Fishery Data Series No. 10-09

Kanektok River Salmon Monitoring and Assessment, 2008

Annual Report for Project FIS 07-305
USFWS Office of Subsistence Management
Fisheries Resource Monitoring Program

by

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and

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March 2010

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)

Measures (fisheries)

fork length	FL
mideye to fork	MEF
mideye to tail fork	METF
standard length	SL
total length	TL

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

A resistance board weir was used on the Kanektok River to estimate escapement and provide a platform to collect samples used in estimating age, sex, and length for Chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, chum *O. keta*, and coho *O. kisutch* salmon. The weir was installed in May, soon after river break up in that reach of the system and was operational from 17 July through 21 August. Estimating total escapement passing the weir in 2008 was not possible for Chinook, chum, or coho salmon due to the late start of the project. However, passage estimates for these species during the operational period was 4,837 Chinook, 54,024 chum, and 24,490 coho salmon. A total escapement estimate for sockeye salmon was possible in 2008 and resulted in an estimated 141,388 sockeye salmon. Aerial counts are used with weir escapement counts to derive escapement estimates for the Kanektok River drainage. The 2008 season was the sixth year Chinook, sockeye, and chum salmon escapement and age, sex, length composition data were collected and the seventh year coho salmon data was collected. Salmon destined for the Kanektok River are harvested in commercial, subsistence, and sport fisheries conducted both inriver and in adjacent marine waters of Kuskokwim Bay (District W-4). The Alaska Department of Fish and Game has quantified subsistence harvests in the Quinhagak area of the Kuskokwim Bay since 1968. From 1998 to 2007, annual subsistence harvests have averaged 3,335 Chinook, 1,510 sockeye, 1,350 chum, and 1,446 coho salmon. Subsistence harvest estimates for 2008 are currently unavailable. The 2008 District W-4 commercial salmon harvest was 13,812 Chinook, 69,743 sockeye, 94,257 coho, and 57,033 chum salmon, for a total of 234,845 fish. Samples were also collected from the District W-4 commercial catch for use in estimating age, sex, and length of the 2008 commercial harvest.

Key words: Chinook *Oncorhynchus tshawytscha*, chum *O. keta*, coho *O. kisutch*, and sockeye salmon *O. nerka*, whitefish *Coregonus* spp., rainbow trout *O. mykiss*, Dolly Varden *Salvelinus malma*, District W-4, Kanektok River, Kuskokwim Area, resistance board weir.

INTRODUCTION

This is the 2008 annual report for project FIS 07-305 funded by the US Fish and Wildlife Service (USFWS) Office of Subsistence Management (OSM). However, the following additional data, necessary for sustainable management of fisheries harvesting Kanektok River salmon, have also been included. These types of data include harvests from subsistence, commercial, and sport fisheries, age, sex and length (ASL) sampling of the commercial fishery and resulting exploitation rate for sockeye salmon *Oncorhynchus nerka*. An accurate Chinook salmon *O. tshawytscha* exploitation rate was not obtainable in 2008 due to incomplete escapement data. Eventually, run reconstruction and brood-year-return tables, which are built upon Kanektok River weir and area fishery information, will be included in reports for subsequent years.

STUDY AREA

Kanektok River is located in the Togiak National Wildlife Refuge in southwestern Alaska (Figure 1). The river originates from Kegati/Pegati Lake and flows westerly for 91 mi (146 km), emptying into Kuskokwim Bay near the village of Quinhagak. The upper portion of the river consists primarily as a single channel flowing through mountainous terrain. The lower portion of the river flows through a broad fluvial plain and is highly braided with many side channels. Kanektok River and its many tributaries drain approximately 500 mi^2 (1,295 km^2) of surface area dominated largely by undisturbed tundra. The surrounding riparian vegetation is composed primarily of cottonwood, willow, and alder. The Kanektok River weir is located at river mile 42 (67.60 km), GPS coordinates N 59° 46.057, W 161° 03.616.

SALMON FISHERIES

Subsistence fishing for salmon occurs throughout the Kanektok River drainage, in nearby Quinhagak area streams, and in Kuskokwim Bay. Salmon caught for subsistence use make an important contribution to the annual subsistence harvests of residents from Quinhagak, Goodnews Bay, Eek, and Platinum (Ward et al. 2003). The Alaska Department of Fish and Game (ADF&G) has quantified subsistence harvests in the Quinhagak area since 1968.

Commercial salmon fishing has occurred in the Quinhagak area since before statehood. In 1960, commercial fishing District W-4 was established offshore of Quinhagak in Kuskokwim Bay (Figure 2). Since the inception of District W-4, its northern boundary has been shifted between Weelung Creek and Oyak Creek in response to overcrowding issues and concern over the interception of fish bound for the Kuskokwim River. In 2004, the Alaska Board of Fisheries (BOF) extended the northern boundary 3 miles north up the coast from the southern edge of Oyak Creek to the southern edge of Weelung Creek. The northern boundary was expanded to address concerns about overcrowding of fishermen in the district during commercial openings. .

The District W-4 commercial fishery targets Chinook, sockeye, and coho salmon *O. kisutch*. Chum *O. keta* and pink salmon *O. gorbuscha* are harvested incidentally, with pink salmon being the least valuable species commercially. District W-4 commercial fishery participation has shown a general decline since 1999. The decline is likely attributable to the poor market value of salmon since 1995, increasing fuel prices, limited number of tenders, limited processing capacity, and other economic opportunity in the area.

In addition to commercial and subsistence harvest, the Kanektok River also supports a popular sport fishery. Sport anglers from around the world ply the drainage from mid-June to the beginning of September each year, targeting salmon, rainbow trout *O. mykiss*, and Dolly Varden *Salvelinus malma*. There are currently 3 seasonal sport fishing guide camp operations located on Kanektok River and numerous guided and non-guided anglers that float the Kanektok River from its headwaters to the village of Quinhagak.

ESCAPEMENT MONITORING

The Kanektok River is the primary spawning stream in the Quinhagak area. Establishing a viable method for monitoring and assessing salmon escapement in Kanektok River has been problematic. The first attempted monitoring project was a counting tower established in 1960 on the lower river near the village of Quinhagak (ADF&G 1960). This tower project was plagued by logistical problems, poor water visibility, and difficulties with species apportionment. In 1961, the tower was relocated to the outlet of Kegati/Pegati Lake and operated through 1962 (ADF&G 1961, 1962). Although successful in providing sockeye salmon escapement information, this site was discontinued after 1962. The next attempted monitoring project was hydroacoustic sonar (1982–1987); however, the use of sonar on this system was deemed unfeasible because of technical obstacles, site limitations, and budget constraints (Huttunen 1984–1986, 1988; Schultz and Williams 1984). In 1996, a cooperative effort between the Native Village of Quinhagak (NVK), USFWS, and ADF&G reinitiated a counting tower located 15 miles upriver from the mouth of the Kanektok River. The counting tower again proved to have limited utility (Fox 1997) despite improvements to the project in 1998 (Menard and Caole 1999). In 1999, resources were redirected towards developing a resistance board weir (Burkey et al. 2001). The weir was operational briefly in 2000, but high water levels, technical limitations, and personnel problems

precluded the project from meeting its objectives (Linderman 2000). During operation in 2000, the site was determined incapable of facilitating a weir because of extensive bank erosion.

In 2001, the weir was relocated approximately 20 miles upriver from the original site. The weir was successfully installed and operated in 2001; however, installation was delayed until 10 August because of high water. In 2002, an attempt was made to install the weir just after ice-out in early May, but high water still delayed complete installation until late June. In 2003, crews arrived on-site even earlier and successfully installed the weir during the last week of April, before snowmelt and spring precipitation raised water levels beyond a workable point. Installation and successful operation of the weir is dependent upon "early installation" in late April, just after ice-out. When feasible, an early installation strategy is employed annually. The project continues as a cooperative venture between ADF&G, USFWS Togiak National Wildlife Refuge, USFWS OSM, and NVK.

Kanektok River drainage salmon escapements have also been monitored by aerial survey techniques since 1962 (Appendix C1). Aerial survey escapement assessment can be variable depending on viewing conditions and observers; however, when observers, timing, and methods are standardized to the extent feasible and survey conditions meet acceptable criteria, the resulting counts are used as an index of escapement. Procedures established in recent years have increased the annual consistency of Kanektok River aerial surveys through the creation of an aerial survey location database, intensive pre-flight planning, and the establishment of a dedicated aerial survey project staff. Additionally, variability between observers and methods has been addressed through standardized training and consistency of the observers, pilots, and aircraft used in resent years.

Aerial surveys targeting Chinook and sockeye salmon are the most reliable for indexing spawning populations. Chum salmon have protracted run timing, which requires multiple surveys throughout the run to ensure accuracy of the index. In addition to timing issues, chum salmon can be problematic for observers to get an accurate index of escapement because it is difficult to see mature spawning populations in deep or slightly turbid conditions in the water column. Chum salmon aerial surveys have been discontinued as an escapement index until survey methods can be improved or funding can be secured to allow for multiple aerial surveys of chum salmon populations throughout the duration of their runs. Additionally, Kanektok River coho salmon have been difficult to survey because of poor fall weather conditions. Coho salmon aerial surveys have been conducted when funding and weather conditions allow.

Spawning occurs downstream of the weir for Chinook, sockeye, chum, pink, and coho salmon. Escapement counts obtained from the weir are evaluated as an index of escapement for these species and are used in combination with aerial survey counts to estimate escapement for the entire Kanektok River drainage.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Annual escapement and commercial ASL composition estimates are used to develop stock-recruitment models, which in turn provide information for projecting future run sizes. Available escapement ASL information for Chinook, sockeye, chum, and coho salmon is limited. Historical summaries of existing ASL information for salmon returning to Kanektok River can be found in Molyneaux et al. (2008). Historical escapement ASL samples prior to 1997 are not included in these summaries (e.g. Huttunen 1984–1986, 1988).

OBJECTIVES

The annual project objectives for Kanektok River weir are to:

1. Enumerate the daily passage of Chinook, chum, sockeye and coho salmon through the weir from mid-June through 21 August.
2. Describe the run timing or proportional daily passage of Chinook, sockeye, chum, and coho salmon through the weir.
3. Estimate the weekly sex and age composition of Chinook, sockeye, chum, and coho salmon such that simultaneous 90% confidence intervals have a maximum width of 0.20.
4. Estimate the mean length of Chinook, chum, sockeye, and coho salmon and Dolly Varden by sex and age.
5. Monitor environmental variables at the weir site, such as relative water level, discharge rate, water chemistry, and water temperature.

METHODS

RESISTANCE BOARD WEIR

Design, construction, and installation of the Kanektok River resistance board weir follow Stewart (2002, 2003, 2004), and Tobin (1994). The approximately 250 ft (76.2 m) weir used at the Kanektok River site is comprised of 3 major parts: the substrate rail, the resistance board panel section, and the fixed picket section. During weir operations, picket spacing of the weir panels allows for a complete census of all but the smallest returning Chinook, sockeye, chum, and coho salmon. The picket spacing allows smaller fish, such as pink salmon and other non-salmon species, to pass through the weir between pickets. Additional details concerning the resistance board weir components used on Kanektok River are described in Estensen and Diesinger (2004).

Installed on the weir were 2 fish passage chutes, (looking downstream) one approximately 100 ft (30.48 m) from the left bank and the other approximately 25 ft (7.62 m) from the right bank. Gates were attached on both chutes to regulate fish passage. A 10 ft (3 m) by 15 ft (4.6 m) live trap was used to collect fish for ASL sampling and installed directly upstream of the right bank passage chute. The general practice was to open the live trap entrance gate and leave the live trap exit gate closed to allow fish to accumulate inside the holding pen. The holding pen was typically allowed to fill with fish and sampling was done during scheduled counting periods. To avoid potential bias caused by the selection or capture of individual fish, all fish within the trap were included in the sample, even if the sample size objective was exceeded.

For various reasons, fish migrated downstream and required an avenue for safe passage over the weir. This behavior was typical among non-salmon species such as rainbow trout, Dolly Varden, and whitefish species *Coregonus* spp. downstream passage chutes on the resistance board weir provided a means of accommodating downstream fish passage. Each chute consisted of a single panel with its resistance board adjusted to allow a small flow of water over the distal end of the panel. Further details of downstream passage chutes are described in Linderman et al. (2002). Fish do not typically pass upstream over these chutes and they are only utilized during periods of active downstream fish migration. However, downstream passage chutes were not used during periods of strong upstream salmon passage. Downstream fish passage over these chutes was not enumerated.

Boat passage was accomplished through a designated boat gate located in the center of the weir and boat operators were able to pass independently of the weir crew. The boat gate consisted of passage panels designed to allow boats to pass over the weir without damaging the panels and are described in Estensen and Diesigner (2004). Boats with jet-drive engines were the most common and could pass over the boat gate panels independent of the crew by reducing speed. Rafts could pass downstream by submerging the boat passage panels and drifting over the weir. Boats with propeller-drive engines were uncommon and would require a towrope when passing upstream.

AERIAL SURVEYS

Aerial surveys are flown annually during peak spawning periods for each species in order to maximize the number of observable fish on the spawning grounds. Peak spawning periods were developed from run timing estimates and vary by species. Aerial surveys are numerically ranked on the scale: 1 = good, 2 = fair, and 3 = poor. Ranking criteria are based on survey method, weather and water conditions, time of survey, and spawning stage. Only surveys with rankings of fair or good (1 or 2) conducted within the peak spawning period are used for run reconstruction estimates for the Kanektok River.

Chinook and coho salmon aerial surveys focus on the main river channel and larger tributaries; while sockeye salmon aerial surveys focus on the main river channel, larger tributaries and lakes, and larger lake tributaries. Kanektok River aerial survey counts are tallied by index area to obtain a total count of observable fish throughout the drainage, which the sustainable escapement goal (SEG) requirements are judged by. Aerial survey counts are also tallied by the total count of fish observed upstream and downstream of the weir to apportion weir counts to obtain total Kanektok River escapement estimates.

ESCAPEMENT MONITORING AND ESTIMATES

To determine salmon escapement past the weir, fish passage counts were made daily during the operational period of the project. Passage counts occurred regularly throughout the day, typically for 1–2 hour periods, beginning in the morning and continuing as late as light permitted. During counting periods, fish passage chute gates were opened allowing fish through the weir. Crew members identified and enumerated all fish by species as they exited the passage chutes. Any fish observed traveling downstream through the fish passage chutes were subtracted from the tally.

Weir escapement was estimated for periods when the weir was inoperable and when breach events occurred. Estimates were assumed to be zero if passage was considered negligible based on historical data and run timing indicators. Estimates were calculated based on the proportional relationship between observed weir counts at the Kanektok River weir and weir counts from a model data set. The model data set may be from a different year at Kanektok River or from the same year at a neighboring project. The model data set was selected based on the strongest (Pearson) correlation between observed passage during the operational period at Kanektok River weir and observed passage from the model data set during the same time period. Daily passage estimates were the result of relative daily passage proportions of the model data set minus any observed passage from the day being estimated, and were calculated using the formula:

$$\breve{n}_d = \left(\frac{\left(n_{d\,c} \times \left(\sum_{d_z}^{d_a} y_e \right) \right)}{\left(\sum_{d_z}^{d_a} y_c \right)} \right) - n_{d_e} \quad (1)$$

Where:

$\breve{n}_d$ = passage estimate for the day weir was not operational,

$n_{d\,c}$ = the number of fish per species that passed the weir on that day for the corresponding year,

$\sum_{d_z}^{d_a} y_e$ = the sum of all daily counts per species for the year being estimated,

$\sum_{d_z}^{d_a} y_c$ = the corresponding sum of all daily counts per species, for the year with the strongest correlation to the year being estimated, and

n_{d_e} = the number of fish per species that passed the weir on that day for the year being estimated.

Drainagewide escapement estimates for Chinook and sockeye salmon were calculated by summing the weir escapement count with the estimated number of fish that spawn below the weir. The number of fish estimated to spawn below the weir was calculated by applying the proportion of fish observed upstream and downstream of the weir during the aerial surveys conducted in 2008 to the weir escapement. The drainage escapement estimates account for the number of fish counted past the weir after the aerial survey date and was calculated using the following formula:

$$N_d = \left(\frac{\left(n_{a_d} \times n_{w_2} \right)}{n_{a_u}} \right) + n_{w_2} \quad (2)$$

Where:

N_d = total drainage escapement estimate,

n_{a_d} = aerial survey count downstream of the weir,

n_{a_u} = aerial survey count upstream of the weir, and

n_{w_2} = final weir escapement count including any estimates.

AGE, SEX, AND LENGTH SAMPLING

Scales were removed from the preferred area of the fish (INPFC 1963). A minimum of 3 scales were removed from each Chinook and coho salmon, and one scale was removed from chum and sockeye salmon. Scales were mounted on numbered and labeled gum cards. Sex was determined by visually examining external morphology, keying in on the development of the kype, roundness of the belly and the presence or absence of an ovipositor for escapement samples and all commercially harvested fish sampled had sex determined by visual inspection of internal

gonads. Length was measured to the nearest millimeter from mideye to tail fork. In the case of escapement sampling, after each fish was sampled it was released upstream of the weir.

Escapement sampling for Chinook, sockeye, and chum salmon ASL composition estimates were conducted based on the pulse sampling design of Molyneaux et al. (2006). Intensive sampling was conducted for 1 to 3 days followed by a few days without sampling. The goal for each pulse is to collect samples from 210 Chinook, 210 sockeye, 200 chum, and 170 coho salmon. These sample sizes were selected for simultaneous 95% confidence interval estimates of age composition ±0.1 and are adjusted from sample sizes recommended by Bromaghin (1993) to account for regenerated and otherwise unreadable scales. The minimum number of pulse samples was one per species from each third of the run. However in 2008, samples were insufficient for determining total estimated age and sex composition of the total escapement.

Salmon were sampled from the live trap installed in the weir. After sampling was completed, relevant information such as sex, length, date, and location was copied from field forms to computer mark–sense forms. The completed gum cards and data forms were sent to the Bethel and Anchorage ADF&G offices for processing.

The weir crew conducted active sampling to increase Chinook salmon sample sizes. Active sampling consisted of capturing and sampling Chinook salmon while actively passing and enumerating all other fish. Further details of active sampling procedures are described in Linderman et al. (2002). Additionally during times when the abundance of Chinook salmon passing through the weir was low, reducing the number of fish captured in the trap, the crew utilized dipnets to capture Chinook salmon from behind the weir for sampling purposes.

In a cooperative effort between Coastal Villages Region Fund (CVRF) and ADF&G, student interns sampled salmon from the Quinhagak dock area where fishermen deliver their catch to the on-site processor. An area was set aside for the sampling crew and processor workers supplied the crew with totes of iced fish for sampling. Pulse samples were collected from a minimum of 3 commercial openings, each representing a third of the total harvest. The goal for each pulse was to collect samples from 210 Chinook, 210 sockeye, 200 chum, and 170 coho salmon. Fish were sampled as efficiently and carefully as possible to reduce processing delays and maintain fish quality.

After sampling was concluded, gum cards and data forms were completed and returned to the Bethel ADF&G office for processing. Further details of sampling procedures can be found in Molyneaux et al. (2006) and Estensen and Diesigner (2004).

