Fishery Data Series No. 12-83

Upper Cook Inlet Salmon Escapement Studies, 2011

by

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and

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December 2012

Alaska Department of Fish and Game **Divisions of Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$log_{2,}$ etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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December 2012

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This document should be cited as:
Westerman, D. L., and T. M. Willette. 2012. Upper Cook Inlet salmon escapements studies, 2011. Alaska Department of Fish and Game, Fishery Data Series No. 12-83, Anchorage.

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ABSTRACT

In 201,1 the Alaska Department of Fish and Game used dual frequency identification sonar (DIDSON) to estimate sockeye salmon (*Oncorhynchus nerka*) escapements into the Kenai, Kasilof, and Yentna rivers of Upper Cook Inlet, Alaska. Bendix Corporation side-looking sonar equipment enumerated sockeye salmon escapement into the Crescent River. Only Kenai, Kasilof, and Crescent rivers escapement estimates were used inseason for management purposes. Yentna River escapement ranges were estimated postseason for sockeye, pink (*O. gorbuscha*), chum (*O. keta*), and coho (*O. kisutch)* salmon by adjusting DIDSON estimates using six sets of fish wheel selectivity indices obtained from the literature. Approximate sockeye salmon escapement estimates were 1,600,000 into the Kenai River, 246,000 into the Kasilof River, 62,000–140,000 into the Yentna River, and 82,000 into the Crescent River. The predominant age classes for sockeye salmon in the Kenai River were 1.3 (38.9%) and 2.3 (45.6%); Kasilof River – 1.3 (31.5%), 2.3 (25.6%), 2.2 (25.2%), and 1.2 (13.7%); Yentna River – 1.3 (55.9%), 0.3 (18.1%) and 1.2 (11.3%); and Crescent River – 1.3 (51.4%), and 2.3 (33.9%). Length and sex ratio information were collected for sockeye salmon in each river.

Key words: sockeye salmon *Oncorhynchus nerka*, Bendix, DIDSON, side-looking sonar, fish wheel coefficient, age, sex, length (ASL), sonar, escapement, salmon migration, passage, fish wheel, substrate-less, Upper Cook Inlet, Kenai River, Kasilof River, Crescent River, Yentna River, Susitna River

INTRODUCTION

In Upper Cook Inlet (UCI), Alaska, sonar technology has been used to estimate hourly and daily salmon (*Oncorhynchus* spp.) run sizes in the Kenai and Kasilof rivers since the late 1970s and in the Yentna and Crescent rivers since the mid-1980s (Figure 1). The species composition of each escapement has been estimated from daily fish wheel catches in each river. In this report, “escapement” refers to estimates of the number of salmon migrating upstream to spawn past a fixed point on the river. When significant numbers of fish are harvested upstream of the enumeration point, the number of fish that survive to spawn will be less than the escapement referred to in this report.

Optimal escapement goals (OEG), which take into consideration both biological and allocative issues, were established by the Alaska Board of Fisheries for late-run sockeye salmon and revised in 2011. The OEG for sockeye salmon into the Kenai River was 700,000–1,400,000 fish and for the Kasilof River was 160,000–390,000 sockeye salmon *O. nerka*. The Alaska Department of Fish and Game (ADF&G) also managed for a Kenai River inriver escapement goal that was dependent upon forecasts and daily inseason evaluations of run strength. If the sockeye salmon run forecast was < 2,300,000, the inriver escapement goal was 900,000–1,100,000; for a run of 2,300,000–4,600,000, the goal was 1,000,000–1,200,000; and for a run > 4,600,000, the goal was 1,100,000–1,350,000 fish. Sustainable escapement goals (SEG, i.e. an escapement index that provides for sustained yields over a 5–10 year period) for Susitna River sockeye salmon were established for weirs at Judd (25,000–55,000), Chelatna (20,000–65,000), and Larson (15,000–50,000) lakes (Fair et al. 2009). In 2009, the SEG for Yentna River sockeye salmon was eliminated due to uncertainty in the Yentna sonar/fish wheel escapement estimates. The biological escapement goal, which provides for the greatest potential for maximum sustained yield, was set at 30,000–70,000 sockeye salmon for the Crescent River.

SONAR DEVELOPMENT IN UCI

Prior to 1968, sockeye salmon escapement estimates in UCI were based on surveys of clear water spawning areas and provided no information about the distribution or number of sockeye salmon in glacially occluded waters (King et al. 1989). Commercial and recreational fishery management efforts were further hampered by lack of daily and cumulative estimates of escapement. These constraints were significantly reduced by the development of side-looking (once referred to as side-scan) sonar techniques by Bendix Corporation[1] to enumerate sockeye salmon in certain glacial tributaries of UCI.

The use of sonar to estimate the inriver salmon migration began on the Kenai and Kasilof rivers in 1968 with the use of multiple transducer systems (MTS), transducers arrayed linearly in up-looking positions (Namtvedt et al. 1977; Davis 1971). Transition from MTS to side-looking sonar aimed horizontally atop an artificial substrate was tested on the Kenai River north bank between 12 July and 3 August 1977 with a single side-looking system (1977 model) transducer deployed on the north bank (escapement counts in 1977 were derived from an MTS array). Side-looking sonar proved to be more practical and was implemented on both banks of the Kenai River in 1978. A similar unit was deployed for the first time on the north bank of the Kasilof River in 1977 (south bank counts also used an MTS array), and by 1979 both banks of the Kasilof River were utilizing side-looking sonar. In the Susitna River, an attempt to utilize MTS equipment failed in 1976, leading to use of side-looking sonar, which began with limited success in 1978. Side-looking sonar has been used since 1979 and is continuing to be used to enumerate the Crescent River sockeye salmon escapement.

Initially, all side-looking transducer systems were mounted on 15 cm (6 in) by 18.3 m (60 ft) diameter aluminum tubing (artificial substrate) and positioned on the bottom of the river, perpendicular to the bank. This arrangement forced fish to move across the artificial substrate and through the sonar beam. A transition to substrate-less counters began in the late 1980s because artificial substrates affected fish behavior, required constant maintenance and created safety problems with tree and brush entanglements. Substrate-less counters began operation in the Kenai River in 1987 (north bank) and 1993 (south bank); Crescent River (both banks) in 1988; Yentna River in 1994 (south bank) and 1995 (north bank); and in the Kasilof River in 2003 (both banks).

Originally, sonar operations were conducted at different sites on the Kasilof, Yentna, and Crescent rivers. In 1983, the Kasilof River site was relocated from the outlet area of Tustumena Lake (about 3 km below the lake) to river kilometer 12.1 (mile 7.5), near the Sterling highway bridge and closer to Cook Inlet (King and Tarbox 1984). The Susitna River site was abandoned in 1985 when recurrent flooding rendered the site untenable. The site was relocated to the Yentna River in 1986, about 9.2 km (6 miles) upstream of the confluence with the Susitna River and about 53 (river) km from Cook Inlet. Sonar operations began at Crescent River in 1979 below the outlet of Crescent Lake but relocated nearer Cook Inlet (~2.5 km) in 1984 (King and Tarbox 1987). The Kenai River sonar site has been located at river kilometer 30.9 (mile 19.2) since the 1960s.

A dual frequency identification sonar (DIDSON; Belcher et al. 2001, Belcher et al. 2002) was used for the first time to estimate escapement on the south bank of the Kenai River in 2007 and on the north bank in 2008; for the first time on both banks of the Kasilof River in 2010, and for the first time in the Yentna River (both banks) in 2009. Bendix Corporation side-looking sonar counters (1978 and 1980 models) as described by King and Tarbox (1989), Gaudet (1983), and Bendix Corporation (1980, 1984) continue to enumerate Crescent River sockeye salmon. No plans have been made to switch to DIDSON technology in the Crescent River in the near future.

[1] Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

FISH WHEELS AND APPORTIONMENT

Fish have been caught by fish wheels at all sonar sites to apportion sonar counts by species (when necessary) and to collect morphological information such as age, sex, length (ASL) and weight data from sockeye salmon. Fish wheels were once deployed along both banks of the Kenai and Kasilof rivers but beginning in the mid-1980s only one fish wheel was deployed on the north bank of each river because species composition was similar between banks. The Yentna River has always required two fish wheels, one on each bank, because of differences in species composition. Factors influencing the accuracy of escapement estimates for pink, coho, chum, and Chinook salmon in the Yentna River were discussed by Tarbox et al. (1981, 1983). Prior to 1993, drift gill nets and a fish trap captured fish in the Crescent River for species apportionment and ASL sampling. Beginning in 1993, the use of a single fish wheel on the south bank made maintenance of sample gear less problematic, improved operational integrity and provided larger sample sizes.

Prior to 1999, a minimum fish wheel catch of 150 fish was required to apportion sonar counts in the Kenai River. However, during periods of low passage rates, it often took several days to attain an adequate sample size. In 1999 the apportionment rules changed so that apportionment would not begin until salmon species other than sockeye exceeded 5% of the total fish wheel catch and the catch of other salmon was in an upward trend. We have also applied the same criteria to the Kasilof River. Altering the method by which sonar counts were apportioned to species did not significantly change the final sockeye salmon estimates ($p<0.05$; S. Carlson, Commercial Fisheries Biometrician (retired), ADF&G, Soldotna; personal communication) and was more defensible. Salmon species have always been apportioned from Yentna River sonar counts by bank because of the variability of run timing and differences in species composition between banks. The same has been true on the Crescent River since 1993, where apportioned sonar counts have been based on the catch of a single fish wheel located on the south bank.

OBJECTIVES

The four main objectives for UCI salmon escapement projects in 2011 were to estimate: (1) the daily and cumulative escapement and run timing of sockeye salmon (*O. nerka*) into the Kenai, Kasilof and Crescent rivers; (2) a minimum and maximum escapement range for the Yentna River; (3) ASL compositions for sockeye salmon escapements in each river; and (4) differences between individual observers who counted DIDSON subsample image files during the season.

METHODS

SONAR SITES

The Kenai River is a glacial river about 120 m wide (at the sonar site) when the water level peaks in early August. River (bottom) profiles (Figure 2) have remained relatively the same since the early 1980s. The Kenai River north bank transducer was located on the inside of a gentle curve of the river that slopes gradually (~1 m drop in 30 m) toward the opposite bank causing fish to be more dispersed during low water. The south bank slope was steeper (dropping ~1.5 m within the first 10 m, 2.2 m/25 m), deeper, and swifter than the north bank, forcing fish to stay within 10 m of shore throughout the run. The river bottom consisted mostly of rocks 10–30 cm in diameter along both banks with a few bigger rocks (~50 cm) scattered along the south bank.

The Kasilof River is a glacial river about 60 m wide at the sonar site when water level peaks in early August. The north bank transducer site sloped downward 0.6 m within the first 3 m from shore then flattened to ~0.25 m in 30 m. The south bank slope was relatively constant, dropping slightly more than 1 m in 40 m. The river bottom consisted mostly of rocks 20–60 mm in diameter along both banks, although larger rocks and boulders exceeding 1 m^3 were common along the north bank.

The Yentna River is very turbid, <15 cm (secchi disc depth) at the surface, ~250–300 m wide at the sonar site, rising and falling up to 0.2 m daily. The river profile at each transducer site was relatively steep, dropping 4 m in 20 m on the north bank and over 3 m in the first 10 m on the south before flattening in the next 10 m of range. The substrate consisted of rounded rocks on the north bank and angular or blocky rocks on the south, averaging 10–30 cm in diameter along both banks.

The width of the Crescent River at the sonar site has generally been 40 m throughout the operational period but can increase to 70 m with an increase in flow. Crescent River bottom profiles have not been plotted. The north bank transducer was located on the inside of a gentle bend in the river where the substrate sloped away along a (intermittently) submerged gravel bar for a considerable distance allowing for a counting range of 10–11 m or more. The south bank transducer was on the outside of the bend and across from the north bank transducer. This bank sloped at a sharp angle limiting total range to 4–5 m. The river bottom consists mostly of rocks 20–60 mm in diameter along both banks, although larger rocks and boulders exceeding 50 mm can be found along the south bank.

DIDSON OPERATIONS

In 2011, DIDSON daily salmon escapement estimates for the Kenai and Kasilof rivers were not converted to Bendix equivalent units as they were in 2010. On the Yentna River, (DIDSON) sockeye salmon migration estimates were not used in 2010 or 2011 for management because of uncertainties in species composition.

The DIDSON operated on one of two frequencies, one of 1.8 MHz with an acoustic beam consisting of 96, 0.3^o x 14^o beams and a range limit of 10 m, and the other of 1.1 MHz with an acoustic beam consisting of 48, 0.4^o x 14^o beams and a range limit of 30 m. Once each hour, DIDSON recorded two 10 min image files of fish passage within ranges of 1–10 m and 10–20 or 10–30 m from shore depending on bank. Laptop computers collected data that were stored and backed up on 750 GB external hard drives and DVDs.

The pulse length of the DIDSON makes it difficult to field test target strengths (TS), however, a 38.1 mm calibration sphere was clearly seen in DIDSON images from early field tests (Maxwell and Gove 2007). The TS of the sphere is theoretically between -38 dB and -39 dB for each frequency at a water temperature of 9^o C. An automated rotator coupled with an attitude sensor assured proper aim once the transducer was deployed. DIDSON created video-like images on a computer screen that were manually counted. Auto counting methods have been tested for DIDSON but have not been very accurate (Suzanne Maxwell, Commercial Fisheries Biologist, ADF&G, Soldotna, personal communication).

The aiming protocol of Maxwell and Smith (2007) was used as a guideline to determine the best aim for each river. The position of DIDSON, the nominal beam angle and range, was needed to calculate and graph the sonar beam over river profile. The height of the transducer was adjusted above the river bottom to determine “best fit” or beam angle for the desired range of the beam. Initially, the angle of the rotator/transducer was set and adjusted by an attitude sensor. However, unless the river bottom changes, the same beam angle was used whenever the DIDSON transducer was placed in the same location and at the same height. To check the aim, an artificial target with an acoustic strength similar to that of a sockeye salmon was moved along the river bottom ~2 m in front of the transducer and through the acoustic beam. Once a proper aim was established, pitch and roll data from the attitude sensor was collected to maintain that aim, particularly when the DIDSON had to be moved or cleaned. Silt buildup behind the DIDSON lens was a problem, so lenses were cleaned once every week on the Kenai River, once a week on the Kasilof River and once a day on the Yentna River to maintain signal strength integrity and visual acuity.

All DIDSON transducers were mounted on an aluminum H-shaped stand in about 0.6 m of water and ~15 cm above the bottom in a horizontal side-looking position on each bank. The attitude sensor was mounted externally to the DIDSON transducer, which was mounted to a rotator operated by a control box located in a shed. The DIDSON transducer was placed 1–1.5 m from the offshore end and immediately upstream of a short weir, which extended approximately 3–6 m into the river.

Technicians played back the image files that contained 10 min recordings of fish passage at the different ranges, counting all fish observed within each 10 min span and expanding to hourly estimates for nearshore (<10 m) and offshore (>10 m) fish passage. The nearshore files, set at high frequency, usually recorded at eight frames per second while the offshore files (low frequency) recorded at six frames per second.

To process and count the raw images as quickly and accurately as possible, a DIDSON background subtraction algorithm was often used to view the images of fish against a black background. For counting purposes, an intensity setting of 40 dB and threshold of 4–5 dB produced the best contrast that ensured counting ease and accuracy. Playback frame rates often varied from 8–30 frames/s depending on fish densities and the ability to accurately differentiate fish images. Intensity and threshold levels used by technicians were relatively constant with small variations between individuals for personal preference.

All moving targets (fish) were counted as observed on the computer screen for each near shore ($_n$) and offshore ($_o$) 10 min file, differentiating upstream (n_u) from downstream (n_d) swimming fish. The number of salmon migrating upstream in an hour (N_h) was estimated by

$$N_h = 60\frac{\left(n_{u(n)} - n_{d(n)}\right) + \left(n_{u(o)} - n_{d(o)}\right)}{10} . \tag{1}$$

All 24 hour estimates of a calendar day were summed to produce the daily escapement (N_d):

$$N_d = \sum_{h=1}^{24} N_h . \tag{2}$$

Observer Errors

Counting variability between observers from the Kenai, Kasilof, and Yentna rivers was examined again in 2011. Each observer recounted a total of 30, 10 minute DIDSON subsample files recorded during or near the peaks of the 2010 Kenai, Kasilof or Yentna river runs. The number of observers depended on the project, totaling four from Kenai, three from Kasilof, and four from the Yentna River projects. All counts were done from nearshore (1–10 m) subsample recordings (both banks) where fish abundance and the likelihood of error was greater than less abundant offshore subsamples. The number of fish per subsample in all Kenai River files ranged between 100 and 1,200 fish, averaging 500 fish/file; Kasilof ranged between 25 and 700 fish (175 fish/file); and Yentna River between 40 and 200 fish (135 fish/file).

For each river, the number of fish counted by each observer per subsample was compared against the crew average for that subsample:

$$\overline{f}_i = \frac{\sum f_i}{n_i} \tag{3a}$$

where:

$\bar{f}_i$ = average number of fish for a given subsample *(i)*

$\sum f_i$ = sum of fish counts of all observers for a given subsample

n_i = number of observers for a given subsample

The number of observers in each crew, (*x*), varied between 3 (Kasilof) and 4 (Kenai and Yentna). The observer average of all subsample counts (*30*) was also compared to the crew average of all subsamples (*30x*):

$$\overline{F}_o = \frac{\sum f_o}{30x} \tag{3b}$$

where:

$\overline{F}_o$ = average of all observers, and

$\sum f_o$ = sum of all subsample counts for all observers.

The standard deviation (*SD*) provided a measure of error between observers, and R^2 values indicated the relationship between an individual's subsample count and the average of the crew for that same subsample.

Previous studies indicated that differences between observers increased at higher densities (Westerman and Willette 2011), more so for the Kenai River and less so for those rivers with lesser densities. Observer counts were stratified for every 100 fish based on averages (3a) of each sample (100–199, 200–299 etc…), then averages determined from these strata were compared against those of each observer.

Standard deviations and correlations (R^2) of individual sample values were compared against the averages for each sample and for all samples (*n*=30).

BENDIX OPERATIONS

In 2011, the Crescent River sockeye salmon migration was estimated using Bendix Corporation, single beam, side-looking sonar counters (1978 and 1980 models). The Bendix counters have a fixed pulse width of 100 µs, use a 515 kHz transducer either multiplexed in an alternating mode between 4^{o} for offshore detection and 2^{o} for nearshore detection, or on a single beam. The counting threshold was preset by the manufacturer at approximately -38 dB but swimming pool tests with a standard target (-41 dB) typically saturated the counters at normal voltage output levels (Westerman and Willette 2010). Theoretical TSs for Bendix of a 38.1 dB calibration sphere was determined to be -43.2 dB (Maxwell and Gove 2007).

Bendix transducers were aimed manually on both banks. The aim was checked and adjusted by moving an artificial target (a sealed, weighted plastic sphere with a target strength approximating that of an adult salmon) along the river bottom and through the ensonified area at various (reachable) distances from the transducer. Aim was verified when the target was detected by the Bendix counter with simultaneous visual recognition on an oscilloscope. Transducer placement in the river has been relatively consistent from year to year where >80% of the fish passage occurs within the nearshore half of the ensonified area (counting range). Short weirs (<6 m wide) were placed immediately downstream of the transducer, ensuring that fish pass through the sonar beam and not too near or behind the transducer.

The Bendix transducers convert electronic signals into an acoustic pulse transmitted from the transducer, through the water along the river bottom. Any object, or target, that passes through this acoustic pulse or "beam" will return an echo to the counter for electronic interpretation. Before a target can be counted as a single "fish" by the Bendix counter, the echoes must meet or exceed a set threshold, fixed "hits to count" criteria and ping rate (pulse repetition rate) that matches the swimming speed of fish. Targets were counted by observing returning echoes displayed on an oscilloscope, then compared to the Bendix count. The ping rate was usually adjusted (calibrated) if relative error between the counter and oscilloscope was >10% although a 20% difference was considered adequate. Calibrations lasted 10 minutes or until at least 100 fish were observed on the oscilloscope, whichever came first. If the automated count was less than observed on the oscilloscope, the ping rate was increased; or slowed if the counts were too high. Under-counting or over-counting depended upon the time a fish spends in the acoustic beam of the transducer. Counters were calibrated between 0700 and 0100, at least two hours/day, and with greater frequency during episodic periods of high fish passage.

The power output or receiver sensitivity, critical in target detection, was set early in the run, at a typical historical level and was not adjusted for calibration purposes. If the counting range was extended or shortened substantially, sensitivity was adjusted up or down to improve target detection if necessary. The sensitivity for each counter was set to maximize detection of migrating fish but limit background noise that can hinder target detection. The spatial distribution of fish from the transducer, based upon sector counts, determined the best counting range.

The Bendix counting range, divided into 12 sectors, recorded fish counts (N_s) wherever the fish crossed the acoustic beam (distance from shore). These sector counts were printed out at the start of every hour (sector hour counts) and summed to get a count for each hour (N_h):

$$N_h = \sum N_{s\,b}\,. \tag{4}$$

A valid count meant that auto counted and manually counted fish were as close to one (within 10%). Valid sector counts were summed for the hour and added to other hourly counts to derive an escapement count for the day (N_d):

$$N_d = \sum N_h . \tag{5}$$

False Counts (Debris)

Occasionally false counts caused by bottom noise (rocks), holding salmon, equipment failure or river debris adversely affected sector/hour counts and were replaced by an interpolated count. An interpolated count for any given sector $\left(\bar{x}_y\right)$ was averaged from all valid counts within the affected and adjoining sectors:

$$\bar{x}_y = \frac{\sum s_{(xyz)}}{n_{(xyz)}} \tag{6}$$

where:

$\sum s$ = sum of all valid counts within affected *(y)* and adjoining sectors (*xz*), and

n = number of valid counts within sectors (*x, y & z*).

When false counts were annotated as debris, Microsoft Excel formatting automatically inserted this interpolated number (equation 6) into the affected sector(s) or hour(s).

$$N_h = \sum s + \sum \bar{x} . \tag{7}$$

Hourly/sector sonar counts were summed to estimate total daily escapement (equation 2). This method was also applied to missing hours of DIDSON counts (sectors are not applicable to DIDSON operations).

A high water event occurred on the Yentna River in 2011 causing the north bank (B_1) to be shut down for more than three days. A ratio of counts between banks was applied to these day(s) to adjust for the missing (daily) escapement estimates for B_1 (hourly estimates were not calculated, only daily estimates):

$$N_d = \left(\frac{\sum_{3d} B_1}{\sum_{3d} B_2} \right) b_2 \tag{8}$$

where:

$\sum_{3d} B_1$ = sum of 3 prior days of valid escapement estimates for bank 1 (B_1)

$\sum_{3d} B_2$ = sum of 3 prior days of valid escapement estimates for bank 2 (B_2)

b_2 = valid daily escapement estimate of bank t for the day(s) bank 1 did not operate.

FISH WHEELS

Fish wheels operated on the north banks of the Kenai and Kasilof rivers, both banks of the Yentna River and on the south bank of the Crescent River to catch fish for apportionment purposes, and to collect age, sex and length (ASL) information from sockeye salmon. All fish wheels were of similar design consisting of framework that supports aluminum or foam filled plastic floats, an axle and livebox. Partitioned, custom made aluminum floats, prevented the fish wheel from sinking or listing should the float develop a leak. Mounted to the axle were two baskets and two paddles, at 90^{o} angles to each other that rotated by the force of the river current. As the axle rotates in the current, the baskets scoop fish from the river, dropping them in a livebox mounted to the outside of the fish wheel frame. The baskets were fitted with 2–2.5 inch (5–6 cm) tarred netting and a slide, which funneled the fish toward an opening in the basket netting and into the livebox. The livebox was mostly submerged in the river, where a constant flow of freshwater kept fish alive and vigorous. All fish wheels were anchored to shore using a boom (either a wooden or steel 4 x 4) to station the wheel in current deep and fast enough to allow the axle to turn. The baskets rotated as close to the bottom as possible where most fish migrate without jamming into the bottom. Cables or rope secured the front end to shore and kept the fish wheel parallel to the current. Depending on current, spinning speed of the fish wheel ranged between 2 and 5 revolutions per minute (rpm) with optimum speed being 3–4 rpm (any slower or faster reduced its effectiveness). A short weir, 3–6 m wide (depending on river) with pickets spaced no more that 7 or 8 cm apart, extended from shore diverting near shore fish toward the spinning baskets. These weirs were either aligned with or just downstream of the axle or immediately below the fish wheel (nearshore) float. At some sites it was practical to extend the weir immediately below the wheel, past the inshore float, to prevent fish from passing under the fish wheel float and avoiding the catch zone.

In 2011, the Kasilof River fish wheel was positioned under the Sterling Highway bridge for the first three weeks of operations, then relocated 30–40 m upriver when the water level was higher. The wheel fished more effectively from start to finish and met our needs for ASL analysis.

Fish wheels also recaptured tagged salmon as part of two studies designed to estimate fish wheel selectivity and Susitna River chum and coho salmon abundance. They were also used to collect genetic samples from Yentna River sockeye salmon. In 2011, the third year of a four year fish wheel selectivity study, each Yentna fish wheel operated for nearly 18 h/d during three time periods; 0600–1200, 1200–1800, and 1800–2359 hours (prior to the study, fish wheels operated about six hours a day).

APPORTIONMENT

Kenai or Kasilof River sonar counts are not apportioned until the species composition of the fish wheel catch is at least 5% pink and/or coho salmon and the evidence of a trend is obvious. This guideline was developed to accommodate situations where run timing of sockeye and pink salmon (and sometimes coho salmon) overlap, usually during even-numbered years. All daily sonar estimates were apportioned for the Yentna and Crescent rivers because of the high numbers of pink, chum, and coho salmon in the daily fish wheel catches.

At Kenai, Kasilof, and Crescent rivers, the daily escapement of each salmon species, and Dolly Varden at Crescent River, N_x, was determined by multiplying the sonar escapement estimate or count (N_d) by the percentage of each species captured in the fish wheels, i.e.,

$$N_x = N_d\left(\frac{F_x}{F_t}\right), \tag{7}$$

where:

F_x = the daily catch of species x, and

F_t = the total daily salmon catch in the fish wheel.

When the fish wheel catch was low (<20 fish) or did not operate during a 24 h period, the catch from the 2 previous days were combined with the low catch to calculate F_x and F_t to estimate N_x.

The abundance of nonsalmon in fish wheel catches, such as rainbow trout and whitefish, are typically small (<1%) so these fish are not apportioned from the total sonar count. However, relatively high abundances (~5–10%) of Dolly Varden are apportioned from the Crescent River counts, because their lengths or acoustic sizes are similar to those of salmon (Davis and King 1994).

Species selectivity of the Yentna River fish wheels have been a persistent concern. Beginning in 2009 and continuing through 2012, fish wheel selectivity coefficients (Table 1) derived from studies on the Susitna (ADF&G 1983) and Taku rivers (Meehan 1961) were factored into daily (total) fish wheel catches to determine a minimum-maximum (Yentna River) escapement range for sockeye, pink, chum and coho salmon.

The lowest and highest of seven estimates, six derived from Table 1 coefficients above and the seventh from traditional means, determined the escapement range for each species ($n_{rs(i)}$). The coefficient adjusted daily escapement was estimated by:

$$n_{rs(i)} = \left(\frac{\dfrac{F_{(rs)}}{c_{i(rs)}}}{\left(\dfrac{F_{(rs)}}{c_{i(rs)}}\right)+\left(\dfrac{F_{(ps)}}{c_{i(ps)}}\right)+\left(\dfrac{F_{(cs)}}{c_{i(cs)}}\right)+\left(\dfrac{F_{(ss)}}{c_{i(ss)}}\right)}\right)N_d, \tag{8}$$

where:

$F_{(rs)}$ = daily fish wheel catch of sockeye salmon,

$F_{(ps)}$ = daily fish wheel catch of pink salmon,

$F_{(cs)}$ = daily fish wheel catch of chum salmon,

$F_{(ss)}$ = daily fish wheel catch of coho salmon,

$c_{i(rs)}$ = the i^{th} fish wheel selectivity coefficient for sockeye salmon,

$c_{i(ps)}$ = the i^{th} fish wheel selectivity coefficient for pink salmon,

$c_{i(cs)}$ = the i^{th} fish wheel selectivity coefficient for chum salmon, and

$c_{i(ss)}$ = the i^{th} fish wheel selectivity coefficient for coho salmon.

CESSATION CRITERIA

Operations ended on the Kenai, Kasilof and Crescent rivers when daily escapements met cessation criteria of $\leq$1% of the total cumulative count of sockeye salmon for three consecutive days. The cessation criteria for the Kenai and Kasilof River sonar enumeration projects could not be applied until after the closure of commercial fishing within the Kenai, Kasilof and East Forelands sections. Exceptions to this criterion have been made if budgetary constraints and/or environmental factors such as high water put equipment or personnel at risk and the end of the run was near and close to the 1% cessation criteria.

AGE, SEX AND LENGTH DATA

Sample sizes for estimating ASL compositions were 0.1% of the previous day's sockeye salmon escapement estimate on the Kenai River, 0.2% on the Kasilof River, and 0.5% on the Crescent River. A single scale for age analysis was collected from a preferred area on the left side of each fish, on a line between the posterior edge of the dorsal fin and anterior portion of the anal fin about two or three scale rows above the lateral line. If the preferred area was scarred or void of scales, the scale was either taken in front of the preferred area or from the same spot on the right side of the fish. Lengths were measured from mideye to fork of tail. ASL information and genetic samples were collected from every sockeye salmon captured by the Yentna River north bank fish wheel and from every sixth sockeye salmon captured by the south bank fish wheel during each of three two-hour (genetic) sampling periods. Total lengths (snout to fork) of pink, chum, and coho salmon (n=400) were also measured from the Yentna River.

STREAM SURVEYS AND WEIR COUNTS

A stream survey on Quartz Creek was conducted during the historical peak of sockeye salmon spawning activity (late August) to get an indication of tributary escapements of the Upper Kenai River. All observed fish, living and dead sockeye salmon and other species of fish, were counted and evidence of predation noted. The Quartz Creek survey covered the lower 7.5 km of the creek, starting at the Matanuska Electric Association substation on the Sterling Highway and ending at Kenai Lake. Weir counts on the Russian River, provided by the Division of Sport Fish, and Hidden Creek, by the Cook Inlet Aquaculture Association (CIAA), were other indicators of run strength in the Upper Kenai River. CIAA conducted weir counts at Judd, Chelatna, Larson, Shell, Fish Lakes Creek, and Red Salmon Lakes within the Susitna River watershed (Northern District lakes). A weir was operated on Fish Creek and stream surveys (aerial and ground) conducted on a number of Northern District streams and lakes by ADF&G (Division of Sport Fish, Palmer).

CLIMATOLOGICAL

Water and air temperatures, water depth (staff gauge), and general weather conditions were recorded at each of the sonar sites. Turbidity (secchi disc) was measured every day in the Kenai and Crescent rivers but not in the Kasilof and Yentna rivers.

RESULTS AND DISCUSSION

The escapement data presented in this report are estimates and not precise representations of escapement although the numbers may indicate otherwise.

Conditions were adequate for using sonar to estimate salmon escapement in each of four river systems in UCI because 1) most sockeye salmon migrate near shore (<10 m) and near the bottom within range of a transducer beam; 2) salmon densities were not consistently overwhelming, allowing for Bendix calibrations or processing of DIDSON files to be completed in a timely and reasonably accurate manner; and 3) the acoustic size of migrating fish and target strengths were within detection thresholds of Bendix counters and DIDSON. The TS of (tracked) salmon averaged -32.2 dB in the Copper River (Maxwell and Gove 2007) and between -32.0 and -32.4 dB in the Yentna River (Tarbox and King 1991). These TS were well within the minimum thresholds for DIDSON which can easily detect calibration spheres of -38.1 dB and Bendix sonar (-43 dB).

This was the first year that escapement estimates from (10 minute/hour) DIDSON subsample recordings were not converted to Bendix equivalents for the Kenai, Kasilof, and Yentna rivers. Crescent River escapement was still enumerated by Bendix counters.

KENAI RIVER

The final Kenai River sockeye salmon escapement estimate (DIDSON) was 1,599,217 fish, rounded to 1,600,000, the seventh highest estimate since 1979 (Tables 2 and 3). Pink and coho salmon were not apportioned from the total sonar estimate because of the length of the project period and run size and/or timing of these species. Fish wheel catches of Chinook salmon were inadequate to justify apportioning this species. See Appendices A1–A2 for daily estimates by bank.

Historically, the species composition in the Kenai River fish wheel catch has been predominantly sockeye salmon, usually exceeding 85% of the catch during even-numbered years (except for 2004). In odd years the percentage of pink and sometimes coho salmon will exceed 5% of the daily fish wheel catch late in the season (August). Counts of species other than sockeye salmon have limited value as indices of total passage, because (1) their run continues beyond the operational time frame of the project and (2) fish wheel avoidance (Chinook salmon). Most Chinook salmon do not migrate near shore and are frequently observed in the outer ranges of DIDSON (10–30 m).

After mid-July, a small number of the fish observed beyond 20 m on the south bank were often Chinook salmon, based on the size and swimming behavior observed in DIDSON images. A few Chinook salmon were also observed offshore of the north bank but were usually intermixed with sockeye salmon. Many of the Chinook salmon appeared to be spawning pairs.

The Kenai River estimate exceeded the maximum inriver goal of 1.0–1.35 million sockeye salmon, a goal based on a Kenai River run forecast of >4 million fish. The largest documented counts occurred in 1987 (the Glacier Bay oil spill, 2.2 million fish) and 1989, (the Exxon Valdez oil spill, 2.3 million fish) when commercial fishing was restricted for part or all the fishing season.

Most of the escapement (~80%) occurred within a 16 day period, beginning 17 July, with the midpoint of the escapement on 22 July (Table 4), two days earlier than the historical average.

The escapement peaked on 17 July when ~230,000 sockeye salmon passed the sonar site with lesser peaks following on 20 July (~113,000 fish) and 24 July (~111,000, Figure 3).

Run timing was similar for both banks with no significant bank preference (~52% north bank) throughout the run (Table 5). However, distribution from shore differed early in the run (Table 6). Between 1–7 July, only 4% of the fish migrated within 0–10 m of the north bank transducer compared to 85% for the south. With time and rising water, fish migrated closer to shore along each bank and by 5 August, >88% were passing within 10 m of the DIDSON transducer on the north and >98% on south. Subsample counts for the season indicated ~75% of the north bank fish and ~98% of the south bank fish migrated within 10 m of each transducer for the season.

Average hourly passage rates were relatively similar between the north and south bank. Salmon passage rates along the north and south banks met or exceeded a constant or average daily rate of 4.2% (the average % hourly passage rate for a twenty-four-hour period) between 1300 and 2300 and were lowest throughout the morning hours (Figure 4; Appendices A3–A4).

The Kenai River fish wheel caught (Table 7) 2,019 salmon with sockeye salmon (99.0%) comprising almost the entire catch with a few pink (0.5%), coho (0.1%) and Chinook salmon (0.3%) present. The high percentage of sockeye salmon was typical, because pink salmon (Table 8) usually do not appear in the river during odd numbered years. Catch per unit effort (3.4 fish/hr) was less than half the historical average (7.7 fish/hr) for an odd year, probably a result of high water clarity.

The predominant age components of the sockeye salmon escapement were 1.3 (38.9%) and 2.3 (45.6%) fish based upon a sample of 791 fish (Table 9). Age-1.3 fish averaged 577 mm and 2.3 fish averaged 583 mm which was about average for each age class. The average length for all age classes combined was 565 mm which was within the historical range of 489–576 mm. The male to female ratio (0.8:1) was consistent with the historical average ratio (Table 10).

In 2011, the proportion of freshwater age-2 fish was the highest since 1993 and the fourth highest since 1970, indicating an unusually high number of juveniles reared for an additional year in freshwater lakes. Slightly more than 90% of the sockeye salmon in the 2011 migration were from the 2005–2006 brood years when escapements exceeded 1.9 million fish (DIDSON) each year, some of the highest documented escapements in the history of the Kenai River sonar project. This high proportion of holdovers in freshwater may be an indication of intraspecific competition for the food source as affected by environmental conditions (DeCino and Edmundson 2003).

Observer count variability was compared between members of the Kenai River crew using average counts as a comparison baseline. Most files selected for this comparison analysis (70%) ranged between 200 and 700 fish/h (10% < 200 fish and 20% > 700 fish). Overall, average counts per observer for all combined samples correlated closely with the crew average (R^2=0.9864–0.9925; Table 11). Observer variability (*SD*=5.5) was analyzed using 30 subsamples (10 min files) that ranged between 164 and 1,070 fish/subsample (average 477 fish). Variability between observers increased as fish densities increased, especially as sample densities exceeded 500 fish (3,000 fish/h), with samples exceeding 900 fish (*n*=2) the highest (*SD*=57.7–85.2) and <500 fish the lowest (*SD*=2.4–8.1; Figure 5).

The biggest challenge to counting fish from Kenai River image files, more so than any other escapement project in UCI, was detecting individual fish within high densities of fish. High densities created acoustic shadowing effects caused by near shore fish that often masked fish passing side by side. The closer to the transducer fish passed, the more profound the problem despite efforts by observers to control the frame rate and intensity to detectable levels. This was a concern on the south bank, where many fish were tightly packed within 5 m throughout the peak of the run, creating these shadowing effects. On the north bank, fish were more distributed throughout the detection range of the DIDSON, especially during the day. Image resolution was not as clear on the north bank because of the long range requirement and capabilities of the particular DIDSON unit. Keeping mental track of which fish were or were not counted added to the challenges on both banks. Because we don't know what the actual count is, rather than use any single observer as a benchmark with which to compare other observers, the average count of the crew was the benchmark for each of the 30 subsamples. Ideally, all observers should be counting fish at a 1 for 1 rate but that was not possible especially with high densities of fish. A counting error of 5% of the crew average was the set standard for all observers.

Late run Russian River and Hidden Creek weir counts and a Quartz Creek stream survey represents an upper Kenai River index of 103,494 sockeye salmon, or ~6.5% of the estimated sockeye salmon migration past rkm 31. The total late run Russian River weir and stream survey count was 76,944 sockeye salmon and the Hidden Lake weir count was 17,771 (Table 12). The late run escapement of sockeye salmon fell within the SEG for the Russian River (30,000–110,000) but was one of the lowest in 30 years. Survey counts for Quartz creek were conservative because 1) unknown quantities of fish were observed in Kenai Lake at the mouth of the creek, 2) any fish in water >1.5 m deep were difficult or impossible to see, and 3) early (or late) spawners were not counted because only one survey was conducted. Ptarmigan Creek was not surveyed this year because of budget constraints and weather. Relationships ($R^2 < 0.25$) between combined survey/weir counts and our sonar estimates have never been very good (Westerman and Willette 2010).

The Kenai River is a glacially fed river and rose steadily (0.6 m) throughout the summer, peaking on 7 August (Table 13; Figure 6). Water clarity was about average (87 cm) and temperature slightly warmer than prior years. Fish distribution from shore was affected by water level; the deeper and swifter the water, the closer to shore fish migrated. The water level was higher in late July during the peak of the run, so fish migrating closer to the bank were less dispersed in the sonar beam and more susceptible to the fish wheel.

KASILOF RIVER

The final 2011 sockeye salmon escapement estimate for the Kasilof River was 245,721 sockeye salmon (Table 14), rounded to 246,000 fish, well within the OEG. The same criteria used on the Kenai River to apportion sonar estimates also applied to the Kasilof River, so sonar counts were not apportioned by species because of a low percentage (<3%) of other species in daily fish wheel catches.

The midpoint of the escapement occurred on 17 July (Table 15), 2 days later than the historical average (1979–2010) with the majority of the escapement (80%) passing the counting site in 40 days, four days longer than the historical average (1979–2010). Two substantial peaks occurred, one on 23 June (Figure 3) and the other 18 July. Approximately 71% of the fish were estimated to have migrated along the north bank which was substantially higher than the historical average of 56% (1979–2010; Table 5; Appendices B1and B2) for daily DIDSON subsample estimates by bank.

Fish migrated farther from shore (10–30 m) in late June and early July on both banks, but as water level slowly rose, fish moved inshore (<10 m) in late July and August (Table 6). By the middle of July, >98% of the fish were passing within 10 m of the transducer along the north bank and 78% within 10 m of the south bank. By the end of July, >94% of the fish were within 10 m of the transducer on both banks. Since 2006, the majority of sockeye salmon (>67%) have been counted on the north bank but prior to 2006, fish were more evenly distributed between banks. What caused fish to favor the north bank is unknown.

Hourly escapement timing patterns varied between banks (Figure 4). The migration along the north bank declined substantially after midnight and tended to increase through late morning, into the late afternoon and evening hours. The migration along the south bank also varied throughout the day with greatest percentages of fish passing the site during early and late morning hours and late evening (Appendices B3–B4).

The fish wheel operated for ~601 hours and caught a total of 1,413 salmon (~99% sockeye) for a CPUE of 2.4 fish/h, lower than the historical average of 4.0 fish/hr (Tables 16 and 17). The fish were more susceptible to capture during the evening and night time hours which may be attributable to abundance and/or any one or a combination of other environmental factors. In other glacial rivers, fish wheel CPUE is comparatively higher than the Kasilof River.

The sockeye salmon escapement age composition was mainly age-1.3 (31.5%), -2.3 (25.6%), -2.2 (25.2%) and -1.2 (13.7%) fish (Table 18) based on a sample of 489 fish. Average lengths were 549 mm for age-1.3, 547 mm for -2.3, 469 mm for -2.2 and 463 mm for -1.2 fish (Table 19). Average lengths for all age classes ranged between 463 mm and 549 mm, averaging 508 mm. The male to female ratio was about average (0.8:1) for this river.

The brood years 2005–2007, which produced the 2011 run, ranked in the top 5 highest escapements since operations began at this site in 1983. The abundance of freshwater age-2.0 fish in 2011 was >20% higher than the historical average, indicating that fry from those brood years stayed in freshwater an extra year. This was similar to the events that happened in the Kenai River, where fry held over an extra year in 2005 and 2006.

Observer comparison studies indicated little difference in counting ability between Kasilof River observers, i.e. a nearly 1:1 relationship (R^2=0.999, *SD*=1.5) existed between observers when counting identical image files (Figure 5; Table 11). Most files or subsamples (87%) contained 100–300 fish, averaging 178 fish/file. Unlike the Kenai crew, variability between observers was minimal because of low fish densities. But, the trend was similar to Kenai as variability increased with higher fish densities. Observer counts of subsamples containing 300 fish or more (*n*=4) were most variable (*SD*=5.1–13.0), and those subsamples containing <300 fish were least variable (*SD*=0.6–1.5). Unlike the Kenai River, spatial distribution and acoustic shadowing effects were not a problem for the Kasilof River crew because of low fish densities. Ideally, all observers should be counting fish at a 1 to 1 rate. We applied a standard of counting within 5% of the crew average throughout the run, and based on these observer comparisons, the crew accomplished that in 2011.

Water temperatures were slightly cooler than average and the water level rose 1.1 m during the run (Table 13). Environmental factors did not appear to influence salmon run timing although water level influenced fish distribution and fish wheel operations. As water level rose, water velocity increased, so fish took the path of least resistance near the banks. Higher water and faster current also made running the fish wheel more difficult and lowered catch efficiency.

YENTNA RIVER

The final inriver escapement estimate for Yentna River was 62,000–140,000 sockeye, 29,000–134,000 pink, 64,000–130,000 chum, and 27,000–162,000 coho salmon (Table 20). Prior to 2010, final apportioned escapement estimates for other salmon were not representative of true escapement strength, because the time frame for operating sonar was set to match sockeye salmon run timing and not that of other species. Factors influencing the accuracy of escapement estimates for pink, coho, chum, and Chinook salmon in the Yentna River have been discussed by Tarbox et al. (1981, 1983). However, in 2010 and 2011, escapement estimates for all species were better indicators of run strength, because sonar operated until 15 August when each species was near 1% or less of their escapement.

Beginning in 2010, the Yentna River sockeye salmon escapement was not estimated inseason for management purposes because of uncertainties associated with fish wheel species selectivity. In 2009, a Bendix based Yentna sockeye salmon SEG was replaced with three new weir SEGs (Fair et al. 2009) for Chelatna (20,000–65,000), Judd (25,000–55,000), and Larson lakes (15,000–50,000).

The midpoint of the sockeye salmon escapement occurred about 20 July, four days earlier than the historical average for 1981–2010 (Table 21). It took 13 days for 80% of the escapement to pass the Yentna River sonar site, three days less than the historical average. A distinct peak in the sockeye salmon escapement occurred on 19 July with two lesser peaks on 26 and 29 July (Figure 7). The pink salmon escapement peaked on 29 July, chum salmon on 29 July and 12 August, and coho salmon on 29 July. Fish passage on each bank peaked on a different day, with the north bank peak occurring on 22 July and the south bank on 19 July.

The abundance of fish along the south bank (~78–84%) was greater than the north bank (~16–22%) in 2011, which was typical for a river that has averaged 79% passage along the south bank since sonar operations began in 1985 (Table 5). Fish abundance by species on the south bank consisted of four to five times more sockeye, three times more chum, and about twice as many coho salmon compared to the north bank (Appendices C1–C2). Pink salmon abundance on the north bank was slightly higher than on the south bank.

Hourly fish passage rates were inconsistent along the north bank where a constant rate (4.2%) was exceeded intermittently throughout the early morning hours and afternoon/evening hours (Figure 8; Appendices C3–C4). The highest north bank passage rates occurred between midnight and 0300, when about 25% of a day's passage occurred, and again at 1100, 1400, 1600, 1700 and 1900 hours. Fish passage on the south bank declined after midnight, was at its lowest between 0400 and 0800 and highest (>4.2% daily passage) between 1000 and 2100. Between 2009 and 2011, the (hourly) passage of salmon was temporarily slowed by near-constant fish wheel operations on both banks. Apparently, fish held below the fish wheels then moved in greater numbers when the wheels were shut down. During these years (2009–2011), each fish wheel ran for 16–18 hours/day in three shifts; 0400–1000, 1130–1830 and 1930–2400. During times the fish wheels did not operate, usually at 1100 and 1900, fish passage increased sharply and then swiftly declined (Figure 9). These peaks were not present or as distinct between 2002 and 2004 when fish wheels operated for about a third the amount of time as they did in 2009–2011.

Assuming fish did not move offshore to avoid the fish wheels (<16% of fish were observed beyond 10 m of each transducer, Table 6) fish wheel activity probably caused only a temporary disruption of fish movement. If the fish wheels were shut down near or at the top of the hour, the timing and duration (10 min) of DIDSON subsample recordings and the sudden increase in numbers of fish moving past the transducers would be reflected in the escapement estimates for those hours. Therefore, the hourly escapement estimates, specifically 1100 and 1900, may have been impacted by the timing of fish wheel operations but the effect this may have had on total daily escapement estimates is unknown.

