Fishery Data Series No. 12-71

George River Salmon Studies, 2011

Final Report for Study 08-303
USFWS Office of Subsistence Management
Fisheries Resource Monitoring Program

by

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and

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

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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ABSTRACT

The George River is a major tributary of the Kuskokwim River and produces Chinook *Oncorhynchus tshawytscha*, chum *O. keta*, and coho salmon *O. kisutch* which contribute to subsistence and commercial salmon fisheries of the Kuskokwim River. The George River weir has operated since 1996 to monitor this salmon spawning tributary, as part of an integrated array of Kuskokwim River escapement monitoring projects. Together, these projects, including George River, provide a means to monitor and assess drainagewide escapement trends that must be considered in harvest management. This project is in place to estimate the return and age, sex, and length compositions of salmon escapements, monitor environmental variables, and facilitate other fisheries projects. In 2011, a resistance board weir was operated from 15 June to 20 September to estimate escapements of three species of Pacific salmon. Chinook escapement of 1,571 was below historic median; chum escapement of 44,640 was above historic median, and coho salmon escapement of 30,028 was above historic median passage levels. Samples were collected from fish caught in a live trap and used to describe the age and sex structure of the Chinook, chum, and coho salmon escapements. Females comprised 37.5% of the Chinook salmon escapement, 48.2% of the chum salmon escapement, and 51.2% of the coho salmon escapement. The Chinook salmon escapement was composed of seven age classes, dominated by age-1.2 fish (35.2%) with age-1.3 fish (33.5%) at a close second. The chum salmon escapement was composed of 4 age classes, dominated by age-0.3 fish (50.0%) with age-0.4 fish (48.8%) at a close second. The coho salmon escapement was composed of 4 age classes, dominated by age-2.1 fish (90.0%).

Key words Chinook salmon, *Oncorhynchus tshawytscha*, chum salmon, *Oncorhynchus keta*, coho salmon, *Oncorhynchus kisutch*, longnose suckers, *Catostomus catostomus*, George River, Kuskokwim River, upper Kuskokwim, escapement, age-sex-length, ASL, resistance board weir, mark–recapture, stock specific run timing

INTRODUCTION

The George River weir has been operated cooperatively by the Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries and the Kuskokwim Native Association (KNA) since its inception in 1996. The George River weir was implemented to fill gaps in data reflective of Middle Kuskokwim River tributaries through collection of escapement and age composition data on Chinook (*Oncorhynchus tshawytscha)*, chum (*O. keta),* and coho salmon (*O. kisutch*). These data are used in conjunction with other assessment projects to monitor salmon returns to the Kuskokwim River while aiding in the development of historical escapement, run timing, and age tables. Currently, Chinook salmon are the only species on the George River with an established escapement goal (3,100 to 7,900 fish annually). The George River Chinook salmon population has shown to track well with other Chinook populations of nearby Kuskokwim River tributaries to provide and informed inseason guess of middle Kuskokwim River escapements. It is a component of the larger escapement monitoring program on the Kuskokwim River, serving as an index site for the middle Kuskokwim River (Molyneaux and Brannian 2006). The George River originates in the northern Kuskokwim Mountains within the middle Kuskokwim River basin and flows south for approximately 120 km to its confluence with the Kuskokwim River (Figures 1 and 2). Prior to the implementation of this weir, most monitoring projects were in the lower Kuskokwim River, additionally this project was one of the first to monitor a tributary that drained from the northern half of the Kuskokwim Mountains which broadened the geographical distribution of salmon monitoring projects (Molyneaux et al. 1997). The George River is popular for sport fishing, and the river is an access route for recreational and subsistence fishermen and hunters. Professional guide operations based within and outside the Kuskokwim Area use the George River as an angling and hunting destination for their clients. In addition to escapement monitoring and age composition data collection, the weir serves as a platform for mark–recapture studies that rely on the weir as a recapture point, weather

and stream studies, and hosting high school and college interns through ADF&G's partnership with KNA.

OBJECTIVES

1. Determine daily and total Chinook, chum, and coho salmon escapements to George River from 15 June to 20 September.
2. Estimate the age, sex, and length (ASL) composition of Chinook, chum, and coho salmon escapements to the George River such that 95% confidence intervals of age composition are no wider than ±10% (α=0.05 and d=0.10).
3. Collect daily air and water temperature, stream level measurements, weather observations, and maintain automated data loggers to monitor air and stream temperatures at George River weir.
4. Serve as a platform to facilitate current and future fisheries research projects by:
    a. Serving as a sockeye salmon monitoring and recovery location for the project: *Kuskokwim River Sockeye Salmon Run Reconstruction*.
    b. Hosting local area high school students as part of KNA's High School Internship Program.

METHODS

STUDY SITE

The George River drains an area of approximately 3,558 km² of mostly upland spruce-hardwood forest. Major tributaries include the East, South, and North Forks, and Michigan and Beaver Creeks. At normal flow, the George River is stained due to organic leaching, which can limit visibility to less than one meter.

The George River provides spawning and rearing habitat for Chinook, chum, and coho salmon (ADF&G 1998), which contribute to the subsistence, commercial, and sport fisheries of the Kuskokwim River. Smaller numbers of sockeye *O. nerka* and pink salmon *O. gorbuscha* also spawn in the George River. In addition to Pacific salmon, other species found throughout the system include: Arctic grayling *Thymallus arcticus*, inconnu (Sheefish) *Stenodus leucichthys*, round whitefish *Prosopium cylindraceum*, whitefishes *Coregonus* spp., Dolly Varden *Salvelinus malma*, northern pike *Esox lucius*, longnose suckers *Catostomus catostomus*, lampreys *Lampetra* spp., slimy sculpin *Cottus cognatus*, burbot *Lota lota*, blackfish *Dallia pectoralis*, and nine-spine stickleback *Pungitius pungitius*.

The weir site is located at lat 61°55.4'N, long 157°41.9'W, approximately seven river kilometers (rkm) up the George River from its confluence with the Kuskokwim River, capturing nearly all the salmon spawning habitat within the drainage (Figure 2). The weir has operated at this location since the project began in 1996 through the joint effort of KNA and ADF&G (Linderman et al. 2002). In 1999, the fixed-panel weir design was replaced with a resistance board weir, which improved performance in subsequent years. The river channel at this site is about 110 m wide and has a depth of about 1 m during normal summer flow. The substrate is composed mostly of gravel, with some sand and cobble. Discharge measurements taken at the site over the years have ranged between 16 and 149 $m^3 \cdot s^{-1}$, with velocities reaching between 0.6

and 1.3 $m \cdot s^{-1}$ in the thalweg. Discharge measurements have not been attempted during flood conditions.

WEIR DESIGN

Details of design and materials used to construct the resistance board weir are described in Tobin (1994) with panel modifications described by Stewart (2002). The George River weir was designed with a gap of 3.33 cm (1-5/16 in) between each picket. This gap is designed to prevent all species of adult Pacific salmon with the exception of pink salmon from passing through the weir. The weir was installed across the entire 110 m channel following the techniques described by Stewart (2003). The substrate rail and resistance board panels covered the middle 100 m portion of the channel, and fixed weir materials extended the weir 5 m to each bank. In 2011 floating and fixed weir lengths were adjusted inseason based upon minor changes in the width and depth in the river.

A live trap and skiff gate were installed within the deeper portion of the channel. The live trap was designed as the primary means of upstream fish passage. The trap could be easily configured to pass fish freely upstream, capture individual fish for tag recovery, or trap numerous fish for collection of ASL or genetic samples. Several modified panels near the deepest portion of the river allowed for the passage of boats across the weir. To accommodate downstream migration of longnose suckers and other non-salmon species, the resistance boards on several panels were released at locations where downstream migrants were most concentrated. Releasing these on one or two adjacent weir panels causes the distal ends to dip slightly below the stream surface to guide downstream migrants while preventing upstream salmon passage. These "chutes" were monitored and adjusted to ensure salmon were not passing upstream. Few salmon have been observed passing downstream over these chutes, and their numbers are considered negligible.

ESCAPEMENT MONITORING

A target operational period, spanning most of the salmon runs, was used to provide for consistent comparisons of annual escapements among years. The target operational period for George River weir has been established as 15 June to 20 September, although actual operational dates may vary annually with stream conditions. In 2011, the George River weir operated from 1500 on 15 June until 1900 on 20 September, spanning the majority of the target operational period. Daily and total annual escapements consisted of the observed passage during the target operational period. Counts of all other species were reported simply as total observed passage.

Passage Counts

Passage counts were conducted periodically during daylight hours. The live trap was used as the primary means of upstream fish passage. A clear plastic viewing window was placed on the stream surface to improve visual identification of fish entering the trap. Substantial delays in fish passage occurred only at night or during ASL sampling. Crew members visually identified each fish as it passed upstream and recorded it by species on a multiple tally counter. Counting continued for a minimum of 1 hour or until passage waned, 4–6 times per day. This schedule was adjusted as needed to accommodate the migratory behavior and abundance of fish, or operational constraints such as reduced visibility in evening hours late in the season. Crew members recorded the total upstream fish count by species for each time period in a designated notebook, and also reported Chinook salmon counts by sex. As sex ratios of Chinook salmon are highly variable, these visual counts were used in conjunction with ASL sampling to examine the

accuracy of sex determination and identify potential areas of sampling bias. At the end of each day, total daily and cumulative seasonal counts were copied to logbook forms. These counts were reported each morning to ADF&G staff in Bethel.

Passage Estimates

A variety of situations were encountered in which passage was missed. Several methods were used to estimate passage depending on duration of the inoperable period. These periods resulted from a breach in the weir and a delayed start date. Estimates were assumed to be zero if passage was likely negligible based on historical and inseason data. To maintain a benchmark for accuracy, years containing levels of missed passage exceeding 20% estimation have generally not been included in inter-year analysis. Total estimates containing actual counts combined with missed passage estimates are reported in Table 1. Estimates for missed passage were calculated using one of the following methods:

Single Day Method

When the weir was not operational for all of one day, an estimate for the inoperable day was calculated using the following formula:

$$\hat{n}_i = \left(\frac{\left(n_b + n_{b-1} + n_a + n_{a+1}\right)}{4} \right). \quad (1)$$

Variables are defined as:

n_b = fish count on day before inoperable period,

n_{b-1} = fish count two days before inoperable period,

n_a = fish count on day after inoperable period, and

n_{a+1} = fish count two days after inoperable period.

The daily estimated missed passage $\hat{n}_i$ will always be reported except for when it is less than the observed passage, as the estimate will be disregarded and observed passage will then be considered the daily passage.

Linear Method

When the weir was not operational for two or more days but later became operational again, passage estimates for the inoperable days were calculated using linear interpolation. Average fish counts from the two days before and two days after the inoperable period were used to estimate the counts during the period of missed passage. The estimated fish count on day i of the inoperable period is:

$$\hat{n}_i = \left(\frac{n_b + n_{b-1}}{2} \right) + i\left(\frac{\left(n_a + n_{a+1}\right) - \left(n_b + n_{b-1}\right)}{2(D+1)} \right). \quad (2)$$

In this equation, we denoted an inoperable period of D days,

$d = (1,\ldots,i,\ldots,D)$.