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

ADF&G staff in Bethel and Anchorage processed ASL data and generated data summaries (Molyneaux et al. 2006). Two types of summary tables were compiled for each species; one described the age and sex composition and the other described length characteristics. These summaries account for ASL composition changes over the season by first partitioning the season into temporal strata based on pulse sample dates, applying age and sex composition of individual pulse samples to the corresponding temporal strata, and finally summing the strata to generate the estimated age and sex composition for the season. This procedure ensured ASL composition estimates were weighted by fish abundance in the escapement or harvest rather than fish abundance in the samples. Likewise, estimated mean length composition was calculated by weighting sample mean lengths from each stratum by the escapement or harvest of salmon

during that stratum. Similar procedures were used for coho salmon; however, sample design modifications implemented in 2004 reduced the ability to estimate changes in ASL composition over the season in favor of estimating ASL composition for the entire run or harvest.

Ages are reported in the tables using European notation. European notation is composed of 2 numerals separated by a decimal, where the first numeral indicates the number of winters spent in fresh water and the second numeral indicates the number of winters spent in the ocean (Groot and Margolis 1991). Total age is equal to the sum of these 2 numerals plus one to account for the single winter of egg incubation in the gravel. The original ASL gum cards, acetates, and mark-sense forms are archived at the ADF&G office in Anchorage. The computer files were archived by ADF&G in the Anchorage and Bethel offices.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrologic conditions were recorded 2 times a day normally, at 0700 hours and 1700 hours. Cloud cover was judged in percent covered and elevation; wind speed was estimated in miles per hour and direction was noted; precipitation was measured in inches per 24 hours, daily air and water temperature were recorded in degrees Celsius. The river gauge height was recorded daily and was pegged to a benchmark established in 2001 and consists of a ¾ inch diameter steel rebar driven into the river bed adjacent to the camp. The top of the benchmark represents a river stage of 100 cm. The river gauge is a steel rule installed near shore in the river and the 100 cm mark is pegged level with the top of a benchmark to achieve relative water level between years.

RESULTS

SALMON FISHERIES

Subsistence, commercial, and sport fishing activities occurred in both District W-4 and Kanektok River in 2008. At the time of this writing, 2008 subsistence harvest estimates for Quinhagak were not final; however, discussions with participants' inseason indicated subsistence needs were met. In District W-4, 146 permit holders fished commercially for total harvests of 13,812 Chinook, 69,743 sockeye, 57,033 chum, and 94,257 coho salmon (Table 1). Exvessel value by species was $140,137 for Chinook, $274,641 for sockeye, $20,581 for chum, and $316,545 for coho salmon for a total exvessel value of $751,903. Sport fish harvest estimates for Kanektok River in 2008 have not yet been determined.

PROJECT OPERATIONS

The Kanektok River weir was operated from 17 July through 21 August 2008 (Table 2; Appendix B1). For the purposes of this report, the operational period is defined as 25 June through 30 August, inclusive of estimates.

Low water coincided with ice out the last week of April allowing partial installation of the weir. High water levels occurred from late June through mid July, due to snow melt and run off. High water prevented the weir from being operational by the target date. Weir operation began 17 July; however, due to problems with the boat gate the weir was not in full operation until 27 July. The Kanektok River generally experiences high water through September and early October. In previous years the weir has been removed in late September if water levels allowed. However, the weir has remained in place in some years through mid October and remained in place over

winter in one year, which caused extensive damage to the weir and required the weir to be replaced. To avoid late season removal weir operations were ceased on 22 August. The crew was successfully able to remove the panels before high water and avoid leaving materials in the river over the winter. Parts of the rail system are left in place to ease installation next season.

Breaches in the weir caused by broken weir panel pickets can occur and one such breach was reported in 2008. The breach occurred for 20 hours on 25 July and was repaired by late 26 July. No estimate of missed passage was made as the breach was considered negligible to fish actively passing over the boat gate. Trouble with the boat gate allowed for some missed passage upstream of the weir from 17 July through 27 July. A visual based estimate of the missed passage was included in daily passage counts. Fish observed passing over the boat gate were estimated based on 3 visual counts for 20 minutes each per day. Daily visual count data was expanded, to represent 24 hours of fish passage, for days while the weir boat gate was inoperable.

AERIAL SURVEYS

An aerial survey of the Kanektok River drainage was conducted on 6 August, 2008. The survey was flown with a Piper PA-18 aircraft and was rated as good (1). Conditions encountered by the aerial observer in the upper and lower sections of the drainage did not affect the quality of the aerial survey being conducted. A total of 3,808 Chinook and 38,900 sockeye salmon were counted in the Kanektok River drainage during the survey completed in 2008 (Table 3; Appendix C1). The results of the Chinook and sockeye salmon aerial survey met or exceeded their respective SEG ranges. No chum or coho salmon aerial surveys were conducted in 2008.

WEIR ESCAPEMENT

Escapement estimates for Chinook and chum salmon passage during the target operational period of 26 June through 21 August were not made for missed passage prior to the weir becoming partially operational on 17 July. Estimates were not made for missed passage prior to the 17 July date due to daily passage rates for Chinook and chum salmon not showing a strong Pearsons correlation with other years for which escapement data exists. The estimates should be considered minimum escapements. It is known that Chinook and chum salmon migrated past the weir prior to its operation; however, it is thought that the number of Chinook salmon that passed the weir was minor compared to the overall escapement.

Chinook salmon escapement that passed the Kanektok River weir in 2008 was estimated to be 4,837 fish and 107 fish are estimated to have passed the weir during the period when the weir was inoperable due to problems with the boat gate. Estimated fish were included in the escapement estimate (Table 2). The first Chinook salmon was observed on 17 July, the first day of weir operations, and was observed until operations ceased on 21 August. Based on the observed daily passage and inclusive of estimated passage, the median passage date was 28 July and the central 50% of the run occurred between 23 July and 2 August. Run timing was later than any other year since the weir began operations in 2002 (Appendix D1).

Sockeye salmon escapement that passed the Kanektok River weir in 2008 was estimated to be 141,388 fish. A total of 68,993 sockeye salmon were observed passing upstream through the weir and 72,395 fish are estimated to have passed the weir during the period when the weir was inoperable due to problems with the boat gate (Table 2). The remaining estimated 71,959 sockeye salmon escapement was estimated by using a previous year's escapement which shows a strong correlation (Pearsons) to the year being estimated. The 2008 run showed a .92 correlation

with the 2004 run. Daily passage rates in 2004 were used to calculate the estimated passage from 30 June through 16 July. Estimates were not made to correspond with the target operational dates of 25 June through 21 August due to no data set showing a strong correlation to the 2008 run with passage rates dating back to the target operational start date of 25 June. The first sockeye salmon was observed on 17 July, the first day of operation and were observed until weir operation ceased on 21 August. Based on the observed daily passage and inclusive of estimated passage, the median passage date was 16 July and the central 50% of the run occurred between 9 July and 22 July (Appendix D1).

Chum salmon escapement that passed the Kanektok River weir in 2008 was estimated to be 54,024 fish. There were 253 fish estimated to have passed the weir during the period when the weir was inoperable due to problems with the boat gate. Estimated fish were included in the escapement estimate (Table 2). The first chum salmon was observed on 17 July, the first day of operation and were observed until operations ceased on 21 August. Based on the observed daily passage and inclusive of estimated passage, the median passage date was 30 July and the central 50% of the run occurred between 26 July and 2 August (Appendix D1).

Coho salmon escapement that passed the Kanektok River weir in 2008 was estimated to be 24,490 fish (Table 2). No passage of coho salmon was observed through the boat gate during the inoperable period. The first coho salmon was observed on 20 July and the last coho salmon was observed on 21 August when weir operations ceased. Based on the operational period, the median passage date was 15 August and the central 50% of the run occurred between 9 August and 19 August (Appendix D1). Coho salmon continue to pass upstream well after weir operations ceased in 2008. No strong correlation with previous years could be determined to estimate passage after 2008 weir operations.

The total count of pink salmon upstream of the Kanektok River weir in 2008 was 142,430 fish (Table 4). No escapement estimate are made for pink salmon that may have passed during periods the weir was inoperable in 2008 because pink salmon are not a species targeted for escapement estimation; additionally, weir panel picket spacing allows some pink salmon to freely pass through the weir unobserved. The first pink salmon was observed on 17 July and the last pink salmon was observed on 21 August.

Dolly Varden, whitefish, and rainbow trout were also counted through the weir in 2008. A total of 8,140 Dolly Varden, 164 whitefish, and 153 rainbow trout were observed passing upstream through the weir during project operations (Table 4). No passage estimates are made for these species because, similar to pink salmon, picket spacing of the weir panels allow them to freely pass through the weir unobserved and uncounted.

DRAINAGE ESCAPEMENT

Drainagewide Kanektok River escapement was estimated for Chinook and sockeye salmon in 2008 based on available escapement estimates. Aerial survey proportions for fish counted above and below the weir site in 2008 were used to apportion weir counts. Based on available data, Chinook salmon drainagewide total escapement was estimated to be 12,093 fish, of which 7,256 (60%) were estimated to have spawned downstream of the weir (Table 3) and were within the Chinook salmon aerial survey SEG range. Chinook salmon drainagewide escapement data in this report may not be an actual representation of true overall drainage abundance, due to missed Chinook salmon passage before 17 July; however, the affect on overall abundance is considered to be minimal.

Sockeye salmon total drainagewide escapement was estimated to be145,761 fish, of which 4,373 (3%) were estimated to have spawned downstream of the weir (Table 3). Sockeye salmon aerial survey results exceeded the upper end of their SEG range.

No coho salmon aerial surveys were conducted in 2008 due to weather and water conditions during the historical peak spawning period.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Kanektok River Weir Escapement

Scale samples, sex, and length were collected from Chinook, sockeye, chum, and coho salmon at the weir in 2008. The samples did not achieve the minimum sample objectives for each species and were not adequate for estimating ASL composition of estimated escapement past the weir. Observed escapement was not partitioned into temporal strata based on sample dates; thus, sex and age information included in this report only apply to the fish actually sampled and not to the overall run.

Age was determined for 34 Chinook salmon sampled. Based on aged samples, percents per age class were 26.5% age-1.2, 38.2% age-1.3, 32.4% age-1.4, and 2.9% age-1.5 fish (Table 5). Sex composition from sampled fish was 47.1% males and 52.9% females. Mean male length from sampled fish by age class was 492 mm for age-1.2, 639 mm for age-1.3, and 769 mm for age-1.4 fish (Table 6). Mean female length from sampled fish by age class was 624 mm for age-1.2, 728 mm for age-1.3, 842 mm for age-1.4, and 856 mm for age-1.5. Overall, sampled male lengths ranged from 447 to 769 mm and female lengths ranged from 546 to 916 mm.

Age was determined for 307 sockeye salmon sampled. Based on aged samples, percents per age class were 0.3% age-0.2, 1% age-0.3, 22.1% age-1.2, 0.3% age-0.4, 74.6% age-1.3, 1.3% age-1.4, and 0.3% age-2.3 fish (Table 7). Sex composition from sampled fish was 62.9% males and 37.1% females. Mean male length from sampled fish by age class was 570 mm for age-0.2, 579 mm for age-0.3, 527 mm for age-1.2, 620 mm for age-1.3, 581 mm for age-2.2, and 582 mm for age-1.4 fish (Table 8). Mean female length from sampled fish by age class was 525 mm for age-0.3, 508 mm for age-1.2, 544 mm for age-2.2, and 532 mm for age-2.3 fish. Overall, sampled male lengths ranged from 407 to 625 mm and female lengths ranged from 450 to 595 mm.

Age was determined for 725 chum salmon sampled. Based on aged samples, percents per age class were 0.6% age-0.2, 45.8% age-0.3, 48.6% age-0.4, and 4.9% age-0.5 fish (Table 9). Sex composition from sampled fish was 46.6% males and 53.4% females. Mean male length from sampled fish by age class was 582 mm for age-0.3, 601 mm for age-0.4, and 602 mm for age-0.5 fish (Table 10). Mean female length from sampled fish by age class was 539 mm for age-0.2, 554 mm for age-0.3, 568 mm for age-0.4, and 563 mm age-0.5 fish. Overall, sampled male lengths ranged from 506 to 687 mm and female lengths ranged from 459 to 625 mm.

Age was determined for 182 coho salmon sampled. Based on aged samples, percents per age class were 3.8% age-1.1, 90.7% age-2.1, and 5.5% age-3.1 fish (Table 11). Sex composition from sampled fish was 54.9% males and 45.1% females. Mean male length from sampled fish by age class was 545 mm for age-1.1, 546 mm for age-2.1, and 567 mm for age-3.1 fish (Table 12). Mean female length from sampled fish by age class was 552 mm for age-1.1, 554 mm for age-2.1, and 552 mm for age-3.1 fish. Overall, sampled male lengths ranged from 444 to 654 mm and female lengths ranged from 425 to 610 mm.

District W-4 Commercial Harvest

Scale samples, sex, and length were collected from Chinook, sockeye, chum, and coho salmon harvested in the 2008 District W-4 commercial fishery. Chinook, chum, and coho salmon samples did not achieve the minimum sample objectives; however, results were considered adequate for estimating ASL composition of District W-4 commercial harvest. Sockeye salmon samples achieved the minimum sample objective and were adequate for estimating ASL composition of District W-4 commercial harvest. Samples were partitioned temporally into strata based on sample dates.

Age was determined for 529 Chinook salmon sampled. Applied to total commercial harvest, age-1.3 Chinook salmon was the most abundant age class comprising 42.4% of the total harvest, followed by age-1.2 (30.3%), age-1.4 (25.7%), age-1.5 (1.1%), and age-2.4 (0.5%) fish (Table 13). Estimated sex composition was 76% males and 24% females. Mean male length by age class was 519 mm for age-1.2, 682 mm for age-1.3, 799 mm for age-1.4, and 832 mm for age-1.5 fish (Table 14). Mean female length by age class was 530 mm for age-1.2, 781 mm for age-1.3, 838 mm for age-1.4, 840 mm for age-1.5, and 750 mm for age 2.4 fish. Overall, male lengths ranged from 425 to 956 mm and female lengths ranged from 530 to 944 mm.

Age was determined for 688 sockeye salmon sampled. Applied to total commercial harvest, age-1.3 sockeye salmon were the most abundant age classes and represent 74.1% of the overall harvest, followed by age-1.2 (19.6%), age-0.3 (2.5%), age-1.4 (2.2%), age-2.3 (0.8%), age-0.4 (0.5%), and age-2.2 (0.3%) fish (Table 15). Sex composition was estimated to be 53.1% males and 46.1% females. Mean male length by age class was 540 mm for age-0.3, 507 mm for age-1.2, 570 mm for age-1.3, 493 mm for age-2.2, 583 mm for age-1.4, and 591 mm for age-2.3 fish (Table 16). Mean female length by age class was 528 mm for age-0.3, 493 mm for age-1.2, 538 mm for age-1.3, 498 mm for age-2.2, 545 mm for age-1.4, and 537 mm for age-2.3 fish. Overall, male lengths ranged from 398 to 619 mm and female lengths ranged from 422 to 593 mm.

Age was determined for 585 chum salmon sampled. Applied to total commercial harvest, age-0.4 chum salmon was the most abundant age class (60.5%), followed by age-0.3 (34.6%), age-0.5 (4.2%), and age-0.2 (0.8%) fish (Table 17). Sex composition was estimated to be 52.7% males and 47.3% females. Mean male length by age class was 529 mm for age-0.2, 587 mm for age-0.3, 598 mm for age-0.4, and 590 mm for 0.5 fish (Table 18). Mean female length by age class was 535 mm for age-0.2, 556 mm for age-0.3, 575 mm for age-0.4, and 575 mm for age 0.5 fish. Overall, male lengths ranged from 481 to 667 mm and female lengths ranged from 495 to 646 mm.

Age was determined for 499 coho salmon sampled. Applied to total commercial harvest, age-2.1 coho salmon was the most abundant age class (87.5%), followed by age-1.1 (8.6%), and age-3.1 (3.9%) fish (Table 19). Sex composition was estimated to contain 52.1% males and 47.9% females. Mean male length by age class was 554 mm for age-1.1, 573 mm for age-2.1, and 575 mm for age-3.1 fish (Table 20). Mean female length by age class was 554 mm for age-1.1, 572 mm for age-2.1, and 570 mm for age-3.1 fish. Overall, male lengths ranged from 429 to 664 mm and female lengths ranged from 440 to 696 mm.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrological observations were recorded daily from 22 June through 30 August (Table 21). Air temperatures ranged from 5° to 26° C. Water temperature was more consistent

ranging from 7° to 14°C. The largest single rain event occurred on 22 June and resulted in an accumulation of 2.0 in (≈5 cm) during this 24 hour period. The Kanektok River weir did not experience heavy rain events in 2008 and water level stayed within operable levels. The river displayed a general decreasing trend in water levels throughout the season. Water levels at the weir site ranged from approximately 15 to 73 cm for the recorded period.

DISCUSSION

PROJECT OPERATIONS

Installation of the weir occurred in late April after ice-out and the weir became operational 17 July. Operation of the weir in 2008 was generally successful even though a complete census of Chinook and chum salmon escapement passed the weir was not possible. However, the majority of the sockeye salmon escapement was determined after estimates. Total enumeration of coho salmon was not possible, because the coho salmon run continues to occur past the time of weir removal.

Trapping Chinook salmon for ASL sampling proved to be problematic. Chinook salmon were generally reluctant to enter the trap when other fish species were present or when the fyke doors on the trap were set. Chinook salmon were also captured outside of the trap by net to increase the number of samples collected.

Reoccurring periods of high water in mid-September has complicated removal of the weir in past years. High water in some years has caused a need to return to the weir site, after high water subsided, for removal of the weir. ADF&G, in consultation with NVK and USFWS determined removal of the weir should occur in late August, prior to the period that high water normally occurs. Early weir removal was successful, with the exception of the rail and cable. The rail and cable were left in place for ease of installation the following season. Early removal prevents weir component damage from over-wintering in the river, as experienced in 2005 (Jones and Linderman 2006). An additional benefit of early removal is that it allows time for the crew to repair inseason damage to the weir as part of the normal camp closing procedures, which was not possible in some years when the weir was removed in September.

ESCAPEMENT MONITORING AND ESTIMATES

The 2008 Chinook salmon weir escapement of 4,837 fish was the lowest escapement among the 6 years of collected data (Figure 3). However, results in 2008 were likely a function of missed passage from 25 June to 17 July. The late run timing pattern of Chinook salmon was assumed to be similar to late runs reported statewide in 2008. Uncertainties associated with the run timing and the lack of a surrogate year to use in estimating for missed escapement prevented a determination for the portion of the run that was missed in 2008. The results of the Chinook salmon aerial survey count met the SEG goal but were near the lower end of the SEG range for the Kanektok River drainage (Appendix C1). Based on available escapement data of 17 July through 21 August, the total drainagewide escapement estimate was 12,093 Chinook salmon, of which approximately 60% spawned downstream of the weir (Table 3). Based on data available in 2008, the total exploitation of Kanektok River Chinook salmon was estimated to be approximately 59%. Results are likely bias high due to no estimate being made for missed passage occurring before 17 July, which historically has represented approximately 37% of the escapement. This estimate is based on the drainage escapement estimate, District W-4 commercial harvest, and estimates of subsistence and sport fishing harvest. Subsistence and sport

fish harvest estimates were not available at the time of publication so the most recent 5-year average for which data exists (2002–2007) of Quinhagak subsistence and Kanektok River sport fish harvest was used to estimate the total run and resulting exploitation rates.