One problem with enumerating salmon on the Yentna River has always been maintaining sonar and fish wheel operations during high water events. An examination of fish wheel efficiency in relation to Bendix sonar counts has shown that when the water level increased, fish wheel efficiency improved but sonar counts often decreased. Davis (1997) found that the Yentna River south bank fish wheel efficiency was high when Bendix sonar counts were low suggesting that the south bank counter was undercounting. Westerman and Willette (2007a, 2007b) determined that fish wheel efficiency was significantly positively correlated ($p<0.05$) with water level in four years (2002–2005) on the south bank and in two of four years on the north bank. These patterns were consistent with changes in fish behavior during periods of high water which caused fish to be more vulnerable to entrapment by the fish wheel. High water between 4 and 6 August temporarily ended sonar and fish wheel operations on the north bank (crew was able to maintain operations on the south bank). A ratio of the previous three days escapement estimates between banks (N:S) was used to compensate for the missing escapement data. Ratios between banks were used 1) if one bank ceased to operate while the other bank continued and 2) to consistently represent run timing and abundance between banks, based on the conclusions of Westerman and Willette (2007a, 2007b). The decline in the south bank (DIDSON) escapement between 4 and 6 August indicated that north bank escapement should be much less if the relative ratios were maintained. Substantiating the comparisons of 2002–2005, the fish wheel CPUEs for each bank were also high during that time and the sonar estimates were low.

All salmon species were shore-oriented on both banks throughout the season (Table 6) with ~72–96% of all fish passing within 10 m of the transducer on the north bank and ~82–99% on the south bank. The percentage of fish nearest shore (1–10 m) was lower for the first two weeks of operations on both banks but increased and remained consistent after 15 July.

The CPUE for the north bank fish wheel was 20.2 salmon per hour with catches consisting of sockeye (6.9%), pink (50.3%), chum (26.2%) and coho salmon (16.5%, Tables 22–25). The percentage of sockeye salmon was about half that of the historical average for the north bank, whereas coho salmon were two times and chum salmon nearly three times the historical average. The south bank fish wheel CPUE was greater than the north bank, which has been typical for the Yentna River since fish wheels were first used on the river in 1982. The south bank fish wheel CPUE averaged 26.0 salmon per hour with catches consisting mostly of sockeye (17.1%), pink (25.8%), chum (44.6%), and coho salmon (12.5%). The percentages of sockeye and pink salmon were about half of the historical average for the south bank, whereas the percentage of chum salmon was nearly seven times the historical average. Coho salmon were about the same as the historical average. One possible explanation for bank preference is that most fish entering the Susitna River are oriented to the west bank (left bank looking upstream), based on fish wheel catches at Flathorn on the Susitna River (Bob DeCino, Commercial Fisheries Biologist, ADF&G, Soldotna, personal communication). Many of the Susitna west bank fish that move into the Yentna River probably stay along the south bank, at least as far as RKM 9.2, based on historical escapement estimates and fish wheel catches for each bank.

In 1998 a modification was made to both fish wheel weirs to increase CPUE. After 1998, the CPUE for sockeye salmon improved ~2–3 times, pink salmon ~3–4 times, chum salmon ~2 times and coho salmon ~3–5 times. Although CPUE may have improved for each species after 1998, the percentages of each species in the fish wheel catches indicated a decline for sockeye and chum salmon of about 2–10% and an increase for pink and coho salmon of about 4–8%. This change was more pronounced on the north bank than the south, although the trend was the same on both banks. The weir modification forced fish to enter the catch zone of fish wheel baskets, eliminating any chance of evading capture by passing under the nearshore fish wheel float. If smaller fish segregate from larger fish and travel nearer shore, then higher percentages of smaller fish could be more vulnerable to capture as a result of this modification, while larger fish could be moving farther offshore and avoiding capture. These percentages have been used to apportionment sonar counts by species and may be partly responsible for biases in Yentna River sockeye salmon escapement estimates.

The effectiveness of operating a fish wheel on the Yentna River can be influenced by several environmental factors such as river size, depth, bottom profile, substrate type, current, turbidity, and fish behavior as well as non-environmental issues such as landownership. For instance, highly variable water level has often affected operations on the Yentna River. Water level can affect species selectivity because all species are more likely to travel closer to shore during high water to avoid stronger currents offshore. Since all species may be more vulnerable to capture under these conditions, species selectivity may be lower.

Species selectivity might also be site-specific. Historically, higher percentages of sockeye salmon have been caught in the south bank fish wheel than the north bank, while more pink salmon have been caught in the north bank fish wheel. The north bank site has been on the edge of an eddy for years, which may be more conducive to holding pink salmon than other species. However, moving the fish wheel(s) to a more suitable location is not practical, because of the river's braided channel, incompatible bottom profiles and land ownership issues.

Since 2009, the department has conducted a tagging study to estimate the species selectivity of Yentna River fish wheels using methods similar to Meehan (1961). Pink, sockeye, chum, and coho salmon were tagged in the lower Susitna River (Flathorn Station) and recaptured in the Yentna fish wheels. This study was designed to test for differences in recapture probability among species over time. If recapture probabilities vary over time, then an attempt will be made to model recapture probabilities in relation to water level and salmon abundance, etc. On the Taku River, Meehan examined fish wheel species selectivity and found that fish wheels were more efficient at capturing smaller Chinook and pink salmon and less efficient at capturing coho and larger Chinook salmon. In 1981 and 1982, ADF&G (1983) found that fish wheels on the Susitna River at Talkeetna and Curry Stations selected more pink salmon and less chum and Chinook salmon with no apparent selectivity for coho or sockeye salmon.

The age composition of Yentna River sockeye salmon consisted mostly of age-1.3 (55.9%), -0.3 (18.1%) and -1.2 (11.3%) fish (Table 26). The overall age composition showed a higher percentage of 3-ocean fish over 2-ocean fish in 2011 with the highest incidence of age-0.3 and next to the lowest incidence of age-1.2 fish (11.3%) since 1983. For the second consecutive year, the percentage of age-0 freshwater fish (18.4%) was the highest in the history of the project indicating these fish were big enough to exit the watershed early in their life cycle. The average lengths for these age classes ranged between 472 mm and 570 mm. The ratios of males to females were consistent with historical ratios for this river (Table 27).

Observer count variability between members of the Yentna River crew using average counts as a comparison baseline is shown in Figure 5 and Table 11. Subsamples generally contained between 100–199 fish/h (n=22), averaging 136 fish per sample. Overall, average counts per observer for all combined samples correlated closely with the crew average (R^2 =0.9964–0.9991; SD=1.6). Unlike the Kenai crew, variability among observers was minimal due to lower fish densities, but the trend was similar with variability increasing slightly as fish densities increased. The number of samples containing 200 fish or more (n=2) were not enough to determine the amount of deviation that would be expected to occur at higher densities.

Acoustic shadowing effects caused by nearshore fish masking offshore fish caused counting problems during the peak of the 2011 escapement, similar to that experienced by the Kenai River crew. Ideally, all observers should be counting subsamples at a 1 to 1 rate, but observer counting variations of 5% were considered acceptable.

CIAA operated weirs on Chelatna, Judd, and Shell lakes in 2011 providing escapement counts for three of the major sockeye salmon spawning areas within the Yentna River drainage. Weir counts exceeded the SEG range for Chelatna Lake (20,000–65,000) and were within the SEG range (25,000–55,000) for Judd Lake. The total sockeye salmon escapements for Chelatna (70,353), Judd (40,041), and Shell lakes (937) was 111,331 sockeye salmon (Table 28), well within the DIDSON escapement range estimates (62,000–140,000) for Yentna River.

Environmental effects on project operations have been discussed throughout this report. Water temperatures were about average for the Yentna River in 2011 (Table 13). Water level fluctuated up to 1.8 m (Figure 10), which was the second greatest fluctuation since 1985 (highest in 2006) causing a three-day cessation to sonar and fish wheel operations on the north bank in early August. Water turbidity, although not measured, was estimated at just a few centimeters. Heavy silt load impairs the DIDSON lenses and the visual acuity of image files if not cleaned every two days and can cause attenuation problems reducing fish detection at longer ranges.

ADF&G continued to investigate potential errors in total DIDSON salmon abundance estimates. The results from these studies will not be published until after these projects conclude in 2012.

CRESCENT RIVER

The Bendix sonar count of 81,952 (91.1%) sockeye, 2,817 (3.1%) pink, 1,850 (2.1%) chum salmon and 3,331 (3.7%) Dolly Varden in the Crescent River was the twelfth highest documented escapement (Table 29). The low counts of pink and chum salmon and the absence of coho and Chinook salmon were not a good indication of run strength because run timing for these species differs from sockeye salmon. The Crescent River is the only river in UCI where Dolly Varden char are apportioned from the daily counts. In 1993, the first year a fish wheel was used for apportionment, Dolly Varden appeared in the catch in large numbers and were big enough (350–500 mm) to meet target detection thresholds (Davis and King 1994). These fish were assumed to be migratory based on morphological characteristics and results of marking studies from 1993–1995 (Davis and King 1996). Assuming sonar counts were over-apportioned to sockeye salmon prior to this discovery, the error probably was not substantial because estimates for dolly Varden have been <10% since 1993 (<5% since 2000).

The 2011 sockeye salmon escapement exceeded the upper end of the BEG for the ninth time since 2000 (the project was not conducted in 2009 but an estimate was derived from average harvest rates). The brood years for this year's run (2005 and 2006) were the second and seventh highest escapements since sonar operations began on the Crescent River.

The midpoint of the escapement occurred on 15 July, two days earlier than the historical midpoint (1984–2010; Table 30). Most of the escapement (~80%) occurred within 25 days, which was about average for this river. There was one distinct peak in the sockeye salmon escapement that occurred on 15 July when >8,700 fish passed the sonar counters with three lesser peaks on 30 June and 4 and 25 July (Figure 11). Relatively high numbers of sockeye were counted on the first two days of operations indicating that a few fish were already in the river prior to the traditional start date. Fish movement along each bank was relatively evenly distributed with 53% of the fish migrating along the north bank (Table 5; Appendices D1–D2). Daily escapement timing trends (per twenty-four-hour period) were similar for each bank. Peak hourly migratory rates ($\geq$ 4.2%) for the north bank occurred mostly during the late morning and late afternoon and evening hours when 58% of the fish were counted (Figure 8; Appendices D3–D4) along that bank. The peak migratory rates for the south bank began in the early/midmorning hours and continued through late evening when 87.5% of the fish were counted along that bank.

The sockeye run past the Crescent River sonar counters, located near Cook Inlet (RKM 2.8), were influenced by the tide cycle (Figure 12). As is typical for the Crescent River escapement, most fish (85%) passed the sonar counters within two to six hours after a morning and/or afternoon-evening high tide (average time - 3 hours).

The fish were shore oriented along both banks with ~92% of the counts within the first 2 m of the north bank transducer and ~95% of the counts within the first 2 m of the south bank (Table 31; Appendices D5–D6). The counting range varied between 5.2 m and 6.1 m on the north bank and between 3.4 m and 5.5 m on the south bank.

The Crescent River fish wheel captured 1,241 sockeye salmon (86.1%) out of a total catch of 1,442 fish (Table 32). The CPUE was less than average for all species (except pink salmon) in 2011 but satisfied minimum sample size requirements for sockeye salmon ASL analysis. The percentage of sockeye salmon in the fish wheel catch was the ninth highest since a fish wheel was first deployed in 1993 (Table 33). Pink (3.8%) and chum salmon (3.3%) were beginning to appear in the fish wheel catch during the last week of July, and Dolly Varden char (6.8%), ranging between 350 mm and 550 mm in length, were present throughout second half of the project period. Daily fish wheel catches expanded to 24 hours indicated the catch was about 5.4% of the sonar count along the south bank.

The fish wheel was located next to shore along the south bank because of water depth, velocity, and nearshore fish distribution. The south side was impractical as a fish wheel site because of shallow water, slower current, and fish dispersal off shore. Like other rivers, high turbidity on the Crescent River improves fish wheel CPUE but occurs with rising or high water, which can be a problem for sonar operations. When the river is low and current slower, the water is less turbid and fish wheel CPUE, especially at low densities of fish, is usually low too.

The age composition for sockeye salmon consisted mostly of age 1.3 (51.4%) and 2.3 (33.9%) fish (Table 34) which was typical for the Crescent River. The average lengths for these age classes were 563 and 561 mm, and for all age classes lengths ranged between 468 mm and 563 mm. The male to female ratio was >1:1 for the major age classes, consistent with historical ratios for this river (Table 35).

Average river water temperature in 2011 was 8.3^{o} C, less than the historical average (Table 13). Water level fluctuated 0.2–1.4 m during the operational period, slightly less than average for this river (Figure 11). Water level, as mentioned above, can have an impact on fish wheel catches and sonar operations.

ACKNOWLEDGMENTS

We acknowledge the work of the permanent seasonal staff responsible for operating and collecting the data: Kenai River sonar – Jim Lazar (Crew Leader), Jennifer Brannen Nelson, Nick Hawkens, and Remy Spring; Kasilof River Sonar – Larry Wheat (Crew Leader), Phil Morin, and Richard Dederick; Yentna River Sonar – Theodore D. Hacklin (Crew Leader), Stan Walker, Kris Dent, and Rachael Maryott; and Crescent River Sonar – Lee Borden (Crew Leader) and Ed Motyka.

We also acknowledge the Alaska Department of Fish and Game (ADF&G) Division of Sport Fish, for data collected at Russian River weir (Kenai River drainage) and Fish Creek weir counts. Cook Inlet Aquaculture Association provided escapement data (weir counts) from Hidden Lake (Kenai River drainage), Larson, Judd, Chelatna, and Shell Lakes (Susitna drainage).

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TABLES AND FIGURES

Table 1.–Fish wheel selectivity coefficients for sockeye, pink, chum, and coho salmon from the Susitna River, 1981–1982 (coefficients 1–4) and Taku River in 1958–1959 (coefficients 5–6).

	Fish Wheel Selectivity Coefficients					
Species	1	2	3	4	5	6
Sockeye	0.072	0.134	0.127	0.087	0.033	0.009
Pink	0.119	0.186	0.174	0.164	0.079	0.083
Chum	0.060	0.052	0.083	0.046	0.022	0.018
Coho	0.147	0.110	0.114	0.065	0.007	0.007

Sources: Meehan 1961 and ADF&G 1983.

Note: Fish wheel selectivity coefficients are based on tag recapture probabilities.

Table 2.–Sockeye salmon escapement point estimates (Bendix and DIDSON) for the Kenai, Kasilof, Crescent, Yentna, and Susitna rivers 1978–2011.

	Kenai R[a]		Kasilof R[b]			
Year	Bendix	DIDSON	Bendix	DIDSON	Crescent R.	Yentna R[c]
1978	398,900	ND	116,600	ND	ND	ND
1979	285,020	412,978	152,179	ND	86,654	ND
1980	464,038	667,458	184,260	ND	90,863	ND
1981	407,639	575,848	256,625	ND	41,213	139,401
1982	619,831	809,173	180,239	ND	58,957	113,847
1983	630,340	866,455	210,271	215,731	92,122	104,414
1984	344,571	481,473	231,685	238,413	118,345	149,375
1985	502,820	680,897	505,049	512,827	128,628	107,124
1986	501,157	645,906	275,963	283,054	20,385[d]	92,076
1987	1,596,871	2,245,615	249,250	256,707	120,219	66,054
1988	1,021,469	1,356,958	204,000[e]	204,336	57,716	52,330
1989	1,599,959	2,295,576	158,206	164,952	71,064	96,269
1990	659,520	950,358	144,136	147,663	52,238	140,290
1991	647,597	954,843	238,269	233,646	44,578	109,632
1992	994,798	1,429,864	184,178	188,819	58,229	66,074
1993	813,617	1,134,922	149,939	151,801	37,556	141,694
1994	1,003,446	1,412,047	205,117	218,826	30,355	128,032
1995	630,447	884,922	204,935	202,428	52,311	121,220
1996	797,847	1,129,274	249,944	264,511	28,729	90,660
1997	1,064,818	1,512,733	266,025	263,780	70,768	157,822
1998	767,558	1,084,996	273,213	259,045	62,257	119,623
1999	803,379	1,137,001	312,587	312,481	66,519	99,029
2000	624,578	900,700	256,053	263,631	56,599	133,094
2001	650,036	906,333	307,570	318,735	78,082	83,532
2002	957,924	1,339,682	226,682	235,731	62,833	78,591
2003	1,181,309	1,656,026	359,633	353,526	122,457	180,813
2004	1,385,981	1,945,383	577,581	523,653	103,201	71,281
2005	1,376,452	1,908,821	348,012	360,065	125,623	36,921
2006	1,499,692	2,064,728	368,092	389,645	92,533	92,896
2007	867,572	1,229,945	336,866	365,184	79,406	79,901
2008	614,946	917,139	301,469	327,018	62,030	90,146
2009	745,170	1,090,055	297,125	326,285	125,114[f]	43,972–153,910
2010	970,662	1,334,769	267,013	295,265	86,333	59,399–145,139
2011	ND	1,599,217	ND	245,721	81,952	62,231–140,445

Note: Bendix counts were converted to DIDSON estimates (equivalents) for Kenai (1979–2006) and Kasilof rivers (1983–2007).

[a] Counting began 22 June, 1978–1987, and 1 July (1988–present).

[b] Includes counts or estimates prior to 15 June (1978–1988) and post enumeration estimates (1981–1986).

[c] Escapement range (2009–2011) based on DIDSON estimates adjusted using seven fish wheel selectivity indices.

[d] Counts through 16 July only.

[e] Combined counts from weirs on Bear and Glacier Flat creeks and surveys of remaining spawning streams.

[f] Did not conduct sonar project in 2009 because of volcanic activity. Escapement estimated using average harvest rates (2001–2008).

Table 3.–Daily sockeye salmon escapement estimates (DIDSON) in the Kenai River, 1 July–13 August, 2011.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	2,256	2,256	0	0	0	0	0	0
2 Jul	4,260	6,516	0	0	0	0	0	0
3 Jul	3,084	9,600	0	0	0	0	0	0
4 Jul	2,244	11,844	0	0	0	0	0	0
5 Jul	4,272	16,116	0	0	0	0	0	0
6 Jul	4,647	20,763	0	0	0	0	0	0
7 Jul	5,302	26,065	0	0	0	0	0	0
8 Jul	4,737	30,802	0	0	0	0	0	0
9 Jul	6,522	37,324	0	0	0	0	0	0
10 Jul	6,846	44,170	0	0	0	0	0	0
11 Jul	3,510	47,680	0	0	0	0	0	0
12 Jul	3,102	50,782	0	0	0	0	0	0
13 Jul	3,822	54,604	0	0	0	0	0	0
14 Jul	6,400	61,004	0	0	0	0	0	0
15 Jul	2,916	63,920	0	0	0	0	0	0
16 Jul	27,826	91,746	0	0	0	0	0	0
17 Jul	230,643	322,389	0	0	0	0	0	0
18 Jul	177,053	499,442	0	0	0	0	0	0
19 Jul	87,978	587,420	0	0	0	0	0	0
20 Jul	113,178	700,598	0	0	0	0	0	0
21 Jul	90,426	791,024	0	0	0	0	0	0
22 Jul	37,974	828,998	0	0	0	0	0	0
23 Jul	106,313	935,311	0	0	0	0	0	0
24 Jul	110,772	1,046,083	0	0	0	0	0	0
25 Jul	79,518	1,125,601	0	0	0	0	0	0
26 Jul	77,982	1,203,583	0	0	0	0	0	0
27 Jul	73,092	1,276,675	0	0	0	0	0	0
28 Jul	55,470	1,332,145	0	0	0	0	0	0
29 Jul	36,540	1,368,685	0	0	0	0	0	0
30 Jul	30,384	1,399,069	0	0	0	0	0	0
31 Jul	18,240	1,417,309	0	0	0	0	0	0
1 Aug	21,714	1,439,023	0	0	0	0	0	0
2 Aug	20,707	1,459,730	0	0	0	0	0	0
3 Aug	10,396	1,470,126	0	0	0	0	0	0
4 Aug	10,074	1,480,200	0	0	0	0	0	0
5 Aug	11,220	1,491,420	0	0	0	0	0	0
6 Aug	22,086	1,513,506	0	0	0	0	0	0
7 Aug	17,316	1,530,822	0	0	0	0	0	0
8 Aug	6,114	1,536,936	0	0	0	0	0	0
9 Aug	12,198	1,549,134	0	0	0	0	0	0
10 Aug	16,524	1,565,658	0	0	0	0	0	0
11 Aug	11,326	1,576,984	0	0	0	0	0	0
12 Aug	12,204	1,589,188	0	0	0	0	0	0
13 Aug	10,029	1,599,217	0	0	0	0	0	0

Note: Pink, coho and Chinook salmon were not apportioned from the sonar estimates.

Table 4.–Cumulative proportion by date of sockeye salmon escapement in the Kenai River, 1995–2011.

	Cumulative Proportion																
Date	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
01 Jul	0.003	0.001	0.003	0.002	0.001	0.003	0.002	0.005	0.005	0.002	0.004	0.001	0.004	0.004	0.003	0.004	0.001
02 Jul	0.005	0.002	0.008	0.007	0.002	0.005	0.011	0.013	0.008	0.005	0.010	0.003	0.010	0.009	0.008	0.008	0.004
03 Jul	0.006	0.003	0.013	0.010	0.003	0.010	0.017	0.018	0.012	0.007	0.015	0.004	0.015	0.014	0.013	0.011	0.006
04 Jul	0.007	0.004	0.020	0.013	0.004	0.015	0.023	0.028	0.017	0.009	0.023	0.006	0.018	0.016	0.020	0.017	0.007
05 Jul	0.010	0.007	0.029	0.018	0.005	0.018	0.029	0.057	0.022	0.010	0.033	0.008	0.021	0.018	0.027	0.027	0.010
06 Jul	0.013	0.010	0.033	0.025	0.007	0.021	0.033	0.085	0.024	0.011	0.042	0.010	0.025	0.019	0.033	0.038	0.013
07 Jul	0.019	0.012	0.037	0.033	0.010	0.028	0.038	0.142	0.028	0.014	0.049	0.012	0.031	0.021	0.041	0.043	0.016
08 Jul	0.021	0.016	0.043	0.041	0.015	0.034	0.047	0.181	0.031	0.018	0.058	0.014	0.041	0.022	0.047	0.051	0.019
09 Jul	0.021	0.018	0.046	0.052	0.020	0.045	0.056	0.207	0.037	0.020	0.078	0.016	0.051	0.026	0.055	0.057	0.023
10 Jul	0.024	0.021	0.067	0.065	0.025	0.059	0.063	0.227	0.046	0.022	0.095	0.019	0.055	0.031	0.062	0.062	0.028
11 Jul	0.026	0.024	0.117	0.070	0.027	0.066	0.071	0.239	0.066	0.024	0.121	0.021	0.061	0.034	0.073	0.070	0.030
12 Jul	0.027	0.028	0.173	0.074	0.030	0.073	0.075	0.247	0.118	0.026	0.158	0.022	0.066	0.037	0.101	0.085	0.032
13 Jul	0.029	0.030	0.235	0.078	0.032	0.113	0.081	0.255	0.154	0.030	0.177	0.024	0.070	0.045	0.117	0.109	0.034
14 Jul	0.031	0.064	0.294	0.081	0.037	0.260	0.097	0.265	0.178	0.113	0.189	0.025	0.075	0.049	0.146	0.126	0.038
15 Jul	0.033	0.217	0.311	0.087	0.047	0.390	0.141	0.291	0.197	0.215	0.199	0.027	0.083	0.092	0.212	0.150	0.040
16 Jul	0.036	0.354	0.347	0.101	0.051	0.464	0.188	0.328	0.273	0.284	0.231	0.036	0.091	0.204	0.288	0.199	0.057
17 Jul	0.079	0.409	0.418	0.149	0.064	0.501	0.250	0.356	0.363	0.320	0.276	0.046	0.097	0.288	0.358	0.265	0.202
18 Jul	0.130	0.443	0.497	0.184	0.095	0.552	0.295	0.400	0.441	0.344	0.313	0.052	0.108	0.318	0.407	0.336	0.312
19 Jul	0.184	0.476	0.503	0.210	0.137	0.591	0.347	0.500	0.501	0.359	0.367	0.056	0.156	0.347	0.442	0.422	0.367
20 Jul	0.242	0.506	0.524	0.233	0.163	0.611	0.388	0.565	0.529	0.366	0.394	0.061	0.174	0.396	0.503	0.480	0.438
21 Jul	0.328	0.538	0.544	0.247	0.198	0.631	0.410	0.600	0.556	0.389	0.409	0.071	0.210	0.449	0.540	0.530	0.495
22 Jul	0.379	0.561	0.554	0.273	0.248	0.650	0.434	0.625	0.614	0.458	0.427	0.093	0.263	0.501	0.552	0.570	0.518
23 Jul	0.455	0.598	0.585	0.336	0.307	0.680	0.467	0.653	0.669	0.479	0.465	0.117	0.308	0.518	0.567	0.605	0.585
24 Jul	0.545	0.645	0.651	0.397	0.359	0.721	0.525	0.680	0.716	0.503	0.506	0.146	0.347	0.537	0.588	0.622	0.654
25 Jul	0.647	0.716	0.661	0.439	0.447	0.759	0.600	0.706	0.742	0.528	0.527	0.181	0.386	0.555	0.599	0.664	0.704
26 Jul	0.708	0.758	0.667	0.466	0.517	0.794	0.678	0.740	0.768	0.558	0.541	0.238	0.441	0.567	0.613	0.682	0.753
27 Jul	0.751	0.776	0.671	0.497	0.592	0.822	0.731	0.752	0.789	0.584	0.549	0.277	0.512	0.595	0.662	0.700	0.798
28 Jul	0.785	0.788	0.675	0.549	0.650	0.847	0.760	0.764	0.823	0.614	0.556	0.317	0.562	0.626	0.715	0.721	0.833
29 Jul	0.799	0.795	0.682	0.606	0.689	0.872	0.784	0.777	0.847	0.640	0.565	0.362	0.598	0.662	0.758	0.736	0.856
30 Jul	0.804	0.803	0.688	0.647	0.717	0.886	0.812	0.788	0.862	0.658	0.588	0.402	0.621	0.704	0.794	0.750	0.875
31 Jul	0.811	0.812	0.694	0.698	0.736	0.897	0.834	0.802	0.877	0.672	0.615	0.435	0.644	0.736	0.830	0.762	0.886

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Table 4.–Page 2 of 2.

Date	Cumulative Proportion																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
01 Aug	0.822	0.829	0.698	0.769	0.759	0.908	0.856	0.815	0.894	0.682	0.633	0.475	0.667	0.772	0.854	0.777	0.900
02 Aug	0.826	0.858	0.701	0.857	0.783	0.916	0.879	0.829	0.913	0.695	0.644	0.508	0.684	0.800	0.882	0.801	0.913
03 Aug	0.839	0.881	0.705	0.873	0.800	0.930	0.896	0.845	0.930	0.724	0.660	0.535	0.694	0.821	0.911	0.841	0.919
04 Aug	0.887	0.902	0.708	0.884	0.817	0.945	0.916	0.861	0.943	0.756	0.673	0.565	0.708	0.844	0.930	0.856	0.926
05 Aug	0.908	0.920	0.711	0.895	0.832	0.958	0.929	0.879	0.951	0.777	0.684	0.596	0.729	0.863	0.946	0.867	0.933
06 Aug	0.911	0.931	0.723	0.915	0.848	0.969	0.943	0.894	0.966	0.796	0.711	0.616	0.755	0.880	0.955	0.879	0.946
07 Aug	0.930	0.941	0.736	0.930	0.872	0.978	0.958	0.910	0.977	0.811	0.735	0.631	0.773	0.893	0.962	0.892	0.957
08 Aug	0.940	0.955	0.757	0.943	0.895	0.985	0.972	0.929	0.985	0.819	0.745	0.640	0.788	0.903	0.967	0.904	0.961
09 Aug	0.951	0.969	0.774	0.953	0.914	0.992	0.979	0.953	0.992	0.840	0.753	0.649	0.816	0.915	0.973	0.917	0.969
10 Aug	0.961	0.983	0.784	0.963	0.923	1.000	0.986	0.972	1.000	0.873	0.760	0.656	0.832	0.931	0.982	0.928	0.979
11 Aug	0.976	0.992	0.805	0.975	0.932	0.000	0.989	0.985	0.000	0.904	0.771	0.665	0.857	0.947	0.987	0.934	0.986
12 Aug	0.985	1.000	0.822	0.986	0.945	0.000	0.998	0.991	0.000	0.936	0.809	0.681	0.882	0.963	0.992	0.940	0.994
13 Aug	0.991		0.842	1.000	0.953	0.000	1.000	0.996	0.000	0.957	0.853	0.695	0.898	0.974	1.000	0.949	1.000
14 Aug	0.940		0.757	0.943	0.895	0.985	0.972	0.929	0.985	0.819	0.745	0.640	0.788	0.903	0.967	0.904	
15 Aug	0.951		0.774	0.953	0.914	0.992	0.979	0.953	0.992	0.840	0.753	0.649	0.816	0.915	0.973	0.917	
16 Aug	0.961		0.878	0.963	0.985	1.000	0.986	0.972	1.000	0.988	0.942	0.752	0.933	0.998	0.982	0.986	
17 Aug	0.976		0.894	0.975	0.993		0.989	0.985		0.996	0.962	0.773	0.944	1.000	0.987	0.992	
18 Aug	0.985		0.907	0.986	1.000		0.998	0.991		1.000	0.974	0.795	0.953		0.992	0.997	
19 Aug	0.991		0.921	1.000			1.000	0.996			0.980	0.819	0.966		1.000	1.000	
21 Aug	1.000		0.933					1.000			0.991	0.844	0.978				
21 Aug			0.945								1.000	0.860	0.985				
22 Aug			0.957									0.882	0.993				
23 Aug			0.970									0.901	1.000				
24 Aug			0.985									0.915					
25 Aug			1.000									0.929					
26 Aug												0.944					
29 Aug												0.989					
30 Aug												0.996					
31 Aug												1.000					
Midpoint	24 Jul	20 Jul	19 Jul	28 Jul	26 Jul	17 Jul	24 Jul	19 Jul	19 Jul	24 Jul	24 Jul	2 Aug	27 Jul	22 Jul	20 Jul	21 Jul	22 Jul
Midpoint Ave: (1995–2010) 24 Jul																	
No. days	51	43	56	50	49	47	50	31	47	49	52	62	54	48	50	50	44
Ave. no. days. (1995–2010) 49 d Ave. no. days 80%: 26 d																	

Note: Data available for the years 1979 to present.

Table 5.–Distribution of sockeye salmon passage by bank (% of total count) in the Kenai, Kasilof, Crescent, and Yentna rivers, 1979–2011.

	River							
	Kenai		Kasilof		Crescent		Yentna	
Year	North	South	North	South	North	South	North	South
1979	72	28	53	47	ND	ND	ND	ND
1980	61	39	52	48	49	51	ND	ND
1981	72	28	69	31	57	43	ND	ND
1982	39	61	73	27	54	46	ND	ND
1983	42	58	51	49	39	61	ND	ND
1984	65	35	56	44	71	28	ND	ND
1985	54	46	70	30	70	30	9	91
1986	62	38	57	43	84	16	32	68
1987	48	52	55	45	64	36	10	90
1988	47	53	32	68	53	47	8	92
1989	57	43	39	61	52	48	12	88
1990	62	38	29	71	44	56	2	98
1991	73	27	39	61	33	67	8	92
1992	60	40	45	55	56	44	5	95
1993	49	51	28	72	41	56	14	86
1994	52	48	47	53	65	35	8	92
1995	52	48	38	62	68	32	11	89
1996	54	46	61	39	68	32	21	79
1997	56	44	41	59	79	21	11	89
1998	55	45	36	64	70	30	49	51
1999	55	45	51	49	53	47	26	74
2000	64	36	51	49	63	37	22	78
2001	50	50	63	37	79	21	38	63
2002	49	51	48	52	74	26	25	75
2003	49	51	50	50	65	35	29	71
2004	49	51	43	57	64	36	6	94
2005	45	55	59	41	65	35	17	83
2006	41	59	67	33	54	46	11	89
2007	50	50	75	25	63	37	16	84
2008	48	52	73	27	60	40	15	85
2009	47	53	74	26	ND	ND	16–19	81–83
2010	51	49	70	30	52	48	17–20	80–82
2011	52	48	71	29	53	47	16–22	78–84
Ave. (1979–2010)	51	49	56	44	65	35	21	79

Table 6.–Nearshore and offshore distribution of fish from both banks of the Kenai, Kasilof and Yentna rivers based on stratified (weekly) DIDSON subsample counts, 2011.

	North Bank											
	Kenai River				Kasilof River				Yentna River			
Dates	1–10 m	%	10–30 m	%	1–10 m	%	10–30 m	%	1–10 m	%	10–30 m	%
15–16 Jun	ND	ND	ND	ND	535	58.6	378	41.4	ND	ND	ND	ND
17–23 Jun	ND	ND	ND	ND	2,339	62.0	1,436	38.0	ND	ND	ND	ND
24–30 Jun	ND	ND	ND	ND	1,970	72.3	755	27.7	ND	ND	ND	ND
1 Jul–7Jul	720	4.0	17,179	96.0	1,704	84.1	321	15.9	18	81.2	4	18.8
8 Jul–14 Jul	4,285	19.8	17,334	80.2	824	86.5	129	13.5	203	72.3	78	27.7
15 Jul–21 Jul	285,726	73.4	103,591	26.6	8,868	98.1	175	1.9	3,658	88.9	458	11.1
22 Jul–28 Jul	220,836	83.4	43,859	16.6	6,535	97.6	158	2.4	5,201	91.1	510	8.9
29 Jul–4 Aug	60,074	76.7	18,272	23.3	1,864	98.0	38	2.0	4,597	91.9	404	8.1
5 Aug–11 Aug	43,535	89.3	5,219	10.7	1,181	100.0	0	0.0	1,893	96.2	74	3.8
12 Aug–15 Aug	9,582	88.2	1,278	11.8	ND	ND	ND	ND	1,139	89.3	136	10.7
Total	624,758	75.1	206,732	24.9	25,820	88.4	3,390	11.6	16,709	90.9	1,665	9.1
SD		23.3		23.3		13.7		13.7		10.6		10.6
min		11.6		2.9		12.9		0.0		52.8		0.8
max		97.1		88.4		100.0		87.1		99.2		47.2
	South Bank											
15–16 Jun	ND	ND	ND	ND	227	42.0	313	58.0	ND	ND	ND	ND
17–23 Jun	ND	ND	ND	ND	1,342	52.8	1,200	47.2	ND	ND	ND	ND
24–30 Jun	ND	ND	ND	ND	1,752	69.2	781	30.8	ND	ND	ND	ND
1 Jul–7Jul	6,954	85.2	1,212	14.8	714	68.3	331	31.7	7	82.5	2	17.5
8 Jul–14 Jul	12,234	91.8	1,086	8.2	531	75.1	176	24.9	185	84.5	34	15.5
15 Jul–21 Jul	338,067	99.2	2,636	0.8	936	78.3	260	21.7	12,038	98.5	187	1.5
22 Jul–28 Jul	273,858	99.1	2,568	0.9	1,382	88.1	186	11.9	8,589	97.7	206	2.3
29 Jul–4 Aug	67,933	97.5	1,776	2.5	723	94.3	44	5.7	6,793	97.3	191	2.7
5 Aug–11 Aug	47,095	98.1	935	1.9	809	98.1	16	1.9	6,665	99.0	67	1.0
12 Aug–15 Aug	11,213	98.6	160	1.4	ND	ND	ND	ND	3,485	98.8	42	1.2
Total	757,354	98.6	10,373	1.4	8,415	71.8	3,307	28.2	37,762	98.1	729	1.9
SD		3.3		3.3		14.8		14.8		6.3		6.3
min		86.0		0.4		23.8		1.1		75.9		0.0
max		99.6		14.0		98.9		76.2		100.0		24.1

Table 7.–Daily fish wheel catch by species for the Kenai River, 1 July–13 August, 2011.

	Hours	Sockeye		Pink		Chum		Coho		Chinook	
Date	open	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	0.00	0	0	0	0	0	0	0	0	0	0
2 Jul	12.00	2	2	0	0	0	0	0	0	0	0
3 Jul	0.00	0	2	0	0	0	0	0	0	0	0
4 Jul	30.25	21	23	1	1	0	0	0	0	0	0
5 Jul	21.50	19	42	0	1	0	0	0	0	0	0
6 Jul	24.50	19	61	0	1	0	0	0	0	0	0
7 Jul	22.25	1	62	0	1	0	0	0	0	0	0
8 Jul	24.00	1	63	0	1	0	0	0	0	0	0
9 Jul	24.00	7	70	0	1	0	0	0	0	1	1
10 Jul	23.67	16	86	0	1	0	0	0	0	0	1
11 Jul	22.50	6	92	0	1	0	0	0	0	0	1
12 Jul	25.75	3	95	0	1	0	0	0	0	0	1
13 Jul	20.92	4	99	0	1	0	0	0	0	0	1
14 Jul	25.17	4	103	0	1	0	0	0	0	0	1
15 Jul	23.22	1	104	0	1	0	0	0	0	0	1
16 Jul	26.83	3	107	0	1	0	0	0	0	0	1
17 Jul	11.00	74	181	0	1	0	0	0	0	0	1
18 Jul	0.50	249	430	0	1	0	0	0	0	0	1
19 Jul	4.75	181	611	0	1	0	0	0	0	0	1
20 Jul	7.92	120	731	0	1	0	0	0	0	0	1
21 Jul	6.08	170	901	0	1	0	0	0	0	0	1
22 Jul	7.08	94	995	0	1	0	0	0	0	0	1
23 Jul	9.42	73	1,068	0	1	0	0	0	0	0	1
24 Jul	4.25	139	1,207	0	1	0	0	0	0	0	1
25 Jul	5.50	95	1,302	0	1	0	0	0	0	2	3
26 Jul	2.25	69	1,371	0	1	0	0	0	0	0	3
27 Jul	1.50	35	1,406	1	2	0	0	0	0	0	3
28 Jul	3.00	53	1,459	0	2	0	0	0	0	0	3
29 Jul	10.00	42	1,501	0	2	0	0	0	0	0	3
30 Jul	7.17	62	1,563	2	4	0	0	0	0	0	3
31 Jul	9.25	45	1,608	1	5	0	0	0	0	0	3
1 Aug	10.75	31	1,639	1	6	0	0	0	0	0	3
2 Aug	14.00	29	1,668	0	6	0	0	0	0	0	3
3 Aug	11.75	16	1,684	0	6	0	0	0	0	0	3
4 Aug	8.25	47	1,731	0	6	0	0	0	0	0	3
5 Aug	16.60	32	1,763	1	7	0	0	1	1	3	6
6 Aug	18.67	25	1,788	2	9	0	0	0	1	1	7
7 Aug	12.75	30	1,818	0	9	0	0	0	1	0	7
8 Aug	10.00	114	1,932	0	9	0	0	0	1	0	7
9 Aug	12.77	8	1,940	0	9	0	0	0	1	0	7
10 Aug	17.25	24	1,964	0	9	0	0	1	2	0	7
11 Aug	12.50	10	1,974	0	9	0	0	0	2	0	7
12 Aug	15.93	20	1,994	2	11	0	0	0	2	0	7
13 Aug	23.75	5	1,999	0	11	0	0	0	2	0	7
% Total			99.0		0.5		0.0		0.1		0.3

Total: 2,019 salmon Hrs Operated: 601.2 CPUE: 3.4 fish/hr

Note: Other fish include seven rainbow trout and four Dolly Varden.

Table 8.–Summary of fish wheel catch and CPUE for the north bank fish wheel at RM 19 on the Kenai River, 1978–2011.

		North Bank fish wheel catch (salmon only)									CPUE by species				
Year	Total Hours	Sockeye	%	Pink	%	Coho	%	Chinook	%	Total Catch	Sockeye	Pink	Coho	Chinook	Total CPUE
1978	853.9	1,445	87.3	207	12.5	4	0.2	0	0.0	1,656	1.7	0.2	0.0	0.0	1.9
1979	301.0	151	84.8	10	5.6	13	7.3	4	2.2	178	0.5	0.0	0.0	0.0	0.6
1980	967.3	464	29.4	1,103	69.8	12	0.8	1	0.1	1,580	0.5	1.1	0.0	0.0	1.6
1981	1,210.	496	95.0	21	4.0	3	0.6	2	0.4	522	0.4	0.0	0.0	0.0	0.4
1982	433.5	1,200	99.5	2	0.2	2	0.2	2	0.2	1,206	2.8	0.0	0.0	0.0	2.8
1983	448.0	1,678	99.8	0	0.0	3	0.2	0	0.0	1,681	3.7	0.0	0.0	0.0	3.8
1984	962.4	5,854	98.3	64	1.1	36	0.6	3	0.1	5,957	6.1	0.1	0.0	0.0	6.2
1985	394.8	3,294	98.2	37	1.1	17	0.5	7	0.2	3,355	8.3	0.1	0.0	0.0	8.5
1986	408.5	797	97.8	6	0.7	9	1.1	3	0.4	815	2.0	0.0	0.0	0.0	2.0
1987	493.1	4,795	98.1	18	0.4	59	1.2	17	0.3	4,889	9.7	0.0	0.1	0.0	9.9
1988	528.4	4,393	97.5	73	1.6	18	0.4	21	0.5	4,505	8.3	0.1	0.0	0.0	8.5
1989	357.0	6,341	98.2	69	1.1	28	0.4	16	0.2	6,454	17.8	0.2	0.1	0.0	18.1
1990	363.6	4,270	97.8	46	1.1	24	0.5	26	0.6	4,366	11.7	0.1	0.1	0.1	12.0
1991	393.0	6,732	98.6	49	0.7	25	0.4	19	0.3	6,825	17.1	0.1	0.1	0.0	17.4
1992	392.5	5,526	94.0	224	3.8	96	1.6	33	0.6	5,879	14.1	0.6	0.2	0.1	15.0
1993	515.2	4,631	99.2	16	0.3	10	0.2	10	0.2	4,667	9.0	0.0	0.0	0.0	9.1
1994	673.9	5,600	93.6	290	4.8	65	1.1	29	0.5	5,984	8.3	0.4	0.1	0.0	8.9
1995	799.4	3,022	98.5	14	0.5	10	0.3	22	0.7	3,068	3.8	0.0	0.0	0.0	3.8
1996	376.5	3,835	91.2	264	6.3	82	2.0	22	0.5	4,203	10.2	0.7	0.2	0.1	11.2
1997	553.8	8,886	96.6	21	0.2	266	2.9	30	0.3	9,203	16.0	0.0	0.5	0.1	16.6
1998	350.5	7,755	96.2	173	2.1	99	1.2	34	0.4	8,061	22.1	0.5	0.3	0.1	23.0
1999	400.8	4,600	95.9	108	2.3	56	1.2	33	0.7	4,797	11.5	0.3	0.1	0.1	12.0
2000	499.0	3,020	88.5	205	6.0	146	4.3	40	1.2	3,411	6.1	0.4	0.3	0.1	6.8
2001	446.7	3,309	96.8	36	1.1	30	0.9	45	1.3	3,420	7.4	0.1	0.1	0.1	7.7
2002	610.5	4,073	88.4	461	10.0	54	1.2	18	0.4	4,606	6.7	0.8	0.1	0.0	7.5
2003	317.1	2,749	98.0	20	0.7	12	0.4	25	0.9	2,806	8.7	0.1	0.0	0.1	8.8
2004	461.7	3,299	75.0	843	19.2	225	5.1	31	0.7	4,398	7.1	1.8	0.5	0.1	9.5
2005	184.9	3,140	97.8	27	0.8	28	0.9	16	0.5	3,211	17.0	0.1	0.2	0.1	17.4
2006	635.0	12,285	86.0	1,413	9.9	485	3.4	101	0.7	14,284	19.3	2.2	0.8	0.2	22.5
2007	933.5	6,243	98.1	16	0.3	76	1.2	27	0.4	6,362	6.7	0.0	0.1	0.0	6.8
2008	862.4	5,250	89.9	489	8.4	80	1.4	18	0.3	5,837	6.1	0.6	0.1	0.0	6.8
2009	427.2	1,435	93.9	76	5.0	10	0.7	7	0.5	1,528	3.4	0.2	0.0	0.0	3.6
2010	741.1	2,002	90.2	131	5.9	57	2.6	29	1.3	2,219	2.7	0.2	0.1	0.0	3.0
2011	601.2	1,999	99.0	11	0.5	2	0.1	7	0.3	2,019	3.3	0.0	0.0	0.0	3.4

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Table 8.–Page 2 of 2.

		North Bank fish wheel catch (salmon only)													
		Average Catch									Average CPUE by species				
Year	Ave. Hours	Sockeye	%	Pink	%	Coho	%	Chinook	%	Total	Sockeye	Pink	Coho	Chinook	Total
Odd	511.0	3,844	97.7	34	0.9	40	1.0	18	0.4	3,935	7.5	0.1	0.1	0.0	7.7
Even	595.3	4,180	88.2	353	9.8	88	1.6	24	0.4	4,645	7.0	0.6	0.1	0.0	7.8
Ave. (%): (1978–2010)			93.4		4.6		1.5		0.5		7.2	0.2	0.4	0.0	0.1
Minimum (%): (1978–2010)			29.4		0.0		0.2		0.0		0.4	0.0	0.0	0.0	0.4
Maximum (%): (1978–2010)			99.8		69.8		7.3		2.2		22.1	2.2	0.8	0.2	23.0
Std.Dev. (%): (1978–2010)			12.6		12.3		1.6		0.5		5.9	0.5	0.2	0.0	6.1

Note: Beginning and end dates varied from year to year; average catches are an indication of fish passage for the operational period only.

Table 9.–Age composition of sockeye salmon sampled from the Kenai River fish wheel, 1970–2011.