We denoted the fish counts on the days just before and just after the inoperable period as,

n_b = fish count on day before inoperable period,

n_{b-1} = fish count two days before inoperable period,

n_a = fish count on day after inoperable period,

n_{a+1} = fish count two days after inoperable period.

Exponential Method

This method uses a non-linear regression to fit an exponential function to existing data. This method is appropriate in estimating the ends of a run or large periods of inoperability which are do not include the apex of a season's passage. Using this method, the trendline was fitted to the data using the exponential function:

$$\hat{n}_i = ae^{bi} \quad . \tag{3}$$

Variables are defined as:

a = y-intercept of the fitted line,

b = slope of the fitted line, and

i = day of the estimated portion of the run as represented by the curve.

In 2011, this method was used to estimate missed passage for the beginning of the chum salmon run and the large period of inoperability during August for chum and coho salmon. We used the rising and falling limbs of the run curve to fit an exponential trend line.

Chum Salmon

The curve $y=0.002e^{0.445i}$ was formulated from 16 to 18 June observed passage to estimate missed passage for 15 June. The curve $y=1071.7e^{-0.153i}$ was formulated from 28 July to 6 August and 25 August to 5 September observed passage to estimate missed passage for 7 to 24 August.

Coho Salmon

The curve $y=5.8498e^{0.1737i}$ was formulated from 26 July to 6 August and 25 to 29 August observed passage to estimate missed passage for 7 to 24 August.

Carcass Counts

The weir was cleaned several times each day, typically after morning and late evening counts. Dead or spawned out live salmon that washed up on the weir, both referred to hereafter as carcasses, were counted by species, visually identified by sex, and passed downstream. Daily and cumulative carcass counts were copied to logbook forms.

AGE, SEX, AND LENGTH COMPOSITION

Sample Size and Distribution

A minimum sample size was determined for each species following conventions described by Bromaghin (1993) to achieve simultaneous 95% confidence intervals of age composition no

wider than ±10% (α=0.05 and d=0.10), assuming 10 age categories for Chinook salmon (n=190), 8 age categories for chum salmon (n=180), and 6 age categories for coho salmon (n=168). These sample sizes were then increased by about 20% to account for unreadable scales or collection errors. This yielded a minimum collection goal for each sample of 230 Chinook, 220 chum, and 200 coho salmon.

The abundance of chum and coho salmon at George River weir was generally high enough to collect a large sample size in a short period of time. Pulse sampling which is a form of stratified random sampling, was employed to ensure adequate temporal distribution of chum and coho salmon samples. Pulse samples were typically obtained in 2–4 days and intended to characterize each major portion of the run (i.e., early, middle, and late). Well-spaced pulse samples are thought to better represent temporal changes in ASL composition than other sampling methods (Geiger and Wilbur 1990). Pulse samples were attempted approximately every 7–10 days. The goal was to collect five pulses of 220 chum salmon and three pulses of 200 coho salmon. These pulses are used to approximate different portions of the run and are used as guidelines when stratifying postseason. Strata are weighted by applying age and sex composition from the pulses proportionally to each stratum's escapement to provide an estimate of ASL composition reflective of that portion of the run. Strata are then combined to obtain an estimate of ASL composition for the entire season's escapement. The relatively low abundance of Chinook salmon at George River weir makes pulse sampling impractical. Instead, the sample was collected continuously over the run following a daily collection schedule based on historical run timing information. Daily sample sizes were determined by spreading the season goal of 230 samples proportional to average historical escapements to ensure a good distribution across the run. Daily sampling is stratified postseason based on sampling effort and run strength. In 2011, Chinook were apportioned into two strata, chum into five strata, and coho into three strata.

Sample Collection Procedures

Chinook, chum, and coho salmon were sampled from the fish trap installed in the weir. Salmon were trapped by opening the entrance gate while the exit gate remained closed. Fish were allowed to swim freely into the live trap, and the V-shape positioning of the entrance gate prevented them from easily escaping. The live trap was allowed to fill with fish until a reasonable number was inside. Short handled dip nets were used to capture fish within the holding box. To obtain length data and aid in scale collection, fish were removed from the dip net and placed into a partially submerged trough, or "fish cradle," which allowed continuous water flow over the fishes' gills. Scales were taken from the preferred area of the fish (INPFC 1963) and transferred to numbered gum cards (DuBois and Molyneaux 2000). Sex was determined through visual examination of the external morphology, focusing on the prominence of a kype, roundness of the belly, and the presence or absence of an ovipositor. Mideye fork length was measured to the nearest millimeter using a straight-edged meter stick. Sex and length data were recorded on standardized numbered data sheets that correspond with numbers on the gum cards used for scale preservation. After sampling, each fish was released upstream of the weir. The procedure was repeated until the holding box was emptied, to ensure no bias was introduced.

A more active sampling approach was used for Chinook salmon, when relative abundance was notably lower than other salmon species. During "active sampling," Chinook salmon could be individually trapped and sampled while other species were allowed to pass. To prevent bias, all Chinook salmon observed during this process were sampled. Further details on active sampling

procedures are described in Linderman et al. (2002). This method was also used for tag recoveries. An additional form of active sampling known as "gate keeper" was employed when time allowed. The sampler would wait at the fully closed trap until a Chinook approached the trap gate, where the sampler would let the Chinook salmon in shutting the gate behind it. The sampler would continue to load the trap in this fashion for a specified amount of time trapping each Chinook, while allowing minimal other species to enter, thus making sampling more time effective and reducing stress on Chinook from having a trap full of chum salmon.

After sampling was completed, all ASL data and metadata were copied to Microsoft Excel™[1] spreadsheets that correspond to numbered gum cards. Completed Excel™ spreadsheets were sent to the Bethel ADF&G office for processing. The original ASL gum cards, acetates, and Excel spreadsheets were archived at the ADF&G office in Anchorage. Data were also loaded into the Arctic-Yukon-Kuskokwim salmon database management system located at: http://www.adfg.alaska.gov/CommFishR3/WebSite/AYKDBMSWebsite/Default.aspx (Brannian et al. 2006). Further details of sampling procedures can be found in Molyneaux et al. (2010).

Data Processing and Reporting

Samples were aged and processed by ADF&G staff in Bethel and Anchorage following procedures described by Molyneaux et al. (2010). Age is reported in the European notation, composed of two numerals separated by a decimal. The first numeral represents the number of winters the juvenile spent in freshwater excluding the first winter spent incubating in the gravel, and the second numeral is the number of winters it spent in the ocean (Groot and Margolis 1991). The total age is therefore one year greater than the sum of these two numerals.

WEATHER AND STREAM OBSERVATION

Consistent with past years, general weather and steam observations were recorded twice daily at approximately 0730 and 1700. Water and air temperatures (°C) were manually measured each day using a hand held thermometer. In addition, notation about wind direction, wind speed, cloud cover, and precipitation were recorded. Daily precipitation was measured (mm) using a rain gauge (Appendix A). River depth (stage height in cm) was determined using a standardized staff gauge which consisted of a metal rod driven into the stream channel with a meter stick attached. The staff gauge was calibrated to an established datum plane by a semi-permanent benchmark (Stewart et al. 2006; Appendix A).

RELATED FISHERIES PROJECTS

Kuskokwim River Sockeye Salmon

The George River weir served as a recovery site for a basinwide mark–recapture study entitled *Kuskokwim River Sockeye Salmon Run Reconstruction*, operated cooperatively with KNA and funded by Alaska Sustainable Salmon Fund (project #45920). Upstream passage of all fishes occurred through the weir's live trap, enabling captures of tagged sockeye salmon. A clear plastic viewing window on the stream surface aided species identification and tag presence. Recorded data for "recovered" fish included the tag number, tag color, fish condition, presence of secondary tag, and recovery date. Tagged fish that passed through the trap without being

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

captured were recorded as "observed" along with the number of tags, tag colors, sex, and passage date.

Kuskokwim Native Association High School Internship Program and In-School Education

Local area high school students were recruited to participate in the KNA High School Internship Program at the George River weir for two weeks. Crew members instructed students in fish species identification, weather and stream observations, and ASL sampling. The crew also assisted the KNA Partners Fisheries Educator in conducting daily lessons related to salmon biology and watershed ecology. Additionally, data from this project are used in a place-based fisheries education curriculum implemented by KNA and the Kuspuk School District, where local fisheries research project results are used to help teach math and science to middle Kuskokwim students.

Temperature Monitoring

George River weir served as a monitoring site for the *Temperature Monitoring* project funded by Office of Subsistence Management, Fishery Resource Monitoring Program (FRMP 08-701). Two Hobo® Water Temp Pro V2 data loggers and a Hobo® Air Temperature R/H data logger were deployed on 15 June. Sensors were downloaded on 23 September and returned to their assigned location to record temperatures through the winter.

RESULTS

WEIR OPERATIONS

George River weir operated from 1500 on 15 June until 1900 on 20 September, spanning the majority of the target operational period. The weir began on the first day of the target operational period, but Chinook and sockeye salmon were not observed passing the weir for several days, counts were not expanded. However, chum salmon for the missed partial day were estimated using the exponential method. A hole in the weir for part of the day on 2 July and high water events on 7 August through 24 August rendered the weir inoperable (Appendix A). The single day method was used to calculate missed passage for Chinook, sockeye, and chum salmon on 2 July. The linear method was used to estimate missed passage of Chinook from 7 August through the 24 August. The exponential method was used to estimate chum and coho salmon from 7 August through 24 August as the run of chum salmon was coming to a close and the coho run was just beginning.

ESCAPEMENT MONITORING

Chinook Salmon

A total of 1,571 Chinook salmon were estimated to have passed upstream of the weir during the target operational period (Table 1). Of these, 1,513 Chinook salmon were actually counted past the weir in 2011 (Appendix B). Missed passage estimates accounted for 3.7% of the total escapement. The first fish was observed on 22 June, daily passage peaked at 215 fish on 12 July, and the last fish was observed on 6 August. The central 50% of the run occurred from 4 to 17 July, with a median passage date of 12 July (Table 1).

Chum Salmon

A total of 44,640 chum salmon were estimated to have passed upstream of the weir during the target operational period (Table 1). Of these, 43,390 chum salmon were actually counted past the weir in 2011 (Appendix B). Missed passage estimates accounted for 2.8% of the total escapement. The first fish passed the weir on 15 June, and a peak count of 2,697 fish occurred on 20 July. The central 50% of the run occurred from 10 to 23 July, with a median passage date of 17 July (Table 1).

Coho Salmon

A total of 30,028 coho salmon were estimated to have passed upstream of the weir during the target operational period (Table 1). Of these, 24,251 coho salmon were actually counted past the weir in 2011 (Appendix B). Missed passage estimates accounted for 19.2% of the total escapement. The first coho salmon was observed on 26 July, and a peak count of 2,463 fish occurred on 29 August. The central 50% of the run occurred from 25 August to 3 September, with a median passage date of 29 August (Table 1).