In 2008, 141,388 sockeye salmon were estimated to have escaped passed the weir, which was near average (Figure 3). The sockeye salmon aerial survey count of 40,075 fish exceeded the upper end of the SEG range (Appendix C1). The drainagewide escapement estimate was 145,761 sockeye salmon, of which approximately 3% spawned downstream of the weir in 2008 (Table 3). Total exploitation of Kanektok River sockeye salmon in 2008 was estimated to be approximately 33%. This estimate is based on the drainage escapement estimate, District W-4 commercial harvest, and estimates of subsistence and sport fishing harvest. Subsistence and sport fish harvest estimates were not available at the time of publication so the most recent 5-year average (2002–2007) of Quinhagak subsistence and Kanektok River sport fish harvest was used to determine total run and exploitation. Sockeye salmon passage estimates in 2008 prior to the weir being operable were based on daily passage rates from a model data set for the same time frame in 2004. Sockeye salmon returns in 2004 were used as the model data set because it indicated the strongest correlation (0.92), with observed passage in 2008, compared to other years with complete data. A correlation error equal to or less than 0.10 is considered acceptable for an approximation of missed passage before the weir was operational. Sockeye salmon run timing in 2008 was similar to 2004; however, the midpoint was 4 days later.

The methodology used to estimate drainagewide escapement for Chinook and sockeye salmon in 2008 was not optimal and is subject to the limitations inherent to aerial surveys. However, the aerial survey data are only used to determine the portion of fish upstream and downstream of the weir while the abundance of fish in the estimate is weighted by weir escapement estimates.

Currently, the spawner to recruit data available to estimate the productivity of salmon stocks in the Kanektok River is generally lacking. ADF&G staff generally uses a Ricker-type spawner-recruit model to estimate the number of spawners that provide maximum sustained yield (MSY), total return at MSY, and the resulting exploitation fraction. Exploitation at MSY for nine sockeye stocks in Bristol Bay averaged 65% (Fair et al. 2004) and ranged from 49% for the least productive Kvichak River off-peak runs to 77% for Ugashik sockeye salmon. Similarly, derived estimates of exploitation at MSY for 26 Chinook salmon stocks in Oregon, Washington, and Alaska averaged 67% (C. Parkin, Department of Fisheries and Oceans Canada; personal communication). Exploitation at MSY for Bering Sea Chinook salmon from Salcha, Chena (Evenson 2002), and Nushagak Rivers (Fair et al. 2004) averaged 75%. In comparison to these stocks, the exploitation of Kanektok River salmon is below the level providing MSY and is well below other northern Alaskan stocks.

It is difficult to assess the quality or any directional bias of the estimates of total abundance and exploitation. Four main issues affect these estimates for 2008: 1) uncertainties in escapement data representing the 2008 target operational period, 2) lack of 2008 estimates of subsistence and sport fish harvests, 3) lack of escapement monitoring of other tributaries and salmon stocks that may be harvested in District W-4, and 4) the accuracy of aerial surveys of the Kanektok River. The 5-year average subsistence and sport fish harvest was added to the 2008 commercial harvest for an estimate of total harvest. The contribution of other stocks of salmon to the District W-4 harvest is unknown but thought to be minimal. An assumption necessary for an unbiased estimate of total escapement, abundance, and exploitation is that the proportion of observable salmon counted during aerial surveys upriver and downriver of the Kanektok River weir is equal.

Differences could arise with differences in environmental conditions or salmon run timing. If a higher proportion of observable salmon are counted above the weir and that relationship is assumed for the area below the weir, total escapement and abundance will be underestimated and exploitation will be biased higher. The inverse will occur if observable salmon have a lower proportion to counted salmon during the aerial survey above the weir than the survey below the weir.

Aerial surveys of the Kanektok River, both above and below the weir are typically conducted on the same day to remove possible bias associated with conditions on different days. Additionally, surveys are conducted by the same observer in a given year when possible. This reduces the possibility of bias caused by differences in methods or different observers employed between the 2 areas; however, experienced staff have described hydrologic differences between river sections above and below the weir that may affect Kanektok River aerial surveys. Although overall depth, watercolor, riparian vegetation, and substrate type is nearly identical between river sections, the river becomes more braided and spreads out over a wider channel below the weir. This braiding makes it difficult to observe every channel during a given survey. This may result in a higher proportion of observable fish being counted upstream of the weir if fewer salmon are observable in the braided sections downstream. Determining whether this actually occurs or not is difficult to do, but the result would bias escapement estimates low and exploitation high.

Differing proportions of observable fish during aerial surveys from above and below the weir may also arise if timing or area is not similar. For Chinook and coho salmon, these factors are not as pronounced because they primarily spawn in the main channel, their peak spawning period is consistent between areas, and similar areas are surveyed. In contrast, the majority of sockeye salmon are lake and lake tributary spawners. Additionally, sockeye salmon timing is protracted compared to other species as sockeye salmon entering the lakes and later moving into lake tributaries to spawn is a critical factor for sockeye salmon aerial surveys. If few sockeye salmon are observed in the lakes and the lake tributaries are not surveyed, it will be unknown whether abundance was actually low (small percent observed) or the majority of sockeye salmon had already moved into the lake tributaries to spawn. In order to reduce this potential for bias, sockeye salmon aerial surveys should be conducted around the perimeter of the lakes but also on the lake spawning tributaries on an annual basis. Historically, it is unclear whether sockeye salmon aerial surveys of the Kanektok River drainage have consistently included lake tributaries. This uncertainty has been addressed in recent years through improvements and standardization of the Kuskokwim Area aerial survey program.

Additionally, the timing of aerial surveys should insure that the majority of salmon counted below the weir will not pass the weir after the survey has been conducted. Historically, 90% of Chinook and sockeye salmon have passed the weir by late July and early August when surveys are conducted.

The use of the 5-year average sport and subsistence harvest should not have a large affect on the 2008 estimates of total abundance and exploitation due to these harvests being somewhat constant and a small proportion of the total run historically.

The direction of the bias in total abundance and exploitation rates due to the omission of other stocks of Chinook and sockeye salmon in the escapement is known. The estimates of total abundance will be biased low and the exploitation will be biased high. The Arolik River is the only other significant salmon-producing river that drains into District W-4, and is thought to

have lower abundance relative to the Kanektok River. In 2005, the first aerial survey of the Arolik River was conducted with a total of 4,061 Chinook and 37,410 sockeye salmon, which supports what has been assumed historically. Kuskokwim River salmon potentially pass through District W-4 during their migration. Few Chinook and no sockeye salmon tagged in District W-4 in 1969 and 1970 were recovered in the Kuskokwim River (Baxter[1]). The bias is thought to be small and in a direction that it leads managers to take a conservative approach to fishery management.

Though it is not known for certain, estimates of exploitation rate for sockeye salmon in 2008 seems reasonable. No large source of bias is apparent and any overall bias would likely skew actual exploitation high. Exploitation rates for Chinook salmon in 2008 are uncertain given the weakness of the escapement estimate and may not represent actual exploitation. They are included in this report only to show that they are within the range of exploitation rates for other Chinook salmon stocks and are assumed to be biased high.

Chum salmon escapement in 2008 of 54,024 fish was the second highest escapement among data results acquired under similar conditions from 2002–2007 and the third highest among historical data dating back to 1996 (Figure 3; Appendix B1). The run timing could be affected by the late start of weir operations and could be artificially later than the actual run in 2008. Chum salmon passage by 17 July since 2002 has averaged approximately 34% of the total escapement. Assuming this percentage of fish passed upstream in 2008, the overall run would have been a record escapement. Chum salmon escapement results on the Kanektok River from 2002–2005 and 2008 indicate relative stability. However, the weir results do not account for the large number of chum salmon, perhaps in excess of weir escapements, known to spawn downstream of the weir. Aerial surveys of chum salmon have been discontinued and a drainagewide total abundance estimate is not possible.

Coho salmon weir escapement in 2008 of 24,494 fish was the lowest escapement of 6 years with complete data (Figure 3). No passage estimates were made after 21 August, when the weir was removed. Removal was earlier than in previous years and a low escapement count is expected due to no counts being made during peak coho salmon migration in September. However, since 2001 approximately 22% of passage has occurred by 21 August and the actual number is likely much higher (Appendix D1). Assuming that only 22% had passed up stream of the weir when operations were terminated for the season the resulting escapement would have been a record. Inseason indications of coho salmon abundance showed that the run in 2008 was indeed a strong run with record daily escapement counts early in the run prior to weir removal. Coho salmon run timing in 2008 was earlier then other recorded years since 2002. However, coho salmon run timing for 2008 is likely skewed early due to late August weir removal and the lack of late season monitoring as in previous years. This conclusion is strengthened by the coho salmon run timing at the Kanektok River weir being relatively consistent in previous years of operation when the weir operated through the peak of the run. Coho salmon aerial surveys were not conducted in 2008 due to weather and logistical difficulties.

The inter-annual run timing pattern between Chinook, sockeye, chum, and coho salmon has varied; however, with only 6 years of data from the Kanektok River weir it is likely that a long term pattern in run timing for this has yet to emerge for forecasting long term patterns.

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[1] Baxter, R. E. *Unpublished*. Quinhagak tagging program 1969–1970. Alaska Department of Fish and Game, Division of Commercial Fisheries, Kuskokwim Stock Separation Report No. 4, Anchorage.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES AND COMPARISONS

Chinook salmon ASL sampling did not meet the minimum sampling objective. Failure to meet sampling goals for Chinook salmon in 2008 resulted from a late start of weir operations and difficulty accessing Chinook salmon for sampling. Historically, it has been problematic in most years to successfully achieve the ASL sampling goals of 210 Chinook salmon each week for a minimum of 6 weeks. The sampling goals were changed in 2006 to bring the Kanektok River weir sampling goals inline with other escapement projects in the Kuskokwim Area.

Chum and sockeye salmon ASL sampling objectives were not met in 2008. Generally, salmon sex and age composition changes slightly throughout the total run. The late start of weir operations may have biased any possible results toward late running fish, and it is difficult to determine if the age and sex of late running fish are an accurate representation of the overall migration. Chum and sockeye salmon sampling goals were also addressed and adjusted in line with sampling objectives from other assessment projects in the Kuskokwim Area. Obtaining 210 pulse samples at the onset and end of their respective runs can be difficult when weekly counts may be less than the sample objectives; however, adjusting the sampling goals to at least one pulse from each third of the run has alleviated problems encountered from low abundance of these species at the tails of their perspective runs. The late start of weir operations contributed to lack of adequate sampling in 2008. Over half of the estimated sockeye salmon escapement occurred before weir operations began in 2008. Historically about a third of the chum salmon run has occurred before the 2008 start date (Appendix D1).

Coho salmon samples were not expected to achieve the ASL objective in 2008. Historically, it has been difficult in most years to obtain the sampling goals of 6 pulse samples of 170 coho salmon each. Weather and water conditions often render the weir inoperable for long periods of time late in the season, which often coincides with the majority of coho salmon passage. Similar to Chinook, sockeye, and chum salmon the escapement sampling goals for the Kanektok weir coho salmon were adjusted to a minimum of one pulse per each third of the run. The early removal of weir operations in 2008 occurred before peak passage time. Thus, a large portion of the coho salmon escapement, which occurred late in season after weir operations, was not accessible for sampling.

In 2008, ADF&G partnered with CVRF to collect District W-4 and W-5 (Goodnews Bay) commercial ASL samples, as has been the commercial sampling protocol since 2005. ADF&G staff trained and maintained oversight of Quinhagak-based CVRF staff and student interns that collected ASL and genetics samples from Chinook, sockeye, chum, and coho salmon harvested in the District W-4 and W-5 commercial fisheries. All sample goals were not achieved for District W-4 commercial harvest, and collecting an adequate number of samples from District W-5 commercial harvest remained problematic. Overall, this sampling program in partnership with CVRF was not successful in the 2008 season due to changes in staffing. However, utilizing local sampling crews to achieve annual ASL sample objectives has advantages over the ability of ADF&G staff alone to successfully achieve sample goals. Historically, CVRF crew samples were generally collected and organized well, which helped to streamline ASL sample processing and data analysis. This program will be further refined in the coming season to address difficulties in achieving commercial ASL sample goals in Districts W4 and W5.

The following discussion focuses on describing ASL trends seen within the Kanektok River weir escapement and District W-4 commercial harvest in 2008. Historically, some comparisons are

made indicating similarities and differences between the weir escapement samples collected and commercial harvest ASL estimates in that year. The limited historical data set for the Kanektok River weir precludes long-term comparisons in escapement ASL trends. The comparison is not possible in 2008 due to lack of adequate escapement ASL sample amounts. Probably the greatest value in collecting ASL information is for future development of spawner-recruit models used for establishing escapement goals (e.g., Clark and Sandone 2001). The information can also be used for forecasting future runs and to illustrate long-term trends in ASL composition (e.g., Bigler et al. 1996).

Chinook, sockeye, chum and coho salmon escapement ASL samples were not adequate for comparison of commercial harvest with total estimated escapement. Comparisons are based on the actual numbers of fish aged from the escapement and the overall commercial harvest distribution.

Chinook Salmon

Age 1.3 was the dominant age class for both the escapement samples and District W-4 commercial ASL estimates (Tables 5 and 13; Figure 5). Due to lack of adequate ASL data collected from the escapement in 2008 no comparison is possible for the annual variation in age classes passing the weir. Chinook samples collected from the escapement do not represent total escapement age distribution. Commercial ASL samples for District W4 in 2008 were dominated by age-1.3 and age-1.2 with 42.4% and 30.3% respectively; available Kanektok River weir escapement samples did not show similar trends among age classes. The relatively high percentage of commercial harvest age-1.2 Chinook salmon may be indicative of better returns as this age class should return in greater abundance as age-1.3 in 2009. No similarity between sex composition of commercial estimates and weir samples is seen. A greater number of escapement samples are needed; however, this trend in escapement data can be due to the late start of weir operations. Young males tend to pass up stream early inseason which means the 2008 escapement may be bias towards older and female fish. Males dominated the commercial estimates. The high male percentage of the estimate was likely a function of the high percentage of age-1.2 fish, which are predominantly male. The relatively high proportion of younger males in the commercial harvest is likely a function of commercial fisheries regulations that restrict the commercial fisheries to gillnets with 6 in or less, mesh (5 AAC 07.331d2). It is known that mesh of this size will catch a larger percentage of smaller, usually male, Chinook than the true male to female proportion that exists in the population. Males exhibited mean length partitioning by age class for age-1.1 through age-1.4 fish in both weir escapement samples and commercial ASL samples (Figure 6). Mean male lengths by age class were nearly identical between the escapement samples and commercial samples. Females exhibited similar mean length partitioning by age class and female length by age class was also similar between escapement samples and commercial ASL samples (Figure 7).

Sockeye Salmon

Age-1.3 and age-1.2 dominated the escapement samples and District W-4 commercial ASL estimates in 2008 and represented approximately 97% of the weir escapement samples and 94% of the commercial harvest (Tables 7 and 15; Figure 5). The dominate age results are similar to the overall trends witnessed in 2002 through 2007 (Figure 8). Males were dominant for both escapement samples and overall commercial harvest. Males did not exhibit length partitioning by age class for both weir escapement samples and commercial ASL estimates (Figure 6). Females

also did not exhibit mean length partitioning by age class (Figure 7). Mean male and female lengths by age class were similar between the escapement samples and commercial estimates for most age groups; however, not all age classes were represented by both data sets.

Chum Salmon

Age-0.4 was the dominant age class for commercial ASL estimates and comprised approximately 61% of the commercial harvest (Table 17; Figure 5). Overall, age-0.4 and age-0.3 chum salmon were the predominate age classes that comprise both the District W-4 commercial harvest and the Kanektok River weir ASL samples. High proportions of chum salmon in these age classes are common. Commercial and escapement data in District W-4 and the Kanektok River have shown that these dominate age classes alternate between years. Age-0.3 tends to be the dominate age class in odd years; whereas, age-0.4 tends to dominate the even years; however, this pattern is not always consistent. Additional collection of paired escapement and commercial ASL data in coming years will aid in analyzing this pattern. Male-to-female percentages were near 50-50 (Tables 9 and 17) for the escapement samples and commercial ASL estimates. It is notable that male chum salmon percentages fluctuated throughout project operations and female percentages increased towards the end of the chum salmon run, which is a typical pattern (Table 17). Males did not display mean length partitioning by age class in 2008 ASL data, with all age classes displaying similar lengths. In 2008, mean male lengths by age class were similar between the collected escapement samples and commercial estimates. Females exhibited minor mean length partitioning by age class (Figure 7). However, length estimates from commercial samples where larger for each of the age classes than the corresponding escapement estimates.

Some similarities existed between commercial ASL estimates and escapement samples collected. However, it remains unclear whether commercial samples can be used to adequately estimate escapement ASL composition, as discrepancies exist between commercial and escapement estimates. The discrepancies noted in the commercial and escapement data may indicate a potential bias in sample collection or harvest method. However, the discrepancy may be due to the fact that large numbers of chum salmon spawn below the location of the weir site and the commercial fishery is located near the mouth of the river, which may have an affect on the male-to-female ratio because of the spawning habits of chum salmon.

Coho Salmon

Age-2.1 was the dominant age class for both escapement samples and commercial ASL estimates which is consistent with other Kuskokwim Area coho salmon populations (Tables 11 and 19; Figure 5). The percentage of age-2.1 fish was similar at approximately 91% for escapement samples and 88% for commercial estimates. Age-1.1 coho salmon typically have higher relative abundance at the beginning of the run and taper off as the run progresses. This trend was not exhibited in the commercial ASL estimates in 2008. The commercial ASL estimate indicated a near 50-50 split between males and females, which is typical for Kuskokwim Area coho salmon populations. Males and females exhibited minor mean length partitioning by age class for commercial ASL estimates, partitioning among age classes is not common for coho salmon populations (Figures 6 and 7). Mean male and female lengths by age class did not show a high degree of similarity between the escapement samples and commercial estimates.

Few similarities existed between commercial ASL estimates and escapement samples which may be attributed to fish spawning below the location of the weir, the weir becoming inoperable prior to the end of the coho run, bias associated with the small sample size from the escapement, or

differential harvest by commercial gear; however, this is speculation and no causation has been positively identified. The last coho salmon was counted on 21 August and historical run timing information indicates only approximately 22% of the run had passed the weir site by that time (Figure 4; Appendix D1). On this basis, the samples collected likely represents less than half of the overall coho salmon run.

CONCLUSIONS

Since the inception of the resistance board floating weir in 2001 the project has:

1. Demonstrated the ability to successfully install and operate a weir in the Kanektok River with a few exceptions involving difficult river conditions or equipment failures.
2. Demonstrated the ability to achieve its annual objectives with the exception of ASL sample objectives in some years for some species.
3. Provided escapement and run timing information for Kanektok River salmon and Dolly Varden populations.
4. Provided a platform for the collection of ASL information from the salmon escapement and Dolly Varden migrating past the weir.
5. Provided a platform for the collection and continual tagging of Dolly Varden migrating past the weir.

RECOMMENDATIONS

Establishing long-term funding for the project would ensure a long-term escapement, run timing, and ASL database required to better understand the spawning populations and carrying capacity of the Kanektok River. A long-term database would lead to the establishment of biological escapement goals for the spawning salmon populations, improving management of the spawning stocks for sustainable yields.

Implementing an inriver Chinook salmon radiotelemetry study would increase the accuracy in determining the total abundance of Chinook salmon spawning below the Kanektok River weir, which in turn increases the accuracy of drainage escapement estimates. Radiotelemetry could also be used to compare and contrast distribution of salmon observed from aerial surveys with radiotelemetry results in order to ground truth aerial survey distribution estimates, which may be applied to historic aerial survey information to extend the data base for the Kanektok system. Such a study could be expanded in the future to examine the number of chum and sockeye salmon spawning below the weir in addition to their spawning distribution within the drainage.