	Percentage Composition by Age Class								
Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	Sample Size
1970	0.0	10.0	17.0	0.0	26.0	25.0	15.0	6.0	225
1971	0.0	8.0	39.0	1.0	3.0	38.0	11.0	0.0	168
1972	0.0	21.0	34.0	0.0	0.0	23.0	20.0	0.0	403
1973	0.0	5.0	68.0	1.0	1.0	8.0	16.0	0.0	632
1974	2.0	18.0	46.0	0.0	3.0	18.0	12.0	0.0	295
1975	2.0	10.0	36.0	2.0	4.0	31.0	14.0	1.0	162
1976	1.0	46.0	20.0	0.0	2.0	22.0	8.0	1.0	948
1977	0.0	6.0	76.0	1.0	0.0	7.0	10.0	0.0	1,265
1978	0.0	2.5	86.7	0.0	0.0	4.9	5.4	0.0	811
1979	0.2	19.6	63.0	0.0	0.0	10.6	6.6	0.0	601
1980	6.1	35.4	36.7	0.0	0.9	14.4	6.5	0.0	557
1981	0.0	19.7	66.4	0.0	0.5	7.9	5.3	0.2	624
1982	0.1	5.8	87.5	0.0	0.0	2.9	3.7	0.0	1,787
1983	0.3	8.4	79.0	0.3	0.5	2.2	8.9	0.4	1,765
1984	0.0	23.1	37.8	3.6	0.5	13.2	19.5	2.3	2,067
1985	0.1	15.9	56.4	0.3	0.1	14.7	11.4	1.1	2,201
1986	0.0	31.8	39.5	0.7	0.3	8.2	18.0	1.5	789
1987	0.0	12.8	78.4	0.1	0.0	3.2	5.2	0.3	745
1988	0.3	11.6	74.2	0.4	0.2	3.1	10.2	0.0	1,420
1989	0.2	5.6	26.7	0.9	0.8	7.6	57.4	0.8	1,587
1990	0.6	21.6	41.4	0.6	0.3	13.7	21.1	0.7	1,513
1991	0.1	48.2	31.6	0.2	0.4	5.7	11.4	2.4	2,502
1992	0.0	2.7	79.9	0.2	0.3	5.9	11.0	0.0	1,338
1993	0.3	12.2	30.5	2.6	6.3	6.4	41.2	0.5	2,088
1994	0.3	6.6	61.1	0.8	0.8	17.8	12.1	0.5	1,341
1995	0.3	31.9	26.4	0.4	2.4	6.6	31.3	0.7	712
1996	0.0	10.8	75.4	0.3	0.7	6.1	5.4	1.3	684
1997	0.1	7.6	75.2	0.4	0.4	2.8	13.0	0.5	963
1998	0.3	27.1	40.7	1.3	6.6	9.6	13.9	0.5	700
1999	0.0	15.1	55.4	0.4	1.2	16.8	9.6	1.5	733
2000	0.0	15.3	55.1	1.0	2.6	9.4	14.5	2.1	560
2001	0.3	10.8	68.9	0.8	1.5	8.3	9.2	0.2	601
2002	0.0	23.0	58.4	0.7	0.7	10.6	6.1	0.5	2,441
2003	0.0	14.4	57.9	0.4	0.1	8.0	18.7	0.5	1,555
2004	0.0	10.1	69.1	0.2	0.2	8.2	11.1	1.1	1,275
2005	0.0	2.8	81.3	0.3	0.2	2.8	11.8	0.8	1,893
2006	0.0	9.9	38.7	2.4	0.4	3.7	44.0	0.9	1,315
2007	0.0	5.9	78.8	1.5	0.7	4.4	7.8	0.9	759
2008	0.0	15.2	60.9	4.6	0.7	7.2	10.9	0.5	567
2009	0.3	6.1	72.6	0.9	0.1	9.8	9.7	0.4	701
2010	0.2	23.4	44.4	0.2	2.8	4.7	23.9	0.4	855
2011	0.1	8.0	38.9	0.4	1.1	5.4	45.6	0.4	791
Ave. (1970–10)	0.4	15.5	55.4	0.8	1.8	10.6	14.7	0.8	1,092

Table 10.–Average lengths of the major age classes of sockeye salmon sampled from the Kenai River fish wheel, 1980–2011.

	Age Class 1.2							Age Class 1.3						
	Male		Female		Both			Male		Female		Both		
Year	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female
1980	482	168	494	100	486	268	1.7:1	580	180	561	192	570	372	0.9:1
1981	493	85	513	73	501	158	1.2:1	590	290	569	430	575	720	0.7:1
1982	483	70	505	32	490	102	2.2:1	596	723	572	841	583	1,564	0.9:1
1983	524	25	520	30	522	55	0.8:1	598	215	577	269	586	484	0.8:1
1984	474	280	473	196	474	476	1.4:1	582	385	559	395	571	780	1.0:1
1985	492	184	490	186	491	370	1.0:1	575	496	552	824	560	1,320	0.6:1
1986	488	155	492	96	489	251	1.6:1	584	112	564	200	571	312	0.6:1
1987	513	39	502	56	507	95	0.7:1	604	183	586	401	591	584	0.5:1
1988	521	79	511	84	516	163	0.9:1	598	428	572	624	583	1,052	0.7:1
1989	464	51	463	40	463	91	1.3:1	592	213	565	218	578	431	1.0:1
1990	474	168	478	127	476	295	1.3:1	586	358	559	318	574	676	1.1:1
1991	488	613	497	577	492	1,190	1.1:1	561	357	539	441	549	798	0.8:1
1992	480	13	462	25	468	38	0.5:1	573	370	549	714	557	1,084	0.5:1
1993	474	123	481	132	477	255	0.9:1	583	247	556	390	566	637	0.6:1
1994	452	46	462	42	457	88	1.1:1	579	367	552	452	564	819	0.8:1
1995	492	116	487	111	489	227	1.0:1	584	81	564	107	572	188	0.8:1
1996	507	47	519	27	511	74	1.7:1	607	243	589	273	597	516	0.9:1
1997	480	34	489	39	485	73	0.9:1	593	372	571	352	582	724	1.1:1
1998	483	95	494	95	488	190	1.0:1	577	146	547	139	562	285	1.1:1
1999	490	72	488	39	490	111	1.8:1	600	202	576	204	588	406	1.0:1
2000	513	47	513	43	513	90	1.1:1	605	159	584	165	594	324	1.0:1
2001	522	35	507	30	515	65	1.2:1	596	196	577	218	586	414	0.9:1
2002	503	306	502	256	503	562	1.2:1	606	665	580	760	592	1,425	0.9:1
2003	483	116	466	117	474	233	1.0:1	593	387	574	504	582	891	0.8:1
2004	497	64	482	65	489	129	1.0:1	585	396	569	485	576	881	0.8:1
2005	483	27	495	30	490	57	0.9:1	588	649	564	883	574	1,532	0.7:1
2006	498	72	497	58	497	130	1.2:1	572	239	553	270	562	509	0.9:1
2007	512	21	499	24	505	45	0.9:1	594	313	567	285	581	598	1.1:1
2008	472	45	465	41	468	86	1.1:1	595	160	576	185	585	345	0.9:1
2009	482	24	492	19	486	43	1.3:1	594	206	578	303	584	509	0.7:1
2010	474	121	493	79	481	200	1.5:1	578	163	568	217	573	380	0.8:1
2011	462	35	479	28	470	63	1.3:1	591	124	568	184	577	308	0.7:1
Ave. (1980–2010)	488	108	491	93	489	200	1.2:1	589	306	566	389	576	695	0.8:1

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Table 10.–Page 2 of 2.

Year	Age Class 2.2							Age Class 2.3						
	Male		Female		Both			Male		Female		Both		
	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female
1980	525	13	534	35	532	48	0.4:1	589	67	579	80	585	147	0.8:1
1981	ND	ND	ND	ND	525	ND	ND	ND	ND	ND	ND	588	ND	ND
1982	530	21	522	30	525	51	0.7:1	598	46	580	21	592	67	2.2:1
1983	524	25	520	30	522	55	0.8:1	595	26	582	35	587	61	0.7:1
1984	505	116	508	159	507	275	0.7:1	570	210	557	192	564	402	1.1:1
1985	513	132	513	196	513	328	0.7:1	570	106	555	129	562	235	0.8:1
1986	ND	ND	ND	ND	ND	ND	ND	585	52	568	89	575	141	0.6:1
1987	510	11	517	13	514	24	0.8:1	608	15	583	24	593	39	0.6:1
1988	527	20	527	24	527	44	0.8:1	596	53	577	92	584	145	0.6:1
1989	499	47	505	73	503	120	0.6:1	605	402	579	501	591	903	0.8:1
1990	494	88	496	113	495	201	0.8:1	589	177	568	132	580	309	1.3:1
1991	497	68	486	89	491	157	0.8:1	572	153	543	139	558	292	1.1:1
1992	485	31	485	44	485	75	0.7:1	570	46	547	88	555	134	0.5:1
1993	514	58	519	76	517	134	0.8:1	583	357	560	503	570	860	0.7:1
1994	481	67	488	171	486	238	0.4:1	578	73	551	89	563	162	0.8:1
1995	504	23	521	24	513	47	1.0:1	588	114	569	109	578	223	1.0:1
1996	511	18	520	24	516	42	0.8:1	606	18	598	19	602	37	0.9:1
1997	489	12	504	15	498	27	0.8:1	600	52	567	73	581	125	0.7:1
1998	501	28	507	39	504	67	0.7:1	574	48	559	49	566	97	1.0:1
1999	517	38	512	85	513	123	0.4:1	592	37	574	33	583	70	1.1:1
2000	519	35	518	20	519	55	1.8:1	603	44	583	41	593	85	1.1:1
2001	519	14	538	36	533	50	0.4:1	600	26	579	29	588	55	0.9:1
2002	515	117	513	142	514	259	0.8:1	604	75	579	74	591	149	1.0:1
2003	514	45	515	73	515	118	0.6:1	594	135	574	163	583	298	0.8:1
2004	513	34	512	71	512	105	0.5:1	596	71	566	71	581	142	1.0:1
2005	499	20	508	39	505	59	0.5:1	582	110	561	111	572	221	1.0:1
2006	521	17	523	31	522	48	0.5:1	577	250	557	329	566	579	0.8:1
2007	517	11	520	22	519	33	0.5:1	587	26	568	33	576	59	0.8:1
2008	489	14	504	27	499	41	0.5:1	589	37	572	25	582	62	1.5:1
2009	506	26	534	43	524	69	0.6:1	591	29	578	39	583	68	0.7:1
2010	488	27	498	13	491	40	2.1:1	591	75	568	129	576	204	0.6:1
2011	479	24	518	19	496	43	1.3:1	596	161	572	200	583	361	0.8:1
Ave. (1980–2010)	506	41	509	61	508	101	0.7:1	587	98	566	115	576	212	0.9:1
2011 (all ages)	569	353	561	438	565	791	0.8:1							

Table 11.–Kenai (top), Kasilof (middle) and Yentna rivers (bottom) observer count variability, 2011.

Kenai R. crew	Abundance	n	Observer 1	2	3	4	Ave	SD
Average	100–199	3	159	166	165	163	164	3.2
R^2			1.0000	0.9987	0.9955	0.9987	0.9982	
Average	200–299	3	282	262	266	263	268	9.1
R^2			0.8924	0.8906	0.9629	0.9944	0.9351	
Average	300–399	7	341	341	344	346	343	2.4
R^2			0.9023	0.8697	0.9796	0.9559	0.9269	
Average	400–499	4	456	438	452	446	448	8.1
R^2			0.9905	0.4005	0.3387	0.9626	0.6731	
Average	500–599	3	560	524	545	572	550	20.6
R^2			0.5085	0.9116	0.9057	0.9933	0.8298	
Average	600–699	3	632	634	650	670	646	17.8
R^2			0.2362	0.9370	0.9677	0.8840	0.7562	
	700–799	1	807	816	790	744	789	32.0
Average	800–899	4	903	851	865	852	868	24.3
R^2			0.9140	0.0081	0.4609	0.7870	0.5425	
	900–999	1	1030	933	906	1001	968	57.7
	>1,000	1	1029	1093	1177	980	1070	85.2
Average		30	501	488	497	494	495	5.5
R^2 (average-obs)			0.9868	0.9925	0.9864	0.9865	-	-
dif from average			5.8	-7.2	2.1	-0.6	-	-

Kasilof R. crew			1	2	3			
Average	<99	9	66	65	65		65	0.6
R^2			0.9973	0.9994	0.9970		0.9979	
Average	100–199	9	126	126	126		126	0.2
R^2			0.9979	0.9980	0.9921		0.9960	
Average	200–299	8	208	207	210		208	1.5
R^2			0.9995	0.9987	0.9992		0.9992	
Average	300–399	2	327	324	334		328	5.1
R^2			1.0000	1.0000	1.0000		1.0000	
Average	>400	2	537	526	552		538	13.0
R^2			1.0000	1.0000	1.0000		1.0000	
Average		30	178	176	179		178	1.5
R^2 (average-obs)			0.9996	0.9995	0.9989		-	-
dif from average			-0.1	-1.5	1.6		-	-

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Yentna River crew	Abundance	n	Observer 1	2	3	4	Ave	SD
Average	<99	6	67	69	69	68	68	1.1
R^2			0.9954	0.9983	0.9971	0.9991	0.9975	-
Average	100–199	22	147	148	148	144	147	1.6
R^2			0.9941	0.9974	0.9902	0.9957	0.9943	-
Average	>200	2	203	209	210	202	206	4.3
R^2			1.0000	1.0000	1.0000	1.0000	1.0000	-
Average		30	134	136	136	133	135	1.6
R^2 (average-obs)			0.9973	0.9991	0.9964	0.9988	-	-
dif from average			-0.6	1.3	1.2	-1.9	-	-

Note: The R2 values indicate the correlation between individual observer counts and the crew average count.

Table 12.–Late run sockeye salmon weir and ground survey counts in four index streams in the Kenai River drainage, 1969–2011.

	Ptarmigan	Quartz Creek		Russian River[a]			Total Index
				Hidden Lake	Above Weir	Below Weir	
Year	ground	weir	ground	weir	weir	ground	
1969	ND	ND	487	500	28,872	1,100	30,959
1970	ND	ND	200	323	26,200	222	26,945
1971	45	ND	808	1,958	54,421	11,442	68,674
1972	ND	ND	ND	4,956	79,115	7,113	91,184
1973	1,041	ND	3,173	690	25,068	6,680	36,652
1974	558	ND	288	1,150	24,904	2,210	29,110
1975	186	ND	1,068	1,375	31,961	690	35,280
1976	505	ND	3,372	4,860	31,939	3,470	44,146
1977	1,513	ND	3,037	1,055	21,362	17,090	44,057
1978	3,529	ND	10,627	4,647	34,334	18,330	71,467
1979	532	ND	277	5,762	87,852	3,920	98,343
1980	5,752	ND	7,982	27,448	83,984	3,220	128,386
1981	1,421	ND	5,998	15,939	44,523	4,160	72,041
1982	7,525	70,540	ND	9,790	30,790	45,000	163,645
1983	9,709	73,345	ND	11,297	33,734	44,000	172,085
1984	18,000	37,659	ND	27,784	92,659	3,000	179,102
1985	26,879	ND	ND	24,784	136,969	8,650	197,282
1986	ND	ND	ND	17,530	40,281	15,230	73,041
1987	14,187	ND	45,400	43,487	53,932	76,530	233,536
1988	31,696	ND	ND	50,907	42,476	30,360	155,439
1989	3,484	ND	ND	7,770	138,377	28,480	178,111
1990	2,230	ND	ND	77,959	83,434	11,760	175,383
1991	4,628	ND	ND	35,576[b]	78,175	22,267	105,070
1992	3,147	ND	ND	32,912	62,584	4,980	103,623
1993	ND	ND	ND	11,582	99,259	12,258	123,099
1994	1,077	ND	ND	6,086	122,277	15,211	144,651
1995	ND	ND	1,372	7,542	61,982	12,479	83,375
1996	ND	ND	4,181	55,256	34,691	31,601	125,729
1997	ND	ND	27,660	56,053	65,905	11,337	160,955
1998	ND	ND	11,130	67,727	113,480	19,593	211,930
1999	ND	ND	3,951	49,406	139,863	19,514	212,734
2000	ND	ND	1,389	45,685	56,580	13,930	117,584
2001	ND	ND	4,792	42,462	74,964	17,044	139,262
2002	ND	ND	66,294	71,983	62,115	6,858	140,956
2003	ND	ND	19,106	11,734	157,469	27,474	215,783
2004	4,428	ND	13,225	18,172	110,244	30,458	176,527
2005	3,036	ND	6,580	13,000[b]	59,473	29,048	98,137
2006	3,461	ND	28,335	38,535	89,160	18,452	177,943
2007	1,938	ND	38,954	16,734	53,068	4,504	115,198
2008	5,530	ND	16,622	15,214	46,638	9,750	93,754
2009	3,980	ND	11,262	11,011	80,088	10,740	117,081
2010	2,184	ND	5,098	41,503	38,848	16,656	104,289
2011	ND	ND	8,779	17,771	41,529	35,415	103,494

Note: Historical survey counts of other upper Kenai tributaries are available.

[a] Late run sockeye salmon counts only, ADF&G, Division of Sport Fish, Soldotna.

[b] Count is incomplete, hole discovered in weir on 8/11.

Table 13.–Mean annual water level gain, turbidity (secchi depth), air and water temperature measured at the Kasilof, Kenai, Crescent, and Yentna river sonar sites, 1979–2011.

	Kasilof River				Kenai River			
Year	Water Level Gain (m)	Turbidity (cm)	Air °C	Water °C	Water Level Gain (m)	Turbidity (cm)	Air °C	Water °C
1979	ND	ND	ND	ND	ND	ND	ND	ND
1980	ND	ND	ND	ND	ND	ND	ND	ND
1981	ND	ND	ND	ND	ND	ND	ND	ND
1982	1.0	ND	12.0	10.2	0.5	ND	14.2	9.3
1983	ND	ND	ND	ND	0.4	ND	ND	12.6
1984	0.6	ND	ND	14.4	0.5	ND	ND	12.5
1985	0.8	ND	ND	13.0	ND	ND	ND	ND
1986	1.3	ND	ND	11.0	ND	ND	ND	ND
1987	ND	ND	ND	ND	0.4	ND	14.7	9.3
1988	ND	ND	ND	ND	0.3	ND	15.8	11.8
1989	1.3	ND	16.6	13.3	0.8	73.9	15.1	6.8
1990	0.8	ND	17.2	15.0	0.5	77.7	15.0	12.6
1991	0.6	ND	15.7	13.3	0.2	89.9	13.4	12.8
1992	0.8	ND	18.0	13.0	0.5	88.9	15.0	12.0
1993	0.9	ND	19.0	16.2	0.7	99.8	16.6	13.0
1994	1.5	ND	17.1	13.2	0.4	87.6	14.3	11.4
1995	0.9	ND	16.0	12.5	0.4	101.6	14.1	11.1
1996	1.0	ND	16.0	13.0	0.8	52.3	13.6	12.1
1997	1.2	ND	19.0	16.0	0.3	66.5	14.0	14.0
1998	0.9	ND	13.6	16.5	0.5	69.1	13.4	12.0
1999	1.0	ND	13.4	14.6	0.4	74.2	13.9	12.5
2000	1.0	ND	11.3	14.6	0.4	77.7	13.3	11.6
2001	0.7	ND	18.6	15.5	0.4	80.0	13.8	12.4
2002	1.1	ND	17.8	9.1	0.3	99.3	15.0	12.6
2003	1.1	ND	17.1	10.4	0.5	58.4	15.1	12.3
2004	1.1	ND	19.9	13.5	0.5	83.3	16.1	14.3
2005	0.9	ND	19.6	14.8	0.2	109.2	14.1	14.2
2006	0.9	ND	16.7	12.5	0.4	107.7	13.0	11.7
2007	1.0	42.2	17.9	14.9	0.4	85.3	13.6	12.5
2008	0.9	ND	16.0	11.3	0.4	92.7	12.5	10.6
2009	1.2	ND	17.0	12.3	1.1	74.1	13.8	12.5
2010	0.9	ND	15.8	12.2	0.4	99.1	13.2	10.2
2011	1.1	ND	17.5	12.8	0.6	86.7	12.3	13.8
Summary 1979– 2010								
Ave.	1.0	ND	16.6	13.3	0.5	84.0	14.3	11.9
Min.	0.6	ND	11.3	9.1	0.2	52.3	12.5	6.8
Max	1.5	ND	19.9	16.5	1.1	109.2	16.6	14.3

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Table 13.–Page 2 of 2.

Year	Crescent River Water Level Gain (m)	Crescent River Turbidity (cm)	Crescent River Air °C	Crescent River Water °C	Yentna River Water Level Gain (m)	Yentna River Turbidity (cm)	Yentna River Air °C	Yentna River Water °C
1979	0.6	ND	ND	9.1	ND	ND	ND	ND
1980	ND	ND	ND	ND	ND	ND	ND	ND
1981	0.4	ND	10.6	19.2	ND	ND	ND	ND
1982	0.2	ND	9.6	18.1	ND	ND	ND	ND
1983	0.4	ND	14.0	7.4	ND	ND	ND	ND
1984	0.2	ND	18.1	9.6	ND	ND	ND	ND
1985	0.8	ND	14.0	7.2	0.8	ND	13.9	ND
1986	1.4	ND	12.4	8.9	1.4	ND	12.5	8.9
1987	ND	ND	ND	ND	ND	ND	ND	ND
1988	ND	ND	ND	ND	ND	ND	ND	ND
1989	0.5	26.2	15.0	8.5	1.5	ND	12.6	8.7
1990	0.4	23.1	15.3	10.6	ND	ND	ND	ND
1991	0.2	35.9	12.0	12.6	1.2	ND	8.3	8.6
1992	0.5	45.0	12.4	7.8	1.2	ND	9.6	8.1
1993	0.4	42.9	12.3	9.2	1.2	ND	13.2	9.8
1994	0.7	45.2	11.8	7.4	0.8	ND	11.7	9.1
1995	0.6	37.3	11.6	8.9	1.4	ND	11.9	9.1
1996	0.3	31.5	12.5	10.3	1.2	ND	10.4	9.2
1997	0.4	15.0	15.0	11.6	1.0	ND	17.2	9.7
1998	0.7	40.1	10.8	7.3	1.1	ND	15.8	8.9
1999	0.5	36.8	15.0	9.4	1.1	ND	14.1	9.4
2000	0.4	47.0	16.7	9.5	1.5	ND	13.2	9.5
2001	0.4	30.2	14.9	8.9	1.4	ND	13.4	9.3
2002	0.3	37.6	14.3	8.2	1.4	ND	13.9	10.4
2003	0.6	40.1	14.9	9.3	1.6	ND	17.2	9.9
2004	0.6	20.3	14.2	9.9	1.0	ND	13.1	9.9
2005	0.5	22.9	14.0	9.9	1.3	ND	12.1	10.3
2006	0.5	33.0	12.5	9.1	2.1	ND	7.3	9.6
2007	0.4	42.2	12.0	9.2	1.4	ND	7.4	10.0
2008	0.3	58.4	10.9	8.2	1.7	ND	6.2	8.8
2009	ND	ND	ND	ND	1.6	ND	6.2	9.4
2010	0.5	44.8	11.1	7.4	1.4	ND	8.6	7.0
2011	0.3	47.6	13.9	8.3	1.8	ND	6.1	9.6
Summary 1979– 2010								
Ave.	0.5	36.0	13.3	9.7	1.3	ND	11.7	9.3
Min	0.2	15.0	9.6	7.2	0.8	ND	6.2	7.0
Max	1.4	58.4	18.1	19.2	2.1	ND	17.2	10.4

Note: Crescent did not operate in 2009 because of volcanic activity.

Table 14.–Daily (DIDSON) estimates of the sockeye salmon escapement into the Kasilof River, 2011.

	Sockeye		Pink	Coho	Chinook		Sockeye		Pink	Coho	Chinook
Date	Daily	Cum	Daily	Daily	Daily	Date	Daily	Cum	Daily	Daily	Daily
15 Jun	5,521	5,521	0	0	0	14 Jul	1,146	106,705	0	0	0
16 Jun	3,192	8,713	0	0	0	15 Jul	1,278	107,983	0	0	0
17 Jun	1,927	10,640	0	0	0	16 Jul	10,302	118,285	0	0	0
18 Jun	2,700	13,340	0	0	0	17 Jul	13,542	131,827	0	0	0
19 Jun	5,808	19,148	0	0	0	18 Jul	15,042	146,869	0	0	0
20 Jun	5,268	24,416	0	0	0	19 Jul	5,506	152,375	0	0	0
21 Jun	5,340	29,756	0	0	0	20 Jul	11,838	164,213	0	0	0
22 Jun	5,508	35,264	0	0	0	21 Jul	3,924	168,137	0	0	0
23 Jun	11,352	46,616	0	0	0	22 Jul	5,856	173,993	0	0	0
24 Jun	11,032	57,648	0	0	0	23 Jul	11,214	185,207	0	0	0
25 Jun	9,162	66,810	0	0	0	24 Jul	8,178	193,385	0	0	0
26 Jun	768	67,578	0	0	0	25 Jul	7,914	201,299	0	0	0
27 Jun	2,442	70,020	0	0	0	26 Jul	7,356	208,655	0	0	0
28 Jun	1,344	71,364	0	0	0	27 Jul	5,826	214,481	0	0	0
29 Jun	6,012	77,376	0	0	0	28 Jul	3,188	217,669	0	0	0
30 Jun	786	78,162	0	0	0	29 Jul	2,908	220,577	0	0	0
1 Jul	2,994	81,156	0	0	0	30 Jul	3,102	223,679	0	0	0
2 Jul	6,606	87,762	0	0	0	31 Jul	2,232	225,911	0	0	0
3 Jul	1,362	89,124	0	0	0	1 Aug	2,214	228,125	0	0	0
4 Jul	2,628	91,752	0	0	0	2 Aug	1,907	230,032	0	0	0
5 Jul	1,392	93,144	0	0	0	3 Aug	1,729	231,761	0	0	0
6 Jul	3,067	96,211	0	0	0	4 Aug	1,926	233,687	0	0	0
7 Jul	534	96,745	0	0	0	5 Aug	2,173	235,860	0	0	0
8 Jul	1,938	98,683	0	0	0	6 Aug	2,466	238,326	0	0	0
9 Jul	2,268	100,951	0	0	0	7 Aug	960	239,286	0	0	0
10 Jul	846	101,797	0	0	0	8 Aug	1,215	240,501	0	0	0
11 Jul	1,398	103,195	0	0	0	9 Aug	1,710	242,211	0	0	0
12 Jul	786	103,981	0	0	0	10 Aug	1,908	244,119	0	0	0
13 Jul	1,578	105,559	0	0	0	11 Aug	1,602	245,721	0	0	0

Table 15.–Cumulative proportion by date of sockeye salmon escapement into the Kasilof River, 1994–2011.

	Cumulative Proportion																	
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
15 Jun	0.007	0.001	0.003	0.007	0.001	0.002	0.001	0.006	0.027	0.004	0.007	0.022	0.009	0.012	0.001	0.008	0.009	0.022
16 Jun	0.010	0.002	0.007	0.013	0.003	0.004	0.002	0.020	0.039	0.007	0.010	0.043	0.013	0.025	0.002	0.015	0.014	0.035
17 Jun	0.014	0.004	0.016	0.026	0.006	0.007	0.004	0.043	0.051	0.009	0.013	0.073	0.018	0.033	0.004	0.018	0.016	0.043
18 Jun	0.017	0.006	0.023	0.039	0.016	0.009	0.010	0.064	0.067	0.011	0.017	0.115	0.023	0.039	0.005	0.022	0.018	0.054
19 Jun	0.020	0.010	0.033	0.061	0.029	0.012	0.015	0.085	0.095	0.017	0.022	0.164	0.030	0.045	0.008	0.028	0.021	0.078
20 Jun	0.025	0.016	0.047	0.098	0.036	0.016	0.022	0.097	0.119	0.032	0.034	0.211	0.039	0.051	0.018	0.049	0.023	0.099
21 Jun	0.029	0.024	0.055	0.125	0.048	0.025	0.027	0.110	0.138	0.053	0.053	0.238	0.054	0.057	0.031	0.060	0.031	0.121
22 Jun	0.034	0.032	0.079	0.141	0.065	0.038	0.040	0.124	0.157	0.065	0.092	0.246	0.065	0.067	0.049	0.065	0.048	0.144
23 Jun	0.039	0.040	0.111	0.157	0.082	0.055	0.055	0.146	0.174	0.092	0.138	0.251	0.076	0.079	0.074	0.073	0.086	0.190
24 Jun	0.047	0.047	0.145	0.184	0.094	0.072	0.075	0.174	0.185	0.113	0.187	0.261	0.087	0.086	0.090	0.084	0.121	0.235
25 Jun	0.058	0.059	0.162	0.227	0.107	0.099	0.096	0.210	0.194	0.128	0.222	0.283	0.104	0.094	0.111	0.104	0.143	0.272
26 Jun	0.071	0.071	0.181	0.276	0.124	0.120	0.122	0.229	0.212	0.152	0.224	0.303	0.124	0.096	0.161	0.116	0.169	0.275
27 Jun	0.094	0.088	0.227	0.321	0.152	0.147	0.147	0.258	0.230	0.155	0.226	0.316	0.144	0.103	0.187	0.137	0.200	0.285
28 Jun	0.129	0.120	0.295	0.337	0.181	0.181	0.169	0.294	0.233	0.156	0.232	0.329	0.164	0.119	0.213	0.142	0.207	0.290
29 Jun	0.172	0.166	0.318	0.360	0.212	0.216	0.202	0.307	0.235	0.165	0.239	0.355	0.184	0.122	0.221	0.153	0.218	0.315
30 Jun	0.220	0.196	0.346	0.392	0.224	0.244	0.233	0.330	0.239	0.188	0.247	0.361	0.191	0.123	0.236	0.166	0.244	0.318
01 Jul	0.250	0.216	0.381	0.412	0.252	0.277	0.264	0.344	0.266	0.197	0.250	0.385	0.197	0.128	0.243	0.199	0.252	0.330
02 Jul	0.256	0.229	0.386	0.454	0.276	0.291	0.301	0.375	0.280	0.214	0.253	0.421	0.211	0.139	0.253	0.214	0.260	0.357
03 Jul	0.282	0.241	0.389	0.468	0.290	0.307	0.328	0.389	0.313	0.248	0.257	0.438	0.225	0.143	0.263	0.229	0.275	0.363
04 Jul	0.322	0.248	0.399	0.513	0.297	0.315	0.337	0.409	0.346	0.264	0.265	0.459	0.244	0.152	0.267	0.262	0.287	0.373
05 Jul	0.333	0.265	0.438	0.521	0.321	0.332	0.361	0.414	0.354	0.268	0.268	0.483	0.261	0.156	0.274	0.271	0.310	0.379
06 Jul	0.375	0.293	0.452	0.526	0.353	0.347	0.383	0.424	0.379	0.284	0.274	0.501	0.275	0.160	0.279	0.298	0.314	0.392
07 Jul	0.437	0.315	0.475	0.544	0.365	0.377	0.394	0.449	0.427	0.314	0.289	0.510	0.288	0.174	0.299	0.313	0.323	0.394
08 Jul	0.483	0.322	0.496	0.548	0.385	0.412	0.416	0.476	0.469	0.329	0.299	0.527	0.295	0.201	0.309	0.320	0.333	0.402
09 Jul	0.501	0.335	0.499	0.556	0.411	0.419	0.441	0.482	0.487	0.351	0.302	0.537	0.310	0.218	0.317	0.339	0.339	0.411
10 Jul	0.535	0.355	0.507	0.566	0.438	0.427	0.472	0.493	0.514	0.379	0.305	0.549	0.330	0.225	0.332	0.353	0.351	0.414
11 Jul	0.545	0.359	0.524	0.582	0.446	0.439	0.481	0.498	0.525	0.410	0.307	0.582	0.337	0.243	0.339	0.396	0.360	0.420
12 Jul	0.552	0.365	0.528	0.598	0.452	0.445	0.502	0.505	0.533	0.463	0.314	0.613	0.342	0.248	0.354	0.411	0.387	0.423
13 Jul	0.565	0.373	0.538	0.617	0.465	0.453	0.534	0.513	0.546	0.480	0.377	0.640	0.348	0.253	0.362	0.427	0.403	0.430
14 Jul	0.584	0.387	0.650	0.624	0.474	0.467	0.594	0.530	0.553	0.504	0.538	0.654	0.358	0.267	0.392	0.465	0.428	0.434
15 Jul	0.623	0.395	0.710	0.630	0.496	0.473	0.664	0.562	0.570	0.523	0.603	0.665	0.400	0.277	0.455	0.535	0.456	0.439
16 Jul	0.636	0.487	0.721	0.643	0.522	0.481	0.673	0.596	0.582	0.603	0.634	0.684	0.437	0.289	0.518	0.561	0.503	0.481
17 Jul	0.679	0.618	0.728	0.673	0.573	0.501	0.691	0.640	0.597	0.675	0.653	0.696	0.447	0.298	0.559	0.584	0.587	0.536
18 Jul	0.711	0.641	0.737	0.682	0.603	0.516	0.702	0.688	0.621	0.706	0.666	0.716	0.456	0.369	0.585	0.601	0.649	0.598

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Table 15.–Page 2 of 2.

	Cumulative Proportion																	
Date	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
19 Jul	0.732	0.667	0.758	0.689	0.642	0.534	0.730	0.706	0.642	0.722	0.676	0.731	0.469	0.425	0.648	0.636	0.678	0.620
20 Jul	0.750	0.688	0.777	0.696	0.671	0.563	0.763	0.717	0.678	0.734	0.684	0.744	0.476	0.449	0.666	0.657	0.709	0.668
21 Jul	0.763	0.704	0.790	0.700	0.687	0.619	0.777	0.729	0.687	0.757	0.711	0.755	0.484	0.520	0.689	0.667	0.736	0.684
22 Jul	0.771	0.753	0.806	0.707	0.713	0.679	0.807	0.733	0.708	0.787	0.724	0.766	0.491	0.585	0.717	0.673	0.760	0.708
23 Jul	0.778	0.807	0.823	0.727	0.740	0.721	0.843	0.746	0.723	0.820	0.741	0.785	0.498	0.623	0.735	0.680	0.780	0.754
24 Jul	0.789	0.868	0.850	0.741	0.773	0.757	0.876	0.800	0.752	0.834	0.755	0.802	0.504	0.663	0.753	0.687	0.807	0.787
25 Jul	0.799	0.883	0.875	0.750	0.799	0.792	0.895	0.901	0.791	0.852	0.769	0.817	0.518	0.728	0.783	0.704	0.816	0.819
26 Jul	0.806	0.898	0.883	0.756	0.820	0.829	0.912	0.911	0.812	0.864	0.780	0.830	0.527	0.784	0.831	0.740	0.822	0.849
27 Jul	0.813	0.919	0.890	0.763	0.839	0.865	0.931	0.927	0.823	0.882	0.788	0.837	0.537	0.819	0.871	0.776	0.834	0.873
28 Jul	0.826	0.927	0.896	0.773	0.870	0.881	0.947	0.936	0.835	0.901	0.799	0.846	0.590	0.833	0.894	0.788	0.856	0.886
29 Jul	0.846	0.934	0.900	0.781	0.893	0.900	0.965	0.950	0.852	0.917	0.807	0.861	0.676	0.848	0.906	0.808	0.866	0.898
30 Jul	0.868	0.939	0.904	0.793	0.913	0.913	0.974	0.967	0.862	0.929	0.815	0.880	0.705	0.863	0.915	0.831	0.875	0.910
31 Jul	0.892	0.945	0.907	0.802	0.938	0.925	0.983	0.980	0.873	0.939	0.822	0.889	0.739	0.881	0.927	0.845	0.889	0.919
01	0.928	0.950	0.923	0.810	0.960	0.935	0.990	0.988	0.887	0.947	0.827	0.896	0.771	0.894	0.938	0.862	0.899	0.928
02	0.943	0.956	0.938	0.820	0.968	0.948	1.000	0.993	0.908	0.956	0.833	0.902	0.806	0.903	0.947	0.878	0.920	0.936
03	0.952	0.969	0.952	0.829	0.974	0.961		1.000	0.925	0.963	0.843	0.911	0.829	0.910	0.957	0.895	0.927	0.943
04	0.959	0.984	0.969	0.836	0.980	0.972			0.940	0.967	0.864	0.915	0.855	0.922	0.967	0.913	0.931	0.951
05	0.966	0.988	0.979	0.850	0.988	0.979			0.949	0.973	0.877	0.923	0.870	0.931	0.974	0.930	0.941	0.960
06	0.972	0.993	0.984	0.872	0.992	0.986			0.958	0.979	0.887	0.933	0.880	0.938	0.980	0.944	0.952	0.970
07	0.977	1.000	0.992	0.896	0.997	0.993			0.969	0.985	0.897	0.936	0.886	0.949	0.984	0.953	0.959	0.974
08	0.981		1.000	0.925	1.000	1.000			0.978	0.990	0.906	0.940	0.892	0.962	0.988	0.965	0.967	0.979
09	0.987			0.945					0.987	0.994	0.923	0.943	0.901	0.974	0.994	0.975	0.972	0.986
10	0.994			0.962					0.994	1.000	0.935	0.947	0.909	0.980	1.000	0.982	0.975	0.993
11	1.000			0.984					1.000		0.946	0.954	0.923	0.989		0.987	0.979	1.000
12				1.000							0.957	0.968	0.940	0.996		0.994	0.984	
13											0.970	0.980	0.956	1.000		1.000	0.989	
14											0.982	0.991	0.966				0.994	
15											0.992	1.000	0.978				1.000	
16											1.000		0.987					
17													0.994					
18													1.000					
Midpoint	9 Jul	17 Jul	10 Jul	4 Jul	16 Jul	17 Jul	12 Jul	12 Jul	10 Jul	14 Jul	14 Jul	6 Jul	24 Jul	21 Jul	16 Jul	15 Jul	16 Jul	17
Midpoint Average (1979–2010): 15 Jul (1994–2010): 15 Jul																		
No. ays for 80%	35	30	37	49	36	34	31	35	44	35	47	46	46	37	35	41	40	40
80% Ave: 1979–2010, 36 d 1994–2010, 39 d																		

Note: Data available dating back to 1979.

Table 16.–Daily fish wheel catch by species for the Kasilof River, 2011.

Date	Hours open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	0.0	0	0	0	0	0	0	0	0
16 Jun	0.0	0	0	0	0	0	0	0	0
17 Jun	0.0	0	0	0	0	0	0	0	0
18 Jun	0.0	0	0	0	0	0	0	0	0
19 Jun	0.0	0	0	0	0	0	0	0	0
20 Jun	0.0	0	0	0	0	0	0	0	0
21 Jun	16.0	16	16	0	0	0	0	0	0
22 Jun	19.0	26	42	0	0	0	0	0	0
23 Jun	23.2	31	73	0	0	0	0	0	0
24 Jun	11.7	45	118	0	0	0	0	0	0
25 Jun	11.8	28	146	0	0	0	0	0	0
26 Jun	21.7	7	153	0	0	0	0	0	0
27 Jun	27.2	9	162	0	0	0	0	0	0
28 Jun	20.4	3	165	0	0	0	0	0	0
29 Jun	25.3	18	183	0	0	0	0	0	0
30 Jun	8.8	77	260	0	0	0	0	0	0
1 Jul	18.9	43	303	0	0	0	0	0	0
2 Jul	11.0	75	378	1	1	0	0	0	0
3 Jul	6.4	43	421	0	1	0	0	0	0
4 Jul	11.2	10	431	0	1	0	0	0	0
5 Jul	10.6	12	443	0	1	0	0	0	0
6 Jul	12.6	33	476	0	1	0	0	0	0
7 Jul	7.9	10	486	0	1	0	0	0	0
8 Jul	26.0	11	497	0	1	0	0	0	0
9 Jul	20.3	64	561	0	1	0	0	0	0
10 Jul	14.0	35	596	0	1	0	0	1	1
11 Jul	13.1	26	622	1	2	0	0	0	1
12 Jul	8.2	29	651	2	4	0	0	0	1
13 Jul	12.5	7	658	0	4	0	0	0	1
14 Jul	13.5	0	658	0	4	0	0	0	1
15 Jul	0.0	10	668	0	4	0	0	0	1
16 Jul	9.5	34	702	0	4	0	0	0	1
17 Jul	5.5	128	830	2	6	1	1	0	1
18 Jul	6.4	124	954	1	7	0	1	1	2
19 Jul	1.4	55	1,009	0	7	0	1	0	2
20 Jul	3.0	15	1,024	0	7	0	1	0	2
21 Jul	4.4	22	1,046	0	7	0	1	0	2
22 Jul	7.0	8	1,054	0	7	0	1	0	2
23 Jul	13.0	71	1,125	2	9	0	1	0	2
24 Jul	11.1	30	1,155	0	9	0	1	0	2
25 Jul	11.9	32	1,187	0	9	0	1	0	2
26 Jul	4.7	35	1,222	0	9	0	1	0	2
27 Jul	3.8	39	1,261	1	10	0	1	0	2
28 Jul	6.6	13	1,274	0	10	0	1	0	2
29 Jul	3.0	11	1,285	0	10	0	1	0	2
30 Jul	8.3	14	1,299	0	10	0	1	0	2
31 Jul	4.5	5	1,304	0	10	0	1	0	2

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Table 16.–Page 2 of 2.

Date	Hours open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Aug	5.1	7	1,311	1	11	0	1	0	2
2 Aug	6.0	1	1,312	0	11	0	1	0	2
3 Aug	4.6	4	1,316	0	11	0	1	0	2
4 Aug	11.8	16	1,332	0	11	0	1	0	2
5 Aug	15.0	18	1,350	1	12	0	1	1	3
6 Aug	12.0	21	1,371	0	12	0	1	0	3
7 Aug	19.0	5	1,376	0	12	0	1	2	5
8 Aug	18.2	4	1,380	0	12	0	1	0	5
9 Aug	14.5	8	1,388	0	12	0	1	0	5
10 Aug	19.7	7	1,395	0	12	0	1	0	5
11 Aug	0.0	0	1,395	0	12	0	1	0	5
%:			98.7		0.8		0.1		0.4

Total catch: 1,413 salmon Hrs Operated: 601.2 CPUE (fish/hr): 2.4

Efficiency: % of total north bank count (fish wheel catch adjusted to 24 hrs).

Note: Fish wheel not operated 15–20 June because of low water.

Table 17.–Summary of fish wheel catches and CPUE for the north bank of the Kasilof River, 1983–2011.

		Actual North Bank fish wheel catch (salmon only)									CPUE by species				
Year	Total Hours	Sockeye	%	Pink	%	Coho	%	Chinook	%	Total Catch	Sockeye	Pink	Coho	Chinook	Total CPUE
1983	582.5	2,094	96.8	26	0.0	2	0.0	41	0.0	2,163	3.6	0.0	0.0	0.1	3.7
1984	809.5	3,907	97.7	44	0.0	8	0.0	41	0.0	4,000	4.8	0.1	0.0	0.1	4.9
1985	747.0	4,996	98.3	49	0.0	4	0.0	32	0.0	5,081	6.7	0.1	0.0	0.0	6.8
1986	613.0	7,186	97.4	77	0.0	6	0.0	108	0.0	7,377	11.7	0.1	0.0	0.2	12.0
1987	768.4	3,910	96.2	20	0.0	0	0.0	136	0.0	4,066	5.1	0.0	0.0	0.2	5.3
1988	720.0	4,662	96.7	37	0.0	3	0.0	119	0.0	4,821	6.5	0.1	0.0	0.2	6.7
1989	959.1	4,017	94.0	154	0.0	5	0.0	99	0.0	4,275	4.2	0.2	0.0	0.1	4.5
1990	1,073.8	1,750	93.4	26	0.0	0	0.0	98	0.1	1,874	1.6	0.0	0.0	0.1	1.7
1991	557.7	1,889	95.9	65	0.0	1	0.0	14	0.0	1,969	3.4	0.1	0.0	0.0	3.5
1992	778.8	2,380	95.0	40	0.0	2	0.0	82	0.0	2,504	3.1	0.1	0.0	0.1	3.2
1993	840.0	2,100	93.9	52	0.0	0	0.0	85	0.0	2,237	2.5	0.1	0.0	0.1	2.7
1994	609.3	3,514	97.3	37	0.0	3	0.0	59	0.0	3,613	5.8	0.1	0.0	0.1	5.9
1995	678.2	2,023	96.4	28	0.0	1	0.0	46	0.0	2,098	3.0	0.0	0.0	0.1	3.1
1996	505.8	3,009	98.9	5	0.0	2	0.0	28	0.0	3,044	5.9	0.0	0.0	0.1	6.0
1997	505.0	2,076	97.0	16	0.0	3	0.0	46	0.0	2,141	4.1	0.0	0.0	0.1	4.2
1998	462.9	1,937	96.6	18	0.0	4	0.0	47	0.0	2,006	4.2	0.0	0.0	0.1	4.3
1999	503.0	1,952	92.1	108	0.1	2	0.0	58	0.0	2,120	3.9	0.2	0.0	0.1	4.2
2000	670.5	1,792	94.2	37	0.0	16	0.0	57	0.0	1,902	2.7	0.1	0.0	0.1	2.8
2001	391.4	1,765	96.4	23	0.0	1	0.0	42	0.0	1,831	4.5	0.1	0.0	0.1	4.7
2002	843.4	2,449	96.9	29	0.0	13	0.0	37	0.0	2,528	2.9	0.0	0.0	0.0	3.0
2003	822.2	1,704	98.3	15	0.0	0	0.0	14	0.0	1,733	2.1	0.0	0.0	0.0	2.1
2004	953.6	1,991	95.7	48	0.0	2	0.0	39	0.0	2,080	2.1	0.1	0.0	0.0	2.2
2005	785.1	1,812	95.5	66	0.0	0	0.0	19	0.0	1,897	2.3	0.1	0.0	0.0	2.4
2006	739.5	1,630	94.4	39	0.0	24	0.0	34	0.0	1,727	2.2	0.1	0.0	0.0	2.3
2007	877.3	1,580	97.8	15	0.0	4	0.0	17	0.0	1,616	1.8	0.0	0.0	0.0	1.8
2008	448.1	1,931	99.4	9	0.0	1	0.0	2	0.0	1,943	4.3	0.0	0.0	0.0	4.3
2009	514.2	1,390	96.8	42	0.0	0	0.0	4	0.0	1,436	2.7	0.1	0.0	0.0	2.8
2010	863.5	1,533	97.4	18	0.0	3	0.0	20	0.0	1,574	1.8	0.0	0.0	0.0	1.8
2011	601.2	1,395	98.7	12	0.0	1	0.0	5	0.0	1,413	2.3	0.0	0.0	0.0	2.4
	Ave %: (1983–2010)		96.3		0.0		0.0		0.0		3.9	0.1	0.0	0.1	4.0
	min %: (1983–2010)		92.1		0.0		0.0		0.0		1.6	0.0	0.0	0.0	1.7
	max %: (1983–2010)		99.4		0.1		0.0		0.1		11.7	0.2	0.0	0.2	12.0
	SD %: (1983–2010)		1.7		0.0		0.0		0.0		2.1	0.0	0.0	0.0	2.2

Table 18.–Age composition of sockeye salmon sampled from the Kasilof River fish wheel catch, 1969–2011.