Other Species

A total of 43 sockeye salmon and 783 pink salmon were observed passing upstream of the weir during the target operational period. Non-salmon species included 5,561 longnose suckers, and one northern pike (*E. lucius*; Appendix B). Arctic grayling (*T. arcticus*) were regularly observed but not counted because they can pass freely through the weir pickets.

Carcasses

Salmon carcass counts included 87 Chinook, 1,371 chum, and 10 coho salmon. Females accounted for 46% of Chinook, 32% of chum, and 70% of coho salmon. The first Chinook salmon carcass was found on 26 July. The first chum salmon carcass was found on 23 June, and a peak count of 169 occurred on 3 August. The first coho salmon carcass was observed on 29 July (Appendix C). Carcass counts are an unrepresentative source of data for count and ASL data and should be viewed as biased. These data are not currently analyzed.

AGE, SEX, AND LENGTH COMPOSITION

Chinook Salmon

The objectives for precision and accuracy in ASL composition estimates were achieved in 2011 and sampling was well distributed across run timing. Samples were collected from 223 Chinook salmon from 28 June to 2 August. Of those, age was determined for 167 (75% of the total sample), or 11% of annual Chinook salmon escapement (Table 2). The escapement was partitioned into 2 temporal strata, 22 June through 13 July (n=93) and 14 July through 15 August (n=74) based on sampling dates. Age-1.2 fish dominated in 2011, with 6 other age classes also detected. Age-1.2 and age-1.3 fish were predominately males, while age-1.4 fish were predominately females. Females composed an estimated 37.5% of escapement and tended to be larger than males of the same age (Table 2).

Chum Salmon

Objectives for precision and accuracy in estimating the ASL composition of total annual chum salmon escapement to George River were achieved for 2011 and sampling was well distributed

across run timing. Samples were collected from 1,120 chum salmon between 2 July and 2 August. Of those, age was determined for 1,024 (91% of the total sample), or 2.3% of chum salmon escapement (Table 3). The escapement was partitioned into 5 temporal strata: 15 June through 6 July (*n*=200), 7 through 13 July (*n*=204), 14 through 20 July (*n*=199), 21 through 28 July (*n*=205), and 29 July through 20 September (*n*=216). Escapement was predominately age-0.3, followed closely by age-0.4. Escapement by age-0.2 and age-0.5 fish was also detected within the run to a lesser extent. Females composed 48.6% of chum salmon escapement and tended return at an earlier age. Females were generally smaller for same age classes after reaching age-0.3 (Table 3).

Coho Salmon

The objectives for precision and accuracy in ASL composition estimates were achieved in 2011. Samples were collected from 601 coho salmon between 28 August and 17 September. Of those, age was determined for 552 (91% of the total sample), or 1.8% of annual coho salmon escapement (Table 4). The escapement was partitioned into 3 temporal strata: 15 June through 1 September (*n*=185), 2 through 8 September (*n*=182), and 9 through 20 September (*n*=185). Escapement was predominately age-2.1. Escapement by age-3.1 and age-1.1 fish was also detected within the run to a lesser extent. Females composed 51.2% of coho salmon escapement and tended to be similarly sized with males especially in the 2.1 age class (Table 4). High river stage delayed sampling during the beginning of the run in August (Table 1).

WEATHER AND STREAM OBSERVATION

Water temperature at the weir ranged from 6.0°C to 14.5°C, with an average of 9.4°C based on twice daily thermometer observations. Air temperature at the weir ranged from -2.0°C to 24.0°C, with an average of 11.5°C. River stage ranged from 40 to 163 cm during the operation of the weir in 2011 (Appendix A).

RELATED FISHERIES PROJECTS

Kuskokwim River Sockeye Salmon

One tagged sockeye salmon was recovered at George River weir. This recovered fish had both anchor tags still attached.

KNA High School Internship and In-School Education Programs

A total of nine students participated in the KNA High School Internship Program, three of which were at George River Weir including two first-year and one returning (who was a two week intern).

Temperature Monitoring

Results for temperature monitoring will be reported under USFWS, Office of Subsistence Management Project No. 08-701.

DISCUSSION

OPERATIONS

Daily and total annual escapements were successfully determined for each of the target species at George River weir in 2011. While low water at the beginning of the season made for easy installation, record high water contributed to interrupted operations later (Figure 3).

ESCAPEMENTS

Chinook Salmon

The percentile escapement goal range for George River weir (3,100–7,900 fish) was not achieved in 2011, the second year in a row. However, the escapement of Chinook salmon in 2011 marked an improvement from 2010, which was the lowest on record (Figure 4). The George River experienced normal run timing but low abundance in 2011 which was similar to many of the other tributaries within the Kuskokwim River drainage (Figure 5).

In 2011, age-1.2, -1.3 fish were represented in greater than historic median proportions, while age-1.4 and -1.5 fish were less than historic median proportions. Proportions by age class were within historical ranges. However, the proportion of age-1.2 fish was the second highest on record and comprised the largest proportion of all age classes (Molyneaux et al. 2010; Figure 6). The percentage of females in 2011 (Table 2) which is within the bounds of historical female percentages is not unusual.

Chum Salmon

The escapement of chum salmon in 2011 surpassed the historical median and was the second highest chum salmon escapement on record (1996–Present) at George River weir (Figure 4). Escapement at other Kuskokwim area projects exhibited typical to higher than typical numbers. Run timing was similar to historical median run timing. Historical and 2011 median passage dates both occurred on 17 July (Figure 5).

In 2011, all age classes were similar to historic median proportions (Figure 6). The percentage of females in 2011 was 49%, which is similar to most recent years (Figure 4).

Coho Salmon

Coho salmon escapement in 2011 was the second highest on record (Figure 4). Escapements of coho salmon were near average across the lower Kuskokwim, and all except Tuluksuk River weir showed marked improvement over 2010. Run timing was within the range of historical median run timing. The 2011 median passage date was similar to the historical median passage date (Figure 5).

Female sex composition was 51.2% which is within the historical range and not unusual. Coho salmon typically exhibit a 1:1 sex ratio (Groot and Margolis 1991). All age class proportions were not unusual and similar to historic median proportions (Figure 6). Age composition for Kuskokwim River coho salmon populations is typically consistent throughout the run, with the age-2.1 class dominating (Molyneaux et al. 2010).

Other Species

The George River does not have large spawning populations of sockeye salmon. Accurate enumeration of spawning pink salmon at the weirs is not possible because their small size allows some individuals, (primarily females) to pass between pickets undetected. Longnose suckers are historically the most abundant non-salmon species, and George River is thought to have a distinct breeding population. Historically, as many as 16,630 longnose suckers have been observed migrating upstream of the weir. However, enumeration of longnose suckers is incomplete because smaller individuals are able to pass freely between pickets and upstream migration appears to start before weir operations typically begin. For 2011, the majority of upstream migration of longnose suckers appears to have taken place during and immediately after weir installation (Appendix B).

WEATHER AND STREAM OBSERVATION

Water temperature was within the historical range for much of the season with exceptions of new low points in late-July and extreme lows from 12 August through most of the remaining season (Figure 7). River stage was within the historical range for much of the season with the exception of record highs which occurred roughly from 5 August through 16 August (Figure 3). High water levels coincided with low water temperatures and low water clarity.

RELATED FISHERIES PROJECTS

George River weir staff successfully hosted 9 KNA high school and college interns. Interns took part in aquatic ecology and fisheries education, and weir operation under supervision of ADF&G and KNA staff. KNA internships benefit both students and the projects that host them. Interns gain exposure to fisheries monitoring projects and the employment opportunities associated with them. The projects gained a much needed level of community involvement, which the authors believe contribute to continued local support of the research and management utility of the weirs.

ACKNOWLEDGEMENTS

The George River weir project was operated cooperatively by KNA and ADF&G, Division of Commercial Fisheries. The USFWS Office of Subsistence Management provided $142,236 in 2011 for this project through the Fisheries Resource Monitoring Program (FRMP), under agreement number 701818J689, with matching support from the State of Alaska and KNA. Additionally, FRMP helps fund salmon age, sex, and length data analysis for this project in the Kuskokwim Area under agreement number 70181AJ028, and also provides a KNA biologist position through its Partners Program in support of this project under agreement number 701817R020. Other groups such as The Kuskokwim Corporation and the ADF&G Division of Sport Fish have provided in-kind support to the project in the form of land use for camp facilities, weir fabrication, and welding services. General Fund support from ADF&G included assistance from staff biologists, fish and wildlife technicians who serve as crew leaders and crew members, equipment purchases, and a portion of operational costs.

Many individuals contributed to the operation of the George River weir in 2011. Administrative and logistical support was provided by Kevin Schaberg and Emerie Fairbanks of ADF&G; and Mike Thalhauser and LaDonn Robbins of KNA. Thanks also to ADF&G personnel: Spenser Brown (technician) Rob Stewart (technician), and Dan Steel (college intern); KNA field personnel: James Kvamme (technician), Kelly Kehlenbach (technician), Charles Grammar (KNA

& ANSEP college intern), Jared Thorsen (college intern), Wendy Parent (college intern); and Scott Fritz (KNA Partners Fisheries Educator) with the high school interns for contributing to the successful project in 2011; and ANSEP intern Angelica Phillips. Thanks to additional help throughout the season provided by Tracy Hansen, Maureen Horne Brine, Zach Liller, Glen Lindsey, Derick Williams, and Dylan Williams of ADF&G, and Harry George of KNA.

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TABLES AND FIGURES

Table 1.–Daily and cumulative percent passage of Chinook, chum, coho, and sockeye salmon at George River weir, 2011.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	%	Daily	%	Daily	%	Daily	%
6/15	0	0	0	0	2[a]	0	0	0
6/16	0	0	0	0	3	0	0	0
6/17	0	0	0	0	2	0	0	0
6/18	0	0	0	0	13	0	0	0
6/19	0	0	0	0	10	0	0	0
6/20	0	0	0	0	8	0	0	0
6/21	0	0	0	0	31	0	0	0
6/22	5	0	0	0	42	0	0	0
6/23	1	0	0	0	17	0	0	0
6/24	0	0	0	0	30	0	0	0
6/25	1	0	0	0	19	0	0	0
6/26	12	1	0	0	126	1	0	0
6/27	0	1	0	0	64	1	0	0
6/28	3	1	0	0	56	1	0	0
6/29	0	1	0	0	45	1	0	0
6/30	1	1	0	0	194	1	0	0
7/1	21	3	0	0	576	3	0	0
7/2	76[b]	8	0[b]	1	843[b]	5	0[b]	0
7/3	87	13	1	3	1,185	7	0	0
7/4	193	25	0	3	1,418	10	0	0
7/5	59	29	0	3	1,262	13	0	0
7/6	54	33	0	3	985	16	0	0
7/7	18	34	0	3	588	17	0	0
7/8	30	36	0	3	1,489	20	0	0
7/9	54	39	1	5	1,023	22	0	0
7/10	51	42	0	5	1,011	25	0	0
7/11	71	47	1	8	1,498	28	0	0
7/12	215	**61**	0	8	2,506	34	0	0
7/13	134	69	0	8	2,455	39	0	0
7/14	42	72	0	8	1,358	42	0	0
7/15	17	73	0	8	885	44	0	0
7/16	12	74	0	8	1,596	48	0	0
7/17	53	77	1	10	1,760	**52**	0	0
7/18	54	80	6	24	1,564	55	0	0
7/19	75	85	2	28	1,895	59	0	0
7/20	54	89	4	38	2,697	66	0	0
7/21	30	91	2	42	1,773	70	0	0
7/22	30	92	2	47	1,301	72	0	0
7/23	28	94	3	**54**	1,100	75	0	0
7/24	15	95	0	54	1,070	77	0	0
7/25	22	97	0	54	1,194	80	0	0
7/26	10	97	2	58	1,123	82	1	0
7/27	7	98	2	63	1,126	85	4	0
7/28	5	98	3	70	977	87	19	0
7/29	6	98	1	72	703	89	10	0
7/30	5	99	2	77	599	90	8	0
7/31	2	99	2	82	549	91	23	0
8/1	4	99	2	86	547	93	19	0
8/2	1	99	3	93	564	94	68	1
8/3	1	99	0	93	401	95	109	1

