of unmarked smolts captured in stratum h ;
 M_h = number of marked smolts released in stratum h ;
 m_h = number of marked smolts recaptured in stratum h ;
 L = number of strata or periods; and

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

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

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

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

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 smolt migration.

The daily migration of sockeye smolts is presented in Appendix 2.

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 smolts was calculated as:

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

Proportion of age = i smolts was calculated as:

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

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

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

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

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

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

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

Since 1976, ADF&G or CIAA has released sockeye salmon fry directly to Tustumena Lake or to Bear Creek, a tributary of Tustumena Lake, for rearing in Tustumena Lake. Since 1996, CIAA

has marked the otoliths of all sockeye fry rearing in Tustumena Lake with a thermal band². The purpose of the thermal band was to identify released fish in the population of smolt migrating from Tustumena Lake or adults migrating back to the lake.

In 2006, to assess the enhancement program, CIAA collected a sample of sockeye smolts migrating from the lake to determine age, weight, and length characteristics of the migrating population and to estimate the proportion of enhanced fish in the smolt migration. Smolts collected for evaluation, were collected daily in proportion to the number of smolts captured by the inclined-plane trap. This was accomplished by collecting a sample of migrating smolts approximately equal to 0.2% of the fish captured. Each sockeye smolt collected for evaluation was first measured to the nearest millimeter for fork length³ and then weighed to the nearest 0.1 gram. Several scales were removed from the primary growth area⁴ and mounted on a glass slide for subsequent age determination.

The otoliths of the collected smolts were removed and placed in a labeled 1dram vial. Ethanol was added to the vial to cover the otoliths; and, after the smolt migration was complete, the otoliths were shipped to CIAA headquarters. Lab staff processed the otoliths and checked each for a hatchery thermal mark following procedures described by Glick and Shields (1993).

In 2006, 549 otoliths were processed and 542 were readable. The enhancement contribution of the migrating smolts was calculated using the same notations and formulas as reported above, but with following exception: i = hatchery or wild.

²The otolith mark is a series of hatchery induced bands produced by controlled temperature changes during incubation.

³Standard fork length was measured from the tip of the snout to the fork of the tail.

⁴Located above the lateral line on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin.

Sockeye smolt characteristics (average weight and length) for captured smolts were estimated with the following notations and formulas.

If:

y = weight or length of fish

c_i = number of age = i smolts sample

Mean weight or length was calculated as:

$$\bar{y}_i = \frac{\sum y_i}{c_i}$$

The standard deviation for weight and length of each age class was calculated as:

$$\sigma_{y_i} = \sqrt{\frac{c_i \sum y_i - (\sum y_i)^2}{c_i(c_i - 1)}}$$

Confidence intervals (95%) for the mean weight and length are, therefore:

$$\bar{y}_i = \pm 1.96 \left(\frac{\sigma_{y_i}}{\sqrt{c_i}} \right)$$

Adult Escapement

Monitoring of the 2006 Tustumena Lake adult sockeye escapement was completed by ADF&G. Based on preliminary information developed by ADF&G, the total estimated 2006 Tustumena Lake sockeye return was 1,658,000 fish; with a commercial harvest of 1,211,408, personal use harvest of 75,000, a sport fish harvest of 5,500, and a lake escapement of 366,592. The 2006 adult return data will be finalized and reported by ADF&G.

Gamete Collection, Incubation and Rearing

CIAA no longer collects gametes at Tustumena Lake

Fish Transport and Stocking

CIAA no longer releases fish at Tustumena Lake.

Adult Otolith Collection

During the 2006 season, CIAA did not collect otoliths.

RESULTS AND DISCUSSION

Environmental Conditions

Environmental conditions during the Kasilof River smolt migration were monitored from 22 May to 26 June 2006. Stream Stage measurements averaged 0.97 feet and ranged from 0.26 to 2.15 feet. During the period of the smolt migration, river temperatures averaged 10.3°C and ranged from 8 to 12°C. Air temperatures averaged 12.1°C and ranged from 8 to 21°C. Thirty-three percent of the days were clear, 31% were partly cloudy, and 36% were completely overcast. A total of 4 mm of rain fell during this period (Appendix 1).

Smolt Enumeration

Based on the statistical analysis a total of 2.8 million ($\pm 756,000$) sockeye smolts migrated from Tustumena Lake (Table 1) in 2005. There were no fry released in 2005, thus smolts resulting from fry released by CIAA in 2004 made up 0.04% ($\pm 0.05\%$) of the migration. In 2007, there will be no smolts resulting from CIAA releases.

Table 1. Tustumena Lake smolt migrations – 1998 to 2006.