	Percentage Composition by Age Class								
Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	n
1969	0.0	14.0	39.0	1.0	0.0	30.0	16.0	0.0	399
1970	0.0	2.0	37.0	2.0	0.0	16.0	11.0	2.0	297
1971	0.0	6.0	69.0	0.0	0.0	8.0	16.0	1.0	153
1972	0.0	42.0	36.0	1.0	0.0	3.0	18.0	0.0	668
1973	0.0	20.0	57.0	0.0	0.0	19.0	4.0	0.0	374
1974	0.0	35.0	59.0	0.0	0.0	4.0	2.0	0.0	254
1975	1.0	29.0	7.0	0.0	0.0	58.0	4.0	1.0	931
1976	0.2	35.9	24.1	0.0	0.0	28.2	11.4	0.2	755
1977	0.3	29.4	30.0	0.0	0.8	27.8	11.7	0.0	1,209
1978	0.0	41.3	40.1	0.0	0.0	10.4	8.2	0.0	967
1979	0.7	58.9	28.2	0.0	0.0	10.5	1.6	0.1	590
1980	2.1	67.0	23.1	0.1	0.0	5.0	2.7	0.0	899
1981	0.0	28.9	63.6	0.0	0.0	5.9	1.6	0.0	1,479
1982	0.8	30.6	54.4	0.0	0.2	9.3	4.7	0.0	1,518
1983	0.0	49.5	33.1	0.0	0.0	12.9	4.5	0.0	1,997
1984	0.0	50.5	24.8	0.0	0.2	17.9	6.6	0.0	2,269
1985	0.2	57.3	21.8	0.1	0.1	17.8	2.6	0.1	3,063
1986	0.0	40.9	42.0	0.3	0.1	11.9	4.6	0.2	1,660
1987	0.2	43.4	27.4	0.0	0.1	22.4	6.4	0.0	1,248
1988	0.1	33.7	36.4	0.2	0.1	17.6	12.0	0.0	2,282
1989	0.0	14.9	35.3	0.1	0.1	36.6	13.0	0.0	1,301
1990	0.4	32.9	20.7	0.3	0.0	33.2	12.4	0.3	762
1991	0.0	31.5	33.4	0.1	0.1	29.0	5.8	0.1	2,106
1992	0.0	21.1	27.5	0.0	0.2	35.3	16.0	0.0	1,717
1993	0.4	16.3	29.8	0.0	0.4	28.0	25.2	0.0	571
1994	0.0	26.4	28.4	0.0	0.0	28.2	17.0	0.0	723
1995	0.2	44.0	15.5	0.0	0.0	25.0	15.3	0.0	587
1996	0.0	24.8	48.3	0.0	0.0	21.4	5.6	0.0	721
1997	0.0	21.1	54.8	0.0	0.0	13.5	10.7	0.0	758
1998	0.1	39.7	28.1	0.4	0.6	22.2	8.9	0.0	857
1999	0.0	29.7	33.8	0.2	0.1	26.7	9.4	0.1	964
2000	0.1	41.9	33.9	0.0	0.4	11.4	12.3	0.0	747
2001	0.4	29.3	48.6	0.2	0.2	16.5	4.8	0.2	564
2002	0.3	33.9	38.1	0.3	1.5	19.3	6.6	0.1	746
2003	0.7	37.3	26.1	0.0	0.2	29.3	6.5	0.0	1,298
2004	0.1	43.7	18.9	0.1	0.2	32.6	4.3	0.1	908
2005	0.7	38.8	32.8	0.0	0.3	18.7	8.8	0.0	1,278
2006	0.5	35.3	30.5	0.0	0.4	27.4	5.8	0.1	737
2007	0.7	44.8	25.3	0.0	0.2	19.3	9.9	0.0	628
2008	0.4	39.5	38.3	0.0	0.2	17.9	3.7	0.0	448
2009	0.0	8.5	60.4	0.3	0.0	17.2	13.6	0.0	331
2010	1.1	27.7	31.2	0.0	1.5	31.2	7.1	0.2	477
2011	1.4	13.7	31.5	0.0	2.7	25.2	25.6	0.0	489
Ave (1969–2010)	0.3	33.3	35.5	0.2	0.2	20.8	8.9	0.1	1,006

Table 19.–Average lengths of the major age classes of sockeye salmon sampled from the Kasilof River fish wheel, 1980–2011.

	Age Class 1.2							Age Class 1.3						
	Male		Female		Total		Ratio	Male		Female		Total		Ratio
Year	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female
1980	474	189	464	376	467	565	0.5:1	531	35	516	115	520	150	0.3:1
1981	503	241	492	146	499	387	1.7:1	566	422	558	369	562	791	1.1:1
1982	481	285	466	235	474	520	1.2:1	549	377	542	428	545	805	0.9:1
1983	493	113	491	78	492	191	1.4:1	558	170	547	187	552	357	0.9:1
1984	480	544	478	428	479	972	2.6:1	539	304	533	383	535	687	0.8:1
1985	474	723	472	897	473	1620	0.8:1	531	341	527	433	529	774	0.8:1
1986	482	266	482	368	482	634	0.7:1	550	342	543	405	546	747	0.8:1
1987	472	282	470	257	471	539	1.1:1	553	191	551	154	552	345	1.2:1
1988	480	353	477	480	478	833	0.7:1	550	311	543	382	546	693	0.8:1
1989	476	77	476	107	476	184	0.8:1	552	233	544	253	547	486	0.9:1
1990	462	139	458	91	460	230	1.5:1	518	81	523	106	521	187	0.8:1
1991	467	326	461	305	464	631	1.1:1	531	418	518	335	525	753	1.3:1
1992	468	184	465	212	467	396	0.9:1	535	195	527	197	531	392	1.0:1
1993	479	40	479	53	479	93	0.8:1	550	101	542	69	547	170	1.5:1
1994	465	96	466	95	465	191	1.0:1	539	102	530	103	535	205	1.0:1
1995	491	117	483	141	487	258	0.8:1	542	42	534	49	538	91	0.9:1
1996	476	96	475	83	475	179	1.2:1	565	214	557	134	562	348	1.6:1
1997	456	80	452	80	454	160	1.0:1	555	223	541	192	548	415	1.2:1
1998	475	178	468	162	472	340	1.1:1	527	110	525	131	526	241	0.8:1
1999	479	140	474	146	476	286	1.0:1	543	167	542	159	542	326	1.1:1
2000	481	162	474	162	478	324	1.0:1	555	140	547	122	551	262	1.2:1
2001	479	77	477	88	478	165	0.9:1	549	149	545	125	547	274	1.2:1
2002	486	114	476	139	480	253	0.8:1	555	144	544	140	549	284	1.1:1
2003	481	230	480	247	481	477	0.9:1	546	167	546	207	546	374	0.8:1
2004	482	181	475	216	478	397	0.8:1	549	82	539	90	544	172	0.9:1
2005	470	260	468	350	469	610	0.7:1	544	142	543	149	543	291	1:1
2006	464	112	458	148	461	260	0.8:1	519	111	513	114	516	225	1.0:1
2007	468	127	464	154	466	281	0.8:1	545	77	538	82	542	159	0.9:1
2008	456	100	454	103	455	203	1.0:1	539	67	533	61	536	128	1.1:1
2009	483	15	485	13	484	28	1.2:1	547	96	542	104	545	200	0.9:1
2010	471	54	466	78	468	132	0.7:1	538	64	532	85	534	149	0.8:1
2011	461	35	465	32	463	67	1.1:1	551	59	549	95	549	154	0.6:1
Ave. (1980–2010)	476	190	472	208	474	398	0.9:1	544	181	538	189	541	370	1.0:1

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Table 19.–Page 2 of 2.

	Age Class 2.2							Age Class 2.3						
	Male		Female		Total		Ratio	Male		Female		Total		Ratio
Year	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female	Length (mm)	Sample Size	Lengt (mm)	Sample Size	Length (mm)	Sample Size	Male-Female
1982	479	65	472	81	475	146	0.8:1	548	41	543	40	546	81	1.0:1
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	546	ND	ND
1984	484	202	482	223	483	425	0.9:1	533	102	526	80	530	182	1.3:1
1985	482	248	476	319	479	567	0.8:1	ND	ND	ND	ND	ND	ND	ND
1986	492	78	489	115	490	193	0.7:1	ND	ND	ND	ND	ND	ND	ND
1987	478	137	474	141	476	278	1.0:1	548	37	541	44	544	81	0.8:1
1988	486	173	479	220	482	393	0.8:1	544	104	543	115	543	219	0.9:1
1989	479	200	480	253	479	453	0.8:1	535	94	537	82	536	176	1.1:1
1990	453	104	457	111	455	215	0.9:1	514	63	529	61	522	124	1.0:1
1991	471	289	480	301	475	590	1.0:1	516	61	514	64	515	125	1.0:1
1992	464	264	465	427	464	691	0.6:1	534	112	532	122	533	234	0.9:1
1993	486	58	480	102	482	160	0.7:1	542	66	533	78	537	144	0.8:1
1994	469	96	470	108	470	204	0.9:1	545	49	528	74	535	123	0.7:1
1995	492	61	485	86	488	147	0.7:1	546	42	536	48	541	90	0.9:1
1996	482	69	472	85	476	154	0.8:1	553	21	556	19	554	40	1.1:1
1997	459	47	450	55	454	102	0.9:1	546	39	526	42	536	81	0.9:1
1998	473	95	469	95	471	190	1.0:1	523	40	519	36	521	76	1.1:1
1999	480	125	475	132	477	257	1.0:1	538	41	530	50	534	91	0.8:1
2000	486	36	482	52	483	88	0.7:1	551	47	551	48	551	95	1.0:1
2001	482	41	473	52	477	93	0.8:1	556	17	540	10	550	27	1.7:1
2002	480	50	470	94	473	144	0.5:1	550	25	546	24	548	49	1.0:1
2003	481	162	479	186	480	348	0.9:1	546	39	537	53	541	92	0.7:1
2004	482	126	475	170	478	296	0.7:1	536	25	523	14	531	39	1.8:1
2005	478	109	467	165	472	274	0.7:1	544	40	533	48	539	88	0.8:1
2006	464	82	466	120	465	202	0.7:1	527	21	521	22	524	43	1.0:1
2007	465	53	462	68	463	121	0.8:1	526	36	517	26	522	62	1.4:1
2008	462	41	458	56	460	97	0.7:1	532	11	501	6	520	17	1.8:1
2009	481	23	480	34	481	57	0.7:1	544	24	531	21	538	45	1.1:1
2010	472	59	474	90	473	149	0.7:1	526	19	521	15	524	34	1.3:1
2011	469	54	469	69	469	123	0.8:1	550	59	543	66	547	125	0.9:1
(1982–2010)	477	110	473	141	474	251	0.8:1	539	47	531	48	536	95	1.0:1
2011 (all ages)	507	216	509	273	508	489	0.8:1							

Table 20.–Estimated minimum and maximum (DIDSON) salmon escapement into the Yentna River drainage, 7 July–15 August, 2011.

	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
Date	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	107	160	107	160	11	70	11	70
8 Jul	217	310	324	470	19	126	31	195
9 Jul	187	275	510	745	19	119	49	314
10 Jul	265	399	775	1,144	27	171	76	486
11 Jul	201	335	976	1,479	37	195	113	681
12 Jul	121	277	1,097	1,757	43	217	157	897
13 Jul	71	144	1,168	1,900	26	128	182	1,025
14 Jul	253	478	1,421	2,379	53	304	236	1,329
15 Jul	225	645	1,646	3,024	168	767	404	2,096
16 Jul	314	764	1,960	3,788	323	1,278	727	3,374
17 Jul	296	808	2,255	4,596	559	1,748	1,286	5,123
18 Jul	8,210	14,230	10,465	18,826	587	4,016	1,873	9,139
19 Jul	20,270	28,745	30,735	47,571	739	5,538	2,612	14,677
20 Jul	8,134	17,324	38,870	64,894	1,161	6,876	3,773	21,553
21 Jul	6,015	13,761	44,885	78,656	1,200	7,330	4,972	28,883
22 Jul	4,181	11,946	49,066	90,602	1,597	8,691	6,569	37,574
23 Jul	1,433	4,710	50,500	95,312	1,796	7,813	8,365	45,387
24 Jul	792	2,452	51,292	97,763	1,902	6,459	10,267	51,846
25 Jul	1,929	4,140	53,221	101,903	440	2,526	10,707	54,372
26 Jul	1,692	5,043	54,913	106,946	562	3,368	11,268	57,740
27 Jul	721	3,098	55,634	110,045	1,204	5,583	12,472	63,323
28 Jul	935	4,237	56,569	114,281	2,453	10,449	14,925	73,772
29 Jul	1,463	5,843	58,032	120,124	3,550	14,240	18,475	88,012
30 Jul	827	3,697	58,859	123,822	2,734	10,570	21,208	98,582
31 Jul	465	2,255	59,325	126,076	1,582	6,565	22,790	105,147
1 Aug	352	1,442	59,676	127,518	1,215	4,248	24,005	109,395
2 Aug	350	1,428	60,026	128,946	1,007	3,587	25,013	112,982
3 Aug	282	693	60,308	129,639	313	1,125	25,326	114,107
4 Aug	27	97	60,335	129,736	17	95	25,343	114,202
5 Aug	78	222	60,413	129,958	20	125	25,363	114,327
6 Aug	141	547	60,554	130,506	111	589	25,474	114,916
7 Aug	420	2,152	60,974	132,657	439	2,534	25,913	117,449
8 Aug	316	1,651	61,290	134,308	610	3,144	26,522	120,594
9 Aug	280	1,751	61,570	136,059	689	3,852	27,211	124,446
10 Aug	196	1,156	61,766	137,216	592	2,863	27,804	127,308
11 Aug	182	1,268	61,948	138,484	540	2,765	28,344	130,073
12 Aug	127	898	62,075	139,382	427	2,128	28,772	132,201
13 Aug	61	429	62,135	139,811	207	1,002	28,978	133,203
14 Aug	57	380	62,193	140,191	141	673	29,119	133,876
15 Aug	38	254	62,231	140,445	78	375	29,197	134,250
% Total of min & max:			34.0%	24.8%			15.9%	23.7%

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Table 20.–Page 2 of 2.

	Chum				Coho			
	Daily		Cum		Daily		Cum	
Date	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	0	0	0	0	2	37	2	37
8 Jul	0	0	0	0	7	98	9	134
9 Jul	0	0	0	0	4	64	13	198
10 Jul	1	8	1	8	11	148	24	346
11 Jul	0	0	1	8	7	96	31	442
12 Jul	16	63	18	71	25	218	56	660
13 Jul	16	53	34	124	20	129	75	789
14 Jul	20	87	54	211	37	286	112	1,075
15 Jul	110	398	164	609	96	691	208	1,766
16 Jul	137	471	301	1,080	138	957	347	2,723
17 Jul	204	686	505	1,766	120	956	466	3,680
18 Jul	313	1,707	818	3,473	771	7,140	1,237	10,820
19 Jul	234	1,584	1,053	5,056	659	8,838	1,897	19,658
20 Jul	834	4,283	1,887	9,339	1,059	10,263	2,956	29,921
21 Jul	1,127	4,990	3,014	14,329	1,182	9,469	4,138	39,390
22 Jul	1,812	6,607	4,826	20,936	1,574	10,954	5,712	50,344
23 Jul	1,437	4,499	6,263	25,435	1,283	7,430	6,995	57,774
24 Jul	952	2,949	7,215	28,384	741	4,836	7,736	62,610
25 Jul	173	881	7,388	29,265	319	2,839	8,055	65,449
26 Jul	274	1,221	7,663	30,486	766	5,068	8,821	70,516
27 Jul	880	2,688	8,543	33,173	1,382	6,670	10,203	77,187
28 Jul	2,479	6,579	11,023	39,752	2,506	11,606	12,709	88,793
29 Jul	4,753	11,787	15,776	51,539	2,473	13,360	15,182	102,153
30 Jul	3,570	8,665	19,345	60,203	2,116	10,672	17,298	112,825
31 Jul	2,050	4,948	21,395	65,151	1,615	7,399	18,913	120,223
1 Aug	873	2,407	22,268	67,558	737	3,945	19,650	124,168
2 Aug	780	2,151	23,048	69,709	646	3,448	20,296	127,616
3 Aug	101	371	23,149	70,080	87	728	20,383	128,344
4 Aug	14	50	23,163	70,130	22	126	20,405	128,470
5 Aug	26	107	23,189	70,237	26	186	20,431	128,656
6 Aug	86	293	23,275	70,530	149	796	20,580	129,452
7 Aug	715	2,067	23,990	72,596	1,051	4,203	21,632	133,655
8 Aug	1,465	3,362	25,455	75,958	1,078	4,492	22,710	138,147
9 Aug	3,835	7,752	29,290	83,710	1,802	7,288	24,512	145,435
10 Aug	5,267	7,996	34,556	91,706	750	3,939	25,262	149,374
11 Aug	9,621	13,214	44,178	104,919	963	5,126	26,225	154,500
12 Aug	10,049	12,862	54,227	117,781	680	3,875	26,905	158,375
13 Aug	5,908	7,137	60,135	124,919	281	1,668	27,186	160,043
14 Aug	2,873	3,723	63,007	128,642	178	1,087	27,365	161,130
15 Aug	1,297	1,756	64,304	130,398	94	555	27,459	161,685
% Total of min & max:			35.1%	23.0%			15.0%	28.5%

Note: Ranges derived from DIDSON subsample counts (not converted to Bendix equivalents).

Table 21.–Cumulative proportion by date of sockeye salmon escapement recorded in the Yentna River, 1995–2011.

	Cumulative Proportion[a]																
Date	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
07 Jul	0.001	0.001	0.004	0.003	0.000	0.007	0.005	0.029	0.004	0.002	0.007	0.004	0.000	0.001	0.001	0.001	0.001
08 Jul	0.001	0.003	0.006	0.006	0.001	0.013	0.010	0.101	0.007	0.004	0.017	0.006	0.001	0.002	0.003	0.002	0.004
09 Jul	0.002	0.005	0.009	0.010	0.002	0.020	0.015	0.155	0.010	0.006	0.021	0.009	0.001	0.004	0.004	0.004	0.006
10 Jul	0.003	0.007	0.011	0.017	0.005	0.024	0.023	0.187	0.014	0.007	0.028	0.013	0.002	0.006	0.008	0.005	0.009
11 Jul	0.004	0.007	0.013	0.030	0.010	0.033	0.029	0.207	0.018	0.008	0.035	0.018	0.002	0.007	0.013	0.007	0.012
12 Jul	0.005	0.009	0.016	0.043	0.017	0.046	0.041	0.226	0.023	0.010	0.041	0.022	0.002	0.010	0.024	0.009	0.014
13 Jul	0.006	0.011	0.030	0.051	0.024	0.075	0.050	0.236	0.051	0.011	0.057	0.024	0.004	0.013	0.045	0.016	0.015
14 Jul	0.006	0.013	0.087	0.056	0.031	0.124	0.058	0.251	0.126	0.014	0.081	0.026	0.004	0.017	0.074	0.034	0.019
15 Jul	0.007	0.022	0.149	0.059	0.044	0.263	0.068	0.271	0.192	0.092	0.109	0.027	0.005	0.068	0.113	0.063	0.023
16 Jul	0.007	0.131	0.197	0.064	0.057	0.407	0.098	0.328	0.239	0.263	0.131	0.031	0.006	0.148	0.189	0.098	0.028
17 Jul	0.012	0.348	0.229	0.072	0.068	0.490	0.184	0.446	0.261	0.377	0.147	0.042	0.009	0.228	0.281	0.163	0.034
18 Jul	0.022	0.519	0.254	0.094	0.081	0.600	0.270	0.535	0.316	0.457	0.165	0.087	0.013	0.299	0.336	0.223	0.145
19 Jul	0.068	0.614	0.280	0.159	0.108	0.730	0.359	0.570	0.372	0.519	0.205	0.160	0.015	0.387	0.377	0.266	0.386
20 Jul	0.160	0.671	0.316	0.239	0.160	0.849	0.414	0.628	0.489	0.555	0.242	0.217	0.040	0.538	0.416	0.332	0.512
21 Jul	0.251	0.702	0.367	0.304	0.222	0.910	0.423	0.684	0.611	0.573	0.273	0.239	0.091	0.636	0.459	0.399	0.610
22 Jul	0.335	0.745	0.434	0.327	0.319	0.950	0.429	0.734	0.678	0.593	0.303	0.257	0.160	0.700	0.497	0.474	0.689
23 Jul	0.378	0.784	0.492	0.338	0.433	0.969	0.480	0.754	0.706	0.619	0.326	0.285	0.251	0.779	0.531	0.529	0.719
24 Jul	0.426	0.822	0.544	0.357	0.510	0.978	0.563	0.783	0.747	0.657	0.365	0.307	0.320	0.821	0.567	0.573	0.735
25 Jul	0.496	0.856	0.606	0.378	0.567	0.984	0.630	0.807	0.783	0.681	0.430	0.325	0.374	0.851	0.591	0.609	0.765
26 Jul	0.580	0.880	0.668	0.403	0.605	0.989	0.704	0.820	0.813	0.711	0.485	0.353	0.417	0.862	0.609	0.649	0.799
27 Jul	0.678	0.899	0.697	0.426	0.653	0.994	0.803	0.835	0.844	0.722	0.516	0.390	0.450	0.868	0.623	0.686	0.817
28 Jul	0.743	0.913	0.722	0.454	0.702	0.996	0.880	0.855	0.865	0.729	0.532	0.459	0.514	0.878	0.646	0.736	0.843
29 Jul	0.796	0.928	0.743	0.493	0.767	0.996	0.921	0.871	0.881	0.739	0.555	0.564	0.564	0.890	0.684	0.768	0.879
30 Jul	0.832	0.941	0.767	0.560	0.804	0.997	0.944	0.891	0.892	0.756	0.581	0.630	0.589	0.897	0.734	0.792	0.901
31 Jul	0.852	0.943	0.795	0.622	0.848	0.999	0.954	0.906	0.909	0.781	0.628	0.698	0.603	0.907	0.756	0.820	0.915
01 Aug	0.875	0.948	0.826	0.684	0.878	1.000	0.970	0.918	0.941	0.792	0.677	0.733	0.619	0.914	0.787	0.851	0.924
02 Aug	0.897	0.954	0.852	0.762	0.895		0.985	0.931	0.963	0.809	0.718	0.769	0.647	0.924	0.838	0.870	0.932
03 Aug	0.915	0.965	0.870	0.830	0.914		0.991	0.947	0.977	0.826	0.766	0.825	0.687	0.939	0.881	0.889	0.937
04 Aug	0.928	0.981	0.893	0.876	0.934		0.994	0.964	0.983	0.851	0.792	0.867	0.725	0.959	0.915	0.918	0.938
05 Aug	0.944	0.991	0.911	0.907	0.947		1.000	0.979	0.990	0.882	0.810	0.897	0.743	0.973	0.932	0.932	0.939
06 Aug	0.975	0.996	0.923	0.927	0.955			0.990	1.000	0.910	0.844	0.919	0.758	0.981	0.947	0.941	0.943
07 Aug	0.990	1.000	0.931	0.938	0.963			0.996		0.934	0.895	0.948	0.790	0.986	0.962	0.950	0.955
08 Aug	0.992		0.945	0.947	0.971			1.000		0.953	0.917	0.970	0.826	0.989	0.977	0.958	0.965
09 Aug	0.996		0.961	0.953	0.978					0.968	0.948	0.982	0.871	0.994	0.986	0.968	0.975
10 Aug	1.000		0.982	0.959	0.988					0.981	0.968	0.989	0.898	1.000	0.992	0.975	0.982

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Table 21.–Page 2 of 2.

	Cumulative Proportion[a]																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
11 Aug			0.992	0.966	0.994					0.993	0.979	0.994	0.933		0.995	0.982	0.989
12 Aug			1.000	0.973	0.997					1.000	0.992	1.000	0.975		1.000	0.987	0.994
13 Aug				0.979	0.999						1.000		0.991			0.993	0.996
14 Aug				0.984	1.000								0.994			0.998	0.999
15 Aug				0.986									0.997			1.000	1.000
16 Aug				0.988									1.000				
17 Aug				0.991													
18 Aug				0.993													
19 Aug				0.996													
20 Aug				0.998													
21 Aug				1.000													
Mid run:	26 Jul	18 Jul	24 Jul	30 Jul	24 Jul	18 Jul	24 Jul	18 Jul	21 Jul	19 Jul	27 Jul	29 Jul	28 Jul	20 Jul	23 Jul	23 Jul	20 Jul
Ave Mid run (1981–2010): 24 Jul																	
(1995–2010): 23 Jul																	
No. days: for 80%:	15	13	22	18	16	8	13	24	18	22	25	19	21	16	21	19	13
80% Ave: 1981–2010: 16 d					1995–2010: 18 d												

Note: Data available dating back to 1981.

[a] Proportion averaged from minimum and maximum daily migration estimates (2009–2011).

Table 22.–Daily fish wheel catch by species for the north bank of the Yentna River, 2011.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	16.9	4	4	2	2	0	0	0	0	0	0
8 Jul	17.6	7	11	3	5	0	0	1	1	2	2
9 Jul	18.0	5	16	7	12	0	0	0	1	2	4
10 Jul	17.4	2	18	2	14	0	0	1	2	1	5
11 Jul	16.6	1	19	3	17	0	0	0	2	1	6
12 Jul	17.3	1	20	6	23	2	2	1	3	0	6
13 Jul	17.6	1	21	4	27	1	3	3	6	1	7
14 Jul	17.5	13	34	15	42	0	3	1	7	3	10
15 Jul	16.8	13	47	39	81	9	12	8	15	0	10
16 Jul	16.5	10	57	66	147	11	23	14	29	0	10
17 Jul	17.7	9	66	107	254	15	38	12	41	1	11
18 Jul	16.8	79	145	222	476	30	68	97	138	0	11
19 Jul	17.5	192	337	209	685	21	89	62	200	0	11
20 Jul	16.2	105	442	192	877	34	123	35	235	0	11
21 Jul	17.4	84	526	154	1,031	43	166	61	296	0	11
22 Jul	17.3	67	593	191	1,222	65	231	58	354	0	11
23 Jul	17.2	37	630	269	1,491	54	285	80	434	0	11
24 Jul	15.5	14	644	435	1,926	53	338	64	498	1	12
25 Jul	15.9	68	712	137	2,063	13	351	39	537	0	12
26 Jul	16.5	77	789	259	2,322	24	375	101	638	0	12
27 Jul	17.1	47	836	597	2,919	66	441	170	808	0	12
28 Jul	17.0	51	887	743	3,662	114	555	170	978	0	12
29 Jul	17.2	75	962	977	4,639	229	784	215	1,193	0	12
30 Jul	17.1	27	989	914	5,553	218	1,002	175	1,368	0	12
31 Jul	17.0	23	1,012	526	6,079	90	1,092	118	1,486	0	12
1 Aug	17.2	14	1,026	703	6,782	93	1,185	112	1,598	0	12
2 Aug	16.9	7	1,033	501	7,283	49	1,234	74	1,672	1	13
3 Aug	9.4	13	1,046	70	7,353	9	1,243	9	1,681	0	13
4 Aug	11.3	10	1,056	24	7,377	4	1,247	12	1,693	1	14
5 Aug	17.4	36	1,092	39	7,416	13	1,260	17	1,710	1	15
6 Aug	17.4	6	1,098	25	7,441	2	1,262	9	1,719	0	15
7 Aug	16.1	26	1,124	98	7,539	34	1,296	49	1,768	0	15
8 Aug	17.3	10	1,134	109	7,648	33	1,329	51	1,819	1	16
9 Aug	17.4	18	1,152	317	7,965	191	1,520	252	2,071	2	18
10 Aug	17.6	23	1,175	264	8,229	224	1,744	163	2,234	1	19
11 Aug	17.3	14	1,189	452	8,681	555	2,299	296	2,530	1	20
12 Aug	16.4	26	1,215	367	9,048	657	2,956	208	2,738	0	20
13 Aug	17.5	18	1,233	210	9,258	349	3,305	107	2,845	0	20
14 Aug	17.5	30	1,263	216	9,474	352	3,657	85	2,930	0	20
15 Aug	17.4	10	1,273	108	9,582	171	3,828	48	2,978	0	20
16 Aug	17.5	3	1,276	66	9,648	144	3,972	34	3,012	0	20
17 Aug	17.7	5	1,281	34	9,682	138	4,110	21	3,033	0	20
18 Aug	17.3	6	1,287	20	9,702	60	4,170	21	3,054	0	20
19 Aug	16.6	8	1,295	15	9,717	76	4,246	24	3,078	1	21
20 Aug	17.9	7	1,302	7	9,724	159	4,405	18	3,096	0	21

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Table 22.–Page 2 of 2.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
21 Aug	17.8	8	1,310	9	9,733	68	4,473	18	3,114	0	21
22 Aug	17.4	6	1,316	7	9,740	98	4,571	10	3,124	0	21
23 Aug	17.8	6	1,322	10	9,750	144	4,715	14	3,138	1	22
24 Aug	17.5	5	1,327	4	9,754	63	4,778	12	3,150	0	22
25 Aug	17.9	1	1,328	5	9,759	61	4,839	8	3,158	0	22
26 Aug	14.8	3	1,331	4	9,763	102	4,941	11	3,169	0	22
27 Aug	15.2	2	1,333	1	9,764	63	5,004	7	3,176	0	22
28 Aug	14.7	2	1,335	3	9,767	31	5,035	8	3,184	0	22
29 Aug	14.9	0	1,335	2	9,769	18	5,053	7	3,191	0	22
30 Aug	14.6	1	1,336	0	9,769	19	5,072	3	3,194	1	23
31 Aug	14.8	1	1,337	2	9,771	13	5,085	3	3,197	0	23
1 Sep	14.7	1	1,338	4	9,775	6	5,091	3	3,200	0	23
2 Sep	12.2	0	1,338	0	9,775	2	5,093	2	3,202	0	23
Percent:			6.9		50.3		26.2		16.5		0.1

Total catch: 19,431 salmon Hrs Operated: 961.0 CPUE (fish/hr): 20.2

Trap efficiency: ~25% of total north bank sonar estimate (catch adjusted through 24 hours).

Table 23.–Daily fish wheel catch by species for the south bank of the Yentna River, 2011.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	18.1	7	7	4	4	0	0	0	0	0	0
8 Jul	17.9	20	27	7	11	0	0	3	3	0	0
9 Jul	17.5	12	39	6	17	0	0	0	3	0	0
10 Jul	17.2	13	52	3	20	1	1	1	4	1	1
11 Jul	17.0	17	69	9	29	0	1	1	5	0	1
12 Jul	17.8	13	82	10	39	0	1	4	9	1	2
13 Jul	17.6	8	90	5	44	1	2	0	9	0	2
14 Jul	17.1	10	100	11	55	3	5	6	15	0	2
15 Jul	17.0	16	116	41	96	8	13	11	26	0	2
16 Jul	17.5	31	147	70	166	7	20	8	34	1	3
17 Jul	18.1	32	179	92	258	16	36	9	43	0	3
18 Jul	17.8	686	865	174	432	33	69	96	139	0	3
19 Jul	17.6	687	1,552	121	553	14	83	53	192	0	3
20 Jul	17.4	275	1,827	98	651	34	117	68	260	0	3
21 Jul	17.9	216	2,043	139	790	42	159	49	309	1	4
22 Jul	17.9	169	2,212	151	941	51	210	71	380	0	4
23 Jul	17.8	73	2,285	217	1,158	64	274	50	430	0	4
24 Jul	16.8	106	2,391	469	1,627	110	384	93	523	0	4
25 Jul	16.7	449	2,840	302	1,929	56	440	95	618	0	4
26 Jul	17.1	346	3,186	324	2,253	57	497	179	797	0	4
27 Jul	17.1	111	3,297	390	2,643	102	599	178	975	1	5
28 Jul	16.8	74	3,371	393	3,036	149	748	175	1,150	0	5
29 Jul	17.5	59	3,430	296	3,332	165	913	91	1,241	0	5
30 Jul	17.7	57	3,487	250	3,582	146	1,059	110	1,351	0	5
31 Jul	17.2	31	3,518	177	3,759	94	1,153	87	1,438	1	6
1 Aug	18.0	59	3,577	225	3,984	92	1,245	90	1,528	0	6
2 Aug	17.1	76	3,653	294	4,278	124	1,369	113	1,641	0	6
3 Aug	14.8	56	3,709	83	4,361	8	1,377	15	1,656	0	6
4 Aug	17.8	24	3,733	53	4,414	14	1,391	21	1,677	0	6
5 Aug	17.4	89	3,822	95	4,509	40	1,431	47	1,724	0	6
6 Aug	17.3	73	3,895	139	4,648	48	1,479	76	1,800	0	6
7 Aug	15.6	41	3,936	107	4,755	46	1,525	98	1,898	0	6
8 Aug	17.8	36	3,972	176	4,931	112	1,637	96	1,994	0	6
9 Aug	17.8	34	4,006	204	5,135	299	1,936	158	2,152	0	6
10 Aug	16.1	66	4,072	493	5,628	1,161	3,097	217	2,369	0	6
11 Aug	17.1	99	4,171	477	6,105	2674	5,771	338	2,707	1	7
12 Aug	17.3	34	4,205	167	6,272	1675	7,446	130	2,837	0	7
13 Aug	17.2	14	4,219	81	6,353	926	8,372	53	2,890	0	7
14 Aug	17.9	16	4,235	80	6,433	581	8,953	55	2,945	0	7
15 Aug	17.5	14	4,249	38	6,471	257	9,210	22	2,967	0	7
16 Aug	17.6	6	4,255	11	6,482	200	9,410	22	2,989	0	7
17 Aug	17.8	8	4,263	13	6,495	215	9,625	29	3,018	0	7
18 Aug	17.4	8	4,271	3	6,498	179	9,804	27	3,045	0	7
19 Aug	16.7	20	4,291	19	6,517	151	9,955	21	3,066	0	7
20 Aug	17.6	6	4,297	8	6,525	188	10,143	13	3,079	0	7

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Table 23.–Page 2 of 2.

Date	Hours open	Sockeye Daily	Sockeye Cum	Pink Daily	Pink Cum	Chum Daily	Chum Cum	Coho Daily	Coho Cum	Chinook Daily	Chinook Cum
21 Aug	17.3	3	4,300	6	6,531	104	10,247	11	3,090	0	7
22 Aug	17.6	4	4,304	2	6,533	123	10,370	9	3,099	0	7
23 Aug	17.4	10	4,314	5	6,538	200	10,570	8	3,107	0	7
24 Aug	17.5	10	4,324	2	6,540	95	10,665	15	3,122	0	7
25 Aug	17.6	4	4,328	0	6,540	177	10,842	9	3,131	0	7
26 Aug	14.6	4	4,332	2	6,542	167	11,009	8	3,139	0	7
27 Aug	15.0	1	4,333	2	6,544	137	11,146	4	3,143	0	7
28 Aug	14.5	1	4,334	1	6,545	48	11,194	3	3,146	0	7
29 Aug	14.4	2	4,336	1	6,546	30	11,224	3	3,149	0	7
30 Aug	14.5	4	4,340	0	6,546	37	11,261	3	3,152	0	7
31 Aug	14.7	2	4,342	2	6,548	18	11,279	4	3,156	0	7
1 Sep	14.6	4	4,346	0	6,548	14	11,293	8	3,164	0	7
2 Sep	6.6	2	4,348	2	6,550	17	11,310	0	3,164	0	7
Percent:			17.1		25.8		44.6		12.5		0.0

Total catch: 25,372 salmon Hrs Operated: 976.2 CPUE (fish/hr): 26.0

Trap efficiency: ~16% of south bank sonar estimate (catch adjusted through 24 hours).

Note: Last day of sonar operations was 15 August.

Table 24.–Summary of fish wheel catch and CPUE by species for the north bank of the Yentna River, 1982–2011.

	Total	Fish wheel catch - North bank										Total	CPUE by species					Total
	Hours	Sockeye	%	Pink	%	Chum	%	Coho	%	Chinook	%	Catch	Sockeye	Pink	Chum	Coho	Chinook	CPUE
1982	1,467.5	904	9.1	7,568	76.3	893	9.0	528	5.3	25	0.3	9,918	0.6	5.2	0.2	0.4	0.0	6.8
1983	1,564.5	933	22.0	2,667	62.8	384	9.0	213	5.0	50	1.2	4,247	0.6	1.7	0.5	0.1	0.0	2.7
1984	828.0	514	6.3	7,141	87.1	448	5.5	88	1.1	9	0.1	8,200	0.6	8.6	0.7	0.1	0.0	9.9
1985	702.5	1,099	17.5	4,415	70.4	502	8.0	241	3.8	14	0.2	6,271	1.6	6.3	0.6	0.3	0.0	8.9
1986	573.2	219	4.9	3,571	80.6	362	8.2	194	4.4	83	1.9	4,429	0.4	6.2	0.9	0.3	0.1	7.7
1987	936.4	1,393	25.5	2,983	54.5	876	16.0	172	3.1	47	0.9	5,471	1.5	3.2	2.8	0.2	0.1	5.8
1988	517.2	981	16.6	3,320	56.2	1,433	24.2	137	2.3	39	0.7	5,910	1.9	6.4	4.6	0.3	0.1	11.4
1989	790.2	2,016	13.8	8,099	55.3	3,669	25.1	803	5.5	46	0.3	14,633	2.6	10.2	2.3	1.0	0.1	18.5
1990	517.6	867	11.5	5,246	69.5	1,165	15.4	248	3.3	27	0.4	7,553	1.7	10.1	1.8	0.5	0.1	14.6
1991	530.1	768	16.2	2,071	43.8	946	20.0	932	19.7	15	0.3	4,732	1.4	3.9	2.3	1.8	0.0	8.9
1992	582.6	693	8.2	5,867	69.7	1,345	16.0	499	5.9	13	0.2	8,417	1.2	10.1	1.4	0.9	0.0	14.4
1993	399.1	931	13.9	4,789	71.3	549	8.2	432	6.4	17	0.3	6,718	2.3	12.0	1.5	1.1	0.0	16.8
1994	492.1	1,374	28.6	2,309	48.0	734	15.3	379	7.9	10	0.2	4,806	2.8	4.7	1.6	0.8	0.0	9.8
1995	511.8	815	17.8	2,343	51.0	826	18.0	587	12.8	19	0.4	4,590	1.6	4.6	0.9	1.1	0.0	9.0
1996	472.4	708	16.0	2,815	63.6	409	9.2	481	10.9	13	0.3	4,426	1.5	6.0	0.6	1.0	0.0	9.4
1997	849.5	2,294	48.1	1,610	33.8	551	11.6	301	6.3	14	0.3	4,770	2.7	1.9	1.0	0.4	0.0	5.6
1998	1,094.1	12,067	37.7	17,057	53.3	1,102	3.4	1,712	5.4	54	0.2	31,992	11.0	15.6	1.0	1.6	0.0	29.2
1999	206.0	1,004	33.5	1,301	43.4	211	7.0	464	15.5	16	0.5	2,996	4.9	6.3	1.2	2.3	0.1	14.5
2000	133.9	904	14.8	4,710	76.9	155	2.5	345	5.6	9	0.1	6,123	6.8	35.2	3.5	2.6	0.1	45.7
2001	145.1	898	13.6	4,705	71.4	501	7.6	477	7.2	13	0.2	6,594	6.2	32.4	3.2	3.3	0.1	45.4
2002	161.7	564	6.3	7,286	80.9	516	5.7	618	6.9	17	0.2	9,001	3.5	45.1	3.4	3.8	0.1	55.7
2003	179.5	2,331	34.5	3,367	49.9	602	8.9	442	6.5	12	0.2	6,754	13.0	18.8	1.4	2.5	0.1	37.6
2004	243.3	394	5.8	4,613	68.1	338	5.0	1,406	20.8	22	0.3	6,773	1.6	19.0	0.8	5.8	0.1	27.8
2005	314.3	582	13.2	2,131	48.5	250	5.7	1,420	32.3	13	0.3	4,396	1.9	6.8	0.8	4.5	0.0	14.0
2006	640.8	1,472	5.7	19,480	75.0	705	2.7	4,295	16.5	27	0.1	25,979	2.3	30.4	1.1	6.7	0.0	40.5
2007	242.9	554	14.4	2,349	61.1	152	4.0	786	20.4	6	0.2	3,847	2.3	9.7	0.6	3.2	0.0	15.8
2008	197.3	752	13.8	3,949	72.6	194	3.6	528	9.7	18	0.3	5,441	3.8	20.0	1.0	2.7	0.1	27.6
2009	631.4	1,061	1.9	50,671	91.5	1,262	2.3	2,363	4.3	33	0.1	55,390	1.7	80.3	2.0	3.7	0.1	87.7
2010	997.2	2,038	13.6	8,821	58.7	2,031	13.5	2,110	14.0	21	0.1	15,021	2.0	8.8	2.0	2.1	0.0	15.1
2011	961.0	1,338	6.9	9,775	50.3	5,093	26.2	3,202	16.5	23	0.1	19,431	1.4	10.2	5.3	3.3	0.0	20.2
Ave.: (1982–10)			14.4		69.1		8.1		8.1		0.2		2.4	11.7	1.4	1.4	0.0	16.9
Min.: (1982–10)			1.9		33.8		2.3		1.1		0.1		0.4	1.7	0.2	0.1	0.0	2.7
Max.: (1982–10)			48.1		91.5		25.1		32.3		1.9		13.0	80.3	4.6	6.7	0.1	87.7
SD (1982–10)			10.9		14.1		6.4		7.1		0.4		2.9	16.6	1.1	1.8	0.0	18.9
pre 1998 Ave %:			15.7		63.6		14.4		5.9		0.4		1.6	6.3	1.5	0.6	0.0	10.0
1998–present			13.0		70.2		6.6		10.1		0.1		4.4	24.2	1.9	3.4	0.1	34.1

Table 25.–Summary of the fish wheel catch and CPUE by species for the south bank of the Yentna River, 1982–2011.

	Total Hours	Fish wheel catch - South bank Sockeye	%	Pink	%	Chum	%	Coho	%	Chinook	%	Total Catch	CPUE by species Sockeye	Pink	Chum	Coho	Chinook	Total CPUE
1982	1,440.0	2,502	19.7	9,059	71.3	368	2.9	675	5.3	102	0.8	12,706	1.7	6.3	0.3	0.5	0.1	8.8
1983	1,506.5	3,715	58.7	1,822	28.8	391	6.2	361	5.7	37	0.6	6,326	2.5	1.2	0.3	0.2	0.0	4.2
1984	788.3	5,985	29.5	13,114	64.6	635	3.1	568	2.8	12	0.1	20,314	7.6	16.6	0.8	0.7	0.0	25.8
1985	883.1	5,616	35.7	8,855	56.2	521	3.3	724	4.6	35	0.2	15,751	6.4	10.0	0.6	0.8	0.0	17.8
1986	608.8	973	13.3	5,422	73.9	589	8.0	327	4.5	28	0.4	7,339	1.6	8.9	1.0	0.5	0.0	12.1
1987	824.2	2,216	32.5	3,333	48.8	966	14.1	293	4.3	20	0.3	6,828	2.7	4.0	1.2	0.4	0.0	8.3
1988	529.4	2,457	26.9	4,536	49.6	1,635	17.9	494	5.4	20	0.2	9,142	4.6	8.6	3.1	0.9	0.0	17.3
1989	818.1	3,856	27.7	7,169	51.5	1,804	12.9	1,081	7.8	23	0.2	13,932	4.7	8.8	2.2	1.3	0.0	17.0
1990	542.2	4,201	32.2	7,058	54.1	1,129	8.6	657	5.0	11	0.1	13,056	7.7	13.0	2.1	1.2	0.0	24.1
1991	445.0	5,368	42.7	3,368	26.8	877	7.0	2,936	23.4	10	0.1	12,559	12.1	7.6	2.0	6.6	0.0	28.2
1992	612.87	3,887	22.2	9,966	56.8	1,940	11.1	1,737	9.9	9	0.1	17,539	6.3	16.3	3.2	2.8	0.0	28.6
1993	446.5	8,561	34.7	12,416	50.3	1,508	6.1	2,178	8.8	25	0.1	24,688	19.2	27.8	3.4	4.9	0.1	55.3
1994	651.3	8,251	55.6	3,763	25.4	1,260	8.5	1,553	10.5	12	0.1	14,839	12.7	5.8	1.9	2.4	0.0	22.8
1995	456.3	2,737	36.3	2,335	31.0	691	9.2	1,766	23.4	11	0.1	7,540	6.0	5.1	1.5	3.9	0.0	16.5
1996	306.5	2,498	28.7	4,335	49.7	752	8.6	1,119	12.8	15	0.2	8,719	8.1	14.1	2.5	3.7	0.0	28.4
1997	318.2	5,431	79.5	672	9.8	317	4.6	397	5.8	18	0.3	6,835	17.1	2.1	1.0	1.2	0.1	21.5
1998	1,114.4	14,394	34.5	21,258	51.0	1,667	4.0	4,326	10.4	50	0.1	41,695	12.9	19.1	1.5	3.9	0.0	37.4
1999	206.3	3,790	42.4	3,213	35.9	223	2.5	1,689	18.9	34	0.4	8,949	18.4	15.6	1.1	8.2	0.2	43.4
2000	125.4	2,611	19.6	9,494	71.4	123	0.9	1,051	7.9	15	0.1	13,294	20.8	75.7	1.0	8.4	0.1	106.0
2001	157.7	2,527	27.7	4,369	47.8	460	5.0	1,755	19.2	20	0.2	9,131	16.0	27.7	2.9	11.1	0.1	57.9
2002	140.7	2,716	14.8	11,590	63.3	712	3.9	3,274	17.9	16	0.1	18,308	19.3	82.4	5.1	23.3	0.1	130.2
2003	146.7	6,095	44.9	4,927	36.3	869	6.4	1,659	12.2	15	0.1	13,565	41.5	33.6	5.9	11.3	0.1	92.5
2004	203.0	2,712	17.4	8,147	52.3	835	5.4	3,832	24.6	43	0.3	15,569	13.4	40.1	4.1	18.9	0.2	76.7
2005	277.6	2,588	26.2	2,280	23.1	571	5.8	4,433	44.9	12	0.1	9,884	9.3	8.2	2.1	16.0	0.0	35.6
2006	636.4	9,277	26.4	15,261	43.4	862	2.5	9,747	27.7	34	0.1	35,181	14.6	24.0	1.4	15.3	0.1	55.3
2007	240.4	2,998	51.8	1,410	24.4	261	4.5	1,117	19.3	2	0.0	5,788	12.5	5.9	1.1	4.6	0.0	24.1
2008	210.7	2,696	36.9	3,245	44.4	349	4.8	1,022	14.0	4	0.1	7,316	12.8	15.4	1.7	4.9	0.0	34.7
2009	629.9	6,901	9.7	55,213	77.8	2,254	3.2	6,569	9.3	33	0.0	70,970	11.0	87.7	3.6	10.4	0.1	112.7
2010	992.0	6,251	24.5	11,053	43.4	4,159	16.3	4,022	15.8	8	0.0	25,493	6.3	11.1	4.2	4.1	0.0	25.7
2011	976.2	4,348	17.1	6,550	25.8	11,310	44.6	3,164	12.5	7	0.0	25,379	4.5	6.7	11.6	3.2	0.0	26.0
		Ave.: (1982–10)	28.3		52.5		6.1		13.0		0.1		8.2	15.3	1.8	3.8	0.0	29.1
		Min.: (1982–10)	9.7		9.8		0.9		2.8		0.0		1.6	1.2	0.3	0.2	0.0	4.2
		Max.: (1982–10)	79.5		77.8		17.9		44.9		0.8		41.5	87.7	5.9	23.3	0.2	130.2
		SD: (1982–10)	15.0		17.2		3.9		9.5		0.2		8.1	23.2	1.4	6.1	0.0	33.2
pre 1998		Ave %:	34.5		49.1		7.8		8.5		0.2		7.6	9.8	1.7	2.0	0.0	21.0
1998–present			23.3		52.6		8.2		15.9		0.1		15.2	32.4	3.4	10.3	0.1	61.3

Table 26.–Age composition of sockeye salmon sampled from fish wheels on the Yentna River, 1983–2011.