-continued-

Table 1.–Page 2 of 2.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	%	Daily	%	Daily	%	Daily	%
8/4	1	99	1	95	497	96	86	1
8/5	0	99	0	95	181	96	24	1
8/6	2	99	0	95	282	97	68	1
8/7	1[c]	99	0[c]	95	199[a]	97	56[a]	2
8/8	1[c]	100	0[c]	95	171[a]	98	67[a]	2
8/9	1[c]	100	0[c]	95	147[a]	98	79[a]	2
8/10	1[c]	100	0[c]	95	126[a]	98	94[a]	2
8/11	1[c]	100	0[c]	95	108[a]	99	112[a]	3
8/12	1[c]	100	0[c]	95	93[a]	99	133[a]	3
8/13	1[c]	100	0[c]	95	80[a]	99	159[a]	4
8/14	1[c]	100	0[c]	95	68[a]	99	189[a]	4
8/15	1[c]	100	0[c]	95	59[a]	99	225[a]	5
8/16	0[c]	100	0[c]	95	50[a]	99	267[a]	6
8/17	0[c]	100	0[c]	95	43[a]	99	318[a]	7
8/18	0[c]	100	0[c]	95	37[a]	100	378[a]	8
8/19	0[c]	100	0[c]	95	32[a]	100	450[a]	10
8/20	0[c]	100	0[c]	95	27[a]	100	535[a]	12
8/21	0[c]	100	0[c]	95	23[a]	100	637[a]	14
8/22	0[c]	100	0[c]	95	20[a]	100	757[a]	16
8/23	0[c]	100	0[c]	95	17[a]	100	901[a]	19
8/24	0[c]	100	2[c]	100	15[a]	100	1,072[a]	23
8/25	0	100	0	100	4	100	932	26
8/26	0	100	0	100	11	100	1,618	31
8/27	0	100	0	100	4	100	955	35
8/28	0	100	0	100	15	100	2,421	43
8/29	0	100	0	100	8	100	2,463	**51**
8/30	0	100	0	100	4	100	2,314	59
8/31	0	100	0	100	9	100	1,157	62
9/1	0	100	0	100	2	100	1,049	66
9/2	0	100	0	100	4	100	915	69
9/3	0	100	0	100	7	100	1,696	75
9/4	0	100	0	100	2	100	1,036	78
9/5	0	100	0	100	5	100	1,083	82
9/6	0	100	0	100	0	100	877	85
9/7	0	100	0	100	0	100	1,118	88
9/8	0	100	0	100	0	100	1,104	92
9/9	0	100	0	100	3	100	762	94
9/10	0	100	0	100	1	100	257	95
9/11	0	100	0	100	1	100	257	96
9/12	0	100	0	100	0	100	52	96
9/13	0	100	0	100	0	100	76	97
9/14	0	100	0	100	0	100	460	98
9/15	0	100	0	100	0	100	152	99
9/16	0	100	0	100	1	100	25	99
9/17	0	100	0	100	0	100	27	99
9/18	0	100	0	100	0	100	209	100
9/19	0	100	0	100	1	100	62	100
9/20	0	100	0	100	1	100	83	100
Totals	1,571	100	43	100	44,640	100	30,028	100

Note: Elongated boxes delineate the central 50% of the run and the bold box delineates the median passage date.

[a] Missed passage was estimated using the Exponential method.

[b] Missed passage was estimated using the Single Day method.

[c] Missed passage was estimated using the Linear method.

Table 2.–Age-sex composition and mean length (mm) of Kuskokwim Area Chinook salmon that escaped past the George River weir, 2011.

Sample Dates	Sample Size		Brood Year (Age) 2008 (1.1) N	%	2007 (1.2) N	%	2006 (1.3) N	%	2005 (1.4) N	%	2005 (2.3) N	%	2004 (1.5) N	%	2004 (2.4) N	%	Total N	%
6/28, 7/01-7/12, 7/14, 7/17-7/26, 7/28-8/02	167	Male	18	1.2	517	32.9	329	20.9	98	6.2	7	0.4	13	0.8	0	0.0	982	62.5
		Female	0	0.0	35	2.2	198	12.6	337	21.4	0	0.0	13	0.8	7	0.4	589	37.5
		Total	18	1.2	552	35.2	527	33.5	434	27.7	7	0.4	26	1.7	7	0.4	1,571	100.0
		95% C.I. (%)		±1.6		±7.1		±7.1		±6.2		±0.8		±1.5		±0.8		
		Male Mean Length		387		530		691		773		670		856		-		
		SE		-		7		11		24		-		60		-		
		Range		368-430		433-635		568-823		480-848		670-670		796-915		0-0		
		n		2		50		33		11		1		2		-		
		Female Mean Length		-		582		740		825		-		805		829		
		SE		-		18		14		13		-		46		-		
		Range		-		546-604		613-863		733-935		-		759-850		829-829		
		n		-		3		20		42		-		2		1		

Note: This represents a weighted sample based on 2 strata. Samples were used to estimate total number and percent of escapement by age and sex category. Samples were used to estimate mean length and summary statistics for each age and sex category. Discrepancies in sums or statistics are attributed to rounding errors.

Table 3.–Age-sex composition and mean length (mm) of Kuskokwim Area chum salmon that escaped past the George River weir, 2011.

			Brood Year (Age)									
			2008		2007		2006		2005			
			(0.2)		(0.3)		(0.4)		(0.5)		Total	
Sample Dates	Sample Size		N	%	N	%	N	%	N	%	N	%
7/02-7/04, 7/09, 7/10, 7/16-7/18, 7/24-7/26, 7/31-8/02	1,024	Male	47	0.1	10,854	24.3	12,056	27.0	176	0.4	23,133	51.8
		Female	315	0.7	11,476	25.7	9,716	21.8	0	0.0	21,507	48.2
		Total	362	0.8	22,331	50.0	21,772	48.8	176	0.4	44,640	100.0
		95% C.I. (%)		±1.1		±3.1		±3.1		±1.0		
		Male Mean Length		487		555		567		549		
		SE		-		2		2		13		
		Range		487-487		470-668		495-646		535-605		
		n		1		239		267		4		
		Female Mean Length		512		531		536		-		
		SE		16		2		2		-		
		Range		471-540		451-636		465-618		-		
		n		6		276		230		-		

Note: This represents a weighted sample based on 5 strata. Samples were used to estimate total number and percent of escapement by age and sex category. Samples were used to estimate mean length and summary statistics for each age and sex category. Discrepancies in sums or statistics are attributed to rounding errors.

Table 4.–Age-sex composition and mean length (mm) of Kuskokwim Area coho salmon that escaped past the George River weir, 2011.

			Brood Year (Age)									
			2008		2007		2006		2005			
			(1.1)		(2.1)		(3.1)		(3.2)		Total	
Sample Dates	Sample Size		N	%	N	%	N	%	N	%	N	%
8/28-8/31, 9/04, 9/05, 9/12-9/17	552	Male	704	2.3	13,006	43.3	939	3.1	0	0.0	14,649	48.8
		Female	760	2.5	14,025	46.7	550	1.8	43	0.1	15,379	51.2
		Total	1,464	4.9	27,031	90.0	1,489	5.0	43	0.1	30,028	100.0
		95% C.I. (%)		±2.0		±2.9		±2.1		±0.3		
		Male Mean Length		539		552		571		-		
		SE		15		3		9		-		
		Range		478-608		412-642		519-641		-		
		n		14		214		15		-		
		Female Mean Length		556		551		579		518		
		SE		8		3		5		-		
		Range		504-581		423-619		477-607		518-518		
		n		16		278		14		1		

Note: This represents a weighted sample based on 3 strata. Samples were used to estimate total number and percent of escapement by age and sex category. Samples were used to estimate mean length and summary statistics for each age and sex category. Discrepancies in sums or statistics are attributed to rounding errors.

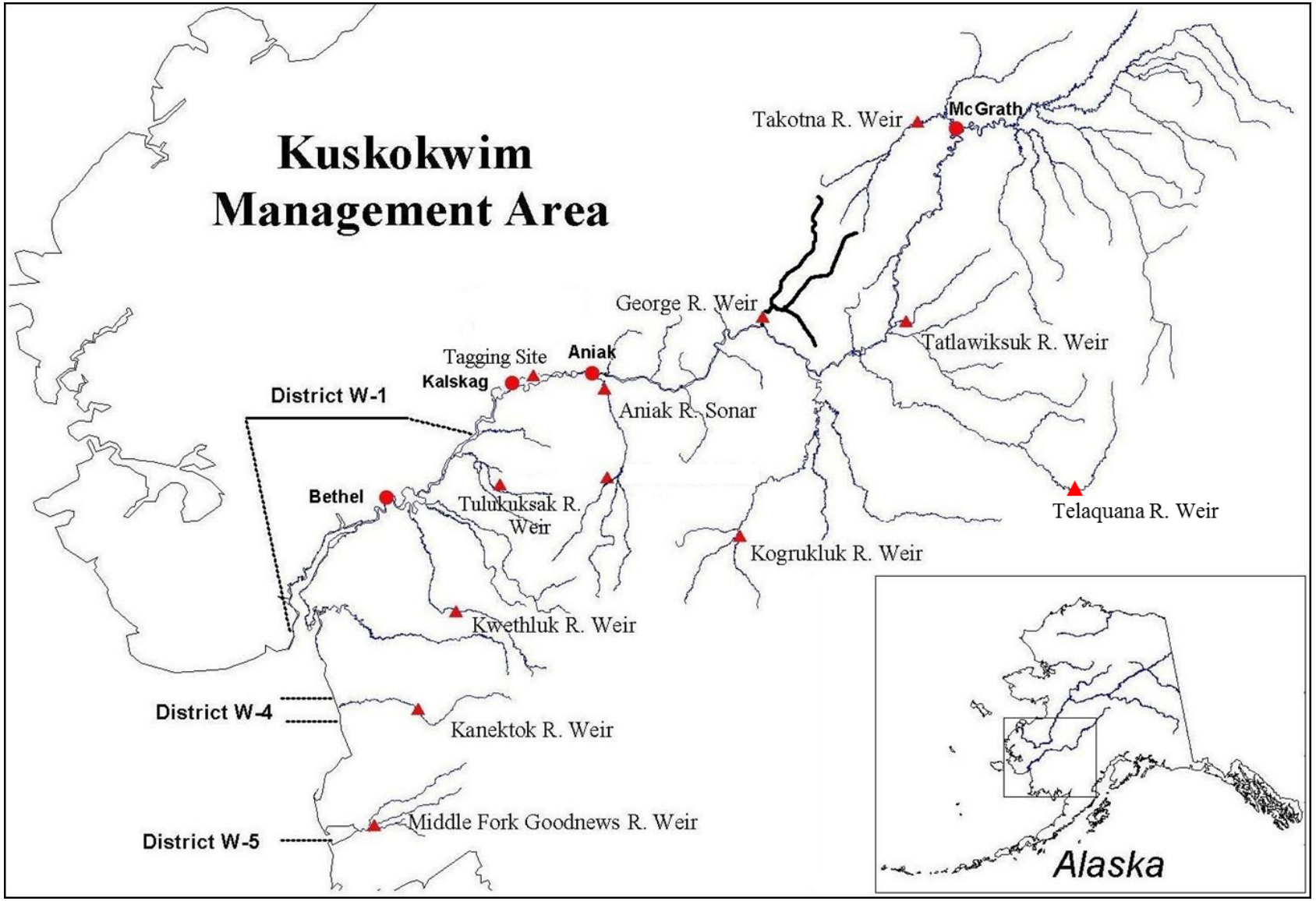


Figure 1.–Map depicting the location of Kuskokwim Area salmon management districts and escapement monitoring projects with emphasis on the George River.