The cooperative effort between NVK, USFWS, and ADF&G should be continued, with ADF&G maintaining its proactive role in the mentoring of NVK technicians, the development of the project, and oversight of seasonal operation. Regular consultations between ADF&G, NVK, and USFWS occurred throughout the field season, coordinating logistics, discussing results, and exchanging ideas. NVK provided 3 technicians for the 2008 season. USFWS used the weir as a platform for a Dolly Varden population study to better understand their spawning populations in Kanektok River. The project can be used in future years as a platform for the study of other anadromous and resident freshwater species in Kanektok River.

Every effort should be made to continue with annual weir installation in mid- to late April to ensure the weir is operational by mid-to late June. To the extent feasible, aerial monitoring and

water level at the weir site should be monitored in mid-April each year to facilitate early installation. The Kanektok River has demonstrated high water level and water flow in May and June having the potential to substantially delay installation until July or later depending on the severity and duration of high water conditions.

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TABLES AND FIGURES

Table 1.–District W-4 commercial harvest by period and exvessel value, 2008.

	Date	Permits	Chinook		Sockeye		Chum		Coho	
Period	Caught	Fished	Harvest	Pounds	Harvest	Pounds	Harvest	Pounds	Harvest	Pounds
1	6/14	102	1,322	15,278	91	604	345	2,739	0	0
2	6/17	99	1,293	15,903	354	2,447	640	4,814	0	0
3	6/24	91	2,891	36,237	1,946	12,739	3,941	30,659	0	0
4	6/26	101	3,359	44,655	2,150	14,335	4,430	34,389	0	0
5	7/01	105	1,544	20,659	6,782	45,521	6,285	47,147	0	0
6	7/05	99	1,015	16,362	6,484	44,147	3,018	23,629	0	0
7	7/08	81	391	6,231	5,494	37,201	3,242	23,809	0	0
8	7/10	86	340	5,097	7,361	49,639	2,901	20,923	1	5
9	7/12	83	340	6,013	8,322	55,339	3,452	24,586	7	46
10	7/14	89	368	6,222	10,141	65,526	6,246	44,312	61	407
11	7/16	78	236	4,151	5,557	36,030	3,325	23,318	110	712
12	7/18	88	225	3,888	5,368	34,733	4,032	27,822	122	836
13	7/21	76	158	2,771	3,041	18,768	4,917	33,952	746	4,840
14	7/23	61	94	1,796	2,029	12,377	3,434	23,591	764	5,078
15	7/25	54	58	1,068	1,140	7,198	2,216	15,305	1,453	9,676
16	7/28	46	32	529	793	4,910	1,073	7,165	1,827	12,350
17	7/30	56	38	707	800	4,746	1,291	8,372	4,332	28,944
18	8/01	53	21	364	484	2,750	707	4,732	4,095	28,078
19	8/04	55	20	318	287	1,744	436	2,838	4,805	33,680
20	8/06	53	12	218	222	1,287	312	2,030	4,762	33,943
21	8/08	50	12	236	174	1,031	186	1,222	3,549	25,222
22	8/10	30	5	108	139	868	130	919	3,645	26,662
23	8/12	66	10	111	127	801	134	955	8,209	61,170
24	8/14	65	4	114	101	701	62	456	13,540	103,990
25	8/16	77	8	133	121	768	80	534	10,175	77,280
26	8/18	66	7	110	82	535	56	403	9,377	73,281
27	8/20	65	2	29	65	442	43	302	9,568	74,875
28	8/22	56	2	17	28	174	34	234	3,242	25,314
29	8/25	38	2	14	42	249	27	187	3,204	24,972
30	8/27	39	1	8	11	71	19	138	2,553	19,933
31	8/29	40	2	27	7	54	19	128	4,110	32,139
Total		146	13,812	189,374	69,743	457,735	57,033	411,610	94,257	703,433
	Average Weight			13.71		6.56		7.22		7.46
	Average Price			0.74		0.6		0.05		0.45
	Exvessel Value			$140,137		$274,641		$20,581		$316,545
	Total Number of Fish		234,845							
	Total Pounds		1,762,152							
	Total Exvessel Value		$751,903							

Table 2.–Daily and cumulative Chinook, sockeye, chum, and coho salmon passage, Kanektok River weir, 2008.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/30	[a]		2,279 [b]	2,279	[a]		[a]	
7/01	[a]		2,783 [b]	5,061	[a]		[a]	
7/02	[a]		1,701 [b]	6,763	[a]		[a]	
7/03	[a]		2,387 [b]	9,150	[a]		[a]	
7/04	[a]		2,335 [b]	11,485	[a]		[a]	
7/05	[a]		3,485 [b]	14,970	[a]		[a]	
7/06	[a]		3,518 [b]	18,487	[a]		[a]	
7/07	[a]		7,168 [b]	25,655	[a]		[a]	
7/08	[a]		6,360 [b]	32,015	[a]		[a]	
7/09	[a]		7,947 [b]	39,961	[a]		[a]	
7/10	[a]		7,118 [b]	47,079	[a]		[a]	
7/11	[a]		6,219 [b]	53,298	[a]		[a]	
7/12	[a]		6,311 [b]	59,610	[a]		[a]	
7/13	[a]		3,189 [b]	62,798	[a]		[a]	
7/14	[a]		3,550 [b]	66,349	[a]		[a]	
7/15	[a]		3,194 [b]	69,543	[a]		[a]	
7/16	[a]		2,416 [b]	71,959	[a]		[a]	
7/17	36 [c]	36	4,163 [c]	76,122	1,794 [c]	1,794	0 [c]	0
7/18	86 [c]	122	4,578 [c]	80,700	1,164 [c]	2,958	0 [c]	0
7/19	145 [c]	267	6,917 [c]	87,617	2,015 [c]	4,973	0 [c]	0
7/20	199 [c]	466	5,003 [c]	92,620	1,084 [c]	6,057	3 [c]	3
7/21	286 [c]	752	6,549 [c]	99,169	760 [c]	6,817	4 [c]	7
7/22	167 [c]	919	6,184 [c]	105,353	1,505 [c]	8,322	0 [c]	7
7/23	367 [c]	1,286	5,255 [c]	110,608	832 [c]	9,154	13 [c]	20
7/24	246 [c]	1,532	4,059 [c]	114,667	893 [c]	10,047	21 [c]	41
7/25	255 [c]	1,787	4,066 [c]	118,733	1,756 [c]	11,803	86 [c]	127
7/26	124 [c]	1,911	1,827 [c]	120,560	2,263 [c]	14,066	105 [c]	232
7/27	221	2,132	1,949	122,509	2,553	16,619	101	333
7/28	401	2,533	3,997	126,506	4,222	20,841	274	607
7/29	322	2,855	1,877	128,383	4,303	25,144	160	767
7/30	257	3,112	1,542	129,925	5,009	30,153	264	1,031
7/31	231	3,343	1,658	131,583	4,658	34,811	250	1,281
8/01	216	3,559	1,367	132,950	3,110	37,921	327	1,608

-continued-

Table 2.–Page 2 of 2.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
8/02	166	3,725	1,383	134,333	4,389	42,310	502	2,110
8/03	184	3,909	931	135,264	1,442	43,752	319	2,429
8/04	186	4,095	842	136,106	1,506	45,258	326	2,755
8/05	69	4,164	517	136,623	1,093	46,351	325	3,080
8/06	178	4,342	704	137,327	1,329	47,680	1,153	4,233
8/07	95	4,437	491	137,818	919	48,599	589	4,822
8/08	91	4,528	472	138,290	1,223	49,822	791	5,613
8/09	54	4,582	364	138,654	706	50,528	670	6,283
8/10	53	4,635	354	139,008	686	51,214	613	6,896
8/11	76	4,711	451	139,459	790	52,004	1,112	8,008
8/12	29	4,740	283	139,742	483	52,487	1,000	9,008
8/13	29	4,769	400	140,142	349	52,836	1,170	10,178
8/14	18	4,787	207	140,349	332	53,168	1,098	11,276
8/15	8	4,795	238	140,587	162	53,330	1,156	12,432
8/16	10	4,805	144	140,731	105	53,435	734	13,166
8/17	7	4,812	131	140,862	189	53,624	919	14,085
8/18	11	4,823	172	141,034	133	53,757	2,317	16,402
8/19	4	4,827	122	141,156	103	53,860	2,205	18,607
8/20	4	4,831	128	141,284	101	53,961	2,853	21,460
8/21	6 [d]	4,837	104 [d]	141,388	63 [d]	54,024	3,030 [d]	24,490
Total	4,837		141,388		54,024		24,490	
Observed	4,730		68,993		53,771		24,490	
Estimated	107		72,395		253		0	
% Observed	97.8		48.8		99.5		100.0	

[a] The weir was not operational; daily passage was not estimated.

[b] The weir was not operational; daily passage was estimated.

[c] Daily passage was estimated due to the occurrence of a hole in the weir.

[d] Partial day count, passage was not estimated.

Table 3.–Escapement summary for the Kanektok River drainage, 2008.

	Chinook	Sockeye	Chum	Coho
Weir Escapement	4,837	141,388	54,024	24,490
Aerial Survey Count	1,523	37,733	[a]	[a]
Percentage Upstream of Weir	40.0	97.0	[a]	[a]

Escapement estimate downstream of the weir

	Chinook	Sockeye	Chum	Coho
Escapement Estimate	7,256	4,373	[a]	[a]
Aerial Survey Count	2,285	1,167	[a]	[a]
Percentage Downstream of Weir	60.0	3.0	[a]	[a]

Total drainage escapement estimate

	Chinook	Sockeye	Chum	Coho
Drainage Escapement	12,093	145,761	[a]	[a]
Drainage Aerial Survey	3,808	38,900	[a]	[a]
Aerial Survey (SEG)	3,500–8,000	14,000–34,000	>5,200	7,700–36,000

Total Run and Exploitation

	Chinook	Sockeye	Chum	Coho
District W-4 Commercial Harvest	13,812	69,743	57,033	94,257
Subsistence Harvest [b]	3,353	1,460	1,431	1,353
Sport Fishing Harvest [b]	550	226	127	1,343
Total Run Estimate [c]	29,808	217,190	[a]	[a]
Harvest Exploitation (%) [d]	59.4	32.9	[a]	[a]

[a] No estimate made in 2008.

[b] Harvest estimates based on the 5 year (2002–2007) averages.

[c] Total Run estimate based on drainage escapement estimate, District W-4 commercial harvest, and 5 year averages (2001–2006) of Quinhagak subsistence and Kanektok River sport harvest.

[d] Exploitation rate based on District W-4 commercial harvest and 5 year averages (2001–2006) of Quinhagak subsistence and Kanektok River sport harvest.

Table 4.–Daily and cumulative pink salmon, Dolly Varden, whitefish, and rainbow trout passage, Kanektok River weir, 2008.

	Pink Salmon		Dolly Varden		Whitefish		Rainbow Trout	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
7/17	241 [a]	241	95 [a]	95	2 [a]	2	1 [a]	1
7/18	413 [a]	654	158 [a]	253	0 [a]	2	4 [a]	5
7/19	677 [a]	1,331	177 [a]	430	2 [a]	4	0 [a]	5
7/20	475 [a]	1,806	182 [a]	612	2 [a]	6	2 [a]	7
7/21	887 [a]	2,693	160 [a]	772	5 [a]	11	3 [a]	10
7/22	3,363 [a]	6,056	643 [a]	1,415	7 [a]	18	0 [a]	10
7/23	2,519 [a]	8,575	305 [a]	1,720	15 [a]	33	5 [a]	15
7/24	4,049 [a]	12,624	442 [a]	2,162	9 [a]	42	1 [a]	16
7/25	6,308 [a]	18,932	870 [a]	3,032	6 [a]	48	5 [a]	21
7/26	9,700 [a]	28,632	598 [a]	3,630	9 [a]	57	3 [a]	24
7/27	9,971	38,603	546	4,176	7	64	8	32
7/28	8,268	46,871	366	4,542	7	71	6	38
7/29	9,270	56,141	395	4,937	2	73	2	40
7/30	8,464	64,605	428	5,365	13	86	5	45
7/31	10,431	75,036	392	5,757	6	92	3	48
8/01	9,588	84,624	313	6,070	11	103	9	57
8/02	9,591	94,215	242	6,312	6	109	1	58
8/03	8,294	102,509	122	6,434	13	122	2	60
8/04	5,053	107,562	86	6,520	6	128	1	61
8/05	4,172	111,734	28	6,548	4	132	1	62
8/06	6700	118,434	167	6,715	0	132	11	73
8/07	3,176	121,610	143	6,858	3	135	24	97
8/08	4,152	125,762	182	7,040	0	135	10	107
8/09	3,064	128,826	92	7,132	1	136	13	120
8/10	2,603	131,429	130	7,262	4	140	7	127
8/11	3,170	134,599	159	7,421	2	142	3	130
8/12	1,941	136,540	122	7,543	0	142	3	133
8/13	1,860	138,400	94	7,637	3	145	3	136
8/14	1,149	139,549	52	7,689	3	148	3	139
8/15	919	140,468	33	7,722	2	150	1	140
8/16	430	140,898	23	7,745	0	150	1	141
8/17	465	141,363	36	7,781	3	153	2	143
8/18	395	141,758	49	7,830	3	156	2	145
8/19	305	142,063	70	7,900	2	158	1	146
8/20	248	142,311	114	8,014	2	160	0	146
8/21	119	142,430	126	8,140	4	164	7	153
Total	142,430		8,140		164		153	

[a] Partial day count, daily passage was not estimated.

Table 5.–Age and sex composition of Chinook salmon escapement, Kanektok River weir, 2008.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Esc	1.1 %	1.2 Esc	1.2 %	1.3 Esc	1.3 %	1.4 Esc	1.4 %	1.5 Esc	1.5 %	2.4 Esc	2.4 %	Total Esc	Total %
7/20-8/6			M	0	0.0	8	23.5	7	20.6	1	3.0	0	0.0	0	0.0	16	47.1
	44	34	F	0	0.0	1	3.0	6	17.6	10	29.4	1	2.9	0	0.0	18	52.9
			Subtotal	0	0.0	9	26.5	13	38.2	11	32.4	1	2.9	0	0.0	34	100.0
Season		34	M	0	0.0	8	23.5	7	20.6	1	3.0	0	0.0	0	0.0	16	47.1
			F	0	0.0	1	3.0	6	17.6	10	29.4	1	2.9	0	0.0	18	52.9
			Total	0	0.0	9	26.5	13	38.2	11	32.4	1	2.9	0	0.0	34	100.0
		1306	M	831	1.3	25,176	39.4	10,968	17.2	6,940	10.9	327	0.5	0	0.0	44,241	69.2
Grand			F	0	0.0	1,930	3.0	2,298	3.6	14,687	23.0	713	1.1	27	0.0	19,655	30.8
Total[a]			Total	831	1.3	27,106	42.4	13,266	20.8	20,627	32.3	1,040	1.6	27	0.0	63,896	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1997, 2002–2004, and 2007.

Table 6.–Mean length (mm) of Chinook salmon escapement, Kanektok River weir, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5	2.4
7/20-8/6	M	Mean Length		492	639	769		
		Std. Error		447-604	536-706	769-769		
		Range						
		Sample Size	0	8	7	1	0	0
	F	Mean Length		624	728	842	856	
		Std. Error		624-624	546-822	737-916	856-856	
		Range						
		Sample Size	0	1	6	10	1	0
Season	M	Mean Length		492	639	769		
		Range		447-604	536-706	769-769		
		Sample Size	0	8	7	1	0	0
	F	Mean Length		624	728	842	856	
		Range		624-624	546-822	737-916	856-856	
		Sample Size	0	1	6	10	1	0
Grand Total [a]	M	Mean Length	410	537	689	831	841	
		Range	370-470	411-593	505-815	578-990	759-945	
		Sample Size	14	502	256	151	8	0
	F	Mean Length		600	757	844	874	800
		Range		480-640	714-798	631-990	770-980	800-800
		Sample Size	0	13	51	287	22	1

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1997, 2002–2004, and 2007.

Table 7.–Age and sex composition of sockeye salmon escapement, Kanektok River weir, 2008.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.2 Esc	0.2 %	0.3 Esc	0.3 %	1.2 Esc	1.2 %	0.4 Esc	0.4 %	1.3 Esc	1.3 %	1.4 Esc	1.4 %	2.3 Esc	2.3 %	Total Esc	Total %
7/20-8/13	451	307	M	1	0.3	1	0.3	31	10.1	1	0.3	156	50.8	4	1.3	0	0.0	193	62.9
			F	0	0.0	2	0.7	37	12.1	0	0.0	73	23.8	0	0.0	1	0.3	114	37.1
			Subtotal	1	0.3	3	1.0	68	22.1	1	0.3	230	74.6	4	1.3	1	0.3	0	100.0
Season		307	M	1	0.3	1	0.3	31	10.1	1	0.3	156	50.8	4	1.3	0	0.0	193	62.9
			F	0	0.0	2	0.7	37	12.1	0	0.0	73	23.8	0	0.0	1	0.3	114	37.1
			Total	1	0.3	3	1.0	68	22.1	1	0.3	230	74.6	4	1.3	1	0.3	307	100.0
Grand		3,069	M	541	0.1	10,747	1.6	142,974	20.6	1,684	0.2	214,764	31.0	9,510	1.4	7,228	1.0	390,093	56.3
Total [a]			F	1,290	0.2	4,012	0.6	136,230	19.7	2,333	0.3	142,825	20.6	6,331	0.9	6,765	1.0	302,699	43.7
			Total	1,831	0.3	14,759	2.1	279,204	40.3	4,017	0.6	357,589	51.6	15,841	2.3	13,993	2.0	692,792	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1997, 2002–2004, and 2007.

Table 8.–Mean length (mm) of sockeye salmon escapement, Kanektok River weir, 2007.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	1.2	1.3	2.2	1.4	2.3
7/20-8/13	M	Mean Length	570	579	527	620	581	582	
		Std. Error	570-570	579-579	407-566	620-620	501-625	553-606	
		Range							
		Sample Size	1	1	31	1	156	4	0
	F	Mean Length		525	508		544		532
		Std. Error		510-540	450-563		480-595		532-532
		Range							
		Sample Size	0	2	37	0	73	0	1
Season	M	Mean Length	570	579	527	620	581	582	
		Range	570-570	579-579	407-566	620-620	501-625	553-606	
		Sample Size	1	1	31	1	156	4	0
	F	Mean Length		525	508		544		532
		Range		510-540	450-463		480-595		532-532
		Sample Size	0	2	37	0	73	0	1
Grand Total [a]	M	Mean Length	575	592	527	614	580	587	559
		Range	553-589	487-666	398-600	572-675	445-660	501-645	515-630
		Sample Size	3	44	626	13	782	38	43
	F	Mean Length	504	537	500	577	545	567	537
		Range	473-552	500-582	424-606	553-678	455-616	520-600	494-590
		Sample Size	6	19	756	15	617	31	41

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1997, 2002–2004, and 2007.