	Percentage Composition by Age Class[a]											
Year	0.2	0.3	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	Other	n
1983	0.4	0.4	4.7	66.9	22.6	0.2	0.9	1.7	1.7	0.0	0.5	1,024
1984	0.2	1.6	1.3	23.7	59.6	0.1	0.3	6.5	6.7	0.0	0.0	2,253
1985	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1986	1.0	1.1	0.0	21.2	65.3	0.2	0.3	4.7	6.2	0.0	0.0	688
1987	1.3	2.4	0.9	23.3	50.6	1.0	0.0	8.6	11.7	0.0	0.0	1,089
1988	2.7	2.4	0.4	33.5	41.9	0.2	1.7	6.5	10.4	0.1	0.0	1,727
1989	4.1	6.2	0.7	20.3	53.7	0.3	0.5	5.5	8.6	0.0	0.0	1,602
1990	0.8	2.4	0.3	29.9	47.6	0.7	0.1	9.8	8.2	0.1	0.2	1,916
1991	2.1	10.6	0.1	25.2	43.6	0.1	0.1	7.1	11.0	0.1	0.1	1,509
1992	1.6	0.7	1.0	31.4	29.2	0.1	0.4	17.1	18.2	0.1	0.4	1,451
1993	1.0	4.6	0.1	32.1	35.5	0.0	0.4	11.7	14.5	0.1	0.0	1,390
1994	1.3	3.9	0.6	23.2	43.2	0.2	0.0	9.7	17.6	0.0	0.3	637
1995	2.2	5.1	0.8	19.7	51.3	0.4	0.2	8.5	11.6	0.0	0.2	507
1996	3.2	3.2	0.4	25.5	43.8	0.0	0.4	9.4	14.0	0.0	0.0	466
1997	1.1	10.5	0.1	32.4	43.7	0.1	0.1	4.7	7.2	0.0	0.1	751
1998	0.7	5.7	0.3	15.7	62.7	0.3	0.0	4.0	10.5	0.0	0.0	1,500
1999	3.6	3.4	0.0	23.4	52.0	0.9	0.0	8.6	8.1	0.0	0.0	444
2000	0.0	5.9	0.0	8.6	61.5	0.2	0.0	3.3	20.2	0.2	0.0	546
2001	0.0	3.4	0.8	21.3	47.8	0.0	0.4	8.4	17.7	0.0	0.2	475
2002	1.7	2.0	0.7	28.8	51.0	0.0	0.0	5.5	10.2	0.0	0.2	459
2003	0.5	2.5	0.1	16.1	63.6	0.4	0.5	6.0	10.3	0.0	0.0	812
2004	0.6	1.1	0.7	17.0	50.0	0.6	0.0	8.3	21.7	0.0	0.0	460
2005	0.5	4.0	1.7	22.7	54.4	0.1	0.1	6.2	10.1	0.0	0.2	823
2006	2.2	3.1	0.5	44.0	39.3	0.2	0.0	5.0	5.8	0.0	0.0	605
2007	1.9	3.6	0.3	18.9	60.9	0.0	0.6	6.3	7.4	0.0	0.1	366
2008	0.8	6.3	1.6	11.8	56.0	0.5	1.1	7.6	13.9	0.0	0.4	382
2009	2.9	2.9	1.5	33.9	31.6	0.8	2.1	17.2	7.2	0.0	0.0	664
2010	12.5	4.2	1.6	39.4	23.3	0.0	1.5	5.8	11.5	0.0	0.2	879
2011	0.4	18.1	0.9	11.3	55.9	0.2	4.3	3.9	5.1	0.0	0.0	565
Mean (1983–2010)	1.8	4.1	0.8	27.0	47.3	0.3	0.5	7.6	10.5	0.0	0.1	896

[a] Percentages weighted by total numbers in the escapement: 1986–2010.

Table 27.–Average lengths of the major age classes of sockeye salmon sampled from the Yentna River fish wheels, 1986–2011.

		Male		Female		Both		
Year	Age Class	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female
1986	1.2	455	104	472	52	460	156	2.0:1
1987		484	158	477	156	480	314	1.0:1
1988		465	408	485	170	471	578	2.4:1
1989		454	239	479	89	461	328	2.7:1
1990		446	305	446	238	446	543	1.3:1
1991		460	253	484	130	468	383	1.9:1
1992		444	360	470	115	450	475	3.1:1
1993		465	279	484	167	472	446	1.7:1
1994		468	107	484	41	473	148	2.6:1
1995		460	58	472	42	465	100	1.4:1
1996		463	78	469	41	465	119	1.9:0
1997		479	110	479	133	479	243	0.8:1
1998		485	104	486	132	486	236	0.8:1
1999		469	56	484	48	476	104	1.2:1
2000		462	35	458	12	461	47	2.9:1
2001		477	53	490	48	483	101	1.1:1
2002		486	76	495	56	490	132	1.4:1
2003		473	77	486	54	478	131	1.4:1
2004		466	53	490	25	474	78	2.1:1
2005		456	125	466	62	459	187	2.0:1
2006		485	134	487	132	486	266	1.0:1
2007		455	43	483	26	466	69	1.7:1
2008		456	40	482	5	459	45	8.0:1
2009		472	139	488	86	478	225	1.6:1
2010		462	208	478	138	468	346	1.5:1
2011		452	35	497	29	472	64	1.2:1
Average (1986–10)		466	144	479	88	470	232	1.6:1
1986	1.3	579	172	563	216	570	388	0.8:1
1987		590	246	565	222	579	468	1.1:1
1988		583	365	551	359	568	724	1.0:1
1989		578	392	555	450	565	842	0.9:1
1990		573	400	552	526	561	926	0.8:1
1991		562	301	542	356	551	657	0.8:1
1992		546	188	543	242	544	430	0.8:1
1993		561	228	549	266	554	494	0.9:1
1994		596	133	561	142	578	275	0.9:1
1995		568	124	545	136	556	260	0.9:1
1996		589	107	568	97	579	204	1.1:1
1997		585	155	555	173	569	328	0.9:1
1998		562	453	538	487	550	940	0.9:1
1999		581	135	553	96	569	231	1.4:1
2000		600	180	568	156	585	336	1.2:1
2001		586	111	555	116	570	227	1.0:1
2002		596	113	561	121	578	234	0.9:1
2003		576	270	548	246	563	516	1.1:1
2004		574	93	553	137	562	230	0.7:1
2005		568	222	546	226	557	448	1.0:1
2006		567	99	554	139	559	238	0.7:1
2007		575	109	552	114	563	223	1.0:1
2008		571	99	555	115	563	214	0.9:1
2009		580	92	557	118	567	210	0.8:1
2010		569	79	548	126	556	205	0.6:1
2011		577	166	561	150	570	316	1.1:1
Average (1986–10)		575	195	553	215	565	410	0.9:1

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Table 27.–Page 2 of 2.

Year	Age Class	Male Length (mm)	Male Sample Size	Female Length (mm)	Female Sample Size	Both Length (mm)	Both Sample Size	Male-Female
1986	2.2	462	23	539	18	496	41	1.3:1
1987		480	48	490	76	487	124	0.6:1
1988		474	75	491	38	481	113	2.0:1
1989		479	45	490	48	485	93	0.9:1
1990		462	91	455	100	459	191	0.9:1
1991		478	57	477	50	478	107	1.1:1
1992		452	181	471	53	456	234	3.4:1
1993		476	93	487	69	481	162	1.3:1
1994		487	30	490	32	488	62	0.9:1
1995		472	23	488	20	479	43	1.2:1
1996		472	21	498	23	486	44	0.9:1
1997		497	15	460	20	475	35	0.8:1
1998		482	36	487	24	484	60	1.5:1
1999		483	16	491	22	487	38	0.7:1
2000		470	10	477	8	473	18	1.3:1
2001		487	19	482	21	485	40	0.9:1
2002		482	16	486	9	483	25	1.8:1
2003		472	23	486	26	480	49	0.9:1
2004		474	24	486	14	478	38	1.7:1
2005		462	29	488	22	473	51	1.3:1
2006		500	17	490	13	496	30	1.3:1
2007		471	8	493	15	486	23	0.5:1
2008		468	19	495	10	477	29	1.9:1
2009		492	73	495	41	493	114	1.8:1
2010		468	26	487	25	477	51	1.0:1
2011		474	15	488	7	479	22	2.1:1
Average (1987–10)		476	41	487	32	481	73	1.3:1
1986	2.3	588	25	555	44	567	69	0.6:1
1987		583	62	565	52	576	114	1.2:1
1988		587	92	558	87	574	179	1.1:1
1989		565	68	549	75	557	143	0.9:1
1990		574	73	542	96	555	169	0.8:1
1991		561	78	536	86	547	164	0.9:1
1992		564	123	538	126	551	249	1.0:1
1993		562	74	544	128	550	202	0.6:1
1994		600	56	561	56	580	112	1.0:1
1995		578	25	544	34	559	59	0.7:1
1996		585	31	558	34	571	65	0.9:1
1997		575	34	548	20	565	54	1.7:1
1998		558	82	534	76	547	158	1.1:1
1999		585	16	546	20	563	36	0.8:1
2000		597	55	563	55	580	110	1.0:1
2001		575	34	552	50	561	84	0.7:1
2002		589	21	551	26	568	47	0.8:1
2003		562	50	543	34	555	84	1.5:1
2004		579	41	551	59	560	100	0.7:1
2005		557	32	537	51	545	83	0.6:1
2006		562	13	553	22	556	35	0.6:1
2007		568	12	544	15	555	27	0.8:1
2008		565	26	535	27	550	53	1.0:1
2009		560	18	548	30	553	48	0.6:1
2010		559	39	545	62	551	101	0.6:1
2011		564	14	544	15	554	29	0.9:1
Average (1986-10)		573	47	548	55	560	102	0.9:1

Table 28.–Index (ground or aerial counts) and weir counts of salmon in various northern district spawning areas in 2011.

	Number of Fish Observed or Estimated				
	Sockeye	Pink	Chum	Coho	Chinook
Alexander Creek (aerial survey, ADF&G-SF)	0	0	0	0	343
Bodenburg Creek (survey ADF&G, SF)	493	0	1	0	0
Chelatna Lake (weir, CIAA)[a]	70,353	7	3	18	7
Chuitna River (aerial survey, ADF&G-CF)	0	0	0	0	1,875
Chulitna River (aerial survey, ADF&G-SF)	0	0	0	0	719
Clear Creek (aerial survey, ADF&G-SF)	0	0	0	0	512
Cottonwood Creek (foot survey, ADF&G, SF)	0	0	0	698	0
Deshka River (weir, ADF&G SF)	0	4,489	0	7,508	18,968
Fish Creek (weir, ADF&G, SF)	66,678	0	0	1,428	0
Fish Lakes Creek (weir, CIAA)	82	60	7	1	2
Goose Creek (aerial survey, ADF&G, SF)	0	0	0	0	80
Jim Creek, Upper (foot survey, ADF&G, SF)	0	0	0	490	0
Judd Lake (weir, CIAA)	39,997	0	0	0	0
Lake Creek (aerial survey, ADF&G-SF)	0	0	0	0	2,563
Larson L (weir CIAA)	12,413	0	0	0	0
Lewis River (aerial survey, ADF&G-SF)	0	0	0	0	92
Little Susitna (weir, ADF&G-SF)	0	0	0	4,826	887
Little Willow Creek (aerial survey, ADF&G-SF)	0	0	0	0	713
McRoberts Creek (foot survey, ADF&G, SF)	0	0	0	261	0
Montana Creek (aerial survey, ADF&G, SF)	0	0	0	0	494
Peters Creek (foot survey, ADF&G, SF)	0	0	0	0	1,103
Prairie Creek (aerial survey, ADF&G-SF)	0	0	0	0	2,038
Red Salmon Lake (weir, CIAA)	756	0	0	0	0
Sheep Creek (survey, ADF&G, SF)	0	0	0	0	350
Shell Lake (weir, CIAA)	937	0	0	1	0
Spring Creek (survey, ADF&G, SF)	0	0	0	576	0
Talachulitna River (aerial, ADF&G-CF)	0	0	0	0	1,368
Theodore River (aerial, ADF&G-CF)	0	0	0	0	327
Wasilla Creek (foot survey, ADF&G, SF)	0	0	0	518	0
Willow Creek (aerial survey, ADF&G, SF)	0	0	0	0	1,061
Combined weir counts (Chelatna+Judd+Shell) 111,331					
Susitna index (SEG = Chelatna+Judd+Larson) 122,619					

[a]Weir washed out 3–10 Aug; weir counts interpolated for missing days.

Table 29.–Estimated salmon migration by species into the Crescent River, 24 June–1 August, 2011, using Bendix side-looking sonar.

	Sockeye		Pink		Chum		Chinook		Dolly Varden	
Date	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	1,786	1,786	0	0	0	0	0	0	0	0
25 Jun	1,855	3,641	0	0	0	0	0	0	0	0
26 Jun	356	3,997	0	0	0	0	0	0	0	0
27 Jun	169	4,166	0	0	0	0	0	0	0	0
28 Jun	114	4,280	0	0	0	0	0	0	0	0
29 Jun	801	5,081	0	0	0	0	0	0	0	0
30 Jun	2,948	8,029	0	0	0	0	0	0	0	0
1 Jul	1,943	9,972	0	0	20	20	0	0	0	0
2 Jul	1,361	11,333	0	0	16	36	0	0	0	0
3 Jul	3,227	14,560	0	0	202	238	0	0	0	0
4 Jul	3,595	18,155	0	0	0	238	0	0	0	0
5 Jul	2,531	20,686	0	0	0	238	0	0	0	0
6 Jul	1,950	22,636	0	0	0	238	0	0	0	0
7 Jul	2,202	24,838	0	0	0	238	0	0	0	0
8 Jul	2,024	26,862	119	119	0	238	0	0	0	0
9 Jul	1,184	28,046	118	237	0	238	0	0	0	0
10 Jul	889	28,935	99	336	0	238	0	0	0	0
11 Jul	1,314	30,249	89	425	0	238	0	0	87	87
12 Jul	2,624	32,873	131	556	0	238	0	0	0	87
13 Jul	2,771	35,644	123	679	0	238	0	0	61	148
14 Jul	4,112	39,756	27	706	0	238	0	0	52	200
15 Jul	8,723	48,479	81	787	0	238	0	0	326	526
16 Jul	5,906	54,385	0	787	0	238	0	0	227	753
17 Jul	5,034	59,419	91	878	275	513	0	0	0	753
18 Jul	3,427	62,846	77	955	157	670	0	0	116	869
19 Jul	3,432	66,278	572	1,527	0	670	0	0	0	869
20 Jul	1,981	68,259	96	1,623	0	670	0	0	49	918
21 Jul	1,621	69,880	102	1,725	32	702	0	0	136	1,054
22 Jul	962	70,842	0	1,725	96	798	0	0	64	1,118
23 Jul	1,464	72,306	31	1,756	82	880	0	0	160	1,278
24 Jul	1,321	73,627	74	1,830	25	905	0	0	197	1,475
25 Jul	3,678	77,305	0	1,830	150	1,055	0	0	513	1,988
26 Jul	853	78,158	285	2,115	0	1,055	0	0	498	2,486
27 Jul	593	78,751	16	2,131	21	1,076	0	0	122	2,608
28 Jul	901	79,652	86	2,217	86	1,162	0	0	86	2,694
29 Jul	950	80,602	130	2,347	43	1,205	0	0	173	2,867
30 Jul	497	81,099	140	2,487	159	1,364	0	0	160	3,027
31 Jul	285	81,384	286	2,773	311	1,675	0	0	129	3,156
1 Aug	568	81,952	44	2,817	175	1,850	0	0	175	3,331
%:		91.1		3.1		2.1		0.0		3.7
Total count: 89,950										

Note: Estimates for species other than sockeye salmon are not indicative of run strength for that species.

Table 30.–Cumulative proportion by date of sockeye salmon escapement recorded in the Crescent River, 1996–2011.

	Cumulative Proportion														
Date	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	2011
22 Jun	0.001														
23 Jun	0.006														
24 Jun	0.008	0.004							0.023	0.012	0.001	0.005	0.001	0.036	0.022
25 Jun	0.011	0.014							0.036	0.034	0.001	0.010	0.001	0.049	0.044
26 Jun	0.012	0.020							0.045	0.050	0.002	0.012	0.002	0.097	0.049
27 Jun	0.013	0.029	0.009	0.001			0.016	0.037	0.062	0.065	0.024	0.021	0.003	0.128	0.051
28 Jun	0.015	0.037	0.016	0.002		0.006	0.072	0.071	0.088	0.079	0.045	0.078	0.003	0.174	0.052
29 Jun	0.018	0.049	0.022	0.007	0.001	0.008	0.112	0.108	0.127	0.092	0.070	0.104	0.006	0.205	0.062
30 Jun	0.036	0.058	0.031	0.038	0.002	0.016	0.149	0.139	0.139	0.110	0.091	0.145	0.008	0.235	0.098
01 Jul	0.060	0.067	0.034	0.086	0.006	0.036	0.186	0.159	0.153	0.134	0.112	0.168	0.014	0.263	0.122
02 Jul	0.074	0.091	0.038	0.115	0.008	0.074	0.225	0.172	0.182	0.151	0.124	0.210	0.055	0.290	0.138
03 Jul	0.087	0.153	0.040	0.137	0.011	0.136	0.271	0.182	0.215	0.169	0.132	0.232	0.078	0.311	0.178
04 Jul	0.105	0.188	0.043	0.161	0.028	0.199	0.310	0.205	0.240	0.199	0.143	0.255	0.124	0.342	0.222
05 Jul	0.129	0.214	0.044	0.184	0.093	0.253	0.351	0.225	0.266	0.224	0.158	0.271	0.145	0.368	0.252
06 Jul	0.148	0.239	0.045	0.204	0.178	0.307	0.398	0.246	0.289	0.238	0.170	0.293	0.159	0.402	0.276
07 Jul	0.161	0.267	0.056	0.215	0.292	0.338	0.440	0.307	0.306	0.253	0.185	0.310	0.210	0.431	0.303
08 Jul	0.174	0.300	0.084	0.247	0.365	0.356	0.465	0.323	0.325	0.272	0.205	0.324	0.260	0.443	0.328
09 Jul	0.181	0.348	0.142	0.267	0.399	0.383	0.480	0.337	0.342	0.295	0.221	0.341	0.320	0.478	0.342
10 Jul	0.189	0.429	0.196	0.278	0.410	0.399	0.489	0.351	0.358	0.321	0.241	0.359	0.384	0.508	0.353
11 Jul	0.197	0.500	0.237	0.284	0.418	0.449	0.497	0.356	0.391	0.344	0.268	0.393	0.412	0.554	0.369
12 Jul	0.202	0.550	0.272	0.328	0.422	0.471	0.521	0.376	0.438	0.362	0.290	0.418	0.472	0.588	0.401
13 Jul	0.262	0.581	0.294	0.375	0.426	0.505	0.562	0.492	0.506	0.393	0.312	0.437	0.526	0.615	0.435
14 Jul	0.391	0.606	0.320	0.403	0.433	0.557	0.614	0.526	0.578	0.422	0.344	0.453	0.585	0.643	0.485
15 Jul	0.471	0.625	0.348	0.410	0.444	0.595	0.628	0.554	0.622	0.436	0.397	0.471	0.632	0.663	0.592
16 Jul	0.513	0.654	0.389	0.458	0.494	0.638	0.648	0.587	0.648	0.448	0.421	0.486	0.653	0.694	0.664
17 Jul	0.551	0.691	0.434	0.548	0.658	0.677	0.673	0.624	0.672	0.473	0.439	0.518	0.684	0.719	0.725
18 Jul	0.595	0.719	0.487	0.600	0.795	0.697	0.682	0.687	0.696	0.506	0.449	0.580	0.730	0.748	0.767
19 Jul	0.653	0.734	0.546	0.645	0.863	0.706	0.707	0.729	0.718	0.532	0.462	0.612	0.771	0.771	0.809
20 Jul	0.692	0.747	0.590	0.703	0.882	0.727	0.732	0.754	0.741	0.549	0.504	0.649	0.795	0.802	0.833
21 Jul	0.729	0.759	0.606	0.729	0.924	0.765	0.784	0.785	0.759	0.589	0.537	0.696	0.828	0.821	0.853
22 Jul	0.746	0.774	0.622	0.780	0.940	0.803	0.809	0.806	0.775	0.616	0.560	0.720	0.860	0.840	0.864

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	Cumulative Proportion														
Date	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	2011
23 Jul	0.757	0.793	0.680	0.815	0.942	0.845	0.829	0.826	0.803	0.656	0.590	0.7453	0.876	0.862	0.882
24 Jul	0.775	0.814	0.714	0.841	0.948	0.871	0.835	0.842	0.814	0.685	0.601	0.7688	0.883	0.886	0.898
25 Jul	0.812	0.833	0.726	0.860	0.954	0.898	0.888	0.864	0.824	0.694	0.640	0.8164	0.896	0.901	0.943
26 Jul	0.864	0.847	0.742	0.881	0.960	0.930	0.929	0.888	0.833	0.738	0.672	0.8547	0.909	0.919	0.954
27 Jul	0.893	0.865	0.769	0.904	0.968	0.950	0.965	0.906	0.836	0.757	0.698	0.8749	0.924	0.929	0.961
28 Jul	0.910	0.885	0.785	0.933	0.969	0.958	0.987	0.917	0.843	0.781	0.722	0.8838	0.942	0.936	0.972
29 Jul	0.924	0.901	0.819	0.960	0.982	0.972	1.000	0.932	0.889	0.803	0.736	0.8923	0.958	0.944	0.984
30 Jul	0.948	0.926	0.853	0.969	0.985	0.983		0.947	0.914	0.845	0.754	0.9066	0.976	0.954	0.990
31 Jul	0.965	0.944	0.890	0.974	0.993	0.992		0.969	0.930	0.873	0.785	0.9249	0.982	0.961	0.993
01 Aug	0.985	0.959	0.919	0.979	1.000	1.000		0.978	0.949	0.891	0.820	0.9367	0.992	0.970	1.000
02 Aug	1.000	0.972	0.934	0.988				0.987	0.965	0.903	0.850	0.9473	1.000	0.981	
03 Aug		0.983	0.949	0.992				1.000	0.979	0.923	0.901	0.957		0.987	
04 Aug		0.991	0.962	1.000					0.992	0.946	0.917	0.9717		0.992	
05 Aug		1.000	0.977						1.000	0.956	0.936	0.9814		1.000	
06 Aug			0.990							0.972	0.948	0.9907			
07 Aug			1.000							1.000	0.965	1.000			
08 Aug											0.976				
09 Aug											0.989				
10 Aug											1.000				
Midpoint	16 Jul	11 Jul	19 Jul	27 Jul	17 Jul	13 Jul	12 Jul	14 Jul	13 Jul	18 Jul	20 Jul	17 Jul	13 Jul	10 Jul	15 Jul
Ave. midpoint: 1984–2010, 17 July					1996–2010, 15 July										
No. days for 80%	25	27	24	26	16	24	28	29	32	34	34	32	23	29	25
Ave. for 80% of the run: 1984–2010, 25 d						1996–2010, 29 d									

Note: No data available for 2009.

Table 31.–Average Bendix sonar counts by sector for the north and south banks of the Crescent River, 2011.

	Bendix Range (m)											
	Sector											
Crescent River	1	2	3	4	5	6	7	8	9	10	11	12
North Bank	8,190	15,174	10,206	7,407	4,026	2,447	1,968	1,110	440	144	138	32
Daily %	16.0	29.6	19.9	14.4	7.9	4.8	3.8	2.2	0.9	0.3	0.3	0.1
Cum. %	16.0	45.6	65.5	79.9	87.8	92.5	96.4	98.5	99.4	99.7	99.9	100.0
Average (m):	0.5	1.0	1.5	2.0	2.5	3.0	3.4	3.9	4.4	4.9	5.4	5.9
Min. and max. counting ranges:		5.2	6.1			Dead range = 0.3					SD	0.3
South Bank	576	4,532	11,626	8,391	5,500	3,872	2,406	1,305	272	87	42	59
Daily %	1.5	11.7	30.1	21.7	14.2	10.0	6.2	3.4	0.7	0.2	0.1	0.2
Cum. %	1.5	13.2	43.3	65.0	79.2	89.2	95.4	98.8	99.5	99.7	99.8	100.0
Average (m):	0.3	0.6	0.9	1.2	1.5	1.8	2.0	2.3	2.6	2.9	3.2	3.5
Min. and max. counting ranges:		3.4	5.5			Dead range = 0.3					SD	0.6

Note: To determine total range from transducer, add dead range to counting range.

Table 32.–Crescent River daily fish wheel catch by species, 2011.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook		Dolly Varden	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	10.0	3	0	0	0	0	0	0	0	0	0	0	0
25 Jun	15.5	7	7	0	0	0	0	0	0	0	0	0	0
26 Jun	24.0	15	22	0	0	0	0	0	0	0	0	0	0
27 Jun	24.0	5	27	0	0	0	0	0	0	0	0	0	0
28 Jun	24.0	15	42	0	0	0	0	0	0	0	0	0	0
29 Jun	24.0	20	62	0	0	0	0	0	0	0	0	0	0
30 Jun	24.0	71	133	0	0	0	0	0	0	0	0	0	0
1 Jul	16.4	7	140	0	0	1	1	0	0	0	0	0	0
2 Jul	21.5	4	144	0	0	0	1	0	0	0	0	0	0
3 Jul	19.3	5	149	0	0	0	1	0	0	0	0	0	0
4 Jul	24.0	16	165	0	0	0	1	0	0	0	0	0	0
5 Jul	24.0	10	175	0	0	0	1	0	0	0	0	0	0
6 Jul	24.0	5	180	0	0	0	1	0	0	0	0	0	0
7 Jul	24.0	7	187	0	0	0	1	0	0	0	0	0	0
8 Jul	24.0	5	192	1	1	0	1	0	0	0	0	0	0
9 Jul	24.0	8	200	1	2	0	1	0	0	0	0	0	0
10 Jul	24.0	5	205	0	2	0	1	0	0	0	0	0	0
11 Jul	24.0	2	207	0	2	0	1	0	0	0	0	1	1
12 Jul	24.0	20	227	1	3	0	1	0	0	0	0	0	1
13 Jul	24.0	90	317	4	7	0	1	0	0	0	0	2	3
14 Jul	15.5	157	474	1	8	0	1	0	0	0	0	2	5
15 Jul	8.0	107	581	1	9	0	1	0	0	0	0	4	9
16 Jul	8.0	26	607	0	9	0	1	0	0	0	0	1	10
17 Jul	8.0	55	662	1	10	3	4	0	0	0	0	0	10
18 Jul	14.0	7	669	1	11	1	5	0	0	0	0	2	12
19 Jul	16.0	18	687	3	14	0	5	0	0	0	0	0	12
20 Jul	21.0	41	728	2	16	0	5	0	0	0	0	1	13
21 Jul	21.0	48	776	3	19	1	6	0	0	0	0	4	17
22 Jul	21.0	30	806	0	19	3	9	0	0	0	0	2	19
23 Jul	21.0	91	897	2	21	5	14	0	0	0	0	10	29
24 Jul	21.0	107	1,004	6	27	2	16	0	0	0	0	16	45
25 Jul	21.0	122	1,126	0	27	5	21	0	0	0	0	17	62
26 Jul	14.0	12	1,138	4	31	0	21	0	0	0	0	7	69
27 Jul	16.0	11	1,149	0	31	0	21	0	0	0	0	6	75
28 Jul	21.0	21	1,170	2	33	2	23	0	0	0	0	2	77
29 Jul	19.0	22	1,192	3	36	1	24	0	0	0	0	4	81
30 Jul	23.0	25	1,217	7	43	8	32	0	0	0	0	8	89
31 Jul	19.0	11	1,228	11	54	12	44	0	0	0	0	5	94
1 Aug	15.0	13	1,241	1	55	4	48	0	0	0	0	4	98
Proportion:			86.1%		3.8%		3.3%		.0%		0.0%		6.8%

Totals: (fish): 1,442 Time Operated (hrs): 765.2 CPUE (fish/hr): 1.9

Efficiency: 5.4% (catch adjusted to 24 hrs) of the total south bank sonar count

Table 33.–Historic fish wheel catch by species for the Crescent River, 1993–2011.

	Total	Actual fish wheel catch												Total	CPUE by species				Total
	Hours	Sockeye	%	Pink	%	Chum	%	Coho	%	Chinook	%	DV	%	Catch	Sockeye	Pink	Coho	Chinook	CPUE
1993	359.0	2,336	78.9	211	7.1	269	9.1	0	0.0	0	0.0	146	4.9	2,962	6.5	0.6	0.0	0.0	8.3
1994	918.5	1,269	59.8	34	1.6	256	12.1	6	0.3	8	0.4	548	25.8	2,121	1.4	0.0	0.0	0.0	2.3
1995	775.0	1,539	81.7	55	2.9	126	6.7	14	0.7	17	0.9	132	7.0	1,883	2.0	0.1	0.0	0.0	2.4
1996	1,005.0	1,028	79.2	7	0.5	109	8.4	2	0.2	6	0.5	146	11.2	1,298	1.0	0.0	0.0	0.0	1.3
1997	1,031.0	1,575	79.1	290	14.6	51	2.6	0	0.0	5	0.3	69	3.5	1,990	1.5	0.3	0.0	0.0	1.9
1998	1,007.0	2,059	93.8	32	1.5	65	3.0	6	0.3	16	0.7	18	0.8	2,196	2.0	0.0	0.0	0.0	2.2
1999	936.0	1,307	53.9	588	24.3	58	2.4	0	0.0	48	2.0	423	17.5	2,424	1.4	0.6	0.0	0.1	2.6
2000	786.0	646	91.9	9	1.3	7	1.0	2	0.3	4	0.6	35	5.0	703	0.8	0.0	0.0	0.0	0.9
2001	860.0	527	83.1	30	4.7	23	3.6	0	0.0	2	0.3	52	8.2	634	0.6	0.0	0.0	0.0	0.7
2002	611.0	1,017	82.1	10	0.8	18	1.5	0	0.0	8	0.6	186	15.0	1,239	1.7	0.0	0.0	0.0	2.0
2003	450.0	2,278	84.1	62	2.3	214	7.9	4	0.1	25	0.9	125	4.6	2,708	5.1	0.1	0.0	0.1	6.0
2004	176.5	1,582	92.6	30	1.8	28	1.6	1	0.1	11	0.6	57	3.3	1,709	9.0	0.2	0.1	0.0	9.7
2005	403.0	2,844	90.2	157	5.0	24	0.8	1	0.0	27	0.9	99	3.1	3,152	7.1	0.4	0.0	0.1	7.8
2006	841.0	2,210	92.4	61	2.6	48	2.0	10	0.4	8	0.3	54	2.3	2,391	2.6	0.1	0.0	0.0	2.8
2007	1,032.0	769	90.4	20	2.4	4	0.5	1	0.1	1	0.1	56	6.6	851	0.7	0.0	0.0	0.0	0.8
2008	892.0	582	95.7	3	0.5	7	1.2	0	0.0	11	1.8	5	0.8	608	0.7	0.0	0.0	0.0	0.7
2010	609.8	1,815	93.3	19	1.0	81	4.2	0	0.0	1	0.1	29	1.5	1,945	3.0	0.0	0.0	0.0	3.2
2011	765.2	1,241	86.1	55	3.8	48	3.3	0	0.0	0	0.0	98	6.8	1,442	1.6	0.1	0.0	0.0	1.9
ave (1993–10):	746.6	1,493	83.7	95	4.4	82	4.0	3	0.1	12	0.6	128	7.1	1,813	2.8	0.1	0.0	0.0	3.3
min (1993–10):	176.5	527	53.9	3	0.5	4	0.5	0	0.0	0	0.0	5	0.8	608	0.6	0.0	0.0	0.0	0.7
max (1993–10):	1,032.0	2,844	95.7	588	24.3	269	12.1	14	0.7	48	2.0	548	25.8	3,152	9.0	0.6	0.1	0.1	9.7
SD (1993–10):	-	-	11.7	-	6.2	-	3.5	-	0.2	-	0.6	-	6.8	-	2.5	0.2	0.0	0.0	2.8

Note: No data available for 2009.

Table 34.–Age composition of sockeye salmon sampled from the Crescent River, 1979–2011.

Year	Percentage Composition by Age Class								
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	Sample Size
1979	0.8	30.9	67.4	0.1	0.1	0.7	0.0	0.0	643
1980	0.0	6.6	87.4	1.8	0.0	2.6	1.6	0.0	511
1981	0.0	8.0	34.0	0.1	0.1	10.6	47.2	0.0	1,117
1982	0.0	12.9	79.2	0.1	0.0	0.8	7.0	0.0	711
1983	0.0	10.9	42.3	0.2	0.6	27.4	18.6	0.0	731
1984	0.0	3.5	16.9	0.0	0.0	20.0	59.4	0.2	780
1985	0.2	4.7	31.3	0.0	0.3	20.5	43.0	0.0	594
1986	0.0	6.5	15.8	0.0	0.0	13.0	64.0	0.7	139
1987	0.0	2.6	47.7	0.0	0.0	4.2	45.0	0.5	191
1988	0.0	10.4	44.9	0.5	0.1	17.8	26.1	0.1	741
1989	0.0	0.7	45.4	0.1	0.0	2.0	51.2	0.6	711
1990	0.0	3.7	48.5	0.4	0.1	3.5	43.2	0.6	591
1991	0.0	14.9	50.4	0.3	0.0	16.8	16.5	1.1	357
1992	0.0	2.6	21.7	0.0	0.0	12.4	61.9	1.5	194
1993	0.2	8.8	37.2	0.0	0.9	5.8	46.9	0.2	465
1994	0.2	6.6	49.6	0.4	0.4	12.3	30.5	0.2	547
1995	0.4	9.2	18.4	0.6	0.2	9.4	61.7	0.2	543
1996	0.0	15.3	25.4	0.0	0.0	23.9	34.9	0.5	393
1997	0.0	10.6	55.9	0.0	0.2	6.6	26.6	0.1	640
1998	0.0	9.9	44.5	0.4	0.0	10.1	35.2	0.0	577
1999	0.0	21.4	39.4	0.4	0.1	9.2	29.3	0.2	912
2000	0.0	2.5	72.8	0.0	0.0	2.2	22.4	0.0	357
2001	0.0	15.7	21.0	0.9	0.5	22.7	38.8	0.4	572
2002	0.0	19.1	33.7	0.3	0.1	11.2	35.5	0.1	750
2003	0.4	14.4	51.1	0.0	0.3	13.4	20.3	0.1	1,080
2004	0.0	14.1	31.3	0.2	0.0	16.0	38.0	0.4	489
2005	0.4	13.3	51.6	0.0	0.0	8.7	25.8	0.2	562
2006	0.0	14.3	42.6	0.0	0.0	7.0	36.2	0.0	484
2007	1.1	8.3	64.4	0.2	1.3	3.5	21.2	0.0	458
2008	0.3	17.7	53.4	0.3	2.8	9.9	15.5	0.1	322
2010	0.2	10.4	37.5	0.2	0.2	15.1	36.4	0.0	451
2011	0.2	7.6	51.4	0.0	0.0	6.9	33.9	0.0	463
Ave. (1979–10)	0.1	11.3	44.4	0.2	0.2	11.1	32.4	0.2	581

Note: No data available for 2009.

Table 35.–Summary by year of average lengths and male to female ratios for the major age classes of sockeye salmon sampled from the Crescent River, 1987–2011.

		Male		Female		Both		
Year	Age Class	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	Male-Female
1987		507	3	457	2	487	5	1.5:1
1988	1.2	470	48	486	29	476	77	1.7:1
1989		475	2	478	3	477	5	0.7:1
1990		547	17	521	7	540	24	2.4:1
1991		517	36	490	17	509	53	2.1:1
1992		473	2	497	3	487	5	0.7:1
1993		484	28	495	13	487	41	2.2:1
1994		458	27	482	9	464	36	3.0:1
1995		485	34	497	16	489	50	2.1:1
1996		477	41	510	19	487	60	2.2:1
1997		463	50	490	18	470	68	2.8:1
1998		473	39	505	18	483	57	2.2:1
1999		468	136	478	59	471	195	2.3:1
2000		464	7	458	2	462	9	3.5:1
2001		462	61	486	29	470	90	2.1:1
2002		471	104	481	39	474	143	2.7:1
2003		474	90	477	65	475	155	1.4:1
2004		460	48	484	21	467	69	2.3:1
2005		457	48	475	27	464	75	1.8:1
2006		475	35	465	34	470	69	1.0:1
2007		464	30	476	8	467	38	3.8:1
2008		444	45	451	12	445	57	3.8:1
2010		480	31	476	16	479	47	1.9:1
2011		458	22	485	13	468	35	1.7:1
Average (1980–10)		474	43	483	22	477	65	2.0:1
1987		601	54	573	37	589	91	1.5:1
1988	1.3	581	195	550	138	567	333	1.4:1
1989		595	174	562	149	580	323	1.2:1
1990		592	184	571	120	584	304	1.5:1
1991		560	105	543	75	553	180	1.4:1
1992		555	24	535	18	546	42	1.3:1
1993		578	81	559	92	568	173	0.9:1
1994		563	124	547	147	554	271	0.8:1
1995		581	40	555	60	565	100	0.7:1
1996		607	50	585	50	596	100	1.0:1
1997		593	164	565	194	578	358	0.8:1
1998		583	114	556	143	568	257	0.8:1
1999		575	164	545	195	558	359	0.8:1
2000		598	99	565	161	578	260	0.6:1
2001		580	45	561	75	568	120	0.6:1
2002		582	103	563	150	571	253	0.7:1
2003		577	235	558	317	566	552	0.7:1
2004		565	72	544	81	554	153	0.9:1
2005		561	109	541	181	548	290	0.6:1
2006		555	85	533	121	542	206	0.7:1
2007		575	118	546	177	557	295	0.7:1
2008		571	76	548	96	558	172	0.8:1
2010		567	76	542	93	554	169	0.8:1
2011		571	135	551	103	563	238	1.3:1
Average (1980–10)		578	114	553	132	565	246	0.9:1

-continued-

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Year	Age Class	Male Length (mm)	Male Sample Size	Female Length (mm)	Female Sample Size	Both Length (mm)	Both Sample Size	Male-Female
1987		489	5	501	3	493	8	1.7:1
1988	2.2	487	72	496	60	491	132	1.2:1
1989		526	6	524	8	525	14	0.8:1
1990		519	14	523	6	521	20	2.3:1
1991		515	42	498	18	510	60	2.3:1
1992		486	10	492	14	490	24	0.7:1
1993		479	16	497	11	486	27	1.5:1
1994		466	54	481	13	469	67	4.2:1
1995		503	40	513	11	505	51	3.6:1
1996		497	65	525	29	506	94	2.2:1
1997		473	30	519	12	486	42	2.5:1
1998		497	27	515	31	507	58	0.9:1
1999		474	57	497	27	481	84	2.1:1
2000		452	6	495	2	463	8	3.0:1
2001		481	87	494	43	485	130	2.0:1
2002		492	48	506	36	498	84	1.3:1
2003		498	81	496	64	497	145	1.3:1
2004		480	47	482	31	481	78	1.5:1
2005		491	28	489	21	490	49	1.3:1
2006		472	21	472	13	472	34	1.6:1
2007		444	12	489	4	455	16	3.0:1
2008		476	22	489	10	480	32	2.2:1
2010		498	31	500	37	499	68	0.8:1
2011		504	19	485	13	497	32	1.5:1
Average (1980–10)		490	41	500	28	494	69	1.5:1
1987		594	49	573	37	585	86	1.3:1
1988	2.3	585	110	556	83	572	193	1.3:1
1989		591	222	564	142	580	364	1.6:1
1990		601	165	573	72	593	237	2.3:1
1991		558	36	537	23	550	59	1.6:1
1992		572	58	547	62	559	120	0.9:1
1993		585	104	558	114	571	218	0.9:1
1994		570	86	549	81	560	167	1.1:1
1995		581	154	553	181	566	335	0.9:1
1996		604	66	577	71	590	137	0.9:1
1997		590	84	569	86	579	170	1.0:1
1998		584	85	563	118	572	203	0.7:1
1999		575	138	545	129	561	267	1.1:1
2000		599	20	566	60	574	80	0.3:1
2001		578	91	559	131	567	222	0.7:1
2002		589	108	563	158	574	266	0.7:1
2003		579	96	559	123	568	219	0.8:1
2004		569	84	545	102	556	186	0.8:1
2005		557	61	541	84	548	145	0.7:1
2006		559	81	555	94	556	175	0.9:1
2007		561	44	549	53	554	97	0.8:1
2008		563	21	545	29	553	50	0.7:1
2010		574	65	550	99	559	164	0.7:1
2011		574	74	550	83	561	157	0.9:1
Average (1980–10)		581	95	556	102	568	197	0.9:1
2011 summary (all ages)		557	251	543	212	551	463	1.2:1

Note: No data available for 2009.

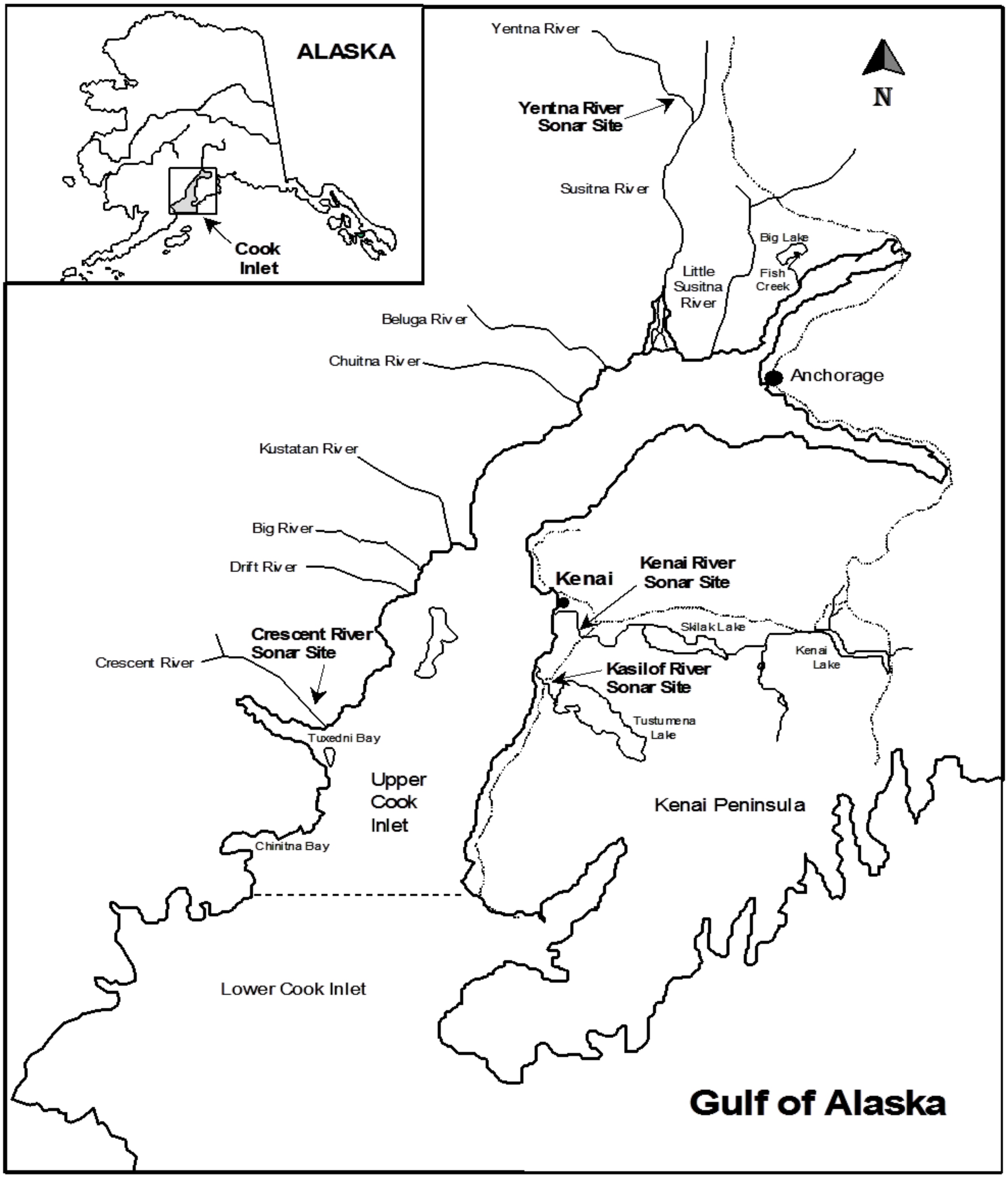


Figure 1.–Map of Upper Cook Inlet, Alaska, showing where the Kenai, Kasilof, Yentna and Crescent rivers escapement projects are located.