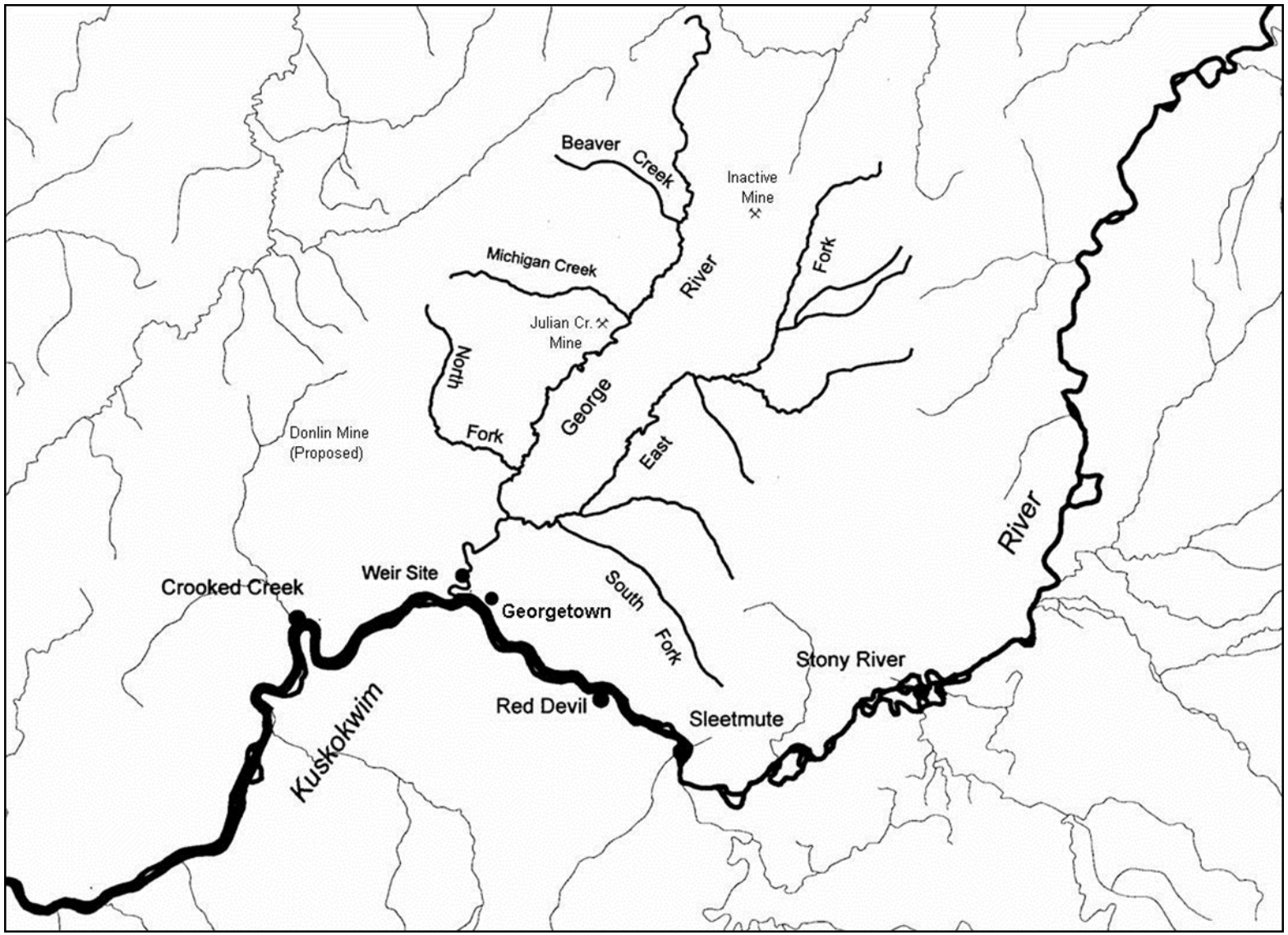


Figure 2.–George River, middle Kuskokwim River basin.

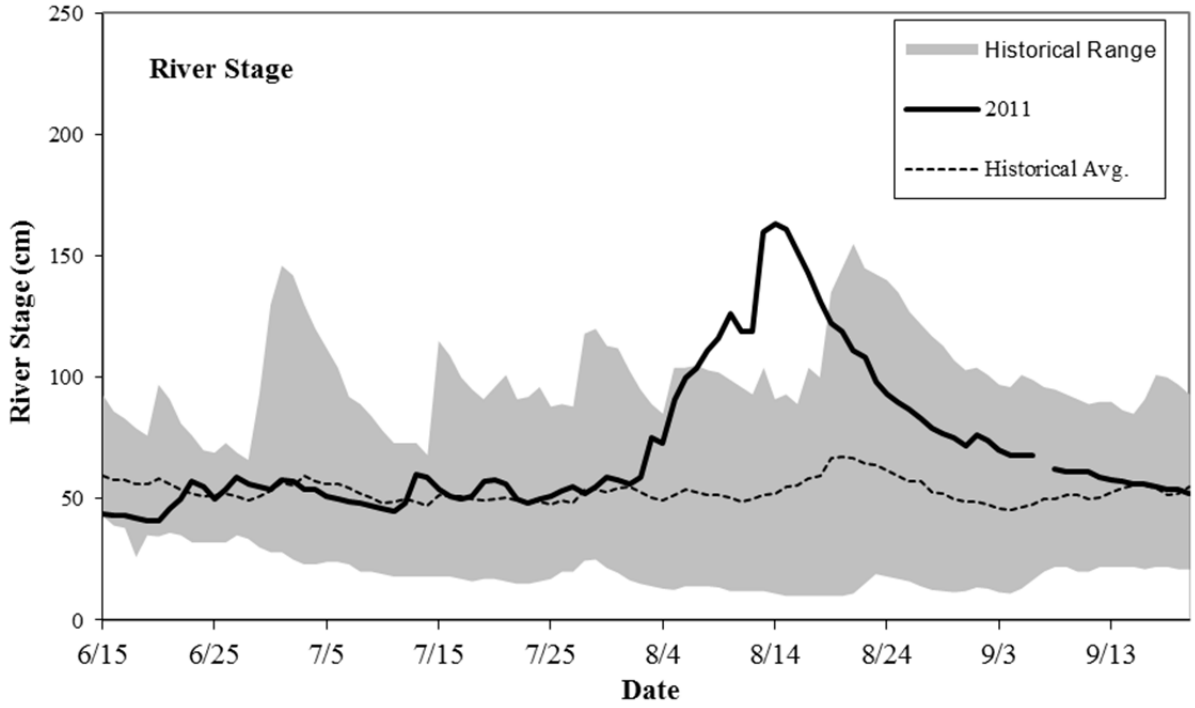
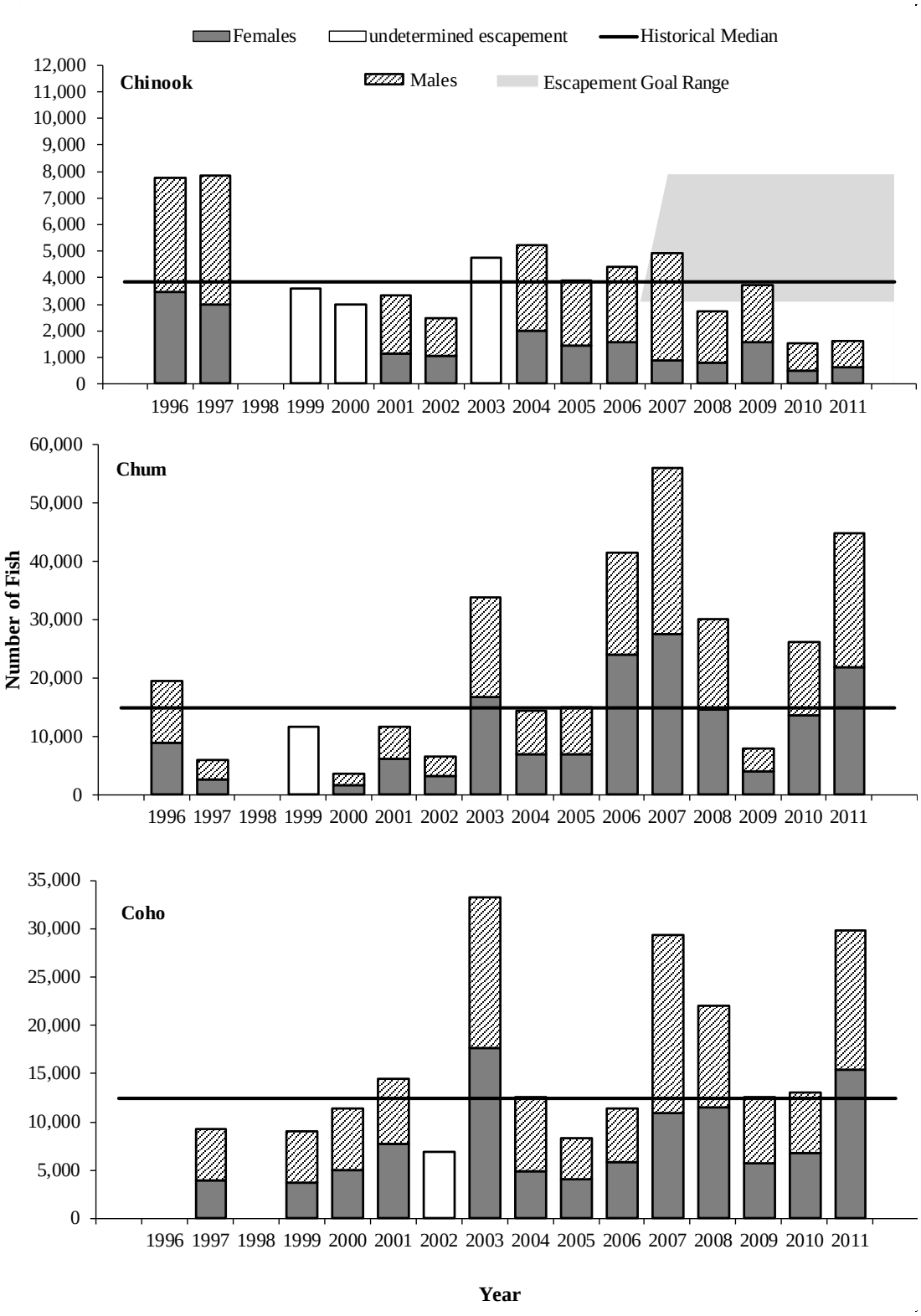
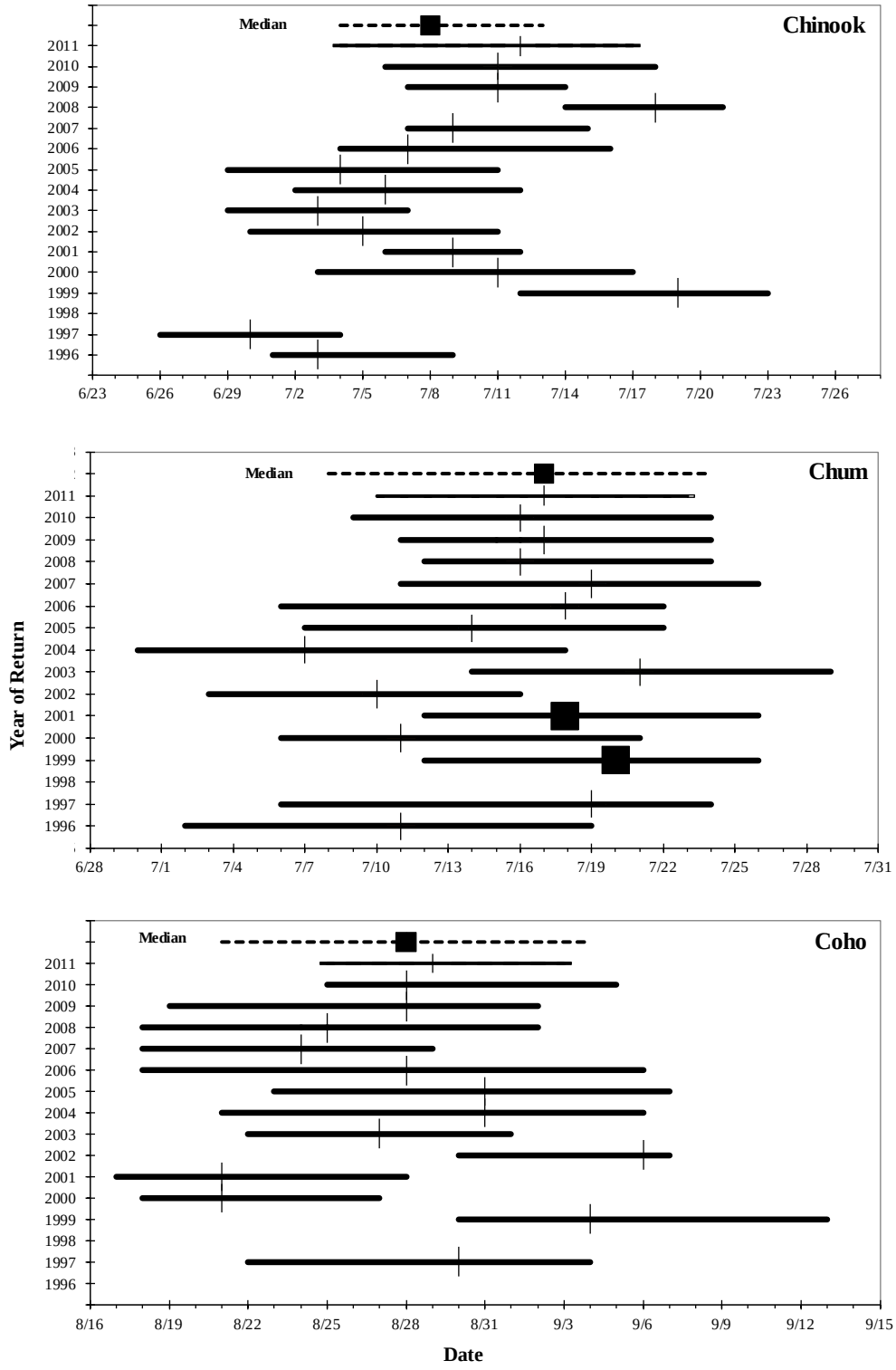