Smolt Year	Total (million)	95% C.I.	Smolt Source		% Hatchery	95% C.I.
			Wild	Hatchery		
1998	4.6	($\pm 395,000$)	3,872,000	727,000	15.8	(± 2.2)
1999	4.5	($\pm 461,000$)	3,555,000	945,000	21.0	(± 2.5)
2000	4.3	($\pm 526,000$)	3,986,000	316,000	7.4	(± 1.8)
2001	5.3	($\pm 612,000$)	5,155,000	105,000	1.9	(± 1.0)
2002	3.5	($\pm 618,000$)	3,474,000	0	0	0
2003	12.9	($\pm 2,437,000$)	10,619,000	2,329,000	18.0	(± 4.6)
2004	6.4	($\pm 997,000$)	3,155,000	3,140,000	49.9	(± 12.6)
2005	11.2	($\pm 2,152,000$)	7,631,000	3,592,000	32.0	(± 7.4)
2006	2.8	($\pm 756,000$)	2,833,000	10,600	0.4	(± 0.5)
Average	6.2		4,920,000	1,240,511		

The smolt migration was composed of 90.7% ($\pm 26.3\%$) age 1 smolts and 9.3% ($\pm 3.6\%$) age 2 smolts (Table 2). The age 1 smolts averaged 81.8 mm (± 0.86 mm) in length and 4.52 g (± 0.08 g) in weight; the age 2 smolts averaged 97.9 mm (± 2.26 mm) in length and 7.40 g (± 0.58 g) in weight. Both age classes of smolts were the largest on record for the entire history of the smolt enumeration project (1980 – 2006).

Table 2. Tustumena Lake smolt characteristics – 1997 to 2006.

Smolt Year	Age Class (%)				Mean length (mm)				Mean weight (g)			
	Age 1.0	95% C.I.	Age 2.0	95% C.I.	Age 1.0	95% C.I.	Age 2.0	95% C.I.	Age 1.0	95% C.I.	Age 2.0	95% C.I.
1997	64.7		35.3		76.9		86.6		3.90		5.20	
1998	79.5		20.5		74.5 (± 0.36)		84.9 (± 1.03)		3.75 (± 0.05)		5.43 (± 0.16)	
1999	77.7 ($\pm 9.6\%$)		22.3 ($\pm 3.8\%$)		76.8 (± 0.34)		88.6 (± 0.66)		3.85 (± 0.05)		5.77 (± 0.13)	
2000	81.3 ($\pm 11.5\%$)		18.7 ($\pm 4.2\%$)		73.4 (± 0.32)		86.0 (± 0.73)		3.20 (± 0.05)		5.01 (± 0.12)	
2001	60.7 ($\pm 9.5\%$)		38.2 ($\pm 6.3\%$)		72.3 (± 0.39)		83.7 (± 0.53)		3.26 (± 0.05)		5.07 (± 0.08)	
2002	39.4 ($\pm 24.1\%$)		60.9 ($\pm 24.8\%$)		74.4 (± 0.42)		81.9 (± 0.64)		3.66 (± 0.06)		5.16 (± 0.11)	
2003	74.2 ($\pm 16.2\%$)		24.8 ($\pm 6.4\%$)		77.8 (± 0.42)		90.5 (± 0.15)		4.80 (± 0.07)		7.20 (± 0.15)	
2004	64.7 ($\pm 13.3\%$)		35.2 ($\pm 8.1\%$)		79.3 (± 0.42)		91.7 (± 0.57)		4.30 (± 0.07)		6.60 (± 0.12)	
2005	91.0 ($\pm 19.0\%$)		9.0 ($\pm 2.3\%$)		76.4 (± 0.25)		90.9 (± 0.74)		3.90 (± 0.72)		6.40 (± 1.19)	
2006	90.7 ($\pm 26.3\%$)		9.3 ($\pm 3.6\%$)		81.8 (± 0.86)		97.9 (± 2.26)		4.52 (± 0.08)		7.40 (± 0.58)	
Ave	72.4		27.4		76.4		88.3		3.91		5.92	

Note: 2001 smolt migration included 1.1% ($\pm 0.07\%$) age class 3 smolt

Note: 2003 smolt migration included 1% ($\pm 0.8\%$) age class 3 smolt

Adult Escapement

Escapement at Bear Creek was not conducted in 2005

Fish Transport and Stocking

CIAA no longer releases fish at Tustumena Lake.

Adult Otolith Collection

CIAA did not collect adult otoliths in 2005.

Gamete Collection

CIAA did not collect gametes from Bear Creek sockeye salmon in 2004.

RECOMMENDATIONS

There are no recommendations.