Table 9.–Age and sex composition of chum salmon escapement, Kanektok River weir, 2008.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.2 Esc	0.2 %	0.3 Esc	0.3 %	0.4 Esc	0.4 %	0.5 Esc	0.5 %	Total Esc	Total %
7/20-8/13			M	0	0.0	141	19.5	184	25.3	13	1.8	338	46.6
	831	725	F	4	0.6	191	26.4	168	23.2	22	3.1	387	53.4
			Subtotal	4	0.6	332	45.8	352	48.6	35	4.9	725	100.0
Season		725	M	0	0.0	141	19.5	184	25.3	13	1.8	338	46.6
			F	4	0.6	191	26.4	168	23.2	22	3.1	387	53.4
			Total	4	0.6	332	45.8	352	48.6	35	4.9	725	100.0
			M	1,578	0.5	89,146	28.5	66,661	21.3	3,383	1.1	160,768	51.4
Grand		4,424	F	3,053	1.0	88,792	28.4	58,627	18.7	1,504	0.5	151,975	48.6
Total [a]			Total	4,631	1.5	177,938	56.9	125,288	40.1	4,887	1.6	312,743	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1997, 2002–2004, and 2007.

Table 10.–Mean length (mm) of chum salmon escapement, Kanektok River weir, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
7/20-8/13	M	Mean Length		582	601	602
		Std. Error		510-668	506-687	550-631
		Range				
		Sample Size	0	144	162	10
	F	Mean Length	539	554	568	563
		Std. Error	485-560	459-614	483-625	529-622
		Range				
		Sample Size	8	225	161	15
Season	M	Mean Length		582	601	602
		Range		510-668	506-687	550-631
		Sample Size	0	144	162	10
	F	Mean Length	539	554	568	563
		Range	485-560	459-614	483-625	529-622
		Sample Size	8	225	161	15
Grand Total [a]	M	Mean Length	552.25	580.8	602	610.5
		Range	485-580	505-670	515-700	562-680
		Sample Size	31	1196	1002	42
	F	Mean Length	533.2	551.8	567.6	574.8
		Range	485-623	475-640	490-685	575-610
		Sample Size	57	1,252	822	22

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1997, 2002–2004, and 2007.

Table 11.–Age and sex composition of coho salmon escapement, Kanektok River weir, 2008.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Esc	1.1 %	2.1 Esc	2.1 %	3.1 Esc	3.1 %	Total Esc	Total %
7/20-8/13			M	5	2.7	89	48.9	6	3.3	100	54.9
		182	F	2	1.1	76	41.8	4	2.2	82	45.1
			Subtotal	7	3.8	165	90.7	10	5.5	182	100
Season	198	182	M	5	2.7	89	48.9	6	3.3	100	54.9
			F	2	1.1	76	41.8	4	2.2	82	45.1
			Total	7	3.8	165	90.7	10	5.5	182	100.0
Grand		1,794	M	5,833	2.3	111,323	44.3	8,566	3.4	125,721	50.0
Total [a]			F	2,856	1.1	111,507	44.4	11,197	4.5	125,559	50.0
			Total	8,689	3.5	222,830	88.7	19,763	7.9	251,280	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1997, 2002–2004, and 2007.

Table 12.–Mean length (mm) of coho salmon escapement, Kanektok River weir, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
7/20-8/13	M	Mean Length	546	545	567
		Std. Error	511-579	444-654	501-603
		Range			
		Sample Size	5	89	6
	F	Mean Length	554	552	554
		Std. Error	525-582	425-610	539-573
		Range			
		Sample Size	2	76	4
Season	M	Mean Length	546	545	567
		Range	511-579	444-654	501-603
		Sample Size	5	89	6
	F	Mean Length	554	552	554
		Range	525-582	425-610	539-573
		Sample Size	2	76	4
Grand Total [a]	M	Mean Length	574	573	579
		Range	465-657	395-678	440-665
		Sample Size	74	820	57
	F	Mean Length	542	578	576
		Range	430-620	475-670	545-649
		Sample Size	29	744	70

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1997, and 2002–2004, and 2007.

Table 13.–Age and sex composition of Chinook salmon from the District W-4 commercial fishery, 2007.

Sample Dates (Stratum)	Aged Sample Size	Sex	Age Class 1.1 Catch	1.1 %	1.2 Catch	1.2 %	1.3 Catch	1.3 %	1.4 Catch	1.4 %	2.3 Catch	2.3 %	1.5 Catch	1.5 %	2.4 Catch	2.4 %	Total Catch	Total %
6/17	180	M	0	0.0	770	29.4	1,002	38.3	291	11.1	0	0.0	73	2.8	0	0.0	2,136	81.7
(6/14,17)		F	0	0.0	0	0.0	160	6.1	290	11.1	0	0.0	29	1.1	0	0.0	479	18.3
		Subtotal	0	0.0	770	29.4	1,162	44.4	581	22.2	0	0.0	102	3.9	0	0.0	2,615	100
6/24	172	M	0	0.0	790	27.3	1,193	41.3	336	11.7	0	0.0	33	1.1	0	0.0	2,353	81.4
(6/24)		F	0	0.0	0	0.0	168	5.8	336	11.6	0	0.0	17	0.6	17	0.6	538	18.6
		Subtotal	0	0.0	790	27.3	1,361	47.1	672	23.3	0	0.0	50	1.7	17	0.6	2,891	100
6/26	177	M	0	0.0	2,581	31.1	2,628	31.6	798	9.6	0	0.0	0	0.0	0	0.0	6,007	72.3
(6/26-8/29)		F	0	0.0	47	0.5	704	8.5	1,501	18.1	0	0.0	0	0.0	47	0.6	2,299	27.7
		Subtotal	0	0.0	2,628	31.6	3,332	40.1	2,299	27.7	0	0.0	0	0.0	47	0.6	8,306	100
Season	529	M	0	0.0	4,141	30.0	4,823	34.9	1,425	10.3	0	0.0	106	0.8	0	0.0	10,495	76.0
		F	0	0.0	47	0.3	1,032	7.5	2,128	15.4	0	0.0	46	0.3	64	0.5	3,317	24.0
		Total	0	0.0	4,188	30.3	5,855	42.4	3,553	25.7	0	0.0	152	1.1	64	0.5	13,812	100.0
Grand	16,633	M		0.7	156,113	22.5	155,937	22.4	127,487	18.3	527	0.1	11,033	1.6	499	0.1	456,778	65.7
Total [a]		F		0.1	19,379	2.8	40,318	5.8	159,243	22.9	296	0.0	17,749	2.6	299	0.0	237,989	34.3
		Total		0.8	175,492	25.3	196,255	28.2	286,730	41.3	823	0.1	28,782	4.1	798	0.1	694,767	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The numbers of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 14.–Mean length (mm) of Chinook salmon from the District W-4 commercial fishery, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	2.3	1.5	2.4
6/17 (6/14,17)	M	Mean Length		525	665	821		848	
		Std. Error		6	9	19		17	
		Range		458-656	503-877	655-935		785-881	
		Sample Size	0	53	69	20	0	5	0
	F	Mean Length			723	864		845	
		Std. Error			23	8		35	
		Range			577-841	801-944		810-879	
		Sample Size	0	0	11	20	0	2	0
6/24 (6/24)	M	Mean Length		528	676	833		796	
		Std. Error		7	8	18		65	
		Range		427-689	523-846	710-956		731-861	
		Sample Size	0	47	71	20	0	2	0
	F	Mean Length			765	834		831	862
		Std. Error			13	9		-	-
		Range			702-828	755-893		831-831	862-862
		Sample Size	0	0	10	20	0	1	1
6/26 (6/26-8/29)	M	Mean Length		515	691	776			
		Std. Error		6	9	20			
		Range		425-676	487-825	677-940			
		Sample Size	0	55	56	17	0	0	0
	F	Mean Length		530	798	834			710
		Std. Error		-	14	10			-
		Range		530-530	684-880	693-940			710-710
		Sample Size	0	1	15	32	0	0	1
Season	M	Mean Length		519	682	799		832	
		Range		425-689	487-877	655-956		731-881	
		Sample Size	0	155	196	57	0	7	0
	F	Mean Length		530	781	838		840	750
		Range		530-530	577-880	693-944		810-879	710-862
		Sample Size	0	1	36	72	0	3	2
Grand Total [a]	M	Mean Length	396.84211	542	697	841	718	909	835
		Range	314- 560	315-1018	454-971	375-1405	520-780	525-1082	736-1001
		Sample Size	128	3291	3477	2607	9	196	10
	F	Mean Length	561.25	612	767	858	798	900	840
		Range	365- 832	445-970	531-963	599-1102	690-893	591-1066	870-892
		Sample Size	6	369	889	3285	6	331	5

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 15.–Age and sex composition of sockeye salmon from the District W-4 commercial fishery, 2008.

Sample Dates (Stratum)	Aged Sample Size	Sex	Age Class 0.2 Catch	%	0.3 Catch	%	1.2 Catch	%	0.4 Catch	%	1.3 Catch	%	2.2 Catch	%	1.4 Catch	%	2.3 Catch	%	Total Catch	%
7/1	139	M	0	0.0	384	2.1	2050.0	11.5	0	0	7,430	41.7	0.0	0	513	2.9	128.0	0.7	10,505	59
(6/24,17,24,26,7/1,5)		F	0	0.0	513	2.9	256.0	1.4	128	0.7	6,021	33.8	0.0	0	256	1.4	128.0	0.7	7,302	41
		Subtotal	0	0.0	897	5	2306.0	12.9	128	0.7	13,451	75.5	0.0	0	769	4.3	256.0	1.4	17,807	100
7/8	191	M	0	0.0	111	0.5	1441.0	6.8	222	1	9,314	44	0.0	0	111	0.5	0.0	0.0	11,198	52.9
(7/8,10,12)		F	0	0.0	332	1.6	1220.0	5.8	0	0	7,872	37.2	111.0	1	222	1.1	222.0	1.0	9,979	47.1
		Subtotal	0	0.0	443	2.1	2661.0	12.6	222	1	17,186	81.2	111.0	1	333	1.6	222.0	1.0	21,177	100
7/16	184	M	0	0.0	0	0	2882.0	12.0	0	0	9,433	39.2	0.0	0	393	1.6	0.0	0.0	12,709	52.7
(7/14,16,18,21)		F	0	0.0	393	1.6	3407.0	14.1	0	0	7,599	31.5	0.0	0	0	0	0.0	0.0	11,398	47.3
		Subtotal	0	0.0	393	1.6	6289.0	26.1	0	0	17,032	70.7	0.0	0	393	1.6	0.0	0.0	24,107	100
7/28	174	M	0	0.0	0	0	535.0	8.1	0	0	1,950	29.3	38.0	1	0	0	0.0	0.0	2,523	37.9
(7/23,25,28,30,8/1,4,6,		F	0	0.0	38	0.6	1912.0	28.7	0	0	2,026	30.5	38.0	1	38	0.6	76.0	1.1	4,129	62.1
8,10,12,14,16,18,20		Subtotal	0	0.0	38	0.6	2447.0	36.8	0	0	3,976	59.8	76.0	1	38	0.6	76.0	1.1	6,652	100
22,25,27,29)																				
Season	688	M	0	0.0	495	0.7	6,908	9.9	222	0.3	28,127	40.4	38	0.1	1,017	1.5	128	0.2	36,935	53.1
		F	0	0.0	1,276	1.8	6,794	9.7	128	0.2	23,518	33.7	149	0.2	516	0.7	426	0.6	32,808	46.9
		Total	0	0.0	1,771	2.5	13,702	19.6	350	0.5	51,645	74.1	187	0.3	1,533	2.2	554	0.8	69,743	100.0
Grand	10,399	M	1,948	0.19	19,660	1.9	166,275	15.9	2,935	0.3	341,882	32.7	6,496	0.6	13,970	1.3	9,049	0.9	562,385	53.8
Total [a]		F	383	0.04	21,996	2.1	128,230	12.3	2,253	0.2	303,636	29.1	5,320	0.5	10,696	1.0	9,870	0.9	482,638	46.2
		Total	2,336	0.22	41,656	4.0	294,505	28.2	5,188	0.5	645,514	61.8	11,813	1.1	24,665	2.4	18,920	1.8	1,045,054	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The numbers of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 16.–Mean length (mm) of sockeye salmon from the District W-4 commercial fishery, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	1.2	1.3	2.2	1.4	2.3
7/1 (6/24,17,24,26, 7/1,5)	M	Mean Length		540	496	572		587	591
		Std. Error		30	9	2		7	-
		Range		492-595	398-539	535-612		570-604	591-591
		Sample Size	0	3	16	58	0	4	1
	F	Mean Length		523	511	541		541	520
		Std. Error		7	20	2		10	-
		Range		503-534	491-530	511-586		531-551	520-520
		Sample Size	0	4	2	47	0	2	1
7/8 (7/8,10,12)	M	Mean Length		539	519	563		536	
		Std. Error		-	6	2		-	
		Range		539-539	489-557	492-607		536-536	
		Sample Size	0	1	13	84	0	1	0
	F	Mean Length		526	484	533	477	543	543
		Std. Error		3	8	2	-	8	1
		Range		521-531	426-513	493-572	477-477	535-550	542-543
		Sample Size	0	3	11	71	1	2	2
7/16 (7/14,16,18,21)	M	Mean Length			510	575		591	
		Std. Error			6	3		10	
		Range			427-550	498-619		571-606	
		Sample Size	0	0	22	72	0	3	0
	F	Mean Length		540	495	541			
		Std. Error		9	4	3			
		Range		523-550	460-540	494-580			
		Sample Size	0	3	26	58	0	0	0
7/28 (7/23,25,28,30,8/1, 4,6,8,10,12,14,16, 18,20,22,25,27,29)	M	Mean Length			501	574	493		
		Std. Error			8	4	-		
		Range			432-534	460-612	493-493		
		Sample Size	0	0	14	51	1	0	0
	F	Mean Length		495	493	541	558	593	550
		Std. Error		-	4	4	-	-	13
		Range		495-495	459-589	422-590	558-558	593-593	537-563
		Sample Size	0	1	50	53	1	1	2

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Table 16.–Page 2 of 2.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	1.2	1.3	2.2	1.4	2.3
Season	M	Mean Length		540	507	570	493	583	591
		Range		492-595	398-557	460-619	493-493	536-606	591-591
		Sample Size	0	4	65	265	1	8	1
	F	Mean Length		528	493	538	498	545	537
		Range		495-550	426-589	422-590	477-558	531-593	520-563
		Sample Size	0	11	89	229	2	5	5
Grand Total [a]	M	Mean Length	461	569	520	575	533	571	571
		Range	410-507	511-656	321-596	305-700	482-602	497-664	497-664
		Sample Size	12	85	1,370	3,065	72	143	143
	F	Mean Length	499	544	502	544	505	547	547
		Range	480-502	474-623	407-590	323-625	463-563	483-610	483-610
		Sample Size	4	124	1,179	2,754	65	123	123

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 17.–Age and sex composition of chum salmon from the District W-4 commercial fishery, 2008.

Sample Dates (Stratum)	Aged Sample Size	Sex	Age Class 0.2 Catch	0.2 %	0.3 Catch	0.3 %	0.4 Catch	0.4 %	0.5 Catch	0.5 %	Total Catch	Total %
6/24	194	M	0	0	3,324	13.4	11,762	47.4	895	3.6	15,981	64.4
(6/14,17,24,26,		F	0	0	1,534	6.2	7,031	28.4	256	1	8,821	35.6
7/1,5,8,10)		Subtotal	0	0	4,858	19.6	18,793	75.8	1,151	4.6	24,802	100.0
7/23	201	M	285	1	4,997	17.4	6,853	23.9	571	2	12,706	44.3
(7/12,14,16,		F	143	0.5	8,423	29.4	6,995	24.4	428	1.5	15,989	55.7
18,'21,23,28)		Subtotal	428	1.5	13,420	46.8	13,848	48.3	999	3.5	28,695	100.0
8/6	190	M	0	0	577	16.3	782	22.1	37	1	1,396	39.5
(7/30,8/1,4,6,8,		F	19	0.5	856	24.2	1,079	30.5	186	5.3	2,140	60.5
10,12,14,16,18,		Subtotal	19	0.5	1,433	40.5	1,861	52.6	223	6.3	3,536	100.0
20,22,25,27,28)												
Season	585	M	286	0.5	8,898	16.5	19,396	34.0	1,503	2.7	30,082	52.7
		F	161	0.3	10,813	19.0	15,106	26.5	870	1.5	26,951	47.3
		Total	447	0.8	19,711	34.6	34,502	60.5	2,373	4.2	57,033	100.0
Grand	14,856	M	6,468	0.7	229,560	25.8	164,623	18.5	6,153	0.7	406,805	45.7
Total [a]		F	7,775	0.9	288,381	32.4	180,360	20.3	7,216	0.8	483,730	54.3
		Total	14,243	1.6	517,942	58.2	344,982	38.7	13,369	1.5	890,522	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors. The numbers of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 18.–Mean length (mm) of chum salmon from the District W-4 commercial fishery, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
6/24 (6/14,17,24,26,) 7/1,5,8,10)	M	Mean Length		604	610	602
		Std. Error		5	3	21
		Range		565-667	546-664	501-645
		Sample Size	0	25	92	7
	F	Mean Length		566	593	622
		Std. Error		5	2	12
		Range		541-597	561-646	610-633
		Sample Size	0	12	55	2
7/23 (7/12,14,16,) 18,21,23,28)	M	Mean Length	529	577	579	572
		Std. Error	1	5	5	10
		Range	528-530	515-633	504-653	547-594
		Sample Size	2	35	48	4
	F	Mean Length	535	553	558	554
		Std. Error	-	3	4	24
		Range	535-535	511-591	495-625	511-595
		Sample Size	1	59	49	3
8/6 (7/30,8/1,4,6,8, 10,12,14,16,18, 20,22,25,27,28)	M	Mean Length		574	592	585
		Std. Error		5	4	6
		Range		481-621	520-648	579-590
		Sample Size	0	31	42	2
	F	Mean Length	539	568	570	561
		Std. Error	-	4	3	8
		Range	539-539	519-633	510-634	534-611
		Sample Size	1	46	58	10

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Table 18.–Page 2 of 2.

Sample Dates (stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
Season	M	Mean Length	529	587	598	590
		Range	528-530	481-667	504-664	501-645
		Sample Size	2	91	182	13
	F	Mean Length	535	556	575	575
		Range	535-539	511-633	495-646	511-633
		Sample Size	2	117	162	15
Grand Total [a]	M	Mean Length	534	582	603	605
		Range	454-675	462-710	492-735	530-694
		Sample Size	119	3,974	2,714	98
	F	Mean Length	530	559	576	583
		Range	486-578	325-683	492-695	516-651
		Sample Size	151	4,791	2,904	100

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 19.–Age and sex of coho salmon from the District W-4 commercial fishery, 2008.

Sample Dates (Stratum)	Aged Sample Size	Sex	Age Class 1.1 Catch	1.1 %	2.1 Catch	2.1 %	3.1 Catch	3.1 %	Total Catch	Total %
8/4	163	M	1,471	5.5	13,889	52.1	654	2.5	16,013	60.1
(7/21,23,25,28,		F	490	1.9	9,477	35.6	653	2.4	10,621	39.9
30,8/1,4,6,8)		Subtotal	1,961	7.4	23,366	87.7	1,307	4.9	26,634	100.0
8/12	136	M	934	3.7	13,257	52.2	187	0.7	14,377	56.6
(8/10,12,14)		F	373	1.4	10,270	40.4	373	1.5	11,017	43.4
		Subtotal	1,307	5.1	23,527	92.6	560	2.2	25,394	100.0
8/16	129	M	1,667	8.5	6,063	31.0	455	2.3	8,185	41.9
(8/16,18,20)		F	1,213	6.2	9,397	48.1	758	3.9	11,367	58.1
		Subtotal	2,880	14.7	15,460	79.1	1,213	6.2	19,552	100
		M	639	2.8	9,582	42.2	320	1.4	10,540	46.5
8/22	71	F	1,277	5.7	10,540	46.5	319	1.4	12,137	53.5
(8/22,25,27,29)		Subtotal	1,916	8.5	20,122	88.7	639	2.8	22,677	100.0
Season	499	M	4,710	5	42,790	45.4	1,615	1.7	49,115	52.1
		F	3,354	3.6	39,684	42.1	2,104	2.2	45,142	47.9
		Total	8,064	8.6	82,474	87.5	3,719	3.9	94,257	100.0
Grand	7,875	M	35,059	4.19	360,866	43.2	17,207	2.1	446,145	53.38
Total [a]		F	29,952	3.58	311,006	37.2	16,008	1.9	389,673	46.62
		Total	65,010	7.8	671,872	80.4	33,214	4.0	835,829	100.0

Note: The numbers of fish in each stratum age and sex category are derived from sample percentages; discrepancies are attributed to rounding errors. The numbers of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums.