Figure 3.–Daily morning river stage at George River weir in 2011 relative to historical average, minimum, and maximum morning readings from 2000 to 2010.



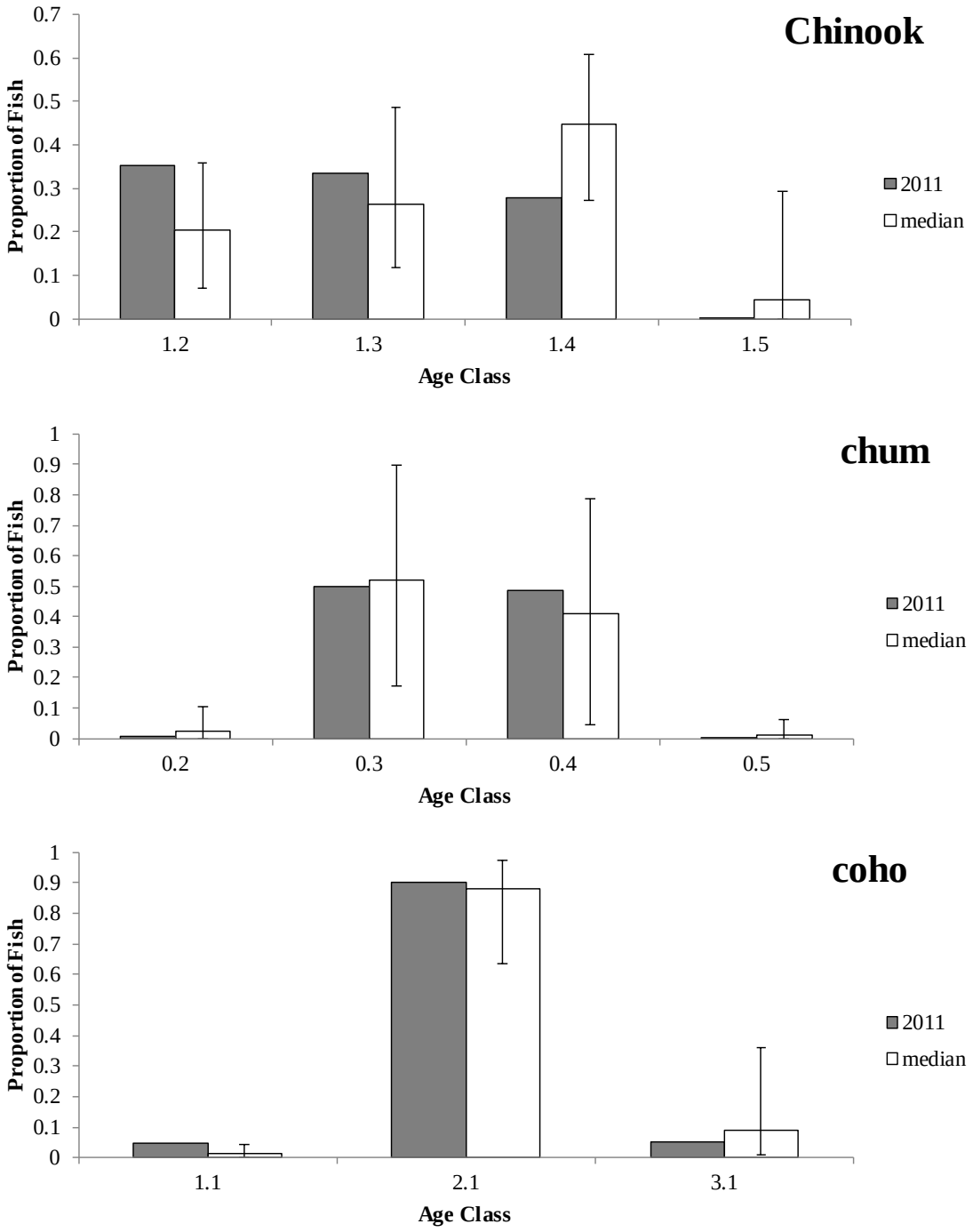
Note: Open bars represent years when estimates of missed passage exceeded 20%, and were not used to calculate historical statistics.

Figure 4.–Historical escapement of Chinook, chum, and coho salmon at the George River weir.



Note: Horizontal bars represent the central 50% of the run and cross-marks represent the median passage date.

Figure 5.–Annual run timing of Chinook, chum, and coho salmon based on cumulative percent passage at George River weir, 1996–2010.



Note: Median data is based upon counts from 1996 to 2010. Error bars represent Historical minimum and Maximum range.

Figure 6.–Escapement year 2011 and median relative age-class abundances of Chinook, chum, and coho salmon at George River weir.

APPENDIX A: WEATHER AND STREAM OBSERVATIONS

Appendix A1.–Daily weather and stream observations at the George River weir site, 2011.