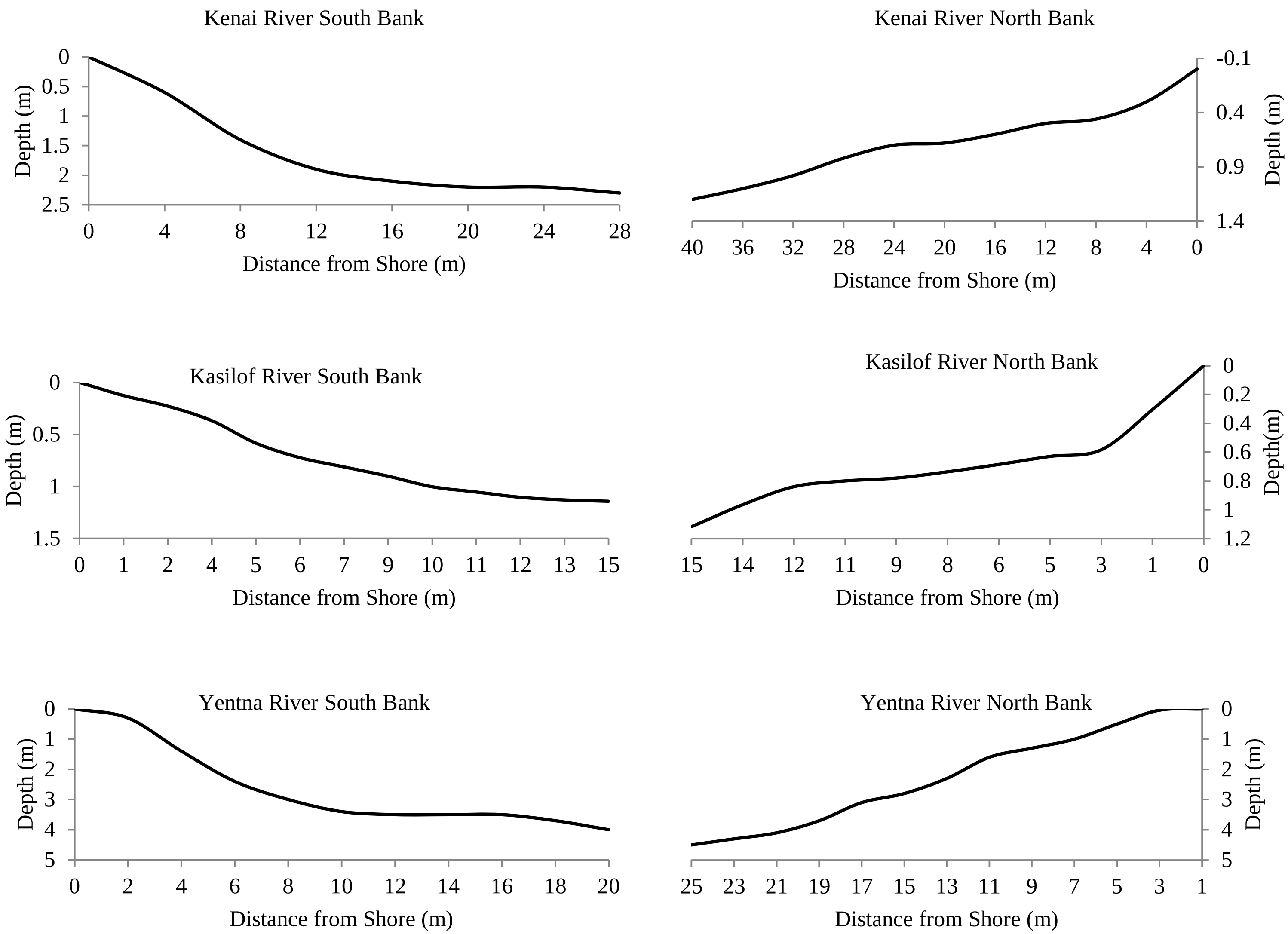


Figure 2.–Sonar site river bottom profiles of the Kenai (top), Kasilof (middle) and Yentna rivers (bottom).

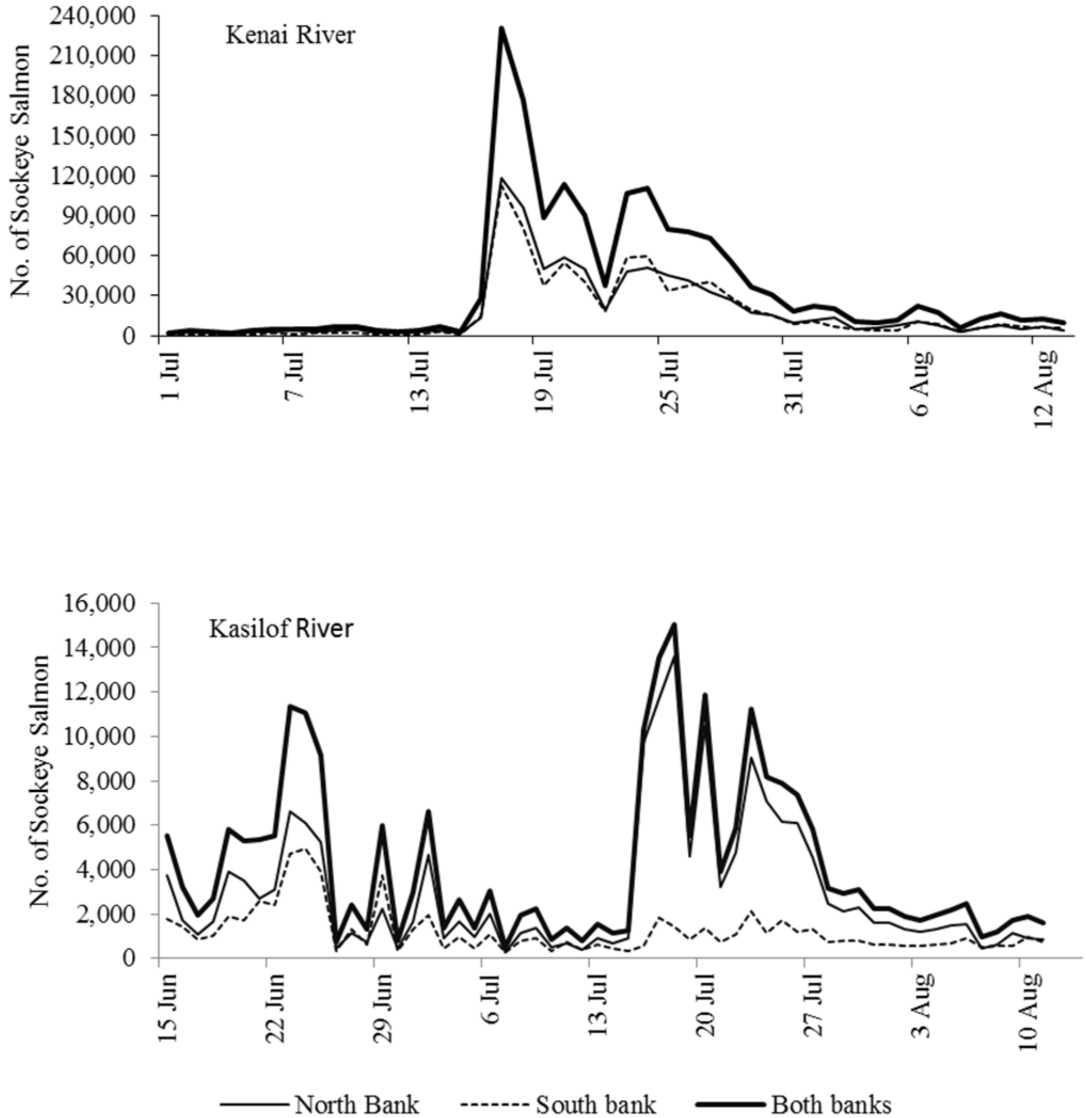
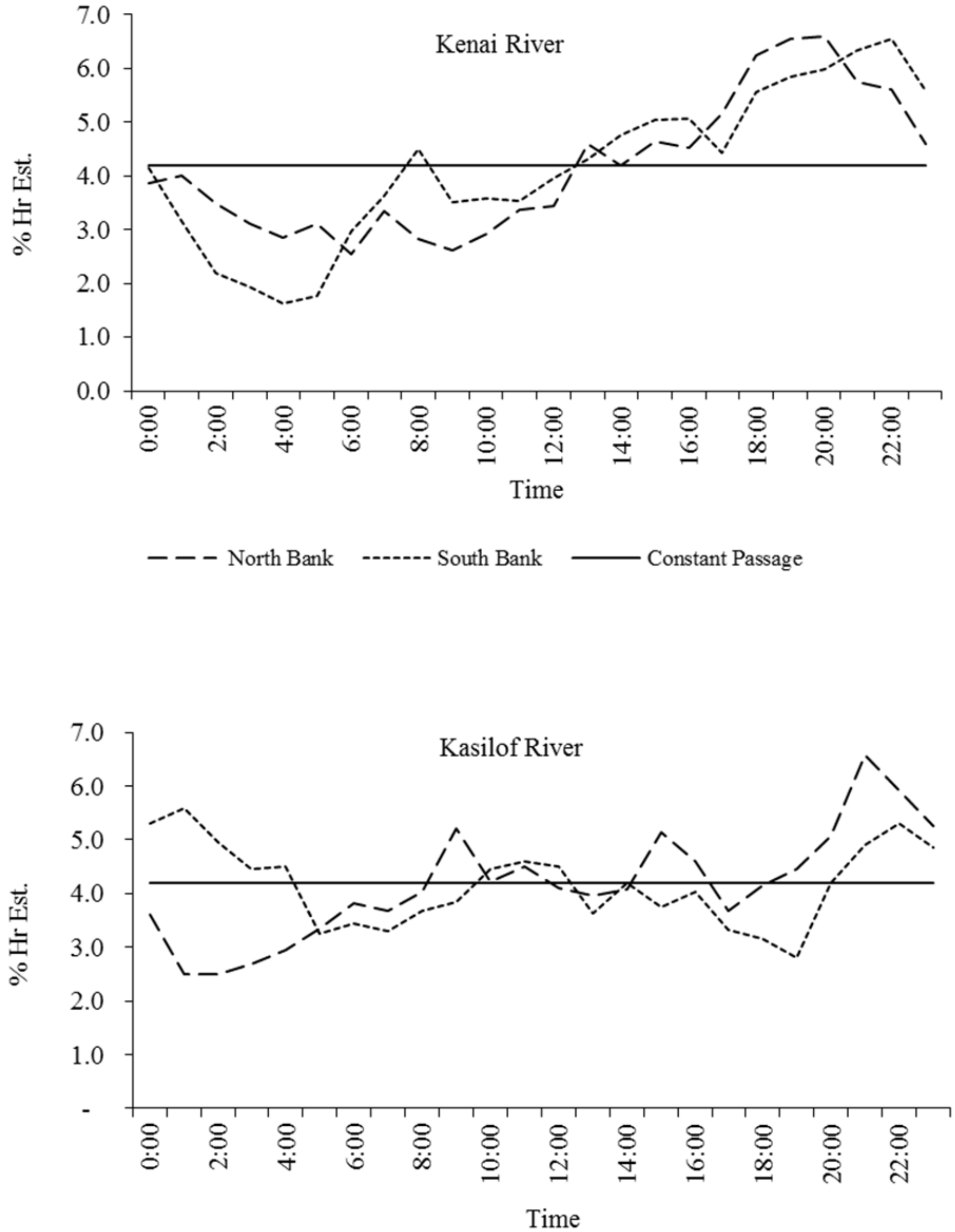
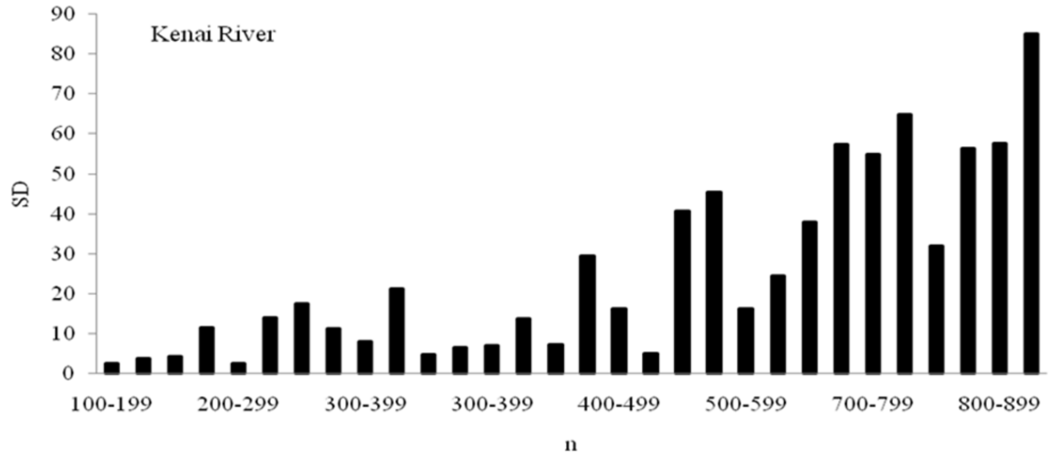


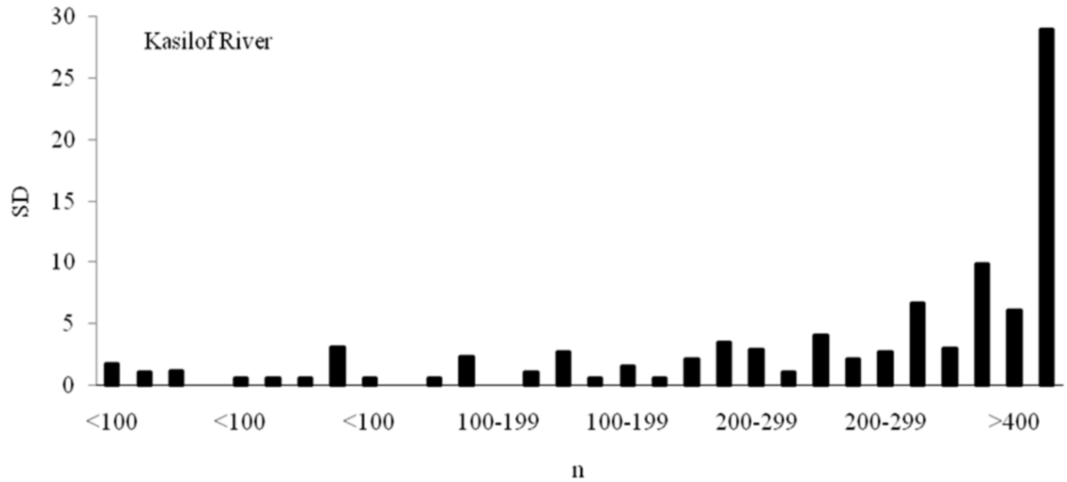
Figure 3.–Total daily escapement estimates by bank for sockeye salmon in the Kenai (top) and Kasilof rivers (bottom), 2011.



Note: The straight line represents a (hypothetical) constant passage rate over a 24-hour period.

Figure 4.–Mean hourly salmon migration rates by bank in the Kenai (top) and Kasilof (bottom) rivers, 2011.





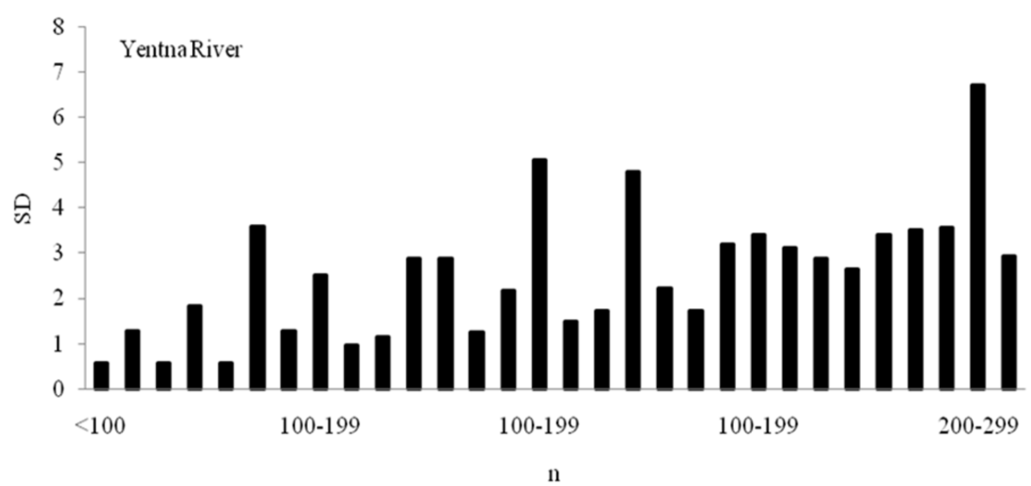
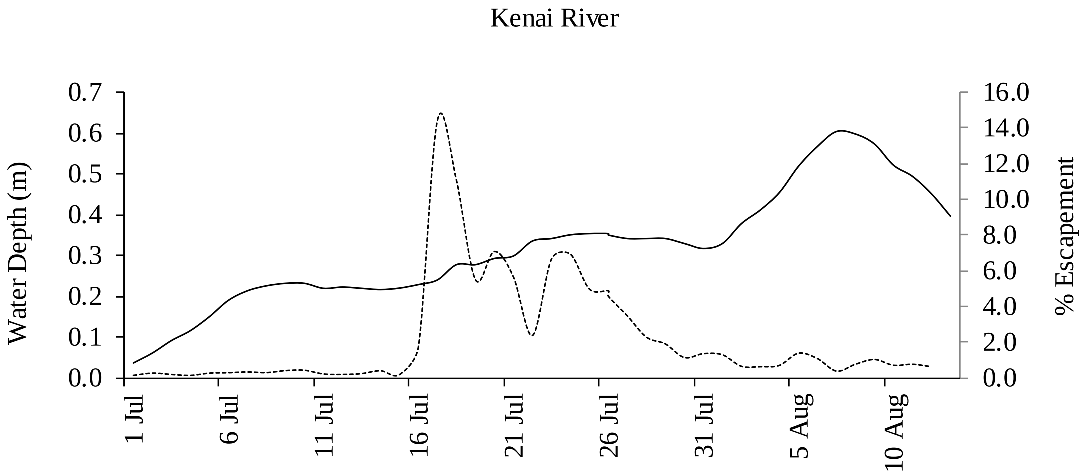
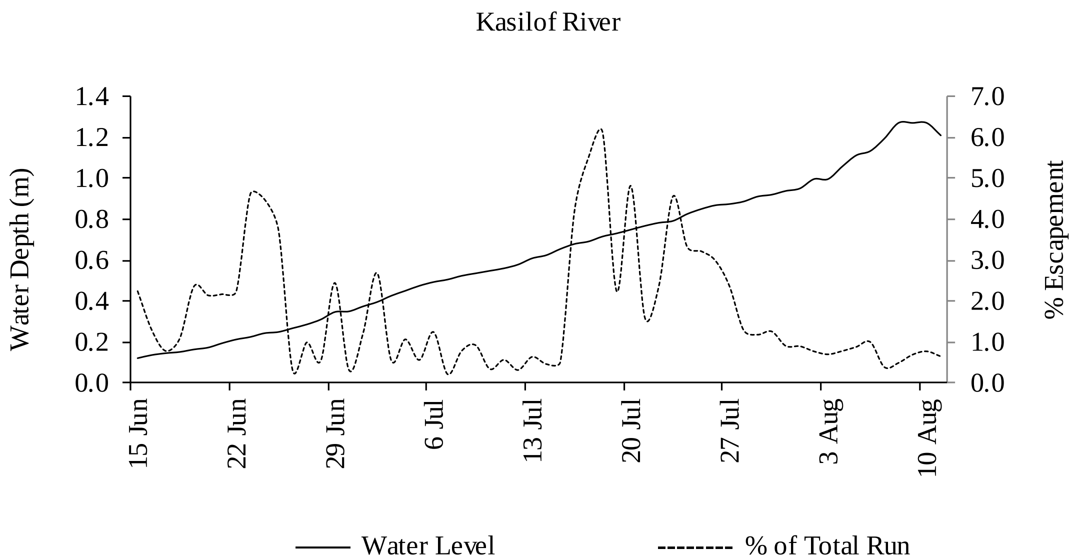


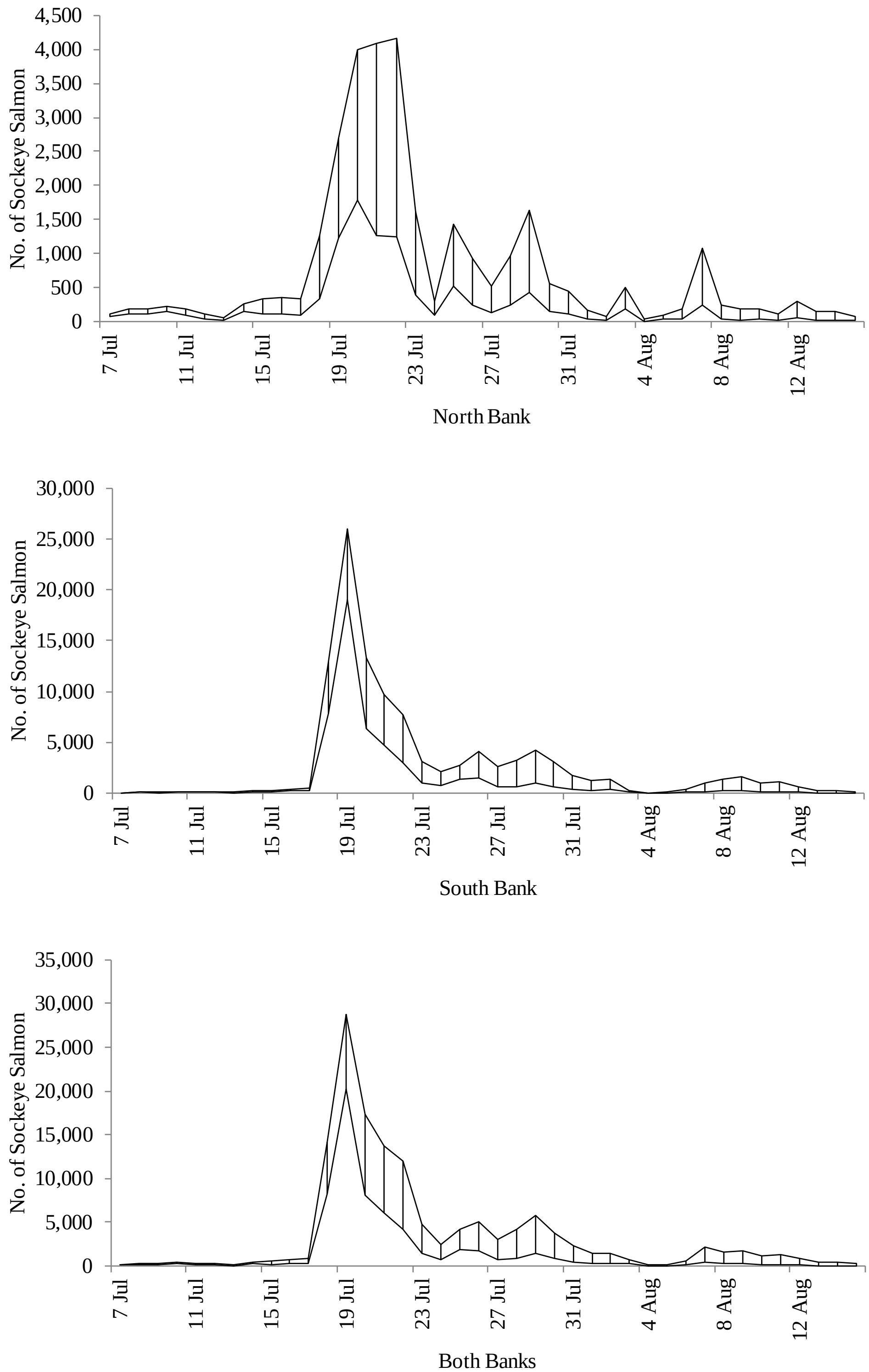
Figure 5.–Standard deviation of DIDSON (subsample) counts among several observers in relation to fish density for Kenai (top), Kasilof (middle) and Yentna (bottom) rivers sonar crews.





Note: Daily escapement timing for sockeye salmon (dotted line) is included for comparison.

Figure 6.–Daily water level fluctuations (solid line) for the Kenai (top) and Kasilof (bottom) rivers, 2011.



Note: The top line represents a maximum migration estimate and the bottom line represents a minimum.

Figure 7.–Daily ranges in migratory timing of sockeye salmon in the Yentna River, 2011.

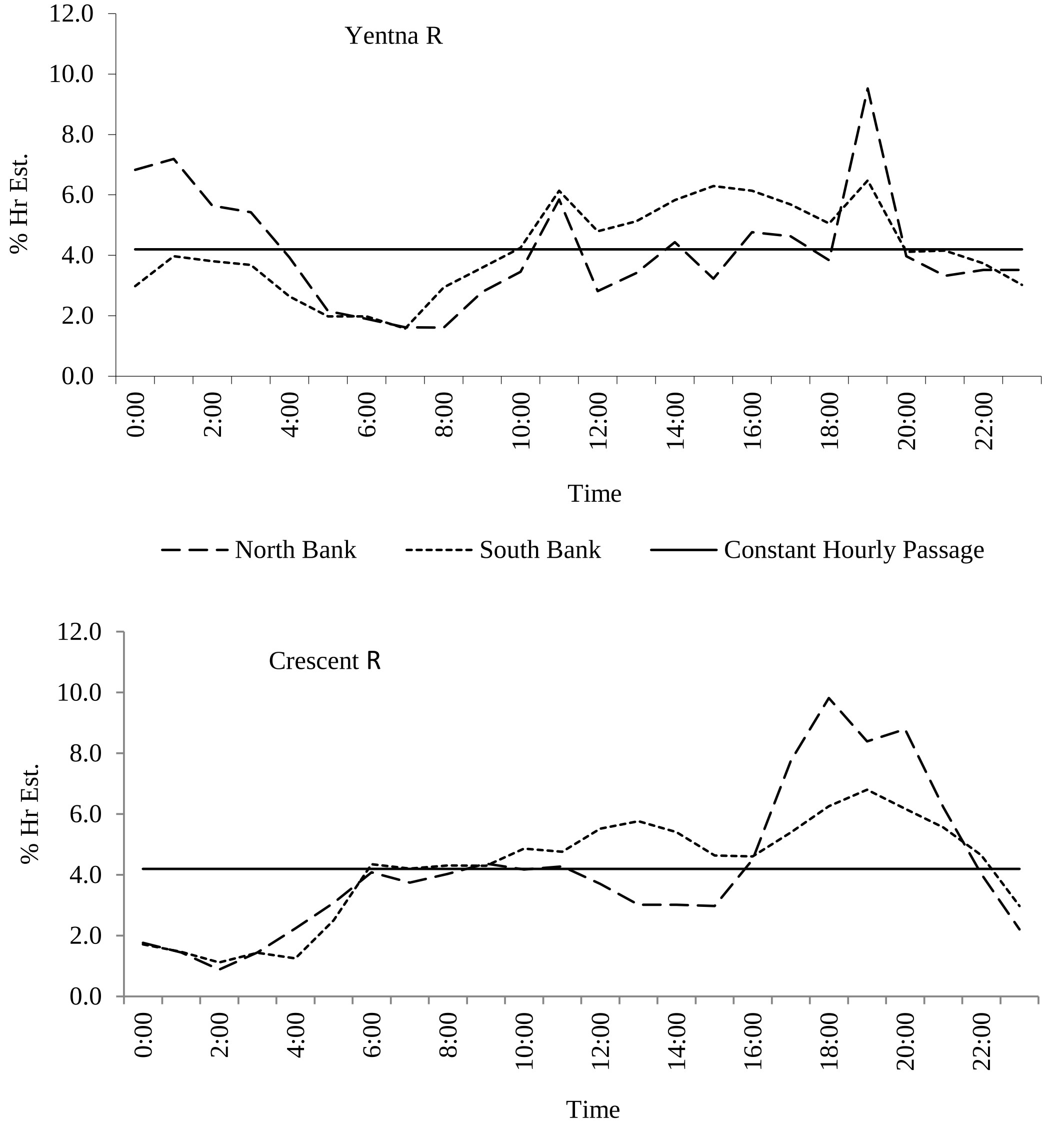
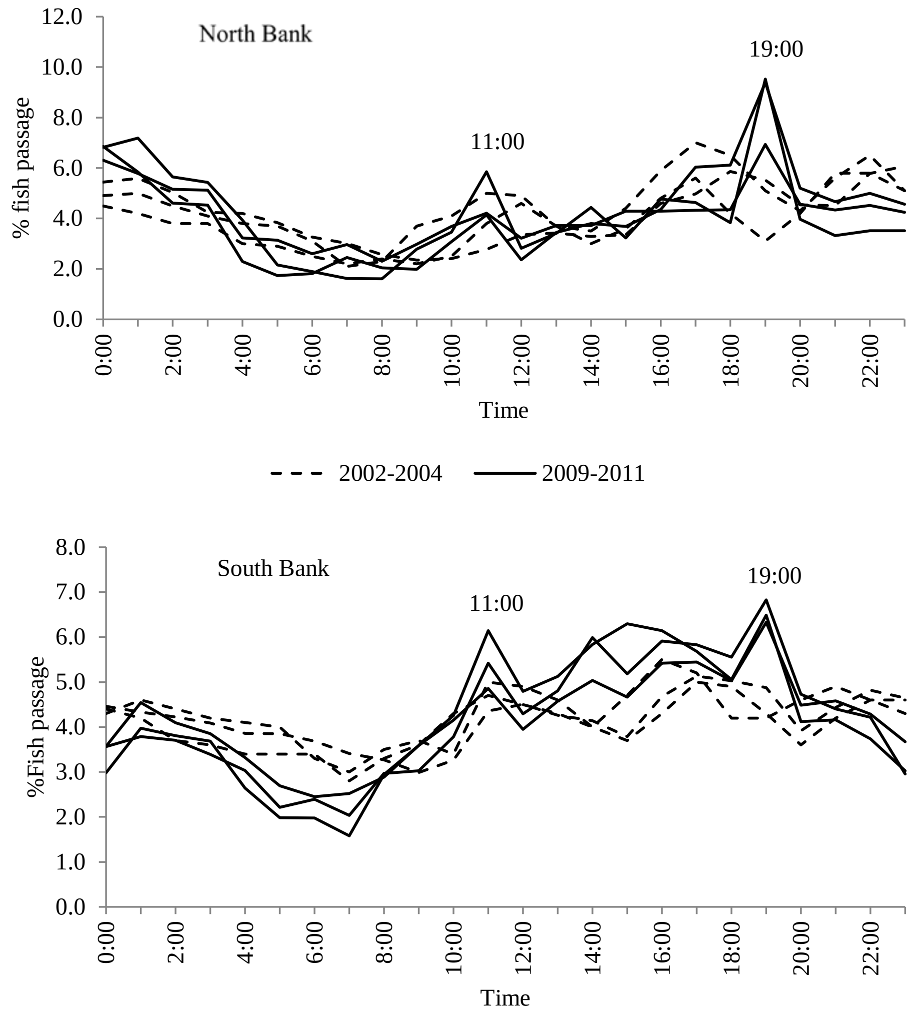
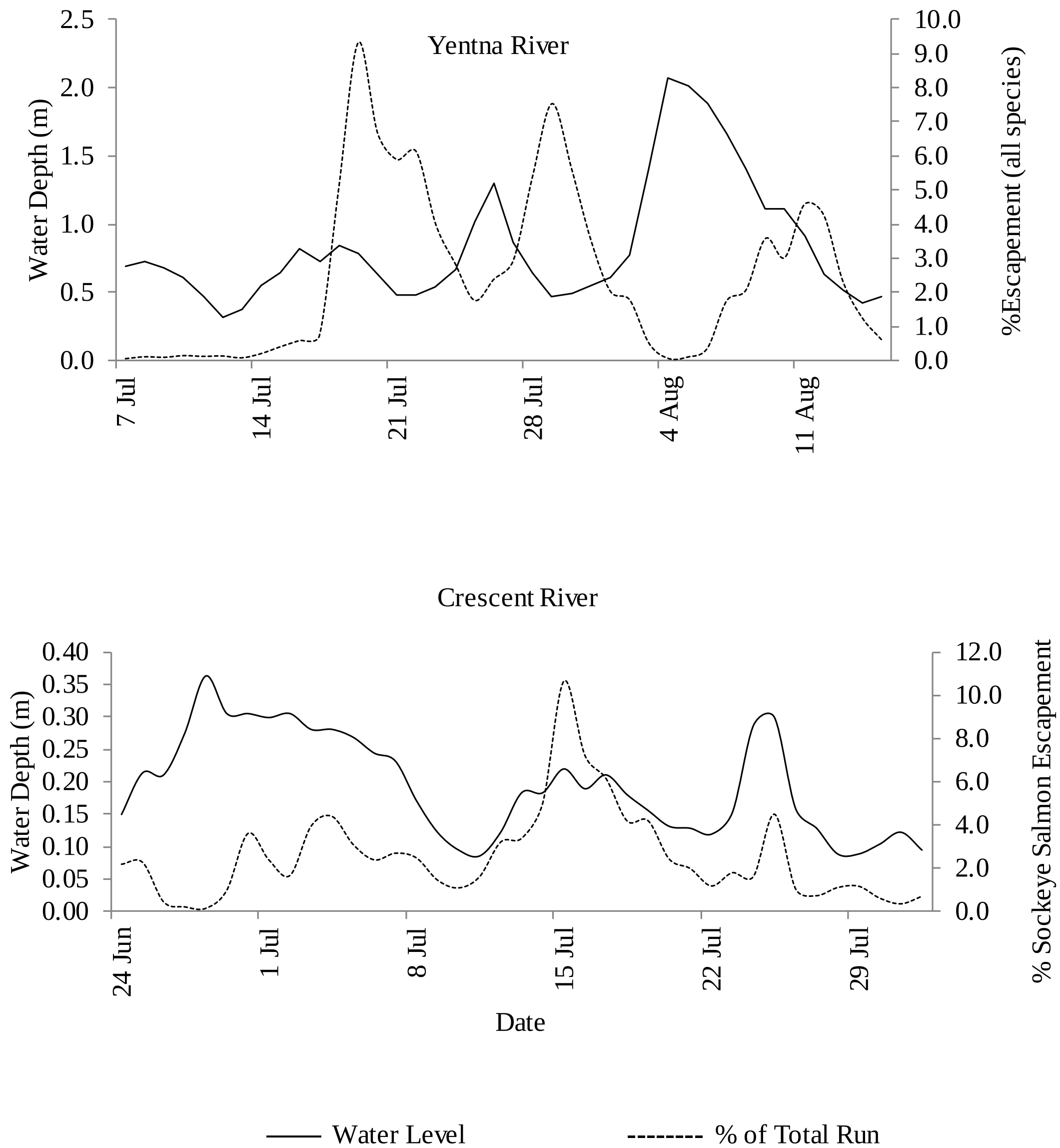


Figure 8.–Mean hourly salmon passage rates by bank in the Yentna (top) and Crescent (bottom, 2011) rivers.



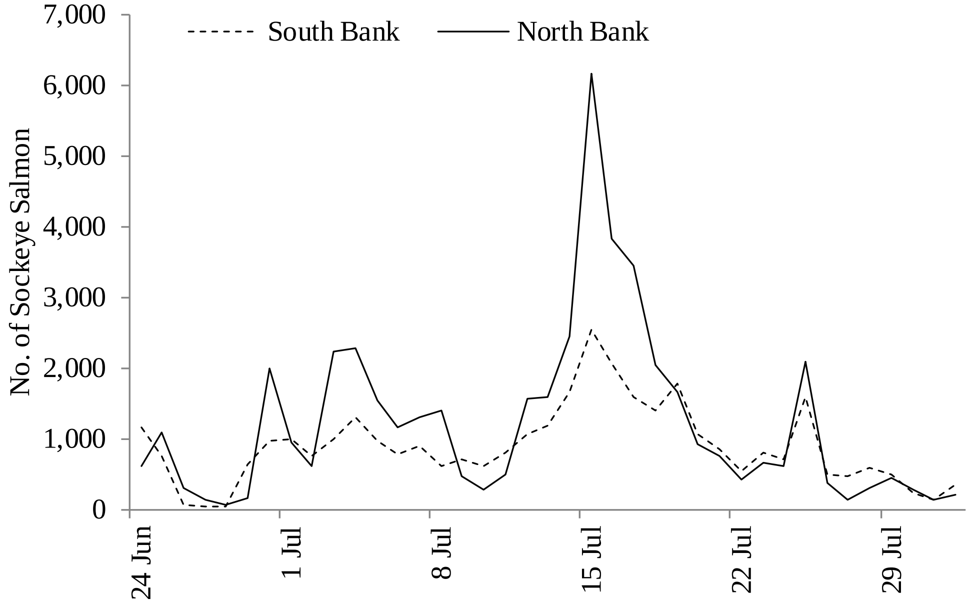
Note: Spikes in fish passages occurred when fish wheels were temporarily shut down.

Figure 9.–Charts showing spikes in fish (all species) passage (1100 and 1900) along the north (top) and south (bottom) banks of the Yentna river comparing hourly % fish passages from 2002 to 2004 to fish passages from 2009 to 2011.



Note: Daily escapement timing is included for comparison (dotted line).

Figure 10.–Daily water level fluctuations for the Yentna (top) and Crescent rivers (bottom), 2011.



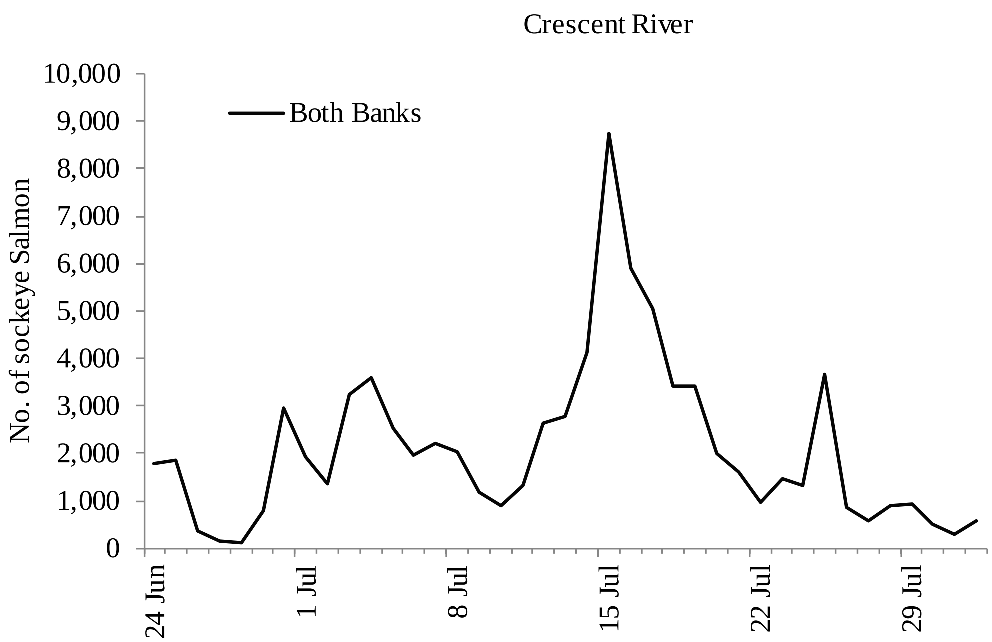


Figure 11.–Daily escapement timing of sockeye salmon by bank (top) and total (bottom) in the Crescent River, 2011.

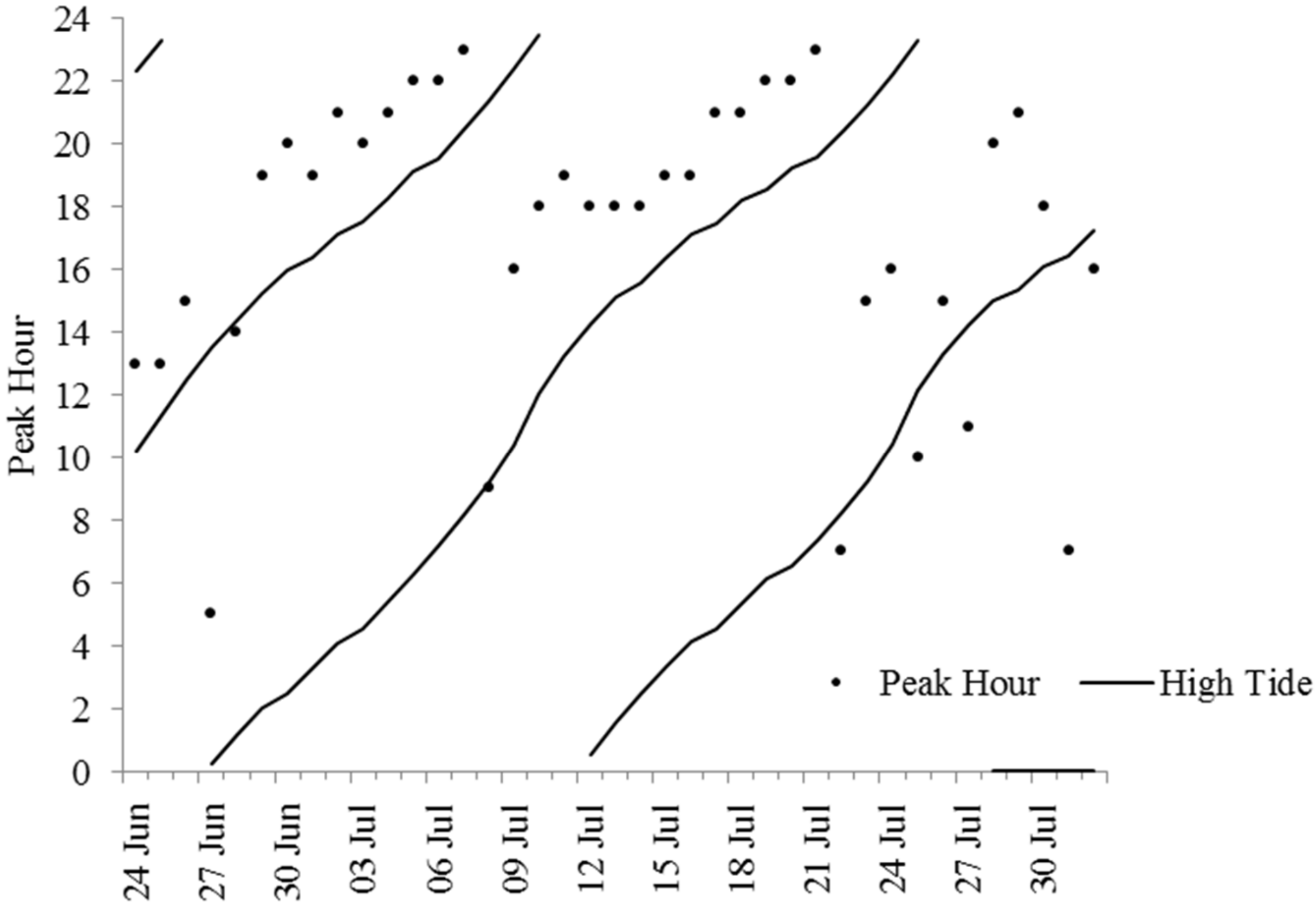


Figure 12.–The relationship between escapement timing (peak hourly counts) and time of high tide in the Crescent River, 2011.

APPENDIX A: KENAI RIVER DATA

Appendix A1.–Salmon escapement estimates (DIDSON) along the north bank of the Kenai River, 2011.

	Sockeye		Pink		Coho		Chinook	
Date	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	1,500	1,500	0	0	0	0	0	0
2 Jul	2,928	4,428	0	0	0	0	0	0
3 Jul	2,160	6,588	0	0	0	0	0	0
4 Jul	1,338	7,926	0	0	0	0	0	0
5 Jul	2,994	10,920	0	0	0	0	0	0
6 Jul	3,093	14,013	0	0	0	0	0	0
7 Jul	3,886	17,899	0	0	0	0	0	0
8 Jul	3,183	21,082	0	0	0	0	0	0
9 Jul	4,122	25,204	0	0	0	0	0	0
10 Jul	4,440	29,644	0	0	0	0	0	0
11 Jul	2,184	31,828	0	0	0	0	0	0
12 Jul	1,602	33,430	0	0	0	0	0	0
13 Jul	2,538	35,968	0	0	0	0	0	0
14 Jul	3,550	39,518	0	0	0	0	0	0
15 Jul	1,770	41,288	0	0	0	0	0	0
16 Jul	13,816	55,104	0	0	0	0	0	0
17 Jul	118,413	173,517	0	0	0	0	0	0
18 Jul	96,396	269,913	0	0	0	0	0	0
19 Jul	50,244	320,157	0	0	0	0	0	0
20 Jul	58,344	378,501	0	0	0	0	0	0
21 Jul	50,334	428,835	0	0	0	0	0	0
22 Jul	19,260	448,095	0	0	0	0	0	0
23 Jul	48,113	496,208	0	0	0	0	0	0
24 Jul	51,138	547,346	0	0	0	0	0	0
25 Jul	45,588	592,934	0	0	0	0	0	0
26 Jul	40,914	633,848	0	0	0	0	0	0
27 Jul	32,832	666,680	0	0	0	0	0	0
28 Jul	26,850	693,530	0	0	0	0	0	0
29 Jul	16,974	710,504	0	0	0	0	0	0
30 Jul	15,066	725,570	0	0	0	0	0	0
31 Jul	9,828	735,398	0	0	0	0	0	0
1 Aug	11,310	746,708	0	0	0	0	0	0
2 Aug	13,585	760,293	0	0	0	0	0	0
3 Aug	5,284	765,577	0	0	0	0	0	0
4 Aug	6,299	771,876	0	0	0	0	0	0
5 Aug	7,374	779,250	0	0	0	0	0	0
6 Aug	11,064	790,314	0	0	0	0	0	0
7 Aug	8,184	798,498	0	0	0	0	0	0
8 Aug	3,240	801,738	0	0	0	0	0	0
9 Aug	6,048	807,786	0	0	0	0	0	0
10 Aug	7,914	815,700	0	0	0	0	0	0
11 Aug	4,930	820,630	0	0	0	0	0	0
12 Aug	6,600	827,230	0	0	0	0	0	0
13 Aug	4,260	831,490	0	0	0	0	0	0

Appendix A2.–Salmon escapement estimates (DIDSON) along the south bank of the Kenai River, 2011.