Table 20.–Mean length (mm) of coho salmon from the District W-4 commercial fishery, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
8/4 (7/21,23,25,28, 30,8/1,4,6,8)	M	Mean Length	547	554	583
		Std. Error	9	4	21
		Range	505-578	448-638	535-636
		Sample Size	9	85	4
	F	Mean Length	545	570	570
		Std. Error	20	3	4
		Range	505-567	521-622	564-580
		Sample Size	3	58	4
8/12 (8/10,12,14)	M	Mean Length	542	575	597
		Std. Error	21	5	-
		Range	484-595	429-654	597-597
		Sample Size	5	71	1
	F	Mean Length	568	569	558
		Std. Error	17	5	14
		Range	551-584	440-696	544-572
		Sample Size	2	55	2
8/16 (8/16,18,20)	M	Mean Length	561	572	589
		Std. Error	8	4	5
		Range	509-596	517-626	578-594
		Sample Size	11	40	3
	F	Mean Length	558	572	567
		Std. Error	13	4	18
		Range	483-616	497-682	514-620
		Sample Size	8	62	5
8/22 (8/22,25,27,29)	M	Mean Length	539	579	536
		Std. Error	48	7	-
		Range	491-586	491-664	536-536
		Sample Size	2	30	1
	F	Mean Length	547	576	592
		Std. Error	38	5	-
		Range	456-637	511-626	592-592
		Sample Size	4	33	1
Season	M	Mean Length	554	573	575
		Range	484-596	429-664	535-636
		Sample Size	27	226	9
	F	Mean Length	554	572	570
		Range	456-637	440-696	514-620
		Sample Size	17	208	12

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Table 20.–Page 2 of 2

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
Grand Total [a]	M	Mean Length	557	579	583
		Range	472-653	419-704	489-660
		Sample Size	193	1915	87
	F	Mean Length	579	583	576
		Range	441-661	412-696	514-620
		Sample Size	132	1637	79

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths.

Table 21.–Daily weather and hydrological observations from the Kanektok River weir site, 2008.

Date	Wind (Dir/ Speed)	Air Temp. (C)	Water Temp. (C)	Cloud Cover % / altitude	Water level (cm)	Precip (in)
6/22	0	11	9	500/1000	73	2.00
6/23	E/5	6	7	100/1500	71	0.00
6/24	SE/10	14	9	100/2500	69	0.00
6/25	E/7	11	7	80/3000	68	0.00
6/26	0	8	7	100/1000	67	0.00
6/27	E/5	8	7	100/2500	65	0.01
6/28	0	8	7	50/Vair.	62	0.05
6/29	0	6	7	FOG	61	0.38
6/30	E/5	5	7	0	58	0.02
7/01	SE/A0	10	7	90/3000	56	0.00
7/02	NE/10	9	8	100/3000	53	0.00
7/03	0	7	8	100/4000	52	0.00
7/04	E/5	16	9	50/Vair.	52	0.00
7/05	SE/2	17	9	50/Vair.	51	0.01
7/06	N/4	16	9	10/Vair	51	0.00
7/07	N/6	14	10	50/Vair.	56	0.20
7/08	E/9	10	10	70/2500	54	0.01
7/09	E/15	13	9	100/100	62	0.00
7/10	E/5	11	8	100/100	51	0.05
7/11	E/7	12	9	100/300	50	0.01
7/12	SE/7	9	9	100/500	49	0.15
7/13	E/4	9	9	100/500	48	0.04
7/14	SE/10	10	8	100/3000	48	0.35
7/15	S/5	11	10	100/1000	47	0.30
7/16	SE/10	12	9.5	100/2800	50	0.09
7/17	S/10	8.5	8	100/2600	50	0.14
7/18	SE/7	16.5	9	65/3100	59	0.17
7/19	NW/8	18	10	90/3300	55	0.00
7/20	SE/12	8	8	100/900	53	0.00
7/21	NW/8	15	9.5	100/3100	51	0.18
7/22	NE/2	6	8	100/3000	49	0.00
7/23	W/3	8	8.5	100/2600	48	0.00
7/24	NW/10	20	11	20/3500	47	0.00
7/25	E/5	15	7	100/3500	45	0.00
7/26	W/7.5	13	10	100/2000	43	0.00
7/27	W/12	16	10	50/2200	40	0.04
7/28	W/5	20	11	50/3200	39	0.02
7/29	W/8	21	12	50/Vair.	38	0.00

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Table 21.–Page 2 of 2

Date	Wind (Dir/ Speed)	Air Temp. (C)	Water Temp. (C)	Cloud Cover % / altitude	Water level (cm)	Precip (in)
7/30	W/7	23	12	100/3000	35	0.00
7/31	W/5	17	12.5	70/2800	35	0.00
8/01	NW/5.5	22	13	35/3000	32	0.00
8/02	E/4	21	14	70/3500	30	0.01
8/03	0	18	14	80/4000	29	0.00
8/04			NO OBS.			
8/05	0	12	12	0	27	0.00
8/06	NE/3	18	10	100/Vair.	26	0.00
8/07	W/7	19	11	90/3100	25	0.00
8/08	W/3	25	14	50/3500	24	0.00
8/09	W/2	26	12	50/4500	23	0.00
8/10	W/2	23.5	12	75/3200	22	0.00
8/11	NW/11	16	12	100/4000	21	0.00
8/12	W/12	20	12	40/3000	20	0.02
8/13	W/2	15	10	100/200	20	0.00
8/14	W/8	14	10	100/1000	23	0.50
8/15	W/7	12	11	100/1000	24	0.00
8/16	W/6	15	10	100/3500	22	0.00
8/17	N/6	16	11	100/3500	21	0.00
8/18	E/2	20	11	50/5000	21	0.30
8/19	0	20	11	80/2000	20	0.01
8/20	0	17	11	100/200	22	0.40
8/21	N/4	17	10	100/400	24	0.22
8/22			NO OBS.			
8/23	0	17	NO OBS.	Fog	19	0.80
8/24	0	21	NO OBS.	Fog	15	0.00
8/25	0	11	NO OBS.	0	NO OBS.	0.00
8/26	0	10	NO OBS.	0	NO OBS.	0.00
8/27	W/10	13	NO OBS.	100/500	NO OBS.	0.01
8/28	NW/6	16	NO OBS.	80/600	NO OBS.	0.00
8/29	0	10	NO OBS.	100/1000	NO OBS.	0.50
8/30	SW/7	10	NO OBS.	100/1500	NO OBS.	0.50

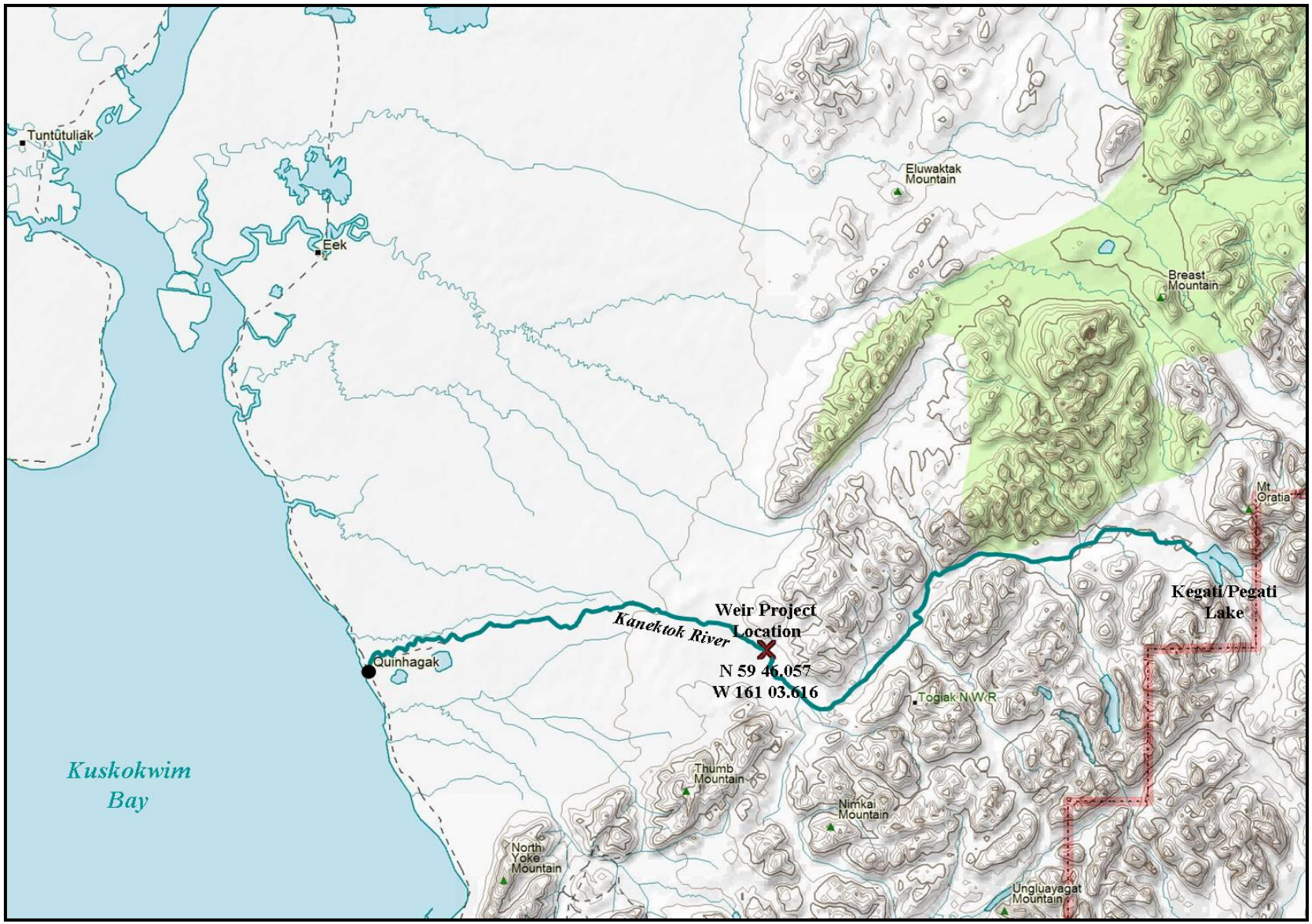


Figure 1.–Kanektok River weir project location.

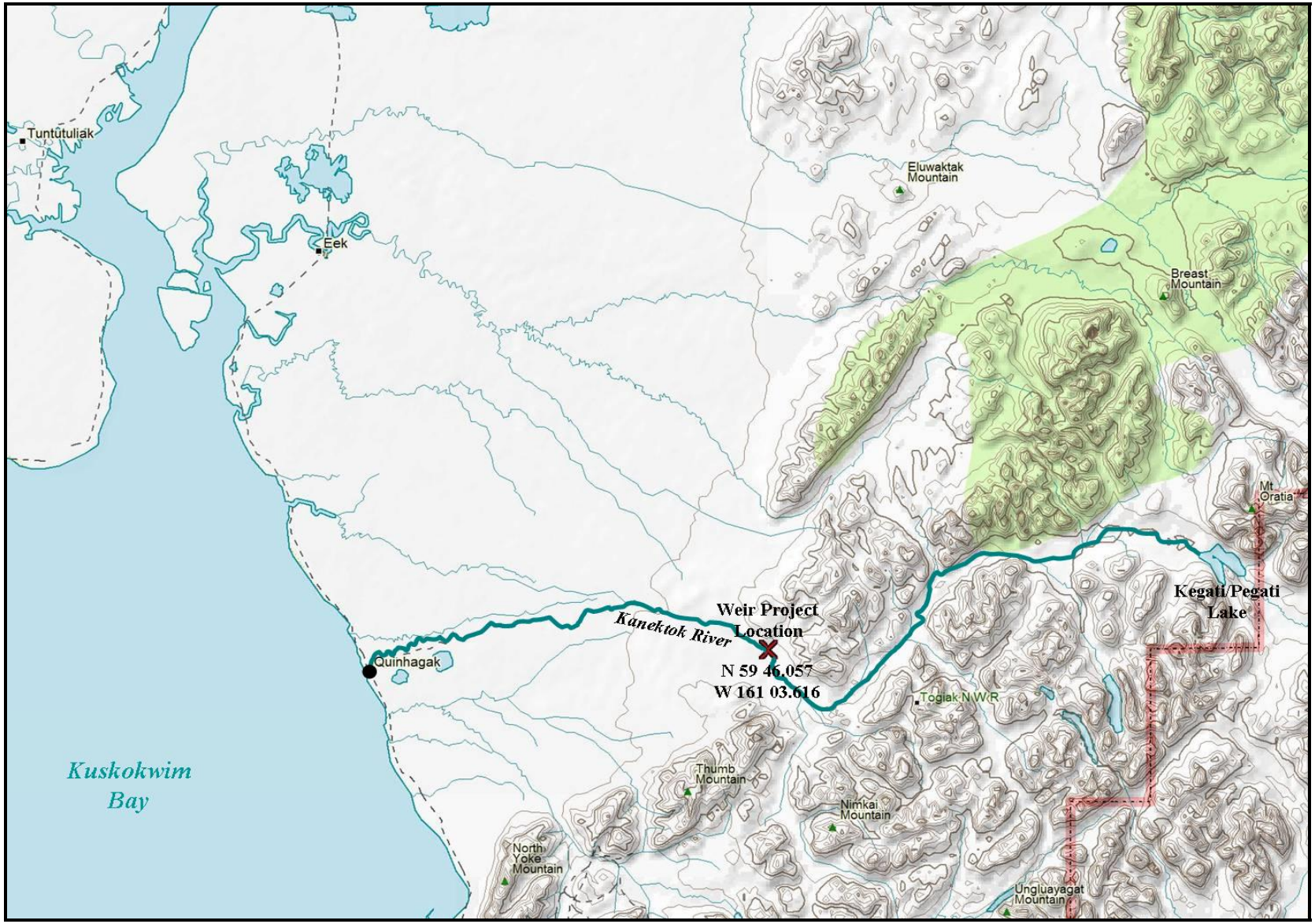


Figure 2.–Commercial Fishing District W-4, Kuskokwim Bay, Alaska, 2005.

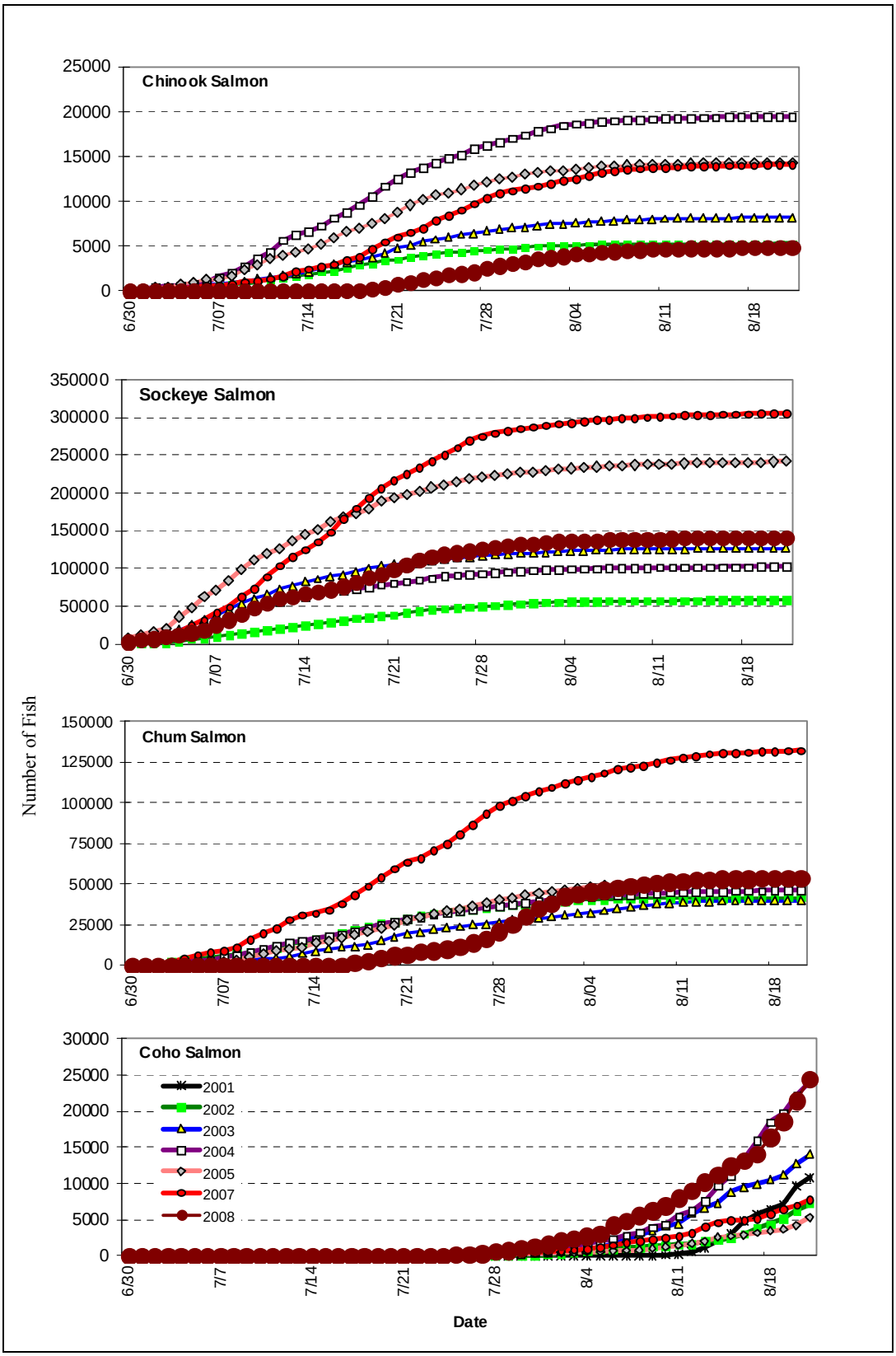


Figure 3.–Historical escapement of Chinook, sockeye, chum, and coho salmon at the Kanektok River weir.