Date	Time	Sky Conditions[a]	Precipitation (mm)[b]	Temperature (°C) Air	Temperature (°C) Water	River Stage (cm)	Water Clarity[c]
6/10	1200	2	0.0	18.0	12.0	47	1
	1700	3	0.0	16.0	12.0	46	1
6/11	1000	3	0.0	17.0	12.0	45	1
	1700	3	0.0	17.0	12.0	45	1
6/12	1000	3	0.0	14.5	10.5	44	1
	1700	3	0.0	17.0	12.0	44	1
6/13	945	3	0.0	13.0	11.0	43	1
	1700	3	0.0	18.0	12.5	43	1
6/14	1000	4	0.5	8.5	11.0	43	1
	1700	4	0.2	13.0	12.5	42	1
6/15	1000	1	0.0	12.0	10.5	44	1
	1700	2	0.0	15.0	11.0	44	1
6/16	0730	1	0.0	12.0	10.0	43	1
	1700	2	0.0	18.0	12.5	43	1
6/17	0730	1	0.0	8.0	11.0	43	1
	1700	1	0.0	22.5	14.5	42	1
6/18	0730	2	0.0	9.5	12.0	42	1
	1700	2	0.0	24.0	15.0	41	1
6/19	0730	4	trace	14.5	13.0	41	1
	1700	3	0.0	21.0	15.0	40	1
6/20	0800	4	2.8	13.0	14.0	41	1
	1700	4	0.8	17.0	14.0	43	1
6/21	0730	4	0.7	9.0	11.5	46	1
	1700	3	0.6	12.0	12.0	48	2
6/22	0730	4	5.8	7.5	10.0	50	2
	1700	4	7.0	10.0	12.0	55	2
6/23	0730	4	0.4	8.0	8.5	57	3
	1700	3	trace	16.0	10.5	58	3
6/24	0730	1	0.0	5.5	9.0	55	2
	1700	2	0.0	19.0	11.5	52	1
6/25	0730	4	0.0	9.0	10.0	50	1
	1700	3	0.6	16.0	11.0	50	1
6/26	0730	2	0.4	7.5	9.0	54	1
	1700	3	trace	15.0	11.5	59	2
6/27	0730	4	0.3	12.0	10.0	59	2
	1700	3	trace	14.0	11.5	57	1
6/28	0730	3	0.0	9.5	10.0	56	1
	1700	3	0.0	12.5	10.5	55	1
6/29	0730	3	0.0	9.5	10.0	55	1
	1700	3	trace	13.0	9.5	54	1
6/30	0730	3	trace	9.5	8.5	54	1
	1700	3	trace	15.0	10.0	54	1
7/1	0730	4	trace	9.5	10.0	58	1
	1700	2	0.0	17.0	12.0	59	1
7/2	0730	3	0.0	7.5	9.0	57	1
	1700	2	0.0	20.5	14.0	57	1
7/3	0730	1	0.0	7.5	11.0	54	1
	1700	2	0.0	18.5	14.0	54	1
7/4	0730	2	trace	8.5	12.0	54	1
	1700	2	0.0	18.0	14.5	51	1
7/5	0730	3	0.0	9.5	12.0	51	1
	1700	1	0.0	17.5	14.0	50	1
7/6	0730	3	0.0	11.0	12.0	50	1

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Appendix A1.–Page 2 of 4.

Date	Time	Sky Conditions[a]	Precipitation (mm)[b]	Temperature (°C) Air	Temperature (°C) Water	River Stage (cm)	Water Clarity[c]
7/6	1700	4	0.0	15.5	13.5	49	1
7/7	0730	4	0.0	10.0	12.0	49	1
	1700	4	0.0	15.0	12.0	49	1
7/8	0730	4	0.0	10.0	11.0	48	1
	1700	3	0.0	17.0	13.0	47	1
7/9	0730	4	0.0	11.0	11.0	47	1
	1700	4	trace	12.0	12.0	46	1
7/10	0730	4	0.5	10.0	11.0	46	1
	1700	4	0.5	15.0	12.0	46	1
7/11	0730	4	0.5	11.0	11.0	45	1
	1700	4	7.0	15.0	12.0	46	1
7/12	0730	4	9.0	8.0	10.0	48	1
	1700	3	0.7	14.0	11.5	53	1
7/13	0730	3	0.0	9.0	10.5	60	2
	1700	3	trace	13.5	11.5	62	2
7/14	0730	4	0.0	9.0	10.0	59	2
	1700	4	0.0	13.0	11.0	55	2
7/15	0730	4	0.0	8.0	10.0	54	2
	1700	4	0.0	12.5	10.5	51	2
7/16	0730	4	trace	9.0	10.0	51	2
	1700	4	0.0	14.0	11.0	50	2
7/17	0730	4	0.0	6.0	10.0	50	2
	1700	4	5.0	11.0	10.0	50	1
7/18	0730	4	1.5	8.0	9.0	51	1
	1700	4	1.0	9.5	10.0	52	1
7/19	0730	3	2.0	6.0	7.0	57	1
	1700	2	trace	17.0	12.0	54	1
7/20	0730	1	0.0	4.0	9.0	58	1
	1700	2	0.0	23.5	14.0	55	1
7/21	0730	4	0.0	11.0	12.0	56	1
	1700	3	0.0	18.0	14.5	50	1
7/22	0730	3	0.0	13.0	13.0	50	1
	1700	3	0.0	23.0	15.0	48	1
7/23	0730	3	0.0	14.0	13.0	48	1
	1700	4	trace	15.0	14.5	48	1
7/24	1000	4	1.0	10.0	11.0	50	1
	1700	4	trace	13.0	12.0	49	1
7/25	0730	4	0.5	9.0	10.5	51	1
	1700	4	0.3	16.5	11.5	50	1
7/26	0730	3	0.0	10.5	11.0	53	1
	1700	3	0.0	17.5	12.5	54	1
7/27	0730	4	1.5	10.0	11.0	55	1
	1700	3	0.5	10.5	14.0	54	1
7/28	0730	4	trace	12.0	12.0	52	1
	1700	3	0.0	16.0	13.0	50	1
7/29	0730	2	4.0	10.0	12.0	55	1
	1700	4	0.5	14.0	12.5	54	1
7/30	0730	4	trace	10.0	10.5	59	2
	1700	4	1.5	12.5	11.0	57	1
7/31	0730	4	0.5	9.5	9.5	58	1
	1700	4	trace	14.5	11.5	56	1
8/1	0730	4	1.7	10.0	10.0	56	1
	1700	4	5.0	13.0	11.0	57	1

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Appendix A1.–Page 3 of 4.

Date	Time	Sky Conditions[a]	Precipitation (mm)[b]	Temperature (°C) Air	Temperature (°C) Water	River Stage (cm)	Water Clarity[c]
8/2	0730	4	6.0	11.0	10.0	59	1
	1700	4	2.0	14.0	11.0	64	1
8/3	0730	4	1.2	10.5	10.0	75	2
	1700	4	0.4	14.0	11.0	75	2
8/4	0730	4	1.9	8.0	9.5	73	2
	1700	4	5.0	11.0	10.0	74	2
8/5	0730	4	7.5	6.0	8.0	91	3
	1700	3	0.5	10.0	9.0	99	3
8/6	0730	4	0.0	6.0	8.0	100	3
	1700	4	3.6	8.0	9.5	99	2
8/7	0730	4	10.0	7.0	6.5	104	2
	1700	3	0.4	10.0	7.5	111	3
8/8	0730	4	2.2	5.0	6.5	111	3
	1800	4	2.0	8.0	7.0	113	3
8/9	0730	3	7.0	5.0	6.0	116	3
	1700	3	0.0	12.0	7.0	124	3
8/10	0730	4	0.4	6.0	6.5	126	3
	1700	4	0.0	15.0	7.0	122	3
8/11	0730	4	2.0	9.0	7.0	119	3
	1700	4	0.1	14.0	7.0	119	3
8/12	0730	4	16.3	11.0	7.0	119	3
	1700	4	9.5	12.5	7.0	128	3
8/13	0730	4	2.2	12.0	6.5	160	3
	1700	4	4.0	13.0	7.0	163	3
8/14	0730	4	0.8	10.0	7.0	163	3
	1700	4	0.1	11.0	7.0	163	3
8/15	0730	3	0.1	11.0	6.5	161	3
	1700	3	0.0	17.0	7.0	158	3
8/16	0730	3	0.0	5.0	7.0	152	3
	1700	3	0.0	19.0	7.5	148	3
8/17	0730	4	1.6	7.0	6.5	143	3
	1700	3	0.0	7.0	8.0	137	3
8/18	0730	4	1.3	5.5	7.0	131	3
	1700	3	0.0	18.0	7.0	127	3
8/19	0730	3	0.5	10.0	7.0	122	3
8/20	0730	3	4.1	10.0	7.0	119	3
	1700	4	2.6	14.0	7.0	112	3
8/21	0730	2	3.4	12.0	7.0	111	3
	1700	3	0.0	14.0	7.0	111	3
8/22	0730	5	0.0	1.0	7.0	108	3
	1700	3	0.5	11.0	7.0	102	3
8/23	0730	2	0.7	1.0	7.0	98	3
	1700	2	0.5	12.0	8.0	95	2
8/24	0730	4	0.0	9.0	6.0	93	2
	1700	4	0.0	11.0	7.0	92	2
8/25	0730	4	0.0	8.5	7.0	90	2
	1700	4	0.0	14.0	7.0	90	2
8/26	0730	4	2.0	5.0	7.0	87	3
	1700	3	trace	16.0	7.0	86	2
8/27	0730	3	0.0	5.0	7.0	83	2
	1700	3	0.0	19.0	7.0	80	2
8/28	0730	4	1.8	8.0	7.0	79	2
	1700	3	0.0	19.0	7.0	79	2
8/29	0730	4	trace	6.0	7.0	77	2

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Appendix A1.–Page 4 of 4.

Date	Time	Sky Conditions[a]	Precipitation (mm)[b]	Temperature (°C) Air	Temperature (°C) Water	River Stage (cm)	Water Clarity[c]
8/30	0730	4	0.0	9.0	7.0	75	2
	1700	4	0.0	12.0	7.0	74	2
8/31	0730	4	6.2	10.0	7.0	72	2
	1700	4	1.0	14.0	7.0	76	2
9/1	0730	4	0.5	7.0	7.0	76	2
	1700	4	0.0	13.0	7.0	76	2
9/2	0730	4	0.4	5.0	7.0	74	2
	1700	4	1.0	5.0	7.0	70	2
9/3	1000	4	1.0	9.0	7.0	70	2
	1700	4	0.7	12.0	7.0	70	2
9/4	1000	3	1.0	9.0	7.0	68	2
9/5	0730	5	0.0	2.0	7.0	68	2
	1700	3	0.0	16.0	7.0	68	1
9/6	0730	2	0.0	9.0	7.0	68	1
	1700	3	0.0	15.0	9.0	65	1
9/7	1700	3	0.0	17.0	7.0	63	1
9/8	0730	4	0.8	10.0	7.0	62	1
	1700	4	0.5	13.0	7.0	61	1
9/9	1000	5	3.8	8.0	7.0	61	1
	1700	4	0.5	13.0	8.0	61	1
9/10	1000	4	0.5	6.0	8.0	61	1
	1700	4	0.1	10.0	7.0	61	1
9/11	1000	4	0.0	8.0	6.5	61	1
	1700	3	0.0	13.0	7.0	60	1
9/12	1000	4	0.3	5.0	6.5	59	1
	1700	3	0.0	14.0	7.0	58	1
9/13	1000	4	0.5	7.0	7.0	58	1
	1700	4	0.0	16.0	7.0	58	1
9/14	1000	4	0.0	10.0	8.0	57	1
9/15	1000	3	0.0	9.0	7.0	56	1
	1700	3	0.0	17.0	7.0	56	1
9/16	1000	3	0.5	1.0	6.5	56	1
	1700	3	0.0	14.0	7.0	56	1
9/17	1000	3	0.0	4.0	6.5	55	1
	1700	3	0.0	15.0	6.5	55	1
9/18	1000	5	4.7	5.0	6.5	54	1
	1700	3	0.6	13.0	6.5	54	1
9/19	1000	5	0.0	-2.0	6.5	54	1
	1700	3	0.0	14.0	6.5	53	1
9/20	1000	4	0.4	5.0	6.5	52	1
	1700	4	1.2	10.0	6.5	52	1
9/21	1000	4	0.9	3.0	6.5	52	1
	1700	3	0.4	12.0	6.5	51	1
9/22	1000	5	0.1	4.0	6.0	51	1

[a] sky conditions
1 = clear or mostly clear skies; <10% cloud cover
2 = partly cloudy; < 50% cloud cover
3 = mostly cloudy; > 50% cloud cover
4 = complete overcast
5 = thick fog

[b] Represents the cumulative precipitation in the 24 hours prior to the daily morning observation.