	Sockeye		Pink		Coho		Chinook	
Date	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	756	756	0	0	0	0	0	0
2 Jul	1,332	2,088	0	0	0	0	0	0
3 Jul	924	3,012	0	0	0	0	0	0
4 Jul	906	3,918	0	0	0	0	0	0
5 Jul	1,278	5,196	0	0	0	0	0	0
6 Jul	1,554	6,750	0	0	0	0	0	0
7 Jul	1,416	8,166	0	0	0	0	0	0
8 Jul	1,554	9,720	0	0	0	0	0	0
9 Jul	2,400	12,120	0	0	0	0	0	0
10 Jul	2,406	14,526	0	0	0	0	0	0
11 Jul	1,326	15,852	0	0	0	0	0	0
12 Jul	1,500	17,352	0	0	0	0	0	0
13 Jul	1,284	18,636	0	0	0	0	0	0
14 Jul	2,850	21,486	0	0	0	0	0	0
15 Jul	1,146	22,632	0	0	0	0	0	0
16 Jul	14,010	36,642	0	0	0	0	0	0
17 Jul	112,230	148,872	0	0	0	0	0	0
18 Jul	80,657	229,529	0	0	0	0	0	0
19 Jul	37,734	267,263	0	0	0	0	0	0
20 Jul	54,834	322,097	0	0	0	0	0	0
21 Jul	40,092	362,189	0	0	0	0	0	0
22 Jul	18,714	380,903	0	0	0	0	0	0
23 Jul	58,200	439,103	0	0	0	0	0	0
24 Jul	59,634	498,737	0	0	0	0	0	0
25 Jul	33,930	532,667	0	0	0	0	0	0
26 Jul	37,068	569,735	0	0	0	0	0	0
27 Jul	40,260	609,995	0	0	0	0	0	0
28 Jul	28,620	638,615	0	0	0	0	0	0
29 Jul	19,566	658,181	0	0	0	0	0	0
30 Jul	15,318	673,499	0	0	0	0	0	0
31 Jul	8,412	681,911	0	0	0	0	0	0
1 Aug	10,404	692,315	0	0	0	0	0	0
2 Aug	7,122	699,437	0	0	0	0	0	0
3 Aug	5,112	704,549	0	0	0	0	0	0
4 Aug	3,775	708,324	0	0	0	0	0	0
5 Aug	3,846	712,170	0	0	0	0	0	0
6 Aug	11,022	723,192	0	0	0	0	0	0
7 Aug	9,132	732,324	0	0	0	0	0	0
8 Aug	2,874	735,198	0	0	0	0	0	0
9 Aug	6,150	741,348	0	0	0	0	0	0
10 Aug	8,610	749,958	0	0	0	0	0	0
11 Aug	6,396	756,354	0	0	0	0	0	0
12 Aug	5,604	761,958	0	0	0	0	0	0
13 Aug	5,769	767,727	0	0	0	0	0	0

Appendix A3.–Kenai River north bank DIDSON estimates (all species) by day and hour, 2011.

	Estimates by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	12	84	30	12	6	60	6	12	18	48	24	30
2 Jul	48	42	66	24	60	72	54	66	42	54	42	24
3 Jul	114	36	60	24	84	72	78	72	168	222	144	102
4 Jul	42	108	36	60	60	102	42	90	24	54	72	18
5 Jul	120	30	90	144	132	150	144	138	96	12	120	66
6 Jul	132	66	162	126	174	96	168	120	138	138	162	78
7 Jul	179	162	162	162	162	162	162	162	162	162	162	162
8 Jul	60	42	102	42	54	114	30	294	66	264	126	252
9 Jul	222	162	108	66	36	36	78	168	222	294	180	372
10 Jul	96	120	204	114	174	102	156	324	390	342	438	390
11 Jul	72	54	96	30	30	132	30	114	48	108	180	174
12 Jul	282	174	54	42	36	186	66	60	66	54	30	162
13 Jul	90	234	78	48	72	24	30	36	48	18	6	108
14 Jul	24	78	180	180	48	96	78	150	156	12	72	66
15 Jul	180	198	120	114	48	108	102	114	48	42	18	12
16 Jul	72	30	84	18	54	24	24	24	48	66	6	6
17 Jul	3,636	3,336	5,028	4,596	4,386	4,158	2,328	2,934	2,286	1,614	4,152	2,850
18 Jul	4,374	3,726	4,410	3,864	1,998	2,364	1,230	3,744	3,600	2,790	2,328	3,318
19 Jul	3,624	3,318	2,034	1,830	2,784	2,838	2,430	2,280	2,028	1,698	534	1,200
20 Jul	1,890	852	318	498	228	1,020	726	1,626	1,326	1,134	864	1,008
21 Jul	3,420	3,042	2,154	1,002	2,460	1,800	2,250	3,486	1,572	1,866	1,554	1,494
22 Jul	822	414	822	402	378	708	306	588	834	582	552	540
23 Jul	924	804	516	894	768	516	330	1,314	1,182	636	1,200	2,357
24 Jul	1,098	2,268	1,728	1,962	1,854	2,022	2,106	834	618	1,368	2,706	3,000
25 Jul	1,578	3,036	1,926	1,560	636	948	1,176	1,398	828	786	918	1,266
26 Jul	1,080	2,742	1,416	1,314	888	1,050	1,200	1,260	792	870	1,272	1,332
27 Jul	432	1,014	558	570	690	798	672	996	690	600	588	972
28 Jul	1,548	1,590	1,104	1,122	1,236	1,422	828	672	720	870	1,134	822
29 Jul	918	654	888	552	600	450	420	570	330	240	444	564
30 Jul	552	588	498	492	396	594	504	462	420	864	510	840
31 Jul	612	726	426	558	414	654	414	684	402	384	150	432

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	Estimates by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
1 Jul	264	96	78	174	42	66	42	114	48	144	24	66
2 Jul	48	60	54	192	216	240	180	342	288	264	306	144
3 Jul	78	54	180	84	126	120	42	36	48	42	96	78
4 Jul	30	0	42	66	78	54	24	90	30	66	96	54
5 Jul	90	102	72	228	126	144	144	144	138	246	192	126
6 Jul	84	54	132	72	186	192	252	144	22	129	129	137
7 Jul	108	114	42	30	90	162	228	246	300	210	264	132
8 Jul	228	168	42	102	180	45	66	318	150	258	120	60
9 Jul	366	144	150	192	60	102	234	144	264	270	174	78
10 Jul	348	144	150	168	36	102	90	24	54	180	138	156
11 Jul	168	132	126	102	132	24	102	60	54	36	66	114
12 Jul	150	30	18	18	48	36	0	24	12	0	24	30
13 Jul	126	264	126	132	96	198	360	102	66	54	156	66
14 Jul	264	324	228	124	138	174	114	192	162	180	270	240
15 Jul	30	48	30	96	36	24	36	30	114	102	60	60
16 Jul	88	48	12	264	114	78	186	600	1,722	2,556	2,238	5,466
17 Jul	2,850	3,492	4,335	4,026	2,838	5,706	10,212	9,294	9,516	8,772	9,678	6,390
18 Jul	3,684	5,718	3,636	5,148	5,334	5,484	4,254	4,350	7,248	4,656	5,868	3,270
19 Jul	1,104	1,728	1,032	1,584	1,800	1,584	2,790	3,414	2,868	2,178	1,854	1,710
20 Jul	2,160	1,944	2,238	3,114	2,892	4,230	4,770	8,046	6,540	3,708	4,134	3,078
21 Jul	1,644	2,496	1,920	1,392	3,036	3,102	2,382	1,638	1,986	1,782	1,800	1,056
22 Jul	246	396	552	654	1,182	948	696	804	930	1,590	2,076	2,238
23 Jul	3,006	3,060	1,470	2,454	2,124	2,106	4,266	5,022	5,652	4,110	2,064	1,338
24 Jul	1,344	4,122	2,748	2,448	1,776	2,784	2,928	1,872	2,040	2,946	1,830	2,736
25 Jul	1,296	1,638	2,850	2,850	3,312	1,938	2,022	4,428	3,318	1,998	2,046	1,836
26 Jul	1,482	2,358	1,350	2,400	1,776	2,400	4,146	2,676	3,048	1,746	1,764	552
27 Jul	1,140	1,368	2,538	2,358	1,062	2,400	2,958	2,472	1,806	2,412	2,406	1,332
28 Jul	930	882	882	1,104	1,398	1,440	1,578	1,374	1,164	1,320	1,002	708
29 Jul	360	630	912	942	1,464	1,020	990	1,014	858	1,068	420	666
30 Jul	330	834	894	960	720	648	750	780	438	516	732	744
31 Jul	228	174	708	378	228	498	354	210	252	324	348	270

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	Estimates by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	366	372	378	570	450	378	234	294	486	396	312	510
2 Aug	744	606	636	402	432	372	336	354	684	432	378	1074
3 Aug	150	210	354	318	186	192	96	204	180	154	306	198
4 Aug	246	120	168	222	186	102	204	228	252	257	180	270
5 Aug	390	414	252	372	402	312	216	96	156	228	258	198
6 Aug	330	354	186	216	264	288	246	492	738	498	558	360
7 Aug	372	360	402	366	168	264	630	438	312	384	258	336
8 Aug	144	120	174	108	90	102	204	66	102	150	90	66
9 Aug	66	126	96	60	60	78	96	108	90	162	234	162
10 Aug	306	282	246	102	84	174	174	138	462	624	492	372
11 Aug	48	72	138	198	156	384	168	348	330	246	210	144
12 Aug	468	270	384	288	258	216	180	156	390	90	180	138
13 Aug	204	372	162	234	60	102	174	54	66	48	180	120
Total	32,087	33,408	29,034	25,878	23,742	25,842	21,126	27,768	23,616	21,861	24,324	27,953
%	3.9	4.0	3.5	3.1	2.9	3.1	2.5	3.3	2.8	2.6	2.9	3.4
Cum	3.9	7.9	11.4	14.5	17.3	20.4	23.0	26.3	29.2	31.8	34.7	38.1

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	Estimates by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
1 Aug	486	294	708	258	510	498	612	768	750	408	732	540
2 Aug	906	978	966	792	738	600	450	444	336	346	291	288
3 Aug	258	408	300	306	258	156	156	162	312	78	162	180
4 Aug	318	270	504	294	360	384	366	210	210	288	372	288
5 Aug	306	192	150	420	354	384	546	342	198	438	360	390
6 Aug	114	498	396	300	804	846	828	762	456	636	588	306
7 Aug	288	372	582	414	330	318	228	426	222	306	288	120
8 Aug	84	162	156	294	168	126	234	132	66	156	114	132
9 Aug	378	348	84	492	360	594	270	408	336	462	528	450
10 Aug	480	468	276	486	462	354	570	300	246	348	354	114
11 Aug	282	570	342	270	72	112	114	150	126	162	138	150
12 Aug	270	582	528	270	432	402	114	144	342	192	144	162
13 Aug	252	420	378	210	120	150	180	258	150	108	120	138
Total	28,696	38,184	34,917	38,662	37,614	42,973	51,864	54,510	54,886	47,790	46,566	38,189
%	3.5	4.6	4.2	4.6	4.5	5.2	6.2	6.6	6.6	5.7	5.6	4.6
Cum	41.5	46.1	50.3	55.0	59.5	64.7	70.9	77.5	84.1	89.8	95.4	100.0

Appendix A4.–Kenai River south bank DIDSON estimates (all species) by day and hour, 2011.

	Estimates by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	30	24	18	12	6	12	18	48	48	18	12	30
2 Jul	36	30	36	12	12	60	24	24	30	54	18	120
3 Jul	24	30	24	24	48	48	30	6	12	54	54	66
4 Jul	6	54	30	36	18	6	12	42	12	48	18	60
5 Jul	30	42	48	24	36	60	84	36	18	42	36	60
6 Jul	24	30	30	42	18	12	54	48	24	108	90	78
7 Jul	6	42	18	24	12	84	24	36	18	54	60	84
8 Jul	90	72	18	18	30	36	36	90	66	84	96	42
9 Jul	42	48	6	36	12	42	36	114	90	168	246	150
10 Jul	60	78	42	126	54	96	120	72	162	150	162	144
11 Jul	60	42	36	12	6	36	66	96	24	114	60	66
12 Jul	60	78	114	102	60	108	48	114	66	24	138	48
13 Jul	24	60	42	6	24	18	30	6	12	12	12	36
14 Jul	114	48	42	84	48	42	48	18	48	114	60	72
15 Jul	108	60	30	18	6	24	72	24	90	24	60	48
16 Jul	42	24	18	12	0	6	30	6	54	24	42	54
17 Jul	2,544	2,748	1,872	2,892	3,600	3,030	3,708	2,862	2,778	2,562	4,398	3,456
18 Jul	4,626	4,140	3,450	1,968	828	1,434	2,802	3,006	4,662	2,688	3,060	2,454
19 Jul	2,094	1,674	936	1,128	846	1,200	1,854	1,350	1,920	1,296	1,470	2,052
20 Jul	1,476	1,914	1,182	858	576	324	1,488	1,452	810	624	1,434	1,356
21 Jul	2,250	2,172	1,386	1,434	1,110	846	2,232	2,340	3,348	2,106	1,848	1,854
22 Jul	1,506	792	420	228	186	174	402	570	918	696	456	678
23 Jul	1,356	678	834	276	444	570	684	1,206	1,698	2,214	1,032	2,280
24 Jul	3,384	1,446	696	600	720	750	1,524	2,826	3,150	2,856	2,340	2,220
25 Jul	2,280	918	318	120	114	246	768	1,320	2,400	1,566	1,404	1,338
26 Jul	2,478	822	816	318	240	348	906	858	2,568	1,980	1,398	1,110
27 Jul	1,554	1,440	456	432	420	294	882	2,040	1,968	882	1,320	1,368
28 Jul	1,038	1,098	894	954	594	1,056	1,032	2,118	1,458	996	594	558
29 Jul	870	996	696	744	342	276	696	1,314	1,086	534	774	684
30 Jul	390	402	384	180	294	384	588	726	510	414	312	330
31 Jul	306	228	240	276	312	432	324	384	510	246	384	354

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	Estimates by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
1 Jul	60	66	60	48	36	24	48	12	18	48	12	48
2 Jul	84	96	72	30	66	60	78	126	102	30	18	114
3 Jul	42	78	126	60	66	30	24	30	0	18	18	12
4 Jul	24	72	36	120	72	30	90	30	24	36	18	24
5 Jul	102	24	60	126	78	72	108	66	36	66	24	0
6 Jul	84	84	42	114	102	192	66	102	42	54	48	66
7 Jul	114	102	60	72	36	42	84	186	162	42	36	18
8 Jul	54	96	12	54	66	72	24	132	120	48	72	126
9 Jul	60	108	66	90	48	120	192	156	108	240	144	78
10 Jul	276	132	138	60	78	66	84	18	108	30	78	72
11 Jul	60	18	30	42	36	30	24	72	72	48	60	216
12 Jul	264	72	18	24	18	30	18	18	30	18	18	12
13 Jul	102	120	120	126	156	72	54	30	60	72	24	66
14 Jul	288	96	306	150	216	114	192	288	186	72	138	66
15 Jul	48	78	90	18	36	42	72	54	36	30	30	48
16 Jul	36	48	108	162	180	156	120	396	150	2,832	4,266	5,244
17 Jul	3,288	3,570	4,014	5,916	7,200	6,612	9,882	8,592	7,524	6,162	7,800	5,220
18 Jul	2,195	4,014	3,666	4,194	4,296	3,198	3,870	4,476	4,038	3,618	4,476	3,498
19 Jul	1,884	2,058	1,512	1,314	1,248	1,428	2,208	2,124	1,362	2,226	1,428	1,122
20 Jul	1,008	1,986	1,722	2,088	2,850	2,160	4,056	4,380	5,838	6,582	5,106	3,564
21 Jul	1,284	744	1,050	960	1,002	954	744	2,184	2,250	2,010	2,034	1,950
22 Jul	462	540	684	492	1,056	798	708	684	858	2,046	1,710	1,650
23 Jul	2,148	1,986	2,532	1,878	2,460	2,628	4,278	4,122	5,286	6,354	5,754	5,502
24 Jul	4,644	2,418	3,642	3,762	2,532	2,898	1,698	2,742	3,702	2,826	2,910	3,348
25 Jul	2,208	2,310	1,992	1,548	1,416	768	1,170	1,782	1,002	2,010	2,760	2,172
26 Jul	1,158	1,338	2,034	2,868	2,226	1,296	2,646	2,424	2,376	1,824	1,668	1,368
27 Jul	1,500	1,272	1,926	2,616	2,796	2,388	2,586	2,040	2,496	3,138	2,940	1,506
28 Jul	1,182	822	1,212	1,518	1,644	1,776	1,740	1,458	1,458	1,140	1,068	1,212
29 Jul	978	1,092	1,452	1,338	882	906	474	558	1,068	642	714	450
30 Jul	600	1,284	810	1,062	912	492	978	852	882	1,230	642	660
31 Jul	300	312	486	672	510	396	186	348	378	258	300	270

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Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	420	372	144	174	360	348	336	480	390	708	432	270
2 Aug	276	192	234	168	204	270	366	372	618	792	642	300
3 Aug	174	84	114	108	108	126	180	162	312	246	312	378
4 Aug	84	60	114	96	24	78	66	108	90	157	282	282
5 Aug	222	72	126	174	144	90	186	162	120	66	108	186
6 Aug	114	174	150	114	132	102	114	210	324	174	258	240
7 Aug	234	84	72	186	90	126	198	366	588	420	696	558
8 Aug	156	96	48	72	42	24	150	66	138	24	48	90
9 Aug	156	24	12	54	36	30	114	126	84	156	162	258
10 Aug	222	132	36	156	42	66	78	156	552	726	384	360
11 Aug	240	318	240	126	60	96	204	186	258	420	390	366
12 Aug	312	156	234	234	144	90	114	156	216	174	204	330
13 Aug	246	204	246	198	180	162	90	168	282	138	198	192
Total	31,764	24,198	16,902	14,856	12,582	13,650	22,818	27,870	34,530	26,953	27,504	27,060
%	4.1	3.2	2.2	1.9	1.6	1.8	3.0	3.6	4.5	3.5	3.6	3.5
Cum	4.1	7.3	9.5	11.4	13.1	14.8	17.8	21.4	25.9	29.5	33.0	36.6

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	Estimates by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
1 Aug	366	1,014	1,128	468	672	396	324	486	204	204	456	252
2 Aug	258	306	270	264	288	264	252	174	222	132	168	90
3 Aug	204	210	222	180	264	366	174	282	288	216	246	156
4 Aug	162	138	216	180	264	216	132	144	180	168	258	276
5 Aug	180	222	186	234	168	84	294	150	150	120	192	210
6 Aug	468	1,008	744	1,140	348	666	786	924	1,044	600	840	348
7 Aug	570	624	660	564	426	348	582	397	380	231	390	342
8 Aug	132	108	132	210	138	150	126	282	186	162	156	138
9 Aug	318	198	666	450	432	576	432	420	426	366	408	246
10 Aug	462	468	894	720	534	474	510	318	450	330	222	318
11 Aug	144	456	348	408	360	198	222	330	294	138	312	282
12 Aug	282	438	438	270	300	168	210	300	168	114	240	312
13 Aug	402	906	546	192	318	228	192	144	198	120	84	135
Total	30,485	33,132	36,528	38,802	38,832	33,984	42,738	44,833	45,962	48,651	50,286	42,807
%	4.0	4.3	4.8	5.1	5.1	4.4	5.6	5.8	6.0	6.3	6.5	5.6
Cum	40.5	44.8	49.6	54.7	59.7	64.1	69.7	75.6	81.5	87.9	94.4	100.0

APPENDIX B: KASILOF RIVER DATA

Appendix B1.–Estimated sockeye salmon escapement (DIDSON) along the north bank of the Kasilof River, 2011.

Date	Daily	Cum	Date	Daily	Cum
15 Jun	3,740	3,740	14 Jul	690	62,343
16 Jun	1,734	5,474	15 Jul	930	63,273
17 Jun	1,083	6,557	16 Jul	9,732	73,005
18 Jun	1,650	8,207	17 Jul	11,676	84,681
19 Jun	3,930	12,137	18 Jul	13,614	98,295
20 Jun	3,522	15,659	19 Jul	4,632	102,927
21 Jun	2,730	18,389	20 Jul	10,476	113,403
22 Jun	3,090	21,479	21 Jul	3,198	116,601
23 Jun	6,648	28,127	22 Jul	4,776	121,377
24 Jun	6,106	34,233	23 Jul	9,060	130,437
25 Jun	5,232	39,465	24 Jul	7,056	137,493
26 Jun	444	39,909	25 Jul	6,168	143,661
27 Jun	1,140	41,049	26 Jul	6,126	149,787
28 Jun	726	41,775	27 Jul	4,524	154,311
29 Jun	2,268	44,043	28 Jul	2,448	156,759
30 Jun	432	44,475	29 Jul	2,098	158,856
1 Jul	1,680	46,155	30 Jul	2,292	161,148
2 Jul	4,662	50,817	31 Jul	1,608	162,756
3 Jul	936	51,753	1 Aug	1,596	164,352
4 Jul	1,650	53,403	2 Aug	1,331	165,683
5 Jul	960	54,363	3 Aug	1,182	166,865
6 Jul	2,004	56,367	4 Aug	1,308	168,173
7 Jul	258	56,625	5 Aug	1,512	169,685
8 Jul	1,140	57,765	6 Aug	1,548	171,233
9 Jul	1,350	59,115	7 Aug	438	171,671
10 Jul	516	59,631	8 Aug	633	172,304
11 Jul	678	60,309	9 Aug	1,164	173,468
12 Jul	402	60,711	10 Aug	936	174,404
13 Jul	942	61,653	11 Aug	858	175,262

Note: No other species were apportioned from the escapement estimates.

Appendix B2.–Estimated sockeye salmon escapement (DIDSON) along the south bank of the Kasilof River, 2011.

Date	Daily	Daily
15 Jun	1,781	1,781
16 Jun	1,458	3,239
17 Jun	844	4,083
18 Jun	1,050	5,133
19 Jun	1,878	7,011
20 Jun	1,746	8,757
21 Jun	2,610	11,367
22 Jun	2,418	13,785
23 Jun	4,704	18,489
24 Jun	4,926	23,415
25 Jun	3,930	27,345
26 Jun	324	27,669
27 Jun	1,302	28,971
28 Jun	618	29,589
29 Jun	3,744	33,333
30 Jun	354	33,687
1 Jul	1,314	35,001
2 Jul	1,944	36,945
3 Jul	426	37,371
4 Jul	978	38,349
5 Jul	432	38,781
6 Jul	1,064	39,845
7 Jul	276	40,121
8 Jul	798	40,919
9 Jul	918	41,837
10 Jul	330	42,167
11 Jul	720	42,887
12 Jul	384	43,271
13 Jul	636	43,907
14 Jul	456	44,363
15 Jul	348	44,711
16 Jul	570	45,281
17 Jul	1,866	47,147
18 Jul	1,428	48,575
19 Jul	874	49,449
20 Jul	1,362	50,811
21 Jul	726	51,537
22 Jul	1,080	52,617
23 Jul	2,154	54,771
24 Jul	1,122	55,893
25 Jul	1,746	57,639
26 Jul	1,230	58,869
27 Jul	1,302	60,171
28 Jul	740	60,911
29 Jul	810	61,721
30 Jul	810	62,531
31 Jul	624	63,155
1 Aug	618	63,773
2 Aug	576	64,349
3 Aug	548	64,896
4 Aug	618	65,514
5 Aug	661	66,175
6 Aug	918	67,093
7 Aug	522	67,615
8 Aug	582	68,197
9 Aug	546	68,743
10 Aug	972	69,715
11 Aug	744	70,459

Note: No other species were apportioned from the escapement estimates.

Appendix B3.–Kasilof River north bank DIDSON subsample estimates by day and hour, 2011.

	Counts by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	156	114	54	54	210	402	233	293	275	264	294	138
16 Jun	72	42	102	72	96	78	174	54	138	192	138	78
17 Jun	24	24	42	42	66	18	84	48	44	44	24	48
18 Jun	18	12	48	72	12	48	24	30	30	60	66	72
19 Jun	66	66	48	36	42	48	24	246	66	78	30	174
20 Jun	324	54	54	108	108	114	120	36	264	120	78	84
21 Jun	180	120	96	72	24	108	48	54	132	180	60	0
22 Jun	258	72	72	126	60	90	18	60	138	222	198	60
23 Jun	132	162	102	72	36	66	126	54	72	84	78	408
24 Jun	378	186	378	576	486	240	132	114	42	168	108	126
25 Jun	216	192	312	390	546	618	756	360	276	246	144	246
26 Jun	12	42	12	18	6	12	12	24	0	0	6	6
27 Jun	42	42	84	48	54	54	66	36	42	12	12	18
28 Jun	24	0	36	6	18	6	6	18	0	24	24	6
29 Jun	18	36	78	60	36	78	174	228	78	42	60	6
30 Jun	24	42	30	36	36	24	0	0	30	6	6	12
1 Jul	0	12	30	12	186	78	24	24	48	72	36	36
2 Jul	90	42	42	60	186	456	354	78	486	570	192	228
3 Jul	90	36	12	36	24	36	42	36	36	0	6	12
4 Jul	36	30	60	54	12	6	60	108	66	48	114	72
5 Jul	30	24	12	-6	6	0	12	0	12	12	0	30
6 Jul	78	54	66	78	36	48	6	48	24	162	72	60
7 Jul	42	42	12	6	6	0	12	0	0	0	0	12
8 Jul	42	18	6	6	0	12	0	12	6	6	18	24
9 Jul	54	48	54	18	24	18	12	6	0	18	0	12
10 Jul	60	30	12	6	30	0	0	18	0	0	6	0
11 Jul	12	12	0	12	24	12	18	18	0	18	42	36
12 Jul	24	6	12	0	6	6	6	0	6	24	6	12
13 Jul	6	12	18	24	54	18	0	0	18	18	6	6
14 Jul	36	24	24	12	6	42	30	6	30	60	30	12
15 Jul	12	30	12	6	6	66	12	6	18	30	42	24

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	Counts by Hour												Daily
Date	13	14	15	16	17	18	19	20	21	22	23	24	Total
15 Jun	30	90	30	60	78	12	90	66	168	318	198	114	3,740
16 Jun	90	18	36	18	12	24	0	48	60	72	72	48	1,734
17 Jun	18	18	6	72	36	24	6	24	72	174	84	42	1,083
18 Jun	66	6	72	42	12	6	24	30	264	330	210	96	1,650
19 Jun	90	216	204	210	192	144	198	126	558	426	222	420	3,930
20 Jun	78	126	102	252	84	102	126	150	180	282	186	390	3,522
21 Jun	42	72	48	60	96	54	60	90	126	348	480	180	2,730
22 Jun	36	60	66	60	30	30	36	90	240	186	534	348	3,090
23 Jun	534	36	168	246	660	558	252	210	384	732	678	798	6,648
24 Jun	138	108	48	96	234	288	144	252	324	426	496	618	6,106
25 Jun	60	66	210	60	54	90	138	120	24	36	42	30	5,232
26 Jun	0	0	0	42	54	24	12	36	12	30	54	30	444
27 Jun	36	24	30	114	186	24	36	54	48	24	24	30	1,140
28 Jun	12	18	42	12	114	72	30	78	60	48	12	60	726
29 Jun	36	12	42	108	186	336	168	150	114	102	66	54	2,268
30 Jun	6	18	18	18	6	30	30	6	6	6	24	18	432
1 Jul	0	18	36	12	6	12	210	180	276	228	72	72	1,680
2 Jul	42	72	30	60	24	150	480	138	30	510	240	102	4,662
3 Jul	18	12	36	42	6	30	6	72	48	138	78	84	936
4 Jul	90	90	24	144	66	60	84	66	84	150	54	72	1,650
5 Jul	6	12	18	18	18	48	60	78	54	180	180	156	960
6 Jul	222	198	222	60	60	72	102	84	42	60	114	36	2,004
7 Jul	0	0	0	12	18	6	18	12	6	6	12	36	258
8 Jul	78	54	54	102	78	66	30	48	66	48	234	132	1,140
9 Jul	150	222	210	96	126	84	60	18	24	48	42	6	1,350
10 Jul	18	30	54	72	18	30	42	24	18	6	12	30	516
11 Jul	30	36	18	84	84	60	30	30	18	60	12	12	678
12 Jul	30	18	12	6	18	42	60	24	36	18	24	6	402
13 Jul	12	42	54	54	54	144	150	96	66	36	24	30	942
14 Jul	30	18	18	6	18	18	66	78	48	36	36	6	690
15 Jul	6	0	0	0	30	6	42	96	24	264	126	72	930

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Date	Counts by Hour 1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	84	42	54	36	30	342	672	114	306	702	438	432
17 Jul	702	414	138	288	354	246	690	1,110	312	924	1,008	552
18 Jul	432	294	342	288	534	300	474	936	1,350	276	870	984
19 Jul	252	132	66	78	48	24	30	48	18	108	102	72
20 Jul	432	390	486	498	432	294	282	600	228	1,524	708	114
21 Jul	132	102	108	240	78	114	24	48	30	54	90	270
22 Jul	114	42	60	96	54	6	102	24	54	90	90	222
23 Jul	174	282	222	282	426	168	432	246	468	660	288	828
24 Jul	126	48	120	174	210	168	114	72	186	108	288	396
25 Jul	126	126	120	60	42	114	150	126	666	348	336	198
26 Jul	72	84	48	36	54	126	168	216	186	144	156	342
27 Jul	288	120	234	114	120	504	366	216	78	372	138	204
28 Jul	96	66	96	30	66	78	24	18	96	66	96	108
29 Jul	78	42	18	12	24	138	84	84	101	84	66	138
30 Jul	132	114	30	72	84	294	222	24	84	96	204	72
31 Jul	30	12	42	54	36	30	66	78	66	108	120	144
1 Aug	90	12	24	12	18	12	60	96	24	198	102	180
2 Aug	120	66	30	30	24	18	12	120	108	30	36	78
3 Aug	48	84	18	30	6	0	18	12	60	96	30	72
4 Aug	54	90	42	18	18	6	0	0	24	66	132	12
5 Aug	12	24	48	48	6	36	6	0	6	24	30	210
6 Aug	30	12	42	30	12	12	12	18	0	84	42	18
7 Aug	48	30	6	6	0	6	18	114	12	36	0	36
8 Aug	6	18	0	12	0	0	18	18	0	0	12	27
9 Aug	24	36	42	30	18	6	24	24	24	54	12	72
10 Aug	42	18	0	12	6	0	6	24	132	60	24	42
11 Aug	24	48	12	24	18	24	48	30	60	18	66	6
Total	6,324	4,374	4,368	4,722	5,160	5,868	6,706	6,430	7,055	9,109	7,380	7,887
%	3.6	2.5	2.5	2.7	2.9	3.3	3.8	3.7	4.0	5.2	4.2	4.5
Cum	3.6	6.1	8.6	11.3	14.2	17.6	21.4	25.1	29.1	34.3	38.5	43.0

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	Counts by Hour												Daily
Date	13	14	15	16	17	18	19	20	21	22	23	24	Total
16 Jul	360	192	210	216	108	174	180	786	1,146	1,134	1,200	774	9,732
17 Jul	120	480	366	396	228	252	384	1,026	498	108	432	648	11,676
18 Jul	420	528	732	456	360	258	408	408	1,152	846	516	450	13,614
19 Jul	348	276	270	324	228	138	132	120	144	942	192	540	4,632
20 Jul	330	846	546	282	318	162	144	228	390	888	204	150	10,476
21 Jul	186	90	84	300	234	162	144	66	72	54	228	288	3,198
22 Jul	294	210	318	270	270	132	276	216	132	192	930	582	4,776
23 Jul	984	636	420	696	570	264	192	288	96	108	180	150	9,060
24 Jul	510	654	732	1,464	444	264	144	108	120	78	204	324	7,056
25 Jul	330	186	168	720	834	462	378	228	132	114	96	108	6,168
26 Jul	186	258	366	354	684	360	534	270	438	426	264	354	6,126
27 Jul	264	102	132	144	96	240	204	300	12	78	114	84	4,524
28 Jul	54	60	120	204	96	96	282	210	66	180	192	48	2,448
29 Jul	216	72	54	78	78	42	138	186	48	120	186	12	2,098
30 Jul	120	6	78	24	0	54	222	42	60	72	102	84	2,292
31 Jul	36	6	6	18	18	66	54	96	72	162	204	84	1,608
1 Aug	54	24	12	72	84	36	36	150	30	72	66	132	1,596
2 Aug	35	6	12	48	24	72	24	18	258	60	42	60	1,331
3 Aug	66	42	42	60	24	24	48	30	114	186	60	12	1,182
4 Aug	48	108	66	108	150	108	78	18	30	48	48	36	1,308
5 Aug	42	84	66	234	174	108	114	24	30	36	54	96	1,512
6 Aug	102	168	216	144	138	126	144	36	12	36	96	18	1,548
7 Aug	12	36	6	18	21	6	0	3	6	0	6	12	438
8 Aug	18	42	18	36	90	78	36	90	72	42	0	0	633
9 Aug	42	18	66	36	24	102	108	132	126	126	12	6	1,164
10 Aug	6	6	60	6	72	0	42	108	114	60	66	30	936
11 Aug	12	84	54	60	48	24	36	60	30	48	12	12	858
Total	7,199	6,930	7,128	9,006	8,073	6,456	7,272	7,821	8,880	11,544	10,348	9,222	175,262
%	4.1	4.0	4.1	5.1	4.6	3.7	4.1	4.5	5.1	6.6	5.9	5.3	
Cum	47.1	51.1	55.1	60.3	64.9	68.6	72.7	77.2	82.2	88.8	94.7	100.0	

Appendix B4.–Kasilof River south bank DIDSON subsample estimates by day and hour, 2011.

	Counts by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	87	87	87	87	87	87	87	87	87	87	72	66
16 Jun	54	84	108	138	54	12	72	66	144	114	156	54
17 Jun	48	30	42	39	30	18	33	52	18	48	90	84
18 Jun	30	54	84	66	36	42	42	30	78	90	72	60
19 Jun	60	90	66	42	36	102	42	168	48	30	24	162
20 Jun	144	48	36	72	60	18	30	30	192	66	36	144
21 Jun	372	180	192	90	108	72	48	30	78	150	60	54
22 Jun	318	180	96	168	102	48	42	78	102	66	210	48
23 Jun	54	462	234	186	288	96	90	24	126	78	114	600
24 Jun	156	552	318	288	138	54	30	60	54	102	378	264
25 Jun	300	288	258	216	480	306	114	138	84	96	60	144
26 Jun	24	18	24	0	6	6	6	6	0	0	6	0
27 Jun	54	102	138	114	72	60	42	96	12	30	24	0
28 Jun	12	0	18	18	12	12	6	6	0	30	12	12
29 Jun	18	90	120	222	174	114	282	138	60	78	48	60
30 Jun	24	36	36	6	36	18	18	6	6	0	6	12
1 Jul	0	6	12	24	132	72	30	30	60	48	66	42
2 Jul	108	48	60	66	96	294	120	36	90	138	84	48
3 Jul	12	18	12	30	12	6	18	6	36	6	12	6
4 Jul	30	24	42	42	18	42	18	30	42	18	96	72
5 Jul	6	0	0	0	6	0	0	0	24	6	18	18
6 Jul	48	42	60	48	180	0	18	12	12	36	36	45
7 Jul	36	18	6	0	6	0	0	0	0	0	0	6
8 Jul	18	12	18	24	18	18	6	0	6	0	12	12
9 Jul	78	12	66	84	18	30	0	24	18	6	42	54
10 Jul	18	30	24	24	12	-6	6	0	0	0	0	12
11 Jul	66	60	84	18	18	24	12	12	0	6	24	18
12 Jul	18	12	24	24	6	6	0	12	0	0	36	24
13 Jul	6	18	18	36	54	0	18	0	0	0	6	36
14 Jul	12	18	18	36	42	12	42	6	0	12	-6	12
15 Jul	18	36	18	0	0	0	6	6	6	0	12	12

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Date	Counts by Hour												Daily
	13	14	15	16	17	18	19	20	21	22	23	24	Total
15 Jun	42	30	48	114	48	59	102	42	114	72	24	78	1,781
16 Jun	36	24	24	6	12	18	0	72	54	36	72	48	1,458
17 Jun	18	24	6	48	24	6	12	0	30	78	48	18	844
18 Jun	24	12	6	18	0	12	6	18	84	144	24	18	1,050
19 Jun	102	90	150	84	60	30	78	6	114	108	90	96	1,878
20 Jun	90	66	42	18	54	48	66	48	78	150	78	132	1,746
21 Jun	84	204	120	72	72	60	30	48	72	282	84	48	2,610
22 Jun	48	30	24	48	24	18	18	66	108	180	330	66	2,418
23 Jun	270	90	42	162	534	120	36	30	72	276	540	180	4,704
24 Jun	462	210	96	72	174	48	18	48	126	462	222	594	4,926
25 Jun	312	330	198	162	60	66	84	96	12	42	18	66	3,930
26 Jun	0	0	18	42	18	12	12	24	12	12	30	48	324
27 Jun	36	18	54	210	66	30	24	84	12	0	18	6	1,302
28 Jun	6	18	18	30	156	54	12	36	54	18	24	54	618
29 Jun	12	24	60	270	276	702	216	186	252	204	78	60	3,744
30 Jun	0	0	12	0	12	18	54	24	18	12	6	6	354
1 Jul	18	24	24	18	30	24	162	60	180	120	78	54	1,314
2 Jul	138	54	54	30	36	48	66	60	12	66	96	96	1,944
3 Jul	12	0	18	6	18	6	0	24	78	36	30	24	426
4 Jul	102	84	66	48	18	24	30	36	36	24	18	18	978
5 Jul	30	42	42	24	24	30	24	6	12	60	12	48	432
6 Jul	59	84	48	66	48	54	48	24	18	36	24	18	1,064
7 Jul	6	24	18	30	12	42	0	12	0	18	30	12	276
8 Jul	78	36	90	36	90	24	30	18	30	42	36	144	798
9 Jul	66	96	42	54	54	24	18	24	30	24	18	36	918
10 Jul	18	36	12	18	18	18	42	18	6	12	6	6	330
11 Jul	36	24	18	60	18	30	12	0	108	42	24	6	720
12 Jul	18	66	0	30	6	18	18	12	18	18	12	6	384
13 Jul	42	18	60	30	48	6	84	6	72	12	42	24	636
14 Jul	24	24	12	6	6	12	36	36	18	36	30	12	456
15 Jul	24	6	18	6	36	12	6	24	42	42	18	0	348

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Date	Counts by Hour 1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	24	12	18	12	30	36	12	6	0	12	6	18
17 Jul	174	54	36	60	78	60	48	84	18	120	54	24
18 Jul	90	108	72	60	30	36	24	24	108	42	72	132
19 Jul	58	42	48	30	12	0	12	24	0	150	66	6
20 Jul	246	138	60	60	42	30	12	48	60	42	66	18
21 Jul	54	42	132	48	12	6	6	0	12	6	24	6
22 Jul	60	12	24	18	12	6	6	12	6	60	18	48
23 Jul	174	156	228	144	162	42	36	54	48	102	18	54
24 Jul	42	78	84	60	42	6	24	90	42	48	42	66
25 Jul	66	102	30	30	36	42	42	36	180	78	234	90
26 Jul	48	72	60	18	42	42	24	150	102	96	78	6
27 Jul	72	54	24	24	78	108	150	120	72	84	102	18
28 Jul	12	12	48	36	36	42	24	42	18	54	72	12
29 Jul	30	24	24	30	12	84	12	30	48	108	24	24
30 Jul	6	6	24	24	54	24	180	108	30	60	6	36
31 Jul	18	30	12	24	18	12	36	36	48	24	72	84
1 Aug	18	30	30	12	18	60	48	24	60	24	54	90
2 Aug	60	54	42	36	6	6	0	24	30	0	12	24
3 Aug	42	42	42	30	18	6	24	12	30	30	18	36
4 Aug	36	48	24	24	0	0	18	6	6	42	30	6
5 Aug	36	54	24	12	18	0	6	18	6	29	31	37
6 Aug	24	30	24	36	24	12	114	12	96	30	24	66
7 Aug	30	24	6	24	0	18	30	42	36	12	24	30
8 Aug	30	24	12	18	12	6	84	0	6	18	18	18
9 Aug	6	24	12	6	24	18	12	18	24	54	12	12
10 Aug	18	0	6	18	6	12	90	78	60	36	78	72
11 Aug	30	12	30	30	12	18	78	30	54	6	96	24
Total	3,733	3,939	3,495	3,132	3,171	2,295	2,430	2,317	2,583	2,708	3,145	3,238
%	5.3	5.6	5.0	4.4	4.5	3.3	3.4	3.3	3.7	3.8	4.5	4.6
Cum	5.3	5.6	5.0	4.4	4.5	3.3	3.4	3.3	3.7	3.8	4.5	4.6

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	Counts by Hour												Daily
Date	13	14	15	16	17	18	19	20	21	22	23	24	Total
16 Jul	18	18	24	12	24	24	18	72	120	6	12	36	570
17 Jul	18	6	6	18	36	66	30	60	24	48	564	180	1,866
18 Jul	18	84	78	66	18	12	0	18	108	174	24	30	1,428
19 Jul	12	12	84	36	6	36	42	30	24	48	60	36	874
20 Jul	90	42	6	18	24	24	54	54	60	-12	84	96	1,362
21 Jul	6	30	12	12	24	6	42	18	24	48	78	78	726
22 Jul	30	12	12	30	54	24	66	12	48	36	222	252	1,080
23 Jul	60	12	282	66	30	120	30	66	72	60	60	78	2,154
24 Jul	48	12	198	36	66	24	30	12	24	12	18	18	1,122
25 Jul	90	60	150	90	90	36	42	60	12	30	54	66	1,746
26 Jul	102	42	54	36	48	24	42	6	24	18	18	78	1,230
27 Jul	24	102	60	6	30	18	60	24	42	24	6	0	1,302
28 Jul	42	0	36	12	0	6	42	36	48	32	24	54	740
29 Jul	42	42	42	18	36	18	30	24	30	24	24	30	810
30 Jul	18	24	12	54	24	30	18	6	18	6	30	12	810
31 Jul	18	18	24	6	6	6	24	30	12	30	18	18	624
1 Aug	18	12	0	18	0	6	18	18	18	-6	0	48	618
2 Aug	18	12	24	18	18	6	0	18	72	24	12	60	576
3 Aug	24	18	13.5	12	6	0	12	6	30	30	18	48	548
4 Aug	12	36	36	66	12	6	30	18	24	24	102	12	618
5 Aug	66	30	42	54	30	18	18	0	60	12	24	36	661
6 Aug	72	24	102	6	42	48	6	18	6	12	48	42	918
7 Aug	12	36	36	36	42	12	24	18	12	12	0	6	522
8 Aug	12	30	24	12	78	18	36	24	48	12	24	18	582
9 Aug	6	18	6	18	12	24	60	42	30	42	30	36	546
10 Aug	48	24	108	36	24	42	54	78	42	12	18	12	972
11 Aug	36	12	36	24	12	18	60	18	54	24	12	18	744
Total	3,173	2,556	2,948	2,634	2,844	2,345	2,232	1,974	2,958	3,446	3,744	3,420	70,459
%	4.5	3.6	4.2	3.7	4.0	3.3	3.2	2.8	4.2	4.9	5.3	4.9	
Cum	4.5	3.6	4.2	3.7	4.0	3.3	3.2	2.8	4.2	4.9	5.3	4.9	

APPENDIX C: YENTNA RIVER DATA

Appendix C1.–Estimated salmon escapement ranges along the north bank of the Yentna River, 2011.

	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
Date	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	73	115	73	115	9	55	9	55
8 Jul	121	189	194	303	15	91	24	146
9 Jul	119	186	313	490	15	89	39	235
10 Jul	141	226	455	715	20	123	59	358
11 Jul	91	182	546	897	29	137	88	495
12 Jul	45	116	591	1,013	32	139	120	634
13 Jul	15	55	606	1,068	20	90	139	724
14 Jul	145	265	752	1,333	32	168	172	892
15 Jul	120	337	872	1,670	97	424	268	1,316
16 Jul	106	356	978	2,026	220	836	488	2,152
17 Jul	100	331	1,077	2,357	414	1,185	903	3,337
18 Jul	328	1,266	1,405	3,623	271	1,460	1,174	4,797
19 Jul	1,221	2,697	2,626	6,320	278	1,663	1,452	6,460
20 Jul	1,777	3,991	4,403	10,311	738	3,582	2,190	10,042
21 Jul	1,266	4,090	5,668	14,401	615	3,418	2,805	13,460
22 Jul	1,242	4,167	6,910	18,568	1,003	4,846	3,809	18,305
23 Jul	396	1,610	7,306	20,178	950	4,004	4,759	22,309
24 Jul	88	304	7,394	20,482	994	2,809	5,753	25,118
25 Jul	526	1,433	7,920	21,915	265	1,363	6,018	26,481
26 Jul	243	927	8,163	22,842	245	1,244	6,262	27,725
27 Jul	124	531	8,287	23,373	552	2,158	6,815	29,883
28 Jul	245	959	8,532	24,331	1,245	4,441	8,060	34,324
29 Jul	423	1,638	8,955	25,969	1,896	6,834	9,956	41,158
30 Jul	144	566	9,099	26,535	1,770	5,744	11,726	46,902
31 Jul	109	444	9,208	26,978	900	3,106	12,627	50,008
1 Aug	46	163	9,254	27,142	852	2,443	13,479	52,451
2 Aug	23	81	9,277	27,223	614	1,665	14,093	54,115
3 Aug	180	499	9,456	27,722	283	968	14,376	55,084
4 Aug	10	38	9,466	27,759	7	38	14,382	55,121
5 Aug	32	90	9,498	27,849	8	51	14,391	55,173
6 Aug	46	180	9,545	28,029	59	286	14,450	55,459
7 Aug	235	1,088	9,780	29,117	282	1,505	14,732	56,963
8 Aug	43	238	9,823	29,354	167	809	14,899	57,772
9 Aug	25	185	9,848	29,539	163	967	15,062	58,739
10 Aug	31	195	9,880	29,734	128	670	15,190	59,409
11 Aug	18	117	9,898	29,850	207	1,117	15,397	60,526
12 Aug	50	299	9,947	30,150	251	1,255	15,649	61,781
13 Aug	26	152	9,973	30,302	109	529	15,758	62,309
14 Aug	25	142	9,999	30,444	69	319	15,826	62,628
15 Aug	12	66	10,010	30,510	46	216	15,873	62,844

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	Chum				Coho			
	Daily		Cum		Daily		Cum	
Date	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	0	0	0	0	2	24	2	24
8 Jul	0	0	0	0	3	40	4	65
9 Jul	0	0	0	0	2	40	7	104
10 Jul	0	0	0	0	7	96	14	200
11 Jul	0	0	0	0	5	64	19	264
12 Jul	16	63	16	63	13	108	32	372
13 Jul	16	49	32	112	17	94	49	466
14 Jul	0	0	32	112	4	64	53	530
15 Jul	66	234	98	346	47	351	100	881
16 Jul	111	351	209	697	114	703	214	1,584
17 Jul	141	437	350	1,134	91	674	306	2,257
18 Jul	136	498	487	1,632	356	1,909	661	4,167
19 Jul	84	438	570	2,070	199	1,869	861	6,036
20 Jul	366	1,592	937	3,662	305	2,808	1,165	8,844
21 Jul	594	2,201	1,531	5,863	680	4,359	1,845	13,203
22 Jul	1,146	3,640	2,677	9,504	826	5,097	2,671	18,300
23 Jul	666	1,940	3,343	11,444	797	4,060	3,468	22,361
24 Jul	318	917	3,661	12,361	308	1,909	3,776	24,270
25 Jul	78	343	3,739	12,705	188	1,431	3,964	25,701
26 Jul	82	303	3,821	13,008	278	1,512	4,243	27,213
27 Jul	211	630	4,032	13,638	439	2,129	4,682	29,342
28 Jul	608	1,733	4,640	15,372	731	3,867	5,413	33,209
29 Jul	1,418	3,771	6,058	19,142	1,054	5,752	6,467	38,961
30 Jul	1,295	3,213	7,353	22,355	776	4,420	7,243	43,381
31 Jul	492	1,327	7,845	23,682	510	2,658	7,753	46,039
1 Aug	308	853	8,153	24,535	290	1,732	8,043	47,771
2 Aug	156	449	8,308	24,984	187	1,139	8,230	48,911
3 Aug	93	330	8,401	25,314	75	603	8,305	49,514
4 Aug	4	16	8,405	25,330	10	54	8,315	49,568
5 Aug	9	39	8,415	25,369	10	73	8,325	49,641
6 Aug	17	61	8,432	25,430	62	330	8,387	49,970
7 Aug	403	1,136	8,835	26,566	469	2,101	8,856	52,071
8 Aug	218	541	9,054	27,108	268	1,046	9,124	53,118
9 Aug	410	1,079	9,464	28,186	505	1,678	9,629	54,796
10 Aug	469	995	9,933	29,182	257	1,058	9,887	55,854
11 Aug	1,074	2,082	11,007	31,263	411	1,776	10,298	57,630
12 Aug	1,966	3,210	12,973	34,474	381	1,930	10,679	59,560
13 Aug	801	1,289	13,774	35,763	147	762	10,825	60,322
14 Aug	471	763	14,246	36,526	67	383	10,893	60,704
15 Aug	322	506	14,568	37,032	52	282	10,945	60,986

Appendix C2.–Estimated salmon escapement ranges along the south bank of the Yentna River, 2011.