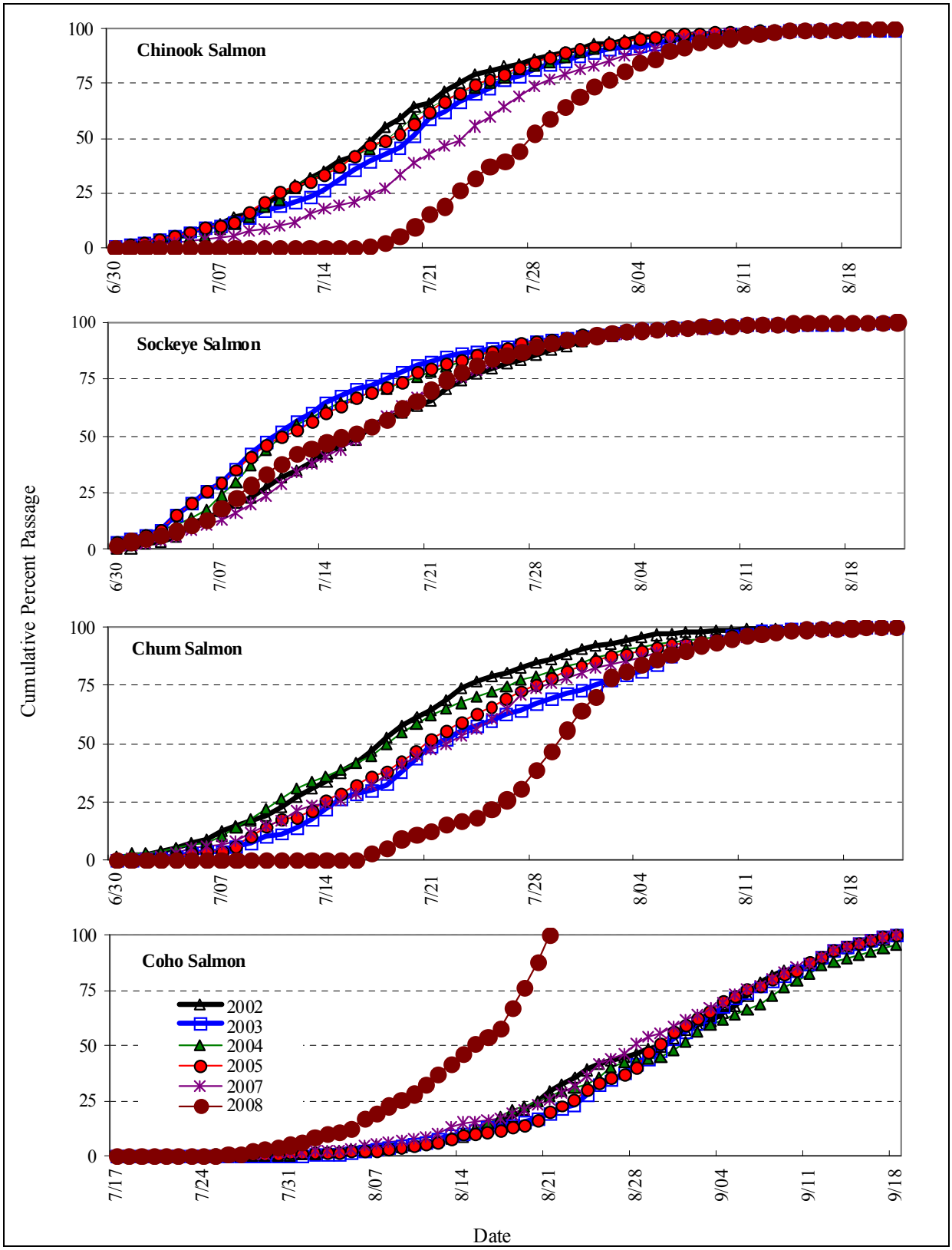
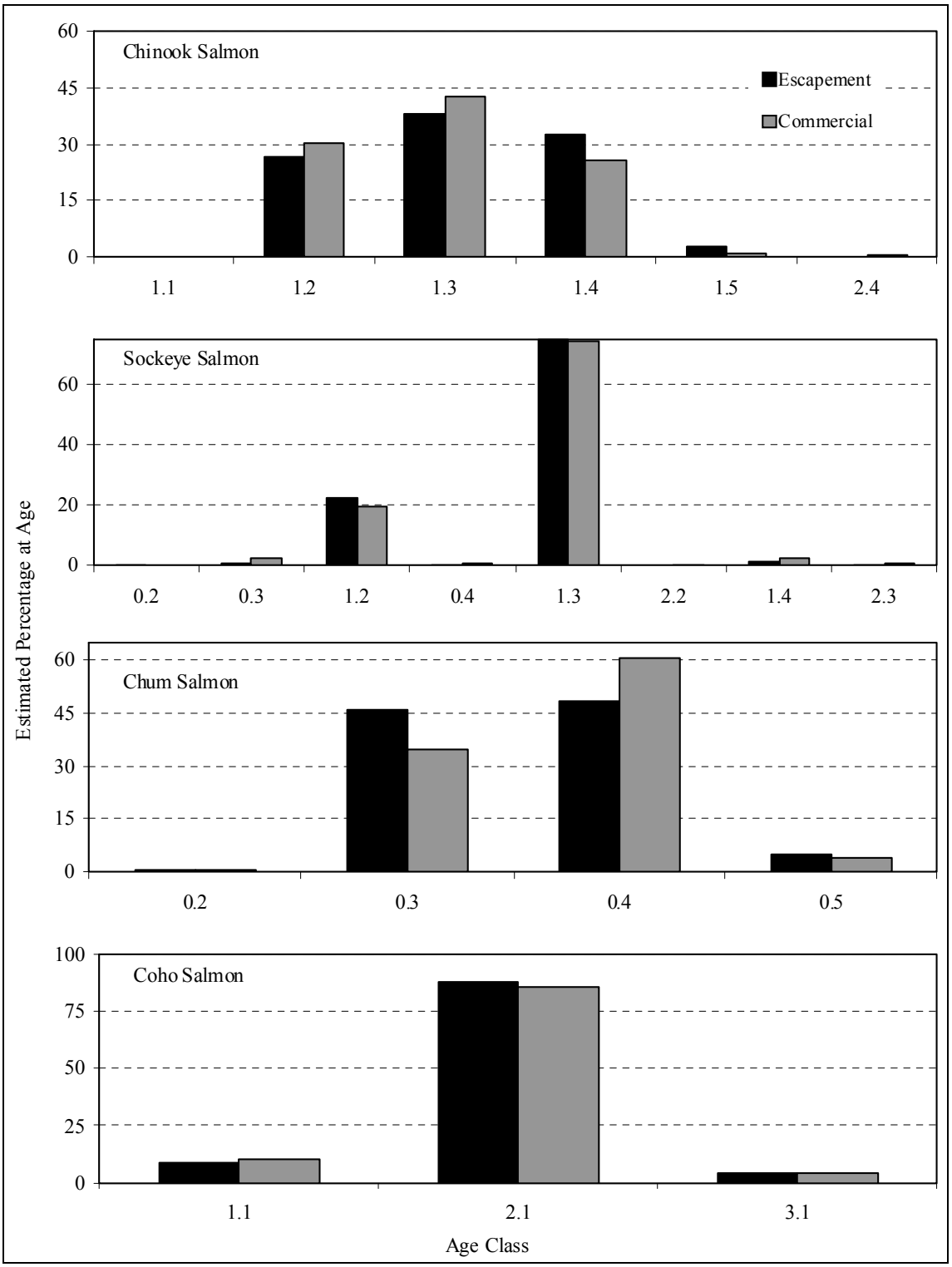
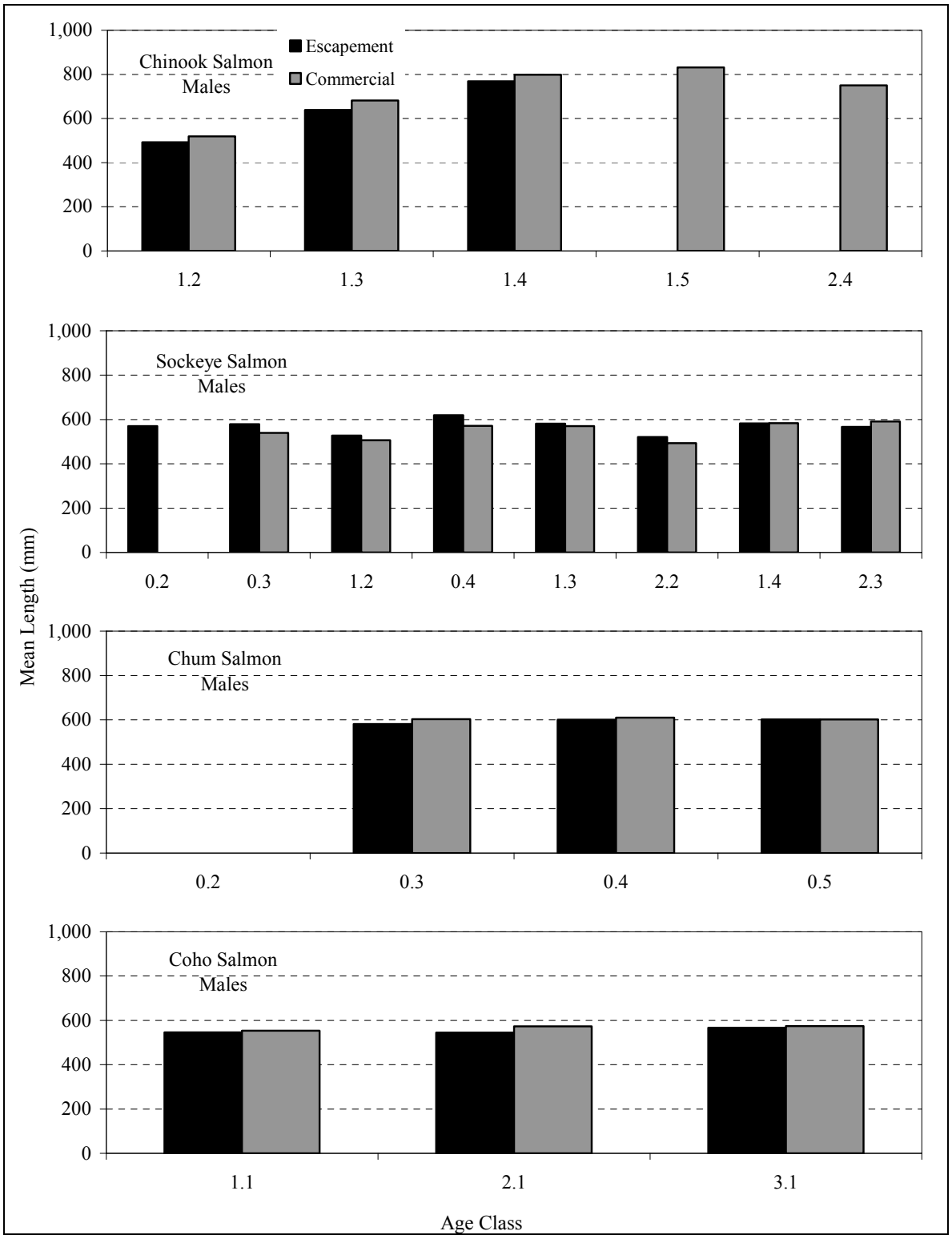


Figure 4.–Historical run timing of Chinook, sockeye, chum, and coho salmon, Kanektok River weir.



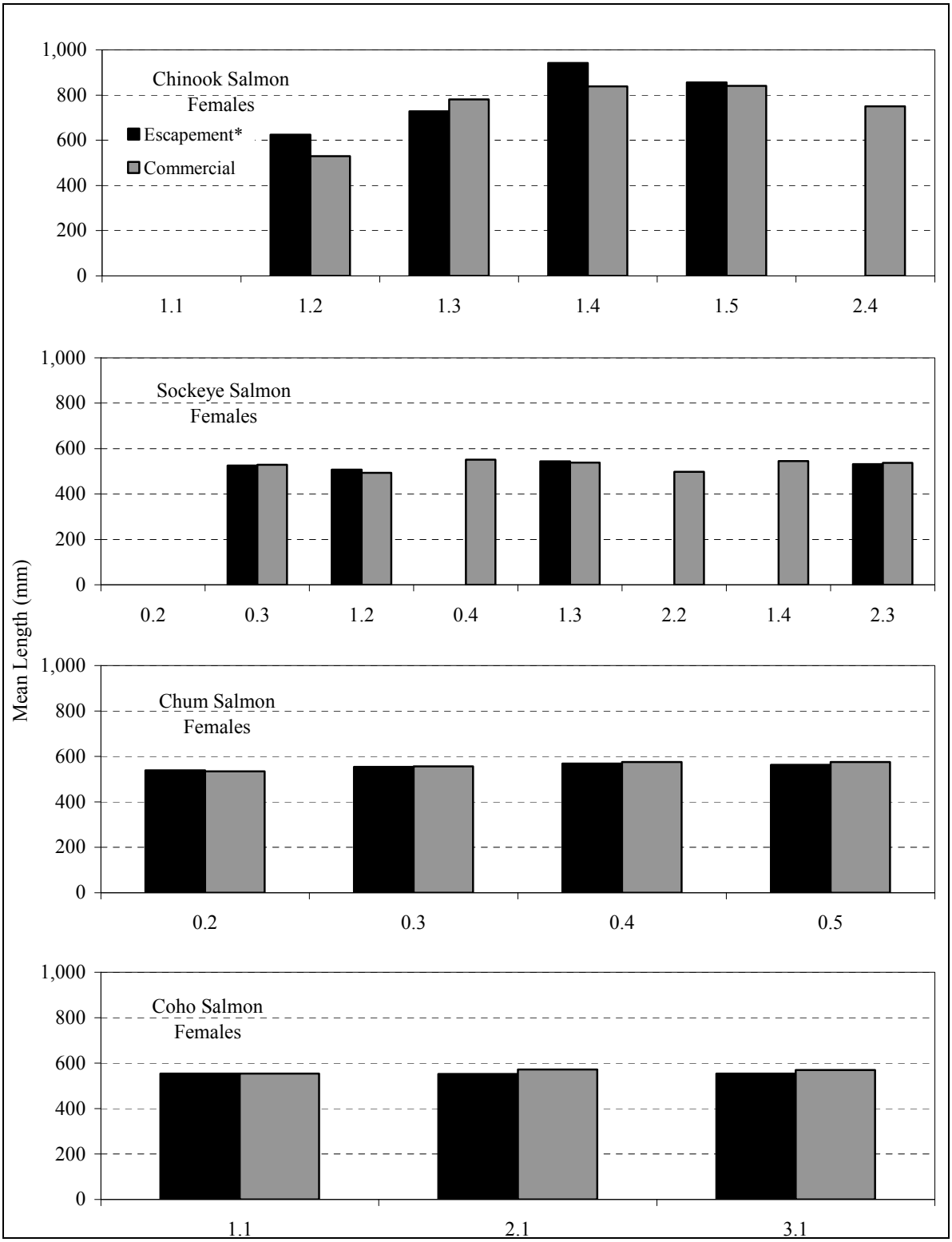
Note: Percentages do not represent actual escapement age class distributions as they are based on escapement age class distributions as they are based on escapement observed and an insufficient set of samples collected during weir operations.

Figure 5.–Age class percentages for Chinook, sockeye, chum, and coho salmon from observed Kanektok River weir escapement and District W-4 commercial fishery, 2008.



Note: Percentages do not represent actual escapement age class distributions as they are based on escapement observed and an insufficient set of samples collected during weir operations.

Figure 6.–Mean length by age class for male Chinook, sockeye, chum, and coho salmon from observed from Kanektok River weir escapement and District W-4 commercial fishery, 2008.



Note: Mean lengths do not represent estimated escapement as they are based on escapement observed and samples collected during weir operations.

Figure 7.–Mean length by age class for female Chinook, sockeye, chum, and coho salmon from observed Kanektok River weir escapement and District W-4 commercial fishery, 2007.

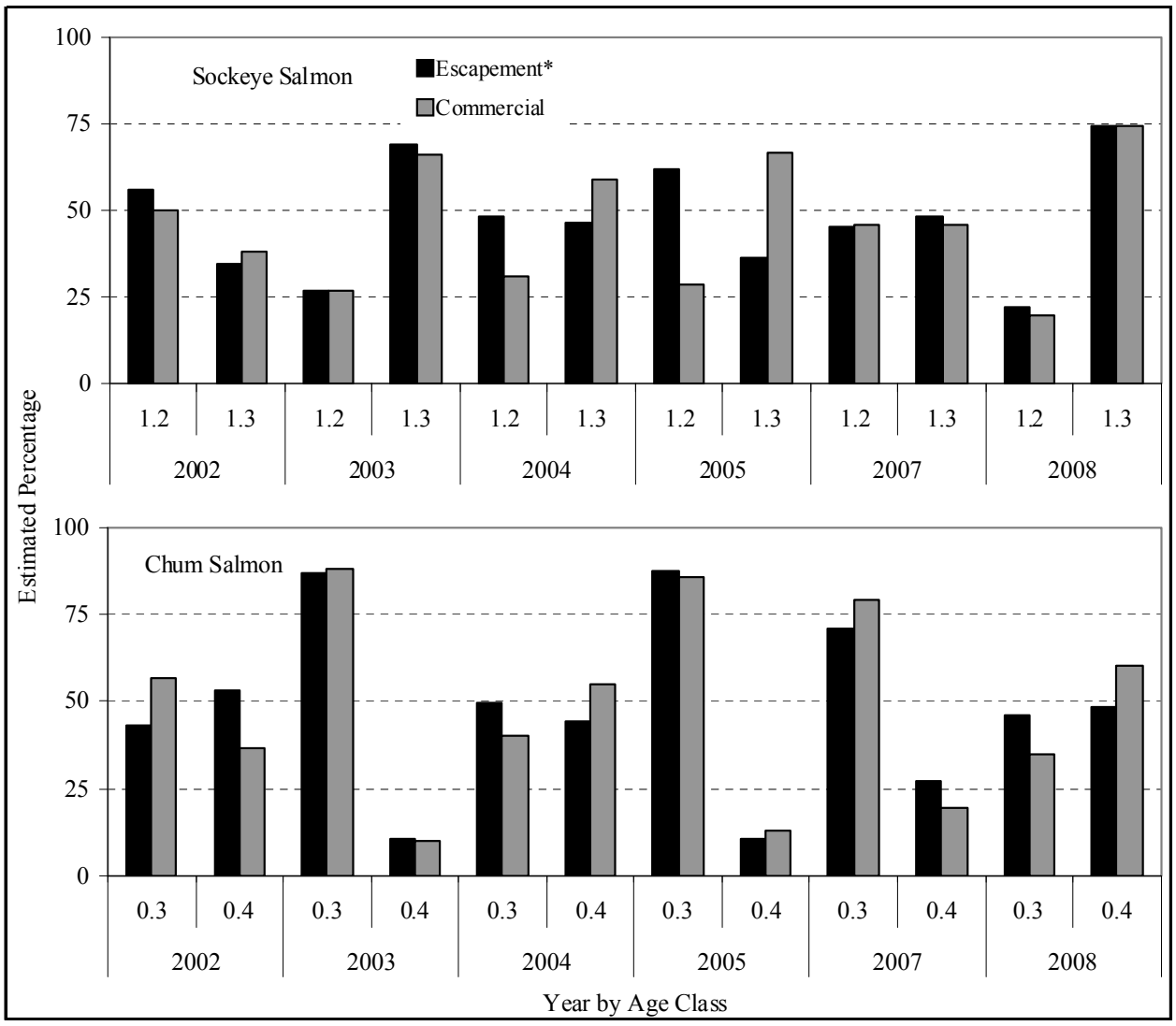


Figure 8.–Percentage of age-1.2 and -1.3 sockeye salmon and age-0.3 and -0.4 chum salmon from Kanektok. River weir escapement and District W-4 commercial ASL estimates, 2002 through 2005 and 2008.