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APPENDICES

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Appendix 1. Kasilof River 2006 - Environmental Conditions

Smolts					Water	Air
Date	Sky	Precip. (mm)	Stage (ft)	Flow	Temp. (oC)	Temp. (oC)
22-May	ND	ND	ND	ND	ND	ND
23-May	1	0	0.26	ND	9.0	15.0
24-May	2	0	0.30	ND	10.5	19.0
25-May	1	0	0.34	ND	10.0	19.0
26-May	2	0	0.35	ND	12.0	21.0
27-May	3	0	0.38	ND	10.0	10.0
28-May	1	0	0.40	ND	12.0	18.0
29-May	2	0	0.44	ND	11.5	17.0
30-May	4	0	0.48	ND	9.5	11.5
31-May	5	0	0.50	ND	9.5	12.0
1-Jun	3	0	0.54	ND	8.5	13.5
2-Jun	1	0	0.57	ND	8.0	15.0
3-Jun	1	0	0.60	ND	11.0	17.0
4-Jun	1	0	0.60	ND	10.5	12.5
5-Jun	1	0	0.62	ND	10.0	14.0
6-Jun	1	0	0.65	ND	10.0	13.0
7-Jun	3	0	0.67	ND	10.0	9.5
8-Jun	4	0	0.70	ND	10.0	10.0
9-Jun	4	0	0.76	ND	10.0	12.5
10-Jun	3	0	0.79	ND	8.0	9.0
11-Jun	4	0	0.86	ND	9.0	8.5
12-Jun	5	0	0.92	ND	9.0	8.0
13-Jun	4	0	0.96	ND	8.5	8.5
14-Jun	4	0	1.10	ND	9.0	9.0
15-Jun	3	0	1.08	ND	9.0	8.5
16-Jun	5	0	1.17	ND	9.5	10.5
17-Jun	3	4	1.23	ND	10.0	10.0
18-Jun	4	0	1.27	ND	10.5	7.5
19-Jun	4	0	1.34	ND	10.0	7.5
20-Jun	3	0	1.40	ND	9.5	7.5
21-Jun	ND	ND	ND	ND	ND	ND
22-Jun	5	1	1.50	ND	9.4	9.0
23-Jun	3	1	1.72	ND	10.0	13.0
24-Jun	1	0	1.90	ND	11.0	11.0
25-Jun	1	0	2.00	ND	12.0	13.0
26-Jun	4	ND	2.06	ND	10.0	10.0
27-Jun	1	0	2.15	ND	12.0	12.0
28-Jun	1	0	2.15	ND	12.0	15.0
Total		7				

ND = No Data

- 1 = Clear
- 2 = Cloud Cover <50%
- 3 = Cloud Cover >50%
- 4 = Overcast
- 5 = Rain

Appendix 2. Kasilof River 2006 - Smolt Migration

Date	Number of Migrants
5/22/2004	2,143
5/23/2004	1,786
5/24/2004	2,524
5/25/2004	12,357
5/26/2004	16,929
5/27/2004	16,238
5/28/2004	15,857
5/29/2004	19,357
5/30/2004	31,524
5/31/2004	87,500
6/1/2004	37,381
6/2/2004	32,738
6/3/2004	17,405
6/4/2004	69,643
6/5/2004	22,381
6/6/2004	13,810
6/7/2004	123,214
6/8/2004	63,190
6/9/2004	66,857
6/10/2004	24,048
6/11/2004	15,833
6/12/2004	12,929
6/13/2004	11,190
6/14/2004	50,905
6/15/2004	50,024
6/16/2004	169,643
6/17/2004	687,690
6/18/2004	560,333
6/19/2004	476,952
6/20/2004	80,357
6/21/2004	24,857
6/22/2004	7,048
6/23/2004	22,690
6/24/2004	43,619
6/25/2004	17,286
6/26/2004	1,429
	* 2,909,667

* This number represents raw data that has not been statistically evaluated

Appendix 3. Tustumena Lake 2006 - Project Update

Smolt Migration			
Dates:	18-May to 28-Jun		
Sockeye total migration:		2,844,000	(±756,000)
Age 1:	90.7%	(±26.3%)	2,579,000 (±749,000)
Age 2:	9.3%	(±3.6%)	266,000 (±103,000)
Hatchery:	0.04%	(±0.05%)	10,600 (±14,800)

Adult Migration*			
Dates:	ND	to	ND
Sockeye return to Cook Inlet:		1,658,500	
Tustumena Escapement:		366,592	22.1%
Commercial Harvest:		1,211,408	73.0%
Personal Use Harvest:		75,000	4.5%
Sport Harvest:		5,500	0.3%

*Migration data provided by ADF&G