[c] Water clarity codes:
1 = visibility greater than 1 meter
2 = visibility between 0.5 and 1 meter
3 = visibility less than 0.5 meter

APPENDIX B: PASSAGE COUNTS BY SPECIES

Appendix B1.–Daily passage counts by species at George River weir, 2011.

Date	Chinook Salmon	Sockeye Salmon	Chum Salmon	Pink Salmon	Coho Salmon	Longnose Sucker	Whitefish	Other[a]
6/15	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
6/16	0	0	3	0	0	239	0	
6/17	0	0	2	0	0	835	0	
6/18	0	0	13	0	0	933	0	
6/19	0	0	10	0	0	241	0	
6/20	0	0	8	0	0	72	0	
6/21	0	0	31	0	0	32	0	
6/22	5	0	42	0	0	31	0	
6/23	1	0	17	0	0	50	0	1P
6/24	0	0	30	0	0	68	0	
6/25	1	0	19	0	0	102	0	
6/26	12	0	126	0	0	201	0	
6/27	0	0	64	0	0	185	0	
6/28	3	0	56	0	0	27	0	
6/29	0	0	45	0	0	23	0	
6/30	1	0	194	0	0	17	0	
7/1	21	0	576	0	0	80	0	
7/2	27[c]	0[c]	826[c]	0[c]	0[c]	154	0	
7/3	87	1	1,185	0	0	355	0	
7/4	193	0	1,418	0	0	611	0	
7/5	59	0	1,262	0	0	194	0	
7/6	54	0	985	1	0	207	0	
7/7	18	0	588	2	0	33	0	
7/8	30	0	1,489	3	0	49	0	
7/9	54	1	1,023	0	0	39	0	
7/10	51	0	1,011	2	0	60	0	
7/11	71	1	1,498	1	0	21	0	
7/12	215	0	2,506	17	0	48	0	
7/13	134	0	2,455	26	0	51	0	
7/14	42	0	1,358	22	0	15	0	
7/15	17	0	885	11	0	14	0	
7/16	12	0	1,596	8	0	27	0	
7/17	53	1	1,760	12	0	14	0	
7/18	54	6	1,564	16	0	4	0	
7/19	75	2	1,895	26	0	19	0	
7/20	54	4	2,697	44	0	122	0	
7/21	30	2	1,773	74	0	62	0	
7/22	30	2	1,301	53	0	135	0	
7/23	28	3	1,100	46	0	50	0	
7/24	15	0	1,070	34	0	10	0	
7/25	22	0	1,194	37	0	4	0	
7/26	10	2	1,123	37	1	6	0	
7/27	7	2	1,126	36	4	16	0	
7/28	5	3	977	37	19	14	0	
7/29	6	1	703	17	10	6	0	
7/30	5	2	599	14	8	3	0	
7/31	2	2	549	8	23	2	0	
8/1	4	2	547	38	19	0	0	
8/2	1	3	564	37	68	0	0	
8/3	1	0	401	43	109	1	0	

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Appendix B1.–Page 2 of 2.

Date	Chinook Salmon	Sockeye Salmon	Chum Salmon	Pink Salmon	Coho Salmon	Longnose Sucker	Whitefish	Other[a]
8/4	1	1	497	39	86	0	0	
8/5	0	0	181	13	24	0	0	
8/6	2	0	282	19	68	0	0	
8/7	0[c]	0[c]	77[c]	3[c]	9[c]	0	0	
8/8	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/9	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/10	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/11	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/12	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/13	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/14	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/15	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/16	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/17	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/18	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/19	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/20	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/21	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/22	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/23	–[b]	–[b]	–[b]	–[b]	–[b]	–	–	
8/24	0[c]	2[c]	6[c]	0[c]	643[c]	4	0	
8/25	0	0	4	2	932	2	0	
8/26	0	0	11	1	1,618	5	0	
8/27	0	0	4	0	955	0	0	
8/28	0	0	15	0	2,421	4	0	
8/29	0	0	8	1	2,463	5	0	
8/30	0	0	4	0	2,314	8	0	
8/31	0	0	9	1	1,157	3	0	
9/1	0	0	2	1	1,049	2	0	
9/2	0	0	4	0	915	1	0	
9/3	0	0	7	0	1,696	6	0	
9/4	0	0	2	0	1,036	1	0	
9/5	0	0	5	0	1,083	9	0	
9/6	0	0	0	1	877	9	0	
9/7	0	0	0	0	1,118	0	0	
9/8	0	0	0	0	1,104	3	0	
9/9	0	0	3	0	762	1	0	
9/10	0	0	1	0	257	1	0	
9/11	0	0	1	0	257	0	0	
9/12	0	0	0	0	52	2	0	
9/13	0	0	0	0	76	0	0	
9/14	0	0	0	0	460	2	0	
9/15	0	0	0	0	152	0	0	
9/16	0	0	1	0	25	1	0	
9/17	0	0	0	0	27	2	0	
9/18	0	0	0	0	209	4	0	
9/19	0	0	1	0	62	2	0	
9/20	0	0	1	0	83	2	0	
Totals	1,513	43	43,390	783	24,251	5,561	0	1P

[a] G= Arctic Grayling; P = Northern pike; D = Dolly Varden: count may not correspond to actual day observed.

[b] Weir was not operable for a full day. No counts were conducted.

[c] Partial day of operation. Actual counts observed here but not applied to the missed passage estimate used.

APPENDIX C: DAILY CARCASS COUNTS

Appendix C1.–Daily carcass counts at George River weir, 2011.

	Chinook			Sockeye			Chum			Pink			Coho			Longnose	White-	
Date	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Sucker	fish	Other[a]
6/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
6/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
6/22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/23	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	4	0	
6/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
6/26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/27	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	
6/28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	
6/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6/30	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	4	0	
7/1	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	1	0	
7/2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
7/3	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	1	0	
7/4	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	
7/5	0	0	0	0	0	0	3	2	5	0	0	0	0	0	0	1	0	
7/6	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
7/7	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	1G
7/8	0	0	0	0	0	0	3	1	4	0	0	0	0	0	0	0	0	
7/9	0	0	0	0	0	0	7	1	8	0	0	0	0	0	0	2	0	
7/10	0	0	0	0	0	0	4	3	7	0	0	0	0	0	0	0	0	
7/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7/12	0	0	0	0	0	0	9	5	14	0	0	0	0	0	0	5	3	
7/13	0	0	0	0	0	0	6	3	9	0	0	0	0	0	0	4	0	
7/14	0	0	0	0	0	0	3	4	7	0	0	0	0	0	0	4	0	
7/15	0	0	0	0	0	0	10	3	13	0	0	0	0	0	0	0	0	
7/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7/17	0	0	0	0	0	0	6	3	9	0	0	0	0	0	0	3	0	
7/18	0	0	0	0	0	0	20	7	27	1	0	1	0	0	0	2	0	

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	Chinook			Sockeye			Chum			Pink			Coho			Longnose	White-	
Date	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Sucker	fish	Other[a]
7/19	0	0	0	0	0	0	9	5	14	0	0	0	0	0	0	0	0	
7/20	0	0	0	0	0	0	17	12	29	0	0	0	0	0	0	1	1	
7/21	0	0	0	0	0	0	20	6	26	0	0	0	0	0	0	1	0	
7/22	0	0	0	0	0	0	23	17	40	1	0	1	0	0	0	0	0	
7/23	0	0	0	0	0	0	6	1	7	0	0	0	0	0	0	1	0	
7/24	0	0	0	0	0	0	26	13	39	0	0	0	0	0	0	0	0	
7/25	0	0	0	0	0	0	26	8	34	0	0	0	0	0	0	2	0	
7/26	1	1	2	0	0	0	40	9	49	2	0	2	0	0	0	1	0	
7/27	0	1	1	0	0	0	41	14	55	2	0	2	0	0	0	3	0	
7/28	0	0	0	0	0	0	53	26	79	4	0	4	0	0	0	1	0	broad
7/29	1	2	3	0	0	0	40	16	56	2	0	2	0	1	1	1	1	wf
7/30	1	1	2	0	0	0	53	25	78	4	1	5	0	0	0	4	0	
7/31	2	3	5	0	0	0	37	12	49	5	0	5	0	0	0	1	0	
8/1	1	4	5	0	0	0	46	8	54	4	2	6	0	0	0	3	1	
8/2	8	8	16	0	0	0	66	40	106	5	6	11	0	0	0	2	1	
8/3	8	8	16	0	0	0	116	53	169	5	5	10	0	0	0	72	5	
8/4	11	4	15	0	0	0	69	48	117	10	4	14	0	0	0	48	1	
8/5	4	4	8	0	0	0	51	34	85	3	0	3	0	0	0	38	0	
8/6	5	2	7	0	0	0	45	20	65	4	0	4	0	0	0	64	1	
8/7	2	1	3	0	0	0	18	5	23	2	0	2	0	0	0	38	0	
8/8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/9	2	1	3	0	0	0	13	5	18	2	0	2	0	0	0	48	0	
8/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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Appendix C1.–Page 3 of 3.

	Chinook			Sockeye			Chum			Pink			Coho			Longnose	White-	
Date	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Sucker	fish	Other[a]
8/22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8/25	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	
8/26	0	0	0	0	0	0	5	1	6	3	2	5	1	0	1	17	0	
8/27	1	0	1	0	0	0	10	3	13	3	0	3	1	0	1	22	0	
8/28	0	0	0	0	0	0	4	2	6	1	2	3	0	0	0	6	1	
8/29	0	0	0	0	0	0	8	1	9	0	1	1	0	0	0	0	0	
8/30	0	0	0	0	0	0	6	3	9	3	2	5	1	0	1	12	0	
8/31	0	0	0	0	0	0	0	0	0	9	2	11	0	0	0	2	0	
9/1	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	12	1	
9/2	0	0	0	0	0	0	0	0	0	1	3	4	0	0	0	9	0	
9/3	0	0	0	0	0	0	0	0	0	4	1	5	0	0	0	12	4	
9/4	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	11	0	
9/5	0	0	0	0	0	0	1	1	2	1	0	1	0	0	0	9	0	
9/6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9/7	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	13	7	
9/8	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	37	49	
9/9	0	0	0	0	0	0	0	3	3	0	0	0	0	1	1	8	25	
9/10	0	0	0	0	0	0	0	4	4	0	0	0	0	1	1	27	10	2P
9/11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9/12	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	31	12	
9/13	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	32	8	1P
9/14	0	0	0	0	0	0	1	0	1	0	0	0	0	2	2	11	0	
9/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	14	
9/16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	20	15	2P,1D
9/17	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	21	12	
9/18	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	38	20	2P
9/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	9	1G, 1D
9/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	12	
Totals	47	40	87	0	0	0	930	441	1371	85	32	117	3	7	10	793	218	

[a] G = Arctic Grayling; P = Northern pike; D = Dolly Varden.