APPENDIX A

Appendix A1.–Historical commercial, subsistence, and sport fishing harvests of Chinook, sockeye, coho and chum salmon, Quinhagak area, 1960 through 2008.

	Chinook			Sockeye			Chum			Coho		
Year	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
1960	0			5,649			0			3,000		
1961	4,328			2,308			18,864			46		
1962	5,526			10,313			45,707			0		
1963	6,555			0			0			0		
1964	4,081			13,422			707			379		
1965	2,976			1,886			4,242			0		
1966	278			1,030			2,610			0		
1967	0	1,349		652			8,087			1,926		
1968	8,879	2,756		5,884			19,497			21,511		
1969	16,802			3,784			38,206			15,077		
1970	18,269			5,393			46,556			16,850		
1971	4,185			3,118			30,208			2,982		
1972	15,880			3,286			17,247			376		
1973	14,993			2,783			19,680			16,515		
1974	8,704			19,510			15,298			10,979		
1975	3,928			8,584			35,233			10,742		
1976	14,110			6,090			43,659			13,777		
1977	19,090	2,012		5,519			43,707			9,028		
1978	12,335	2,328		7,589			24,798			20,114		
1979	11,144	1,420		18,828			25,995			47,525		
1980	10,387	1,940		13,221			65,984			62,610		
1981	24,524	2,562		17,292			53,334			47,551		
1982	22,106	2,402		25,685			34,346			73,652		
1983	46,385	2,542	1,511	10,263			23,090		315	32,442		367
1984	33,663	3,109	922	17,255		143	50,422		376	132,151		1,895
1985	30,401	2,341	672	7,876	106	12	20,418	901	149	29,992	67	622
1986	22,835	2,682	938	21,484	423	200	29,700	808	777	57,544	41	2,010
1987	26,022	3,663	508	6,489	1,067	153	8,557	1,084	111	50,070	125	2,300
1988	13,883	3,690	1,910	21,556	1,261	109	29,220	1,065	618	68,605	4,317	1,837
1989	20,820	3,542	884	20,582	633	101	39,395	1,568	537	44,607	3,787	1,096
1990	27,644	6,013	503	83,681	1,951	462	47,717	3,234	202	26,926	4,174	644
1991	9,480	3,693	316	53,657	1,772	88	54,493	1,593	80	42,571	3,232	358

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Appendix A1.–Page 2 of 2.

	Chinook			Sockeye			Chum			Coho		
Year	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
1992	17,197	3,447	656	60,929	1,264	66	73,383	1,833	251	86,404	2,958	275
1993	15,784	3,368	1,006	80,934	1,082	331	40,943	1,008	183	55,817	2,152	734
1994	8,564	3,995	751	72,314	1,000	313	61,301	1,452	156	83,912	2,739	675
1995	38,584	2,746	739	68,194	573	148	81,462	686	213	66,203	2,561	970
1996	14,165	3,075	689	57,665	1,467	335	83,005	930	200	118,718	1,467	875
1997	35,510	3,433	1,632	69,562	1,264	607	38,445	600	212	32,862	1,264	1,220
1998	23,158	4,041	1,475	41,382	1,702	942	45,095	1,448	213	80,183	1,702	751
1999	18,426	3,167	854	41,315	2,021	496	38,091	1,810	293	6,184	2,021	1,091
2000	21,229	3,106	833	68,557	1,088	684	30,553	912	231	30,529	1,088	799
2001	12,775	2,923	947	33,807	1,525	83	17,209	747	43	18,531	1,525	2,448
2002	11,480	2,475	779	17,802	1,099	73	29,252	1,839	446	26,695	1,099	1,784
2003	14,444	3,898	323	33,941	1,622	107	27,868	1,129	14	49,833	2,047	1,076
2004	25,465	3726	288	34,627	1086	112	25,820	1112	33	82,398	1209	1362
2005	14,195	3,083	520	68,801	1,633	156	13,529	915	108	51,780	1,443	1,006
2006	19,184	3,521	754	106,308	2,177	523	39,151	1,865	145	26,831	1,019	1,742
2007	19,573	3412	633	109,343	1143	385	61,228	1725	15	34,710	1303	1087
2008	13,812	[a]	[a]	69,743	[a]	[a]	57,033	[a]	[a]	94,257	[a]	[a]
10-Year Average[b]	17,993	3,335	741	55,588	1,510	356	32,780	1,350	154	40,767	1,446	1,315
Historical Average[c]	16,041	3,140	842	28,961	1,259	276	33,402	1,316	237	35,649	1,884	1,161

Source: Linderman et al.2003.

Note: Commercial harvest from District W-4 (Quinhagak), subsistence harvest by the community of Quinhagak, subsistence harvest estimates prior to 1988 are based on a different formula and are not comparable with estimates from 1988 to present.

[a] Not available at time of publication.

[b] 10-year average from 1998–2007.

[c] Historical average of subsistence harvest from 1988–2007.

APPENDIX B

Appendix B1.–Historical escapement, Kanektok River escapement projects, 1996–2008.

Year	Method	Dates of Operation	Chinook	Sockeye	Chum	Pink [a]	Coho
1996	Counting Tower [b]	2–13, 20–25 July	6,827 [e]	71,637 [e]	70,617 [e]	[e]	[e]
1997	Counting Tower [b]	11 June–21 August	16,731	96,348	51,180	7,872	23,172 [e]
1998	Counting Tower [b]	23 July–17 August	[e]	[e]	[e]	[e]	
1999	Tower/Weir [b]	Not Operational					
2000	Resistance Board Weir [c]	Not Operational					
2001	Resistance Board Weir [d]	10 August–3 October	132 [e]	735 [e]	1,058 [e]	19 [e]	35,677
2002	Resistance Board Weir [d]	1 July–20 September	5,343	58,367	42,014	87,036	24,883
2003	Resistance Board Weir [d]	24 June–18 September	8,221	127,471	40,071	2,443	72,448
2004	Resistance Board Weir [d]	29 June–20 September	19,528	102,867	46,444	98,060	87,828
2005	Resistance Board Weir [d]	8 July-8 September	14,331	242,208	53,580	3,530	26,343
2006	Resistance Board Weir [d]	Not Operational					
2007	Resistance Board Weir [d]	19 June- 11 September	14,120	307,750	133,215	3,075	30,471
2008	Resistance Board Weir [d]	17 July- August 21	4,837	141,388	54,024	142,430	24,490

[a] Picket spacing of the weir panels allows pink salmon to freely pass through the weir unobserved.

[b] Project located approximately 15 river miles from the mouth of the Kanektok River.

[c] Project located approximately 20 river miles from the mouth of the Kanektok River.

[d] Project located approximately 42 river miles from the mouth of the Kanektok River.

[e] No counts or incomplete counts as the project was not operational during a large portion of species migration.

APPENDIX C

Appendix C1.–Aerial survey escapement indices of the Kanektok River drainage by species, 1965–2008.

Year	Chinook	Sockeye	Chum	Coho
1962	935	43,108	[a]	[a]
1965	[a]	[a]	[a]	[a]
1966	3,718	[a]	28,800	[a]
1967	[a]	[a]	[a]	[a]
1968	4,170	8,000	14,000	[a]
1969	[a]	[a]	[a]	[a]
1970	3,112	11,375	[a]	[a]
1971	[a]	[a]	[a]	[a]
1972	[a]	[a]	[a]	[a]
1973	814	[a]	[a]	[a]
1974	[a]	[a]	[a]	[a]
1975	[a]	6,018	[a]	[a]
1976	[a]	22,936	8,697	[a]
1977	5,787	7,244	32,157	[a]
1978	19,180	44,215	229,290 [b]	[a]
1979	[a]	[a]	[a]	[a]
1980	[a]	[a]	[a]	[a]
1981	[a]	[a]	[a]	69,325
1982	15,900	49,175	71,840	[a]
1983	8,142	55,940	[a]	[a]
1984	8,890	2,340	9,360	[a]
1985	12,182	30,840	53,060	46,830
1986	13,465	16,270	14,385	[a]
1987	3,643	14,940	16,790	[a]
1988	4,223	51,753	9,420	20,056
1989	11,180	30,440	20,583	[a]
1990	7,914	14,735	6,270	[a]
1991	[a]	[a]	2,475	[a]
1992	2,100	44,436	19,052 [c]	4,330
1993	3,856	14,955	25,675	[a]
1994	4,670	23,128	1,285	[a]
1995	7,386	30,090	10,000	[a]
1996	[a]	[a]	[a]	[a]
1997	[a]	[a]	[a]	[a]
1998	6,107	22,020	7,040	23,656
1999	[a]	[a]	[a]	5,192
2000	1,118	11,670	10,000	10,120
2001	6,483	38,610	11,440	[a]
2002	[a]	[a]	[a]	[a]
2003	6,206	21,335	2,700	[a]
2004	28,375	78,380	[a]	[a]
2005	14,202	110,730	[a]	[a]
2006	8,433	382,800	[a]	[a]
2007	[a]	[a]	[a]	[a]
2008	3,808	38,900	[a]	[a]
SEG[d]	3,500–8,000	14,000–34,000	>5,200	7,700–36,000

Note: Aerial surveys are those rated as fair to good obtained between 20 July and 5 August for Chinook and sockeye salmon, 20 and 31 July for chum salmon, and 20 August and 5 September for coho salmon.

[a] Survey either not flown or did not meet acceptable survey criteria.

[b] Chum salmon count excluded from escapement objective because of exceptional magnitude.

[c] Some chum salmon may have been incorrectly speciated as sockeye salmon.

[d] Current Kanektok River drainage aerial survey Sustainable Escapement Goals (ADF&G 2004).

APPENDIX D

Appendix D1.–Historical Chinook, sockeye, chum, and coho salmon cumulative percent passage, Kanektok River weir.

	Chinook Salmon						Sockeye Salmon							Chum Salmon						Coho Salmon					
Date	2002	2003	2004	2005[a]	2007	2008[a]	2002	2003	2004	2005[a]	2007	2008	2002	2003	2004	2005[a]	2007	2008[a]	2001	2002	2003	2004	2005[a]	2007	2008[a]
6/24	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		0	0	
6/26	0	0		0	0		0	1		0	0		0	0		0	0		0	0	0		0	0	
6/27	0	0		0	0		0	1		1	0		0	0		0	0		0	0	0		0	0	
6/28	0	0		0	0		0	1		1	0		0	0		0	0		0	0	0		0	0	
6/29	0	0	0	0	0		0	2	0	2	1		0	0	0	0	0		0	0	0	0	0	0	
6/30	0	1	1	1	1		0	3	2	3	1	2	0	0	1	0	0		0	0	0	0	0	0	
7/01	1	1	2	1	1		0	5	5	5	2	4	0	0	3	0	1		0	0	0	0	0	0	
7/02	2	2	2	3	1		2	6	7	6	3	5	2	1	3	1	1		0	0	0	0	0	0	
7/03	2	3	3	4	2		3	9	9	9	4	6	4	1	4	1	2		0	0	0	0	0	0	
7/04	4	5	3	5	2		6	15	11	15	6	8	5	2	5	2	3		0	0	0	0	0	0	
7/05	7	7	5	7	3		11	20	14	20	8	11	8	3	7	3	5		0	0	0	0	0	0	
7/06	9	9	5	9	4		14	26	17	26	11	13	9	4	8	4	6		0	0	0	0	0	0	
7/07	11	10	8	10	5		17	30	24	30	13	18	12	4	11	4	7		0	0	0	0	0	0	
7/08	14	12	11	12	6		20	35	30	35	16	23	15	6	14	6	8		0	0	0	0	0	0	
7/09	15	14	14	16	8		23	42	37	41	20	28	17	8	18	10	12		0	0	0	0	0	0	
7/10	20	17	18	21	8		27	47	44	46	24	33	19	10	22	14	15		0	0	0	0	0	0	
7/11	24	19	22	26	10		32	52	49	49	29	38	23	11	26	17	17		0	0	0	0	0	0	
7/12	27	21	29	28	12		35	57	55	52	34	42	27	14	31	18	21		0	0	0	0	0	0	
7/13	32	23	32	30	15		38	60	58	57	38	44	31	18	33	21	23		0	0	0	0	0	0	
7/14	34	27	34	33	17		42	65	61	60	41	47	33	22	36	26	24		0	0	0	0	0	0	
7/15	40	31	37	37	20		46	68	64	63	44	49	38	26	39	29	26		0	0	0	0	0	0	
7/16	42	36	42	42	21		48	71	66	67	48	51	42	28	42	32	29		0	0	0	0	0	0	
7/17	48	39	45	47	24	1	54	72	69	69	54	54	47	30	45	36	32	3	0	0	0	0	0	0	0
7/18	55	43	49	49	27	3	58	75	71	71	58	57	53	33	50	38	37	5	0	0	0	0	0	0	0
7/19	59	46	54	52	33	6	60	78	73	74	63	62	58	38	55	42	41	9	0	0	0	0	0	0	0
7/20	64	51	60	57	39	10	63	81	76	78	67	66	61	44	58	47	45	11	0	0	0	0	0	0	0
7/21	66	59	64	62	43	16	65	83	78	80	70	70	64	49	62	52	48	13	0	0	0	0	0	0	0
7/22	72	62	67	67	46	19	70	85	80	82	73	75	68	52	65	55	50	15	0	0	0	0	0	0	0
7/23	75	67	71	71	49	27	74	86	83	84	76	78	73	56	68	59	53	17	0	0	0	0	0	0	0
7/24	79	70	73	74	56	32	77	87	85	86	79	81	77	58	70	63	56	19	0	0	0	0	1	0	0
7/25	80	73	76	77	60	37	80	88	87	87	82	84	79	60	72	66	61	22	0	0	0	0	1	0	1
7/26	83	77	78	79	64	40	82	89	89	89	84	85	80	63	75	69	65	26	0	0	0	0	1	1	1
7/27	84	78	81	82	69	44	83	90	90	90	87	87	82	64	77	73	70	31	0	0	0	0	1	1	1
7/28	86	82	83	84	74	52	86	91	91	91	89	89	85	67	79	75	74	39	0	0	0	0	1	1	2
7/29	88	84	85	87	77	59	87	92	92	92	91	91	86	69	81	78	76	47	0	0	0	0	1	1	3

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	Chinook Salmon						Sockeye Salmon						Chum Salmon						Coho Salmon						
Date	2002	2003	2004	2005[a]	2007	2008	2002	2003	2004	2005[a]	2007	2008	2002	2003	2004	2005[a]	2007	2008	2001	2002	2003	2004	2005[a]	2007	2008
7/30	89	86	87	89	79	64	89	93	93	93	92	92	88	72	83	81	78	56	0	0	0	0	1	2	4
7/31	91	87	89	91	81	69	91	94	94	94	93	93	90	73	85	84	80	64	0	0	0	1	1	2	5
8/01	93	89	91	92	83	74	93	95	94	94	93	94	92	75	87	85	82	70	0	1	1	1	1	2	7
8/02	93	91	93	93	85	77	94	95	95	95	94	95	93	77	89	87	84	78	0	1	1	1	2	2	9
8/03	95	91	95	94	87	81	95	96	96	95	95	96	94	79	90	88	86	81	0	2	1	2	2	3	10
8/04	96	92	95	95	88	85	96	96	96	96	95	96	96	81	91	90	87	84	0	3	1	2	2	3	11
8/05	96	93	96	97	91	86	97	97	97	97	96	97	97	84	92	91	89	86	0	4	2	2	2	4	13
8/06	97	95	96	97	93	90	97	97	97	97	96	97	97	87	93	93	91	88	0	4	2	3	3	5	17
8/07	97	96	97	98	95	92	98	98	97	97	97	97	98	90	94	93	92	90	0	5	3	3	3	6	20
8/08	98	96	98	98	96	94	98	98	98	97	97	98	98	92	95	94	93	92	0	5	4	4	3	7	23
8/09	98	97	98	98	97	95	98	98	98	98	97	98	98	94	96	95	94	94	0	5	5	5	4	7	26
8/10	98	98	98	99	97	96	98	98	98	98	98	98	99	96	96	96	95	95	0	6	6	5	5	8	28
8/11	98	98	98	99	98	97	98	99	98	98	98	99	99	97	97	97	96	96	1	6	6	6	6	9	33
8/12	98	98	99	99	98	98	99	99	98	98	98	99	99	98	98	98	97	97	2	7	8	7	7	10	37
8/13	99	99	99	99	99	99	99	99	99	99	98	99	99	98	98	98	98	98	3	8	9	9	8	13	42
8/14	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	99	98	98	6	9	10	11	10	15	46
8/15	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	99	8	10	12	13	10	16	51
8/16	99	99	99	99	99	99	99	99	99	99	99	100	100	99	99	99	99	99	14	12	13	15	11	16	54
8/17	99	99	99	99	99	99	99	99	99	99	99	100	100	99	99	99	99	99	16	16	14	18	12	17	58
8/18	99	99	99	100	99	100	99	99	99	99	99	100	100	100	99	100	99	100	18	18	14	21	13	19	67
8/19	100	99	99	100	100	100	100	99	99	99	99	100	100	100	99	100	99	100	20	21	15	22	14	21	76
8/20	100	99	100	100	100	100	100	99	99	100	99	100	100	100	99	100	99	100	27	25	18	25	16	23	88
8/21	100	99	100	100	100	100	100	99	99	100	99	100	100	100	100	100	100	100	30	29	19	27	20	26	100
8/22	100	99	100	100	100	100	100	99	99	100	99	100	100	100	100	100	100	100	33	33	22	29	23	29	100
8/23	100	100	100	100	100	100	100	100	99	100	99	100	100	100	100	100	100	100	35	36	23	31	26	32	100
8/24	100	100	100	100	100	100	100	100	99	100	99	100	100	100	100	100	100	100	38	39	28	33	30	37	100
8/25	100	100	100	100	100	100	100	100	99	100	99	100	100	100	100	100	100	100	41	42	32	35	33	42	100
8/26	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	45	43	34	40	36	44	100
8/27	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	48	45	38	42	37	47	100
8/28	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	52	46	42	43	40	51	100
8/29	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	57	48	44	44	47	54	100
8/30	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	62	49	48	45	51	56	100
8/31	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	66	53	53	48	56	58	100
9/01	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	69	57	56	52	59	62	100
9/02	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	71	59	60	56	63	64	100
9/03	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	73	61	63	60	66	67	100

-continued-

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	Chinook Salmon						Sockeye Salmon						Chum Salmon						Coho Salmon					
Date	2002	2003	2004	2005[a]	2007	2008	2002	2003	2004	2005[a]	2007	2008	2002	2003	2004	2005[a]	2007	2008	2001	2002	2003	2004	2005[a]	2007	2008
9/04	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	75	65	68	62	70	69	100
9/05	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	77	68	72	64	73	73	100
9/06	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	78	72	74	66	75	75	100
9/07	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	79	78	77	69	77	77	100
9/08	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	80	81	79	72	80	80	100
9/09	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	81	84	82	76	82	83	100
9/10	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	84	85	84	79	84	86	100
9/11	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	85	87	87	83	87	87	100
9/12	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	87	90	90	86	90	90	100
9/13	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	89	92	93	87	93	93	100
9/14	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90	94	95	89	95	95	100
9/15	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	92	95	96	91	96	96	100
9/16	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	93	97	98	92	98	98	100
9/17	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	94	98	99	94	99	99	100
9/18	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	95	99	100	96	100	100	100

Note: Boxes represent the central 50% of the run and median date of passage. Shaded areas represent the central 80% of the run.

[a] Cumulative percent passage is inclusive of estimated passage for periods when a breach occurred in the weir and when the weir was inoperable.