	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
Date	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	33	45	33	45	2	6	2	6
8 Jul	81	132	114	177	4	14	7	19
9 Jul	66	89	180	266	4	12	11	31
10 Jul	123	175	303	441	6	18	17	49
11 Jul	110	154	413	594	9	23	26	73
12 Jul	75	162	488	756	12	37	37	110
13 Jul	56	88	544	844	6	17	43	126
14 Jul	78	240	622	1,084	21	78	64	205
15 Jul	104	309	727	1,393	71	235	135	440
16 Jul	196	435	922	1,828	104	274	239	713
17 Jul	195	477	1,117	2,305	145	378	384	1,091
18 Jul	7,882	12,964	8,999	15,269	315	976	699	2,067
19 Jul	19,049	26,047	28,049	41,317	461	1,362	1,160	3,429
20 Jul	6,358	13,333	34,406	54,650	423	1,411	1,582	4,840
21 Jul	4,750	9,671	39,156	64,321	584	1,848	2,167	6,687
22 Jul	2,940	7,779	42,096	72,100	593	2,063	2,760	8,751
23 Jul	1,037	3,100	43,133	75,200	845	2,736	3,606	11,486
24 Jul	704	2,155	43,837	77,355	908	2,831	4,514	14,318
25 Jul	1,403	2,707	45,240	80,062	175	540	4,689	14,858
26 Jul	1,449	4,116	46,689	84,178	317	1,144	5,006	16,002
27 Jul	597	2,568	47,286	86,746	652	2,678	5,657	18,681
28 Jul	690	3,278	47,976	90,024	1,207	5,169	6,865	23,849
29 Jul	1,040	4,205	49,016	94,229	1,653	6,263	8,518	30,112
30 Jul	683	3,132	49,699	97,361	964	4,078	9,482	34,190
31 Jul	356	1,811	50,056	99,172	681	3,070	10,163	37,260
1 Aug	306	1,279	50,362	100,450	363	1,448	10,526	38,708
2 Aug	327	1,350	50,689	101,800	393	1,550	10,920	40,258
3 Aug	98	198	50,787	101,998	30	87	10,950	40,345
4 Aug	17	59	50,804	102,058	11	39	10,961	40,384
5 Aug	45	132	50,849	102,189	13	45	10,973	40,429
6 Aug	95	368	50,944	102,557	51	208	11,024	40,637
7 Aug	185	1,064	51,129	103,621	157	824	11,181	41,461
8 Aug	272	1,413	51,402	105,034	443	2,051	11,624	43,513
9 Aug	255	1,567	51,656	106,601	526	2,790	12,150	46,303
10 Aug	156	962	51,812	107,562	464	2,133	12,615	48,436
11 Aug	162	1,152	51,974	108,714	333	1,648	12,948	50,083
12 Aug	77	598	52,051	109,313	176	873	13,124	50,956
13 Aug	35	277	52,085	109,590	97	476	13,221	51,431
14 Aug	32	239	52,117	109,828	72	354	13,294	51,786
15 Aug	27	187	52,144	110,016	32	151	13,326	51,937

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	Chum				Coho			
	Daily		Cum		Daily		Cum	
Date	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	0	0	0	0	1	12	1	12
8 Jul	0	0	0	0	5	57	5	70
9 Jul	0	0	0	0	2	24	7	94
10 Jul	1	8	1	8	4	52	10	146
11 Jul	0	0	1	8	2	32	12	178
12 Jul	0	0	1	8	11	110	24	288
13 Jul	1	4	2	12	3	35	26	323
14 Jul	20	87	22	99	33	222	59	545
15 Jul	44	164	66	263	49	340	108	885
16 Jul	26	120	92	383	24	255	132	1,140
17 Jul	63	249	155	632	29	283	161	1,422
18 Jul	177	1,209	332	1,841	415	5,231	576	6,653
19 Jul	151	1,145	482	2,986	460	6,969	1,036	13,622
20 Jul	467	2,691	950	5,677	755	7,455	1,791	21,077
21 Jul	533	2,789	1,483	8,466	502	5,109	2,293	26,187
22 Jul	666	2,966	2,149	11,432	748	5,857	3,041	32,044
23 Jul	771	2,558	2,919	13,990	486	3,369	3,527	35,413
24 Jul	634	2,032	3,554	16,023	433	2,927	3,960	38,340
25 Jul	96	537	3,649	16,560	131	1,408	4,091	39,748
26 Jul	192	918	3,842	17,477	487	3,556	4,578	43,304
27 Jul	669	2,058	4,511	19,535	943	4,541	5,521	47,845
28 Jul	1,872	4,846	6,383	24,381	1,775	7,740	7,296	55,584
29 Jul	3,335	8,016	9,718	32,396	1,419	7,608	8,715	63,193
30 Jul	2,275	5,452	11,992	37,848	1,340	6,251	10,055	69,444
31 Jul	1,557	3,621	13,550	41,469	1,105	4,740	11,160	74,184
1 Aug	565	1,554	14,115	43,023	446	2,213	11,606	76,397
2 Aug	625	1,702	14,740	44,725	459	2,308	12,066	78,705
3 Aug	8	40	14,748	44,766	12	125	12,078	78,830
4 Aug	10	35	14,758	44,801	12	71	12,090	78,902
5 Aug	17	68	14,775	44,868	16	112	12,106	79,014
6 Aug	69	231	14,843	45,100	88	467	12,194	79,480
7 Aug	312	930	15,155	46,030	582	2,101	12,776	81,582
8 Aug	1,247	2,821	16,402	48,850	810	3,446	13,586	85,028
9 Aug	3,424	6,673	19,826	55,523	1,297	5,610	14,882	90,638
10 Aug	4,798	7,001	24,624	62,524	492	2,881	15,375	93,519
11 Aug	8,547	11,132	33,171	73,656	552	3,350	15,927	96,868
12 Aug	8,083	9,652	41,254	83,307	299	1,945	16,227	98,813
13 Aug	5,107	5,848	46,360	89,155	134	906	16,361	99,719
14 Aug	2,401	2,960	48,762	92,115	111	705	16,472	100,424
15 Aug	975	1,250	49,736	93,366	42	273	16,514	100,697

Appendix C3.–Yentna River north bank DIDSON estimates (total fish) by day and hour, 2011.

	Estimates by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	0	12	12	6	0	0	6	12	6	0	6	18
8 Jul	12	0	0	18	18	12	0	0	12	6	6	12
9 Jul	12	6	6	6	6	18	18	6	0	24	12	0
10 Jul	12	6	12	0	0	0	6	6	6	12	12	12
11 Jul	12	18	12	18	0	0	0	18	6	0	6	18
12 Jul	12	6	36	12	6	18	6	24	0	18	18	6
13 Jul	0	6	12	0	6	0	6	6	0	0	12	0
14 Jul	0	6	18	12	18	0	18	12	6	6	6	12
15 Jul	12	30	24	48	36	12	18	6	18	6	18	0
16 Jul	60	102	72	84	102	30	60	48	0	18	24	48
17 Jul	54	78	48	36	6	18	24	24	12	36	84	30
18 Jul	132	48	126	102	102	18	66	42	24	162	186	162
19 Jul	240	282	174	228	66	66	162	30	84	48	168	288
20 Jul	642	624	426	300	258	72	48	108	114	204	168	288
21 Jul	522	612	354	588	180	138	168	126	42	192	210	462
22 Jul	408	948	498	738	552	180	132	102	138	222	234	456
23 Jul	402	624	414	564	492	252	141	42	30	132	252	444
24 Jul	210	540	426	288	120	108	18	96	78	192	132	48
25 Jul	108	132	156	72	96	30	60	48	54	54	144	126
26 Jul	222	156	102	54	54	54	60	24	54	60	78	132
27 Jul	150	120	102	133	133	133	133	36	90	60	54	222
28 Jul	384	540	318	228	240	96	30	150	96	192	90	528
29 Jul	1,128	864	654	552	360	210	84	156	84	210	90	1026
30 Jul	942	738	750	456	582	222	121	156	120	144	744	162
31 Jul	498	330	336	462	138	30	78	42	36	72	36	300
1 Aug	180	168	168	132	108	114	72	60	150	174	216	66
2 Aug	138	144	300	192	144	120	36	60	54	84	48	198
3 Aug	126	132	72	78	72	30	58	18	12	24	18	58
4 Aug	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5 Aug	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6 Aug	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7 Aug	132	132	132	132	132	132	132	132	132	132	120	120
8 Aug	30	42	18	18	12	12	18	6	42	48	72	54
9 Aug	126	120	126	84	72	36	60	48	72	192	30	120
10 Aug	216	96	60	36	18	48	60	42	-6	24	66	114
11 Aug	108	78	66	120	60	30	72	42	108	90	84	354
12 Aug	102	120	96	102	78	54	108	42	61	114	282	414
13 Aug	84	84	72	60	30	60	18	24	30	102	42	78
14 Aug	120	24	36	30	36	24	6	6	6	12	36	84
15 Aug	36	6	24	30	30	18	6	0	12	24	28	28
Total	7,572	7,974	6,258	6,019	4,363	2,395	2,109	1,800	1,783	3,090	3,832	6,488
Daily %	6.8	7.2	5.6	5.4	3.9	2.2	1.9	1.6	1.6	2.8	3.5	5.8
Cum %	6.8	14.0	19.7	25.1	29.0	31.2	33.1	34.7	36.3	39.1	42.5	48.4

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Appendix C3.–Page 2 of 2.

	Estimates by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
7 Jul	12	0	6	6	0	-6	13	0	6	6	12	0
8 Jul	0	0	6	12	9	9	27	18	12	18	6	6
9 Jul	6	6	6	6	0	0	6	24	24	18	0	6
10 Jul	18	12	12	18	18	24	30	24	12	18	6	12
11 Jul	6	6	12	6	18	0	12	12	24	12	12	12
12 Jul	6	0	6	0	12	6	24	6	0	0	6	12
13 Jul	12	-6	12	15	0	12	6	6	6	18	0	30
14 Jul	24	12	0	0	12	12	18	12	24	18	30	48
15 Jul	24	24	48	48	42	66	24	66	36	24	48	72
16 Jul	48	60	32	18	30	66	24	132	30	90	48	54
17 Jul	42	42	42	72	150	144	54	174	132	84	78	120
18 Jul	108	132	234	72	60	84	156	480	30	96	120	72
19 Jul	144	108	216	96	102	108	144	504	120	108	132	234
20 Jul	342	108	240	78	378	540	162	588	144	300	276	420
21 Jul	216	138	318	108	312	306	384	732	468	264	438	312
22 Jul	126	312	390	228	426	534	552	864	510	408	426	282
23 Jul	156	162	282	282	306	216	84	528	318	66	162	198
24 Jul	72	114	144	144	138	114	96	288	145	48	36	60
25 Jul	42	132	108	54	66	168	96	294	72	138	198	108
26 Jul	72	84	186	48	114	78	90	186	102	48	72	84
27 Jul	84	48	114	66	150	102	96	414	252	222	90	179
28 Jul	270	294	288	105	240	345	108	996	342	228	228	108
29 Jul	390	378	558	132	642	546	234	1014	294	222	300	336
30 Jul	108	198	210	438	360	408	306	432	258	108	300	120
31 Jul	60	474	264	90	210	150	120	336	108	60	150	90
1 Aug	102	54	90	48	162	120	156	402	168	132	84	78
2 Aug	48	66	66	30	48	18	48	60	54	24	66	42
3 Aug	58	58	58	58	58	58	58	58	58	58	58	58
4 Aug	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5 Aug	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6 Aug	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7 Aug	72	114	210	156	222	138	162	138	138	114	72	78
8 Aug	48	30	36	54	42	96	156	156	162	120	102	132
9 Aug	102	156	102	162	36	114	90	204	36	60	90	63
10 Aug	60	60	84	36	114	126	84	186	66	54	30	36
11 Aug	72	120	198	102	264	150	174	330	72	168	84	162
12 Aug	66	168	168	564	252	168	264	516	138	138	72	162
13 Aug	30	54	96	126	162	60	72	282	30	48	42	36
14 Aug	48	42	48	42	48	24	90	42	12	132	24	36
15 Aug	28	28	28	60	84	36	36	66	6	12	6	42
Total	3,122	3,788	4,918	3,580	5,287	5,140	4,256	10,570	4,410	3,682	3,904	3,900
Daily %	2.8	3.4	4.4	3.2	4.8	4.6	3.8	9.5	4.0	3.3	3.5	3.5
Cum %	51.2	54.6	59.1	62.3	67.0	71.7	75.5	85.0	89.0	92.3	95.9	99.4

Appendix C4.–Yentna River south bank DIDSON estimates (total fish) by day and hour, 2011.

	Counts by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	2	2	2	2	2	2	0	0	0	12	0	0
8 Jul	0	0	12	0	6	6	6	6	0	6	6	6
9 Jul	6	6	12	18	0	12	0	0	0	0	0	0
10 Jul	0	6	6	6	6	6	6	0	12	12	0	6
11 Jul	6	-6	12	0	0	12	0	0	6	12	18	0
12 Jul	0	18	12	6	0	12	0	0	12	18	6	12
13 Jul	6	12	0	6	0	0	6	6	0	6	12	0
14 Jul	12	0	0	6	12	18	18	36	6	6	12	24
15 Jul	30	6	30	36	24	6	18	12	18	12	36	36
16 Jul	30	54	78	48	24	54	12	12	24	12	6	42
17 Jul	66	36	72	66	24	12	18	6	0	42	18	66
18 Jul	120	144	162	126	138	156	90	72	108	150	444	954
19 Jul	990	2,274	2,574	2,088	1,590	414	654	786	1,074	1,560	1,140	1,818
20 Jul	654	918	942	1,170	756	660	402	216	132	300	978	1,356
21 Jul	504	768	744	780	523	523	342	96	480	342	534	804
22 Jul	390	636	522	522	312	318	246	210	282	444	522	936
23 Jul	402	480	270	396	162	96	186	132	156	246	198	498
24 Jul	330	504	276	438	156	132	198	132	162	258	222	510
25 Jul	48	42	54	12	24	6	222	36	174	66	48	276
26 Jul	102	204	174	210	168	168	102	120	78	102	72	402
27 Jul	318	114	258	228	108	126	84	96	72	240	360	540
28 Jul	174	378	300	288	330	186	120	258	474	498	432	495
29 Jul	234	630	480	438	432	420	336	498	444	642	774	816
30 Jul	300	396	366	408	240	234	300	180	474	480	672	414
31 Jul	228	210	270	228	252	96	192	114	6	222	390	588
1 Aug	312	126	120	102	114	90	78	42	60	138	96	168
2 Aug	96	144	168	150	180	150	108	126	300	300	396	72
3 Aug	18	6	42	48	24	12	24	0	0	12	-6	0
4 Aug	6	0	0	6	0	0	0	0	0	6	12	12
5 Aug	30	6	0	0	0	18	6	0	0	6	6	12
6 Aug	12	6	6	6	0	6	6	6	6	18	6	36
7 Aug	12	18	30	54	42	36	12	42	12	30	42	114
8 Aug	42	24	36	18	-6	24	48	18	96	66	132	108
9 Aug	264	240	294	144	96	126	186	60	642	534	648	588
10 Aug	198	132	144	90	78	72	60	54	186	174	564	216
11 Aug	228	192	102	66	42	78	282	24	516	642	276	1,152
12 Aug	318	276	96	174	114	168	84	66	492	246	324	234
13 Aug	282	120	66	84	90	66	66	60	246	258	180	444
14 Aug	84	18	18	18	6	24	18	78	42	108	192	372
15 Aug	36	30	42	24	36	30	30	42	6	60	54	54
Total	6,890	9,170	8,792	8,510	6,105	4,575	4,566	3,642	6,798	8,286	9,822	14,181
Daily%	3.0	4.0	3.8	3.7	2.6	2.0	2.0	1.6	2.9	3.6	4.3	6.1
Cum%	3.0	7.0	10.8	14.4	17.1	19.1	21.0	22.6	25.6	29.2	33.4	39.6

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Appendix C4.–Page 2 of 2.

	Counts by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
7 Jul	2	0	0	0	0	12	0	12	0	0	0	0
8 Jul	6	6	12	24	12	0	6	18	0	6	0	6
9 Jul	12	6	6	0	12	6	0	0	0	12	0	-6
10 Jul	24	6	12	0	0	0	42	0	0	24	12	12
11 Jul	0	0	12	12	36	24	12	12	0	0	0	6
12 Jul	6	0	24	18	12	12	18	0	0	18	0	6
13 Jul	0	6	6	6	-6	18	0	6	6	0	6	6
14 Jul	0	0	42	12	12	30	12	30	6	18	24	36
15 Jul	54	12	48	6	30	30	24	24	60	24	54	6
16 Jul	18	42	30	12	66	6	18	48	18	18	12	48
17 Jul	42	24	54	36	60	6	12	114	12	78	6	42
18 Jul	564	528	1,104	1,476	834	1,158	486	1,350	894	1,440	1,152	882
19 Jul	1,308	1,326	1,020	1,398	816	594	954	1,218	978	582	540	324
20 Jul	690	1,212	648	930	588	624	630	678	132	420	552	378
21 Jul	438	684	588	648	990	642	546	528	294	390	126	240
22 Jul	246	474	846	624	492	636	552	732	300	426	450	138
23 Jul	306	270	612	354	432	270	192	246	312	276	144	456
24 Jul	312	258	312	276	324	354	288	276	156	60	114	6
25 Jul	102	90	234	246	126	258	222	258	252	276	222	180
26 Jul	348	180	252	414	456	444	384	480	342	282	216	240
27 Jul	234	252	66	468	336	486	666	636	276	318	264	312
28 Jul	594	744	888	1,002	1,008	594	486	834	540	546	540	384
29 Jul	924	558	924	1,128	696	636	864	882	570	576	810	576
30 Jul	564	648	516	546	456	750	468	576	426	630	372	451
31 Jul	666	510	666	528	342	486	384	300	384	288	204	48
1 Aug	234	150	258	240	318	186	138	252	138	114	144	120
2 Aug	300	378	234	174	150	186	120	126	24	54	12	36
3 Aug	36	12	12	0	12	0	6	24	6	12	6	0
4 Aug	0	12	6	12	0	0	6	6	24	0	6	6
5 Aug	6	12	12	6	24	6	12	12	18	6	12	0
6 Aug	0	60	54	24	54	42	72	54	54	60	72	72
7 Aug	84	210	264	246	324	360	342	126	114	120	114	60
8 Aug	672	282	486	420	408	606	372	234	354	426	390	318
9 Aug	282	528	240	768	780	642	696	660	510	228	390	384
10 Aug	396	294	534	492	888	696	714	924	468	558	480	204
11 Aug	756	768	1,098	492	1,326	708	690	1,332	648	522	234	348
12 Aug	294	780	498	858	534	594	702	1,140	648	486	822	408
13 Aug	420	312	294	264	828	600	306	492	390	138	18	162
14 Aug	102	144	456	300	330	252	108	270	102	96	66	36
15 Aug	30	54	102	84	84	168	126	66	54	78	36	54
Total	11,072	11,832	13,470	14,544	14,190	13,122	11,676	14,976	9,510	9,606	8,622	6,986
Daily%	4.8	5.1	5.8	6.3	6.1	5.7	5.1	6.5	4.1	4.2	3.7	3.0
Cum%	44.3	49.5	55.3	61.6	67.7	73.4	78.5	85.0	89.1	93.2	97.0	100.0

APPENDIX D: CRESCENT RIVER DATA

Appendix D1.–Escapement counts by species for the north bank of the Crescent River, 2011.

	Sockeye		Pink		Chum		Chinook		Dolly Varden	
Date	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	623	623	0	0	0	0	0	0	0	0
25 Jun	1,100	1,723	0	0	0	0	0	0	0	0
26 Jun	297	2,020	0	0	0	0	0	0	0	0
27 Jun	137	2,157	0	0	0	0	0	0	0	0
28 Jun	77	2,234	0	0	0	0	0	0	0	0
29 Jun	165	2,399	0	0	0	0	0	0	0	0
30 Jun	1,988	4,387	0	0	0	0	0	0	0	0
1 Jul	948	5,335	0	0	10	10	0	0	0	0
2 Jul	613	5,948	0	0	7	17	0	0	0	0
3 Jul	2,226	8,174	0	0	139	156	0	0	0	0
4 Jul	2,291	10,465	0	0	0	156	0	0	0	0
5 Jul	1,551	12,016	0	0	0	156	0	0	0	0
6 Jul	1,161	13,177	0	0	0	156	0	0	0	0
7 Jul	1,296	14,473	0	0	0	156	0	0	0	0
8 Jul	1,408	15,881	83	83	0	156	0	0	0	0
9 Jul	480	16,361	48	131	0	156	0	0	0	0
10 Jul	278	16,639	31	162	0	156	0	0	0	0
11 Jul	499	17,138	33	195	0	156	0	0	33	33
12 Jul	1,563	18,701	78	273	0	156	0	0	0	33
13 Jul	1,582	20,283	70	343	0	156	0	0	35	68
14 Jul	2,457	22,740	16	359	0	156	0	0	31	99
15 Jul	6,170	28,910	58	417	0	156	0	0	231	330
16 Jul	3,834	32,743	0	417	0	156	0	0	147	477
17 Jul	3,439	36,182	63	479	188	344	0	0	0	477
18 Jul	2,035	38,217	46	525	93	437	0	0	69	546
19 Jul	1,658	39,875	276	802	0	437	0	0	0	546
20 Jul	926	40,801	45	847	0	437	0	0	23	569
21 Jul	763	41,564	48	895	15	452	0	0	64	633
22 Jul	427	41,991	0	895	43	495	0	0	28	661
23 Jul	659	42,649	14	909	37	532	0	0	72	733
24 Jul	623	43,273	35	944	12	544	0	0	93	826
25 Jul	2,079	45,352	0	944	85	629	0	0	290	1,116
26 Jul	366	45,718	122	1,066	0	629	0	0	214	1,330
27 Jul	127	45,845	4	1,069	5	634	0	0	26	1,356
28 Jul	307	46,152	29	1,099	29	663	0	0	29	1,385
29 Jul	444	46,596	61	1,159	20	683	0	0	81	1,466
30 Jul	274	46,870	77	1,236	88	771	0	0	88	1,554
31 Jul	142	47,012	142	1,378	155	926	0	0	64	1,618
1 Aug	205	47,217	16	1,394	63	989	0	0	63	1,681
Percent		92.1		2.7		1.9		0.0		3.3
Total		51,281	(57% of total escapement)							

Appendix D2.–Escapement counts by species for the south bank of the Crescent River, 2011.

	Sockeye		Pink		Chum		Chinook		Dolly Varden	
Date	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	1,163	1,163	0	0	0	0	0	0	0	0
25 Jun	755	1,918	0	0	0	0	0	0	0	0
26 Jun	59	1,977	0	0	0	0	0	0	0	0
27 Jun	32	2,009	0	0	0	0	0	0	0	0
28 Jun	37	2,046	0	0	0	0	0	0	0	0
29 Jun	636	2,682	0	0	0	0	0	0	0	0
30 Jun	960	3,642	0	0	0	0	0	0	0	0
1 Jul	995	4,637	0	0	10	10	0	0	0	0
2 Jul	748	5,385	0	0	9	19	0	0	0	0
3 Jul	1,001	6,386	0	0	63	82	0	0	0	0
4 Jul	1,304	7,690	0	0	0	82	0	0	0	0
5 Jul	980	8,670	0	0	0	82	0	0	0	0
6 Jul	789	9,459	0	0	0	82	0	0	0	0
7 Jul	906	10,365	0	0	0	82	0	0	0	0
8 Jul	616	10,981	36	36	0	82	0	0	0	0
9 Jul	704	11,685	70	107	0	82	0	0	0	0
10 Jul	611	12,296	68	174	0	82	0	0	0	0
11 Jul	815	13,111	54	229	0	82	0	0	54	54
12 Jul	1,061	14,172	53	282	0	82	0	0	0	54
13 Jul	1,189	15,361	53	335	0	82	0	0	26	81
14 Jul	1,655	17,016	11	345	0	82	0	0	21	102
15 Jul	2,553	19,569	24	369	0	82	0	0	95	197
16 Jul	2,072	21,641	0	369	0	82	0	0	80	277
17 Jul	1,595	23,236	29	398	87	169	0	0	0	277
18 Jul	1,392	24,628	32	430	64	232	0	0	47	324
19 Jul	1,774	26,402	296	725	0	232	0	0	0	324
20 Jul	1,055	27,457	51	777	0	232	0	0	26	350
21 Jul	858	28,315	54	831	17	249	0	0	72	422
22 Jul	535	28,850	0	831	53	303	0	0	36	458
23 Jul	805	29,655	18	849	45	348	0	0	88	546
24 Jul	698	30,352	39	888	13	361	0	0	104	650
25 Jul	1,599	31,951	0	888	65	426	0	0	223	873
26 Jul	487	32,438	162	1,050	0	426	0	0	284	1,157
27 Jul	466	32,904	13	1,063	16	442	0	0	96	1,253
28 Jul	594	33,498	57	1,120	57	499	0	0	57	1,309
29 Jul	506	34,004	69	1,189	23	522	0	0	92	1,401
30 Jul	223	34,228	63	1,252	72	593	0	0	72	1,473
31 Jul	143	34,371	143	1,395	156	750	0	0	65	1,538
1 Aug	363	34,734	28	1,423	112	861	0	0	112	1,650
Percent		89.8		3.7		2.2		0.0		4.3
Total		38,669	(43% of total escapement)							

Appendix D3.–Crescent River north bank escapement counts (total fish) by day and hour, 2011.

	Counts by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	50	52	17	10	29	17	21	37	11	4	19	81
25 Jun	21	28	32	39	82	98	65	53	41	41	23	70
26 Jun	9	5	2	7	20	11	14	11	16	30	9	28
27 Jun	0	4	9	3	8	10	6	1	8	4	8	9
28 Jun	3	0	1	1	0	3	2	3	1	2	1	0
29 Jun	5	1	6	6	8	11	10	8	7	4	8	2
30 Jun	1	7	0	1	3	4	1	1	3	14	32	145
01 Jul	29	26	36	13	24	42	96	60	60	52	38	46
02 Jul	15	6	1	1	2	0	0	2	32	28	4	11
03 Jul	13	11	0	1	0	1	1	0	1	4	4	8
04 Jul	13	25	10	6	31	19	13	32	94	170	68	123
05 Jul	18	19	4	26	138	4	105	2	82	33	97	63
06 Jul	67	4	1	6	13	8	0	16	7	65	46	117
07 Jul	13	8	19	14	29	9	8	10	0	2	20	168
08 Jul	35	10	57	103	85	65	35	20	267	131	75	48
09 Jul	72	24	12	9	31	17	27	7	4	18	21	13
10 Jul	2	10	6	13	6	6	0	1	2	5	6	17
11 Jul	0	3	8	18	9	8	8	5	2	2	20	8
12 Jul	16	17	28	36	67	65	39	13	10	29	48	80
13 Jul	2	2	3	0	29	68	60	95	50	23	58	49
14 Jul	11	32	13	15	22	105	134	126	42	59	63	93
15 Jul	8	32	4	3	3	129	490	218	110	233	470	221
16 Jul	15	8	1	7	17	159	300	246	75	274	261	143
17 Jul	19	5	0	9	7	25	127	267	383	161	180	109
18 Jul	183	15	0	46	96	88	12	234	212	85	25	67
19 Jul	45	115	24	54	22	40	40	4	73	193	117	62
20 Jul	16	14	6	11	120	30	68	0	34	35	35	38
21 Jul	20	15	15	114	18	108	27	26	26	37	35	28
22 Jul	26	37	23	46	31	38	67	22	33	27	16	13
23 Jul	16	34	11	20	37	50	34	18	42	17	36	32
24 Jul	2	5	1	2	15	12	11	13	18	30	22	57
25 Jul	52	5	8	18	48	151	112	214	192	301	128	150
26 Jul	88	127	41	44	35	31	28	32	27	18	12	10
27 Jul	2	5	8	6	3	15	8	6	5	6	33	7
28 Jul	2	2	4	4	10	9	7	12	5	3	1	3
29 Jul	7	8	16	15	30	26	38	39	28	29	29	20
30 Jul	2	12	12	7	5	35	25	31	33	32	24	24
31 Jul	2	2	11	6	8	42	34	24	22	23	25	12
1 Aug	4	6	4	3	8	21	23	13	12	19	23	19
Total	904	741	454	743	1,149	1,580	2,096	1,922	2,070	2,243	2,140	2,194
%	1.8	1.4	0.9	1.4	2.2	3.1	4.1	3.7	4.0	4.4	4.2	4.3
Cum	1.8	3.2	4.1	5.5	7.8	10.9	15.0	18.7	22.7	27.1	31.3	35.6

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	Counts by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
24 Jun	71	31	13	37	30	26	6	9	14	12	18	8
25 Jun	79	73	28	69	61	50	68	38	19	11	7	4
26 Jun	22	10	17	10	16	13	20	20	2	2	3	0
27 Jun	11	14	6	10	7	7	0	0	9	0	2	1
28 Jun	3	8	4	2	6	5	7	7	6	4	6	2
29 Jun	3	9	13	9	7	5	13	6	10	7	3	4
30 Jun	70	58	72	24	25	59	437	450	244	116	114	107
1 Jul	11	10	7	9	2	2	126	131	64	55	11	8
2 Jul	11	3	15	15	11	1	3	122	190	90	33	24
3 Jul	19	45	29	8	19	13	209	915	671	288	64	41
4 Jul	67	59	94	42	29	23	32	147	627	406	105	56
5 Jul	78	47	56	17	34	72	33	38	184	250	119	32
6 Jul	51	39	20	32	21	13	17	11	58	299	190	60
7 Jul	83	105	100	29	46	5	18	12	20	33	384	161
8 Jul	137	72	100	49	39	30	13	3	2	1	1	113
9 Jul	3	20	40	98	62	14	10	16	8	1	0	1
10 Jul	2	3	48	12	40	46	41	18	16	2	7	0
11 Jul	27	23	22	10	31	116	123	57	40	3	12	11
12 Jul	100	87	74	269	107	203	173	106	35	27	7	5
13 Jul	80	18	84	33	182	321	203	127	85	62	35	18
14 Jul	141	75	52	61	39	693	397	137	88	48	43	15
15 Jul	139	172	91	63	141	1,496	1,420	417	334	94	147	23
16 Jul	110	49	53	223	460	70	766	469	142	87	30	16
17 Jul	73	28	32	8	258	147	559	400	556	196	106	34
18 Jul	42	19	29	18	15	8	4	306	433	186	57	63
19 Jul	47	98	43	23	21	7	5	41	215	422	162	61
20 Jul	51	49	19	32	19	17	7	14	99	196	46	38
21 Jul	25	20	8	13	12	30	12	13	14	36	155	83
22 Jul	28	7	16	12	10	5	6	3	7	4	6	15
23 Jul	21	43	62	49	71	56	44	32	6	44	1	6
24 Jul	34	43	38	85	71	53	50	33	76	30	33	29
25 Jul	123	78	105	64	309	241	46	28	25	27	16	13
26 Jul	24	33	39	12	17	8	10	18	27	14	4	3
27 Jul	5	3	7	0	4	8	16	2	9	2	1	0
28 Jul	12	9	20	15	36	27	38	46	56	32	29	13
29 Jul	21	13	17	22	9	27	39	46	50	20	39	18
30 Jul	36	23	27	5	21	26	18	28	23	30	27	21
31 Jul	24	27	34	18	13	20	21	21	31	35	35	13
1 Aug	15	23	15	20	6	14	27	14	16	19	12	11
Total	1,899	1,546	1,549	1,527	2,307	3,977	5,037	4,301	4,511	3,191	2,070	1,131
%	3.7	3.0	3.0	3.0	4.5	7.8	9.8	8.4	8.8	6.2	4.0	2.2
Cum	39.3	42.3	45.3	48.3	52.8	60.5	70.4	78.7	87.5	93.8	97.8	100.0

Appendix D4.–Crescent River south bank escapement counts (total fish) by day and hour, 2011.

	Counts by Hour											
Date	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	94	88	37	0	9	31	33	44	15	19	19	88
25 Jun	6	2	5	24	22	20	45	18	56	67	22	27
26 Jun	3	0	1	1	1	1	6	1	5	0	0	0
27 Jun	0	0	0	3	9	3	2	1	4	2	0	1
28 Jun	0	3	0	0	0	0	0	2	0	0	1	8
29 Jun	0	6	2	0	1	2	1	0	0	2	1	1
30 Jun	31	29	8	8	13	15	38	31	74	78	36	32
01 Jul	10	17	18	7	16	12	93	54	32	39	77	46
02 Jul	13	9	0	3	6	0	5	3	42	52	35	19
03 Jul	26	24	1	2	0	19	2	9	70	0	19	44
04 Jul	6	21	38	23	39	17	43	19	77	93	106	103
05 Jul	9	33	2	18	9	8	0	7	21	24	87	88
06 Jul	21	7	10	0	11	15	11	18	21	2	18	93
07 Jul	4	18	31	15	25	9	1	1	2	1	20	9
08 Jul	33	22	22	13	5	10	20	19	31	18	44	55
09 Jul	84	45	25	14	0	12	54	30	32	27	27	28
10 Jul	1	26	30	15	4	1	0	0	4	6	21	9
11 Jul	0	30	47	32	9	17	30	26	29	39	48	45
12 Jul	89	17	25	40	18	26	49	22	39	22	57	83
13 Jul	7	1	8	10	18	74	63	98	55	41	47	33
14 Jul	15	1	4	6	30	108	109	110	37	43	63	34
15 Jul	3	0	3	1	5	27	173	212	103	177	180	240
16 Jul	12	3	4	48	20	56	162	205	91	101	60	56
17 Jul	1	1	3	1	3	9	141	221	167	92	65	82
18 Jul	36	25	20	38	4	50	2	61	125	93	52	42
19 Jul	29	35	22	46	32	56	41	35	49	116	203	119
20 Jul	20	12	8	17	24	22	10	18	39	57	102	69
21 Jul	3	4	2	5	2	37	36	12	17	25	43	39
22 Jul	36	14	6	33	18	42	29	34	32	19	19	29
23 Jul	3	4	6	2	1	56	41	61	78	35	48	33
24 Jul	10	5	4	10	3	4	12	23	16	23	47	48
25 Jul	0	11	7	19	36	41	213	36	136	166	112	99
26 Jul	7	15	12	54	22	11	47	24	21	57	18	25
27 Jul	15	22	8	12	15	16	18	25	7	12	41	21
28 Jul	6	12	4	14	13	59	27	45	43	23	38	12
29 Jul	5	4	8	2	30	37	56	44	41	33	18	23
30 Jul	3	1	1	3	4	10	21	19	16	27	34	17
31 Jul	5	0	1	8	2	19	41	26	12	7	27	15
1 Aug	15	1	0	7	5	14	6	14	27	25	24	24
Total	661	568	433	554	484	966	1,681	1,628	1,666	1,663	1,879	1,839
%	1.7	1.5	1.1	1.4	1.3	2.5	4.3	4.2	4.3	4.3	4.9	4.8
Cum	1.7	3.2	4.3	5.7	7.0	9.5	13.8	18.0	22.3	26.6	31.5	36.3

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Appendix D4.–Page 2 of 2.

	Counts by Hour											
Date	13	14	15	16	17	18	19	20	21	22	23	24
24 Jun	102	126	71	56	112	49	82	5	20	23	38	2
25 Jun	66	59	59	16	79	56	51	21	18	13	2	1
26 Jun	2	0	15	7	2	3	4	4	1	1	1	0
27 Jun	0	2	0	0	3	0	1	0	1	0	0	0
28 Jun	1	6	0	8	0	0	2	1	1	4	0	0
29 Jun	4	1	2	0	41	54	153	134	59	67	42	63
30 Jun	41	25	39	33	40	31	93	113	36	52	37	27
1 Jul	60	34	10	26	75	12	110	103	69	30	22	33
2 Jul	41	46	77	33	19	10	26	92	76	85	44	21
3 Jul	65	42	52	28	23	12	32	198	239	93	51	13
4 Jul	63	45	42	20	45	39	17	44	157	109	86	52
5 Jul	88	52	59	98	35	16	21	33	58	142	45	27
6 Jul	69	43	24	15	24	25	13	28	10	146	130	35
7 Jul	46	93	82	48	50	23	22	22	16	20	192	156
8 Jul	32	87	83	46	39	30	13	4	4	0	2	20
9 Jul	53	51	54	83	63	34	8	24	10	9	5	2
10 Jul	21	60	53	64	78	134	67	59	10	8	8	0
11 Jul	32	60	31	38	66	48	58	100	79	9	18	33
12 Jul	80	62	28	34	104	122	72	52	33	25	8	7
13 Jul	47	35	87	34	94	178	121	85	45	48	22	17
14 Jul	189	77	94	56	46	110	210	148	77	68	36	16
15 Jul	152	186	110	69	87	120	293	231	169	87	28	16
16 Jul	134	87	29	191	50	36	196	309	128	79	62	33
17 Jul	42	55	41	28	32	22	27	201	209	129	90	49
18 Jul	63	40	31	28	43	35	47	49	180	180	143	147
19 Jul	74	70	87	54	50	77	28	59	180	267	232	109
20 Jul	88	67	64	66	19	17	48	55	43	130	84	53
21 Jul	47	83	83	52	31	202	23	6	25	42	128	54
22 Jul	11	73	58	27	26	19	32	8	19	13	9	18
23 Jul	30	65	164	97	34	49	72	31	33	6	5	1
24 Jul	60	54	93	104	46	66	40	31	42	23	53	37
25 Jul	119	152	54	107	114	194	146	55	26	16	22	6
26 Jul	36	81	119	15	42	36	40	66	106	48	23	9
27 Jul	62	37	15	24	14	51	53	38	42	20	5	18
28 Jul	13	19	53	41	39	44	57	72	44	38	30	18
29 Jul	22	44	34	18	17	30	43	51	49	32	33	16
30 Jul	16	19	6	41	22	36	33	28	20	24	11	17
31 Jul	29	44	39	37	22	34	30	26	29	27	22	6
1 Aug	33	47	48	51	54	31	34	46	26	36	28	19
Total	2,133	2,229	2,090	1,793	1,780	2,085	2,418	2,632	2,389	2,149	1,797	1,151
%	5.5	5.8	5.4	4.6	4.6	5.4	6.3	6.8	6.2	5.6	4.6	3.0
Cum	41.8	47.5	52.9	57.6	62.2	67.6	73.8	80.6	86.8	92.4	97.0	100.0

Appendix D5.–Crescent River north bank Bendix sonar escapement counts (total fish) by day and sector, 2011.

	Counts by Sector											
Date	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	19	64	104	144	102	55	10	96	17	10	1	1
25 Jun	91	293	445	202	44	8	3	3	0	3	5	3
26 Jun	28	73	100	68	21	4	0	1	1	0	1	0
27 Jun	31	33	30	29	10	4	0	0	0	0	0	0
28 Jun	9	5	21	29	9	2	2	0	0	0	0	0
29 Jun	8	8	50	62	5	2	13	14	3	0	0	0
30 Jun	22	225	826	394	327	73	11	51	38	21	0	0
1 Jul	9	32	72	169	151	79	301	64	24	44	8	5
2 Jul	0	2	19	146	97	133	172	26	3	10	9	3
3 Jul	6	63	812	699	424	202	111	27	4	3	12	2
4 Jul	1	194	1,079	595	218	115	49	28	7	3	0	2
5 Jul	59	173	632	253	193	104	52	77	7	1	0	0
6 Jul	6	113	386	205	105	107	176	51	9	2	0	1
7 Jul	4	40	266	268	222	159	223	96	11	5	2	0
8 Jul	7	36	247	225	137	146	170	378	136	7	1	1
9 Jul	0	35	59	137	93	100	63	29	11	0	0	1
10 Jul	0	3	7	36	27	63	93	54	21	3	0	2
11 Jul	8	17	75	173	156	88	31	11	6	1	0	0
12 Jul	278	592	490	108	53	16	2	0	100	1	0	1
13 Jul	578	638	280	77	34	10	2	1	2	6	56	3
14 Jul	872	948	488	129	31	1	3	0	0	1	31	0
15 Jul	2,517	3,132	421	246	97	25	15	2	0	2	0	1
16 Jul	792	1,936	466	523	220	27	11	2	3	1	0	0
17 Jul	1,028	1,953	313	220	103	38	28	5	1	0	0	0
18 Jul	167	1,213	305	284	142	81	38	7	3	2	1	0
19 Jul	174	566	205	384	294	207	93	7	3	0	0	1
20 Jul	191	342	53	103	113	109	71	6	5	1	0	0
21 Jul	161	359	69	151	48	59	37	4	2	0	0	0
22 Jul	59	143	36	86	86	51	34	2	1	0	0	0
23 Jul	222	310	59	108	52	14	6	5	2	0	1	3
24 Jul	184	230	164	90	46	30	7	8	2	1	1	0
25 Jul	248	809	957	255	64	73	28	16	2	1	1	0
26 Jul	100	172	171	98	41	76	24	18	2	0	0	0
27 Jul	21	29	8	46	31	12	5	5	1	3	0	0
28 Jul	29	47	80	134	47	35	15	2	1	5	0	0
29 Jul	75	112	78	135	62	83	45	5	5	5	1	0
30 Jul	77	99	129	139	40	19	10	4	4	1	3	2
31 Jul	76	101	132	125	43	16	8	1	0	0	1	0
1 Aug	33	34	72	132	38	21	6	4	3	1	3	0
Total	8,190	15,174	10,206	7,407	4,026	2,447	1,968	1,110	440	144	138	32
%	16.0	29.6	19.9	14.4	7.9	4.8	3.8	2.2	0.9	0.3	0.3	0.1
Cum	16.0	45.6	65.5	79.9	87.8	92.5	96.4	98.5	99.4	99.7	99.9	100.0

Appendix D6.–Crescent River south bank Bendix sonar counts (total fish) by day and sector, 2011.

	Counts by Sector											
Date	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	1	87	206	497	334	35	2	0	0	0	0	1
25 Jun	17	45	238	298	133	21	1	0	0	0	0	2
26 Jun	11	11	0	0	5	9	7	0	1	0	0	15
27 Jun	11	10	5	0	2	3	0	1	0	0	0	0
28 Jun	12	14	0	1	2	2	1	0	0	4	0	1
29 Jun	24	206	269	62	16	16	19	15	3	0	3	3
30 Jun	14	227	474	139	42	24	9	10	3	0	5	13
1 Jul	7	172	504	176	77	33	11	10	6	4	5	0
2 Jul	5	109	376	149	57	39	13	5	2	0	1	1
3 Jul	2	108	420	278	121	77	27	14	5	1	2	9
4 Jul	6	283	643	212	75	50	24	9	1	1	0	0
5 Jul	10	148	407	210	97	59	27	17	2	1	0	2
6 Jul	4	96	262	171	112	71	51	20	1	1	0	0
7 Jul	18	127	339	185	112	76	28	16	2	0	1	2
8 Jul	0	31	115	153	168	113	46	21	4	0	1	0
9 Jul	1	10	80	111	158	231	113	61	7	2	0	0
10 Jul	5	5	26	61	124	164	152	113	21	7	0	1
11 Jul	3	11	52	102	141	246	225	102	28	8	3	3
12 Jul	5	63	231	237	212	162	98	65	28	10	3	0
13 Jul	14	125	398	267	188	125	84	43	13	8	3	0
14 Jul	14	206	528	406	234	126	109	54	8	1	0	1
15 Jul	56	475	1,048	542	295	131	75	39	8	3	0	0
16 Jul	33	329	786	423	240	138	90	69	20	11	11	2
17 Jul	12	189	686	432	198	101	53	38	2	0	0	0
18 Jul	10	139	442	366	257	181	86	44	7	2	0	0
19 Jul	12	147	512	534	396	282	129	47	9	1	1	0
20 Jul	13	123	305	252	190	125	75	41	6	2	0	0
21 Jul	8	59	330	275	129	85	61	36	13	3	1	1
22 Jul	4	53	149	136	89	87	57	40	6	3	0	0
23 Jul	45	136	230	189	138	105	53	47	11	0	0	1
24 Jul	63	196	204	186	104	39	27	25	7	3	0	0
25 Jul	69	313	603	486	212	116	53	28	4	2	1	0
26 Jul	4	31	190	210	189	155	96	49	8	2	0	0
27 Jul	4	16	56	77	104	136	126	61	10	1	0	0
28 Jul	5	27	114	151	160	146	108	40	12	1	0	0
29 Jul	15	37	102	108	97	129	126	65	7	4	0	0
30 Jul	4	43	87	95	74	72	41	12	1	0	0	0
31 Jul	13	51	90	105	90	80	54	21	1	1	1	1
1 Aug	22	74	119	109	128	82	49	27	5	0	0	0
Total	576	4,532	11,626	8,391	5,500	3,872	2,406	1,305	272	87	42	59
%	1.5	11.7	30.1	21.7	14.2	10.0	6.2	3.4	0.7	0.2	0.1	0.2
Cum	1.5	13.2	43.3	65.0	79.2	89.2	95.4	98.8	99.5	99.7	99.8	100.0