Fishery Data Series No. 06-50

Goodnews River Salmon Monitoring and Assessment, 2005

Annual Report for Project FIS 04-312
USFWS Office of Subsistence Management
Fisheries Information Services Division

by

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and

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September 2006

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

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 to enumerate 5 species of Pacific salmon and Dolly Varden *Salvelinus malma* migrating into the Middle Fork Goodnews River in 2005. A total of 4,633 Chinook *Oncorhynchus tshawytscha*, 113,809 sockeye *O. nerka*, 26,691 chum salmon *O. keta*, 5,926 pink salmon *O. gorbuscha*, 15,682 coho salmon *O. kisutch*, and 2,128 Dolly Varden *Salvelinus malma* were enumerated as they passed through the weir from 26 June through 12 September. Chinook, sockeye, chum, and coho salmon sustainable escapement goals were achieved or exceeded in 2005. Escapements for Chinook and sockeye were above average, chum salmon escapement was average, and coho salmon escapement was below average. A live trap was used to collect samples from Chinook, sockeye, chum, and coho salmon throughout their respective runs to estimate the age, sex, and length composition of each population. The sockeye salmon run was 45.7% male and 79.0% age-1.3 fish. The chum salmon run was 47.1% male and 83.4% age-0.3 fish. Sex and length estimates were not made for Chinook and coho salmon because insufficient samples were collected. Aerial surveys were not conducted in the Goodnews River drainage in 2005 because no aircraft or pilots were available during the peak spawning period. Chinook and sockeye salmon run abundance was estimated based on the recent 5-year average aerial survey proportions between Middle Fork and North Fork aerial survey estimates.

Key words: Goodnews River, Kuskokwim Area, Kuskokwim Bay, resistance board weir, escapement monitoring, Chinook salmon, *Oncorhynchus tshawytscha*, sockeye salmon, *O. nerka*, chum salmon, *O. keta*, pink salmon, *O. gorbuscha*, coho salmon *O. kisutch.*, Dolly Varden *Salvelinus malma.*

INTRODUCTION

Salmon returning to the Goodnews River support subsistence, commercial, and sport fisheries each summer near the community of Goodnews Bay in Southwest Alaska. The Alaska Department of Fish and Game (ADF&G), in cooperation with the U.S. Fish and Wildlife Service (USFWS), operates a resistance board weir to enumerate by species returning adult salmon on the Middle Fork Goodnews River (Middle Fork) in an effort to ensure future sustainability of this resource.

The Goodnews River watershed drains an area of nearly 1,000 mi^2 (2,589.9 km^2) along the west side of the Togiak National Wildlife Refuge (Figure 1). It flows a distance of 60 river miles (96.6 river kilometers) along its main stem, from the Ahklun Mountains southwest into Goodnews Bay. Two major tributaries, the Middle Fork and South Fork Goodnews Rivers, join the main stem a few miles from its mouth and are included within its drainage. In order to differentiate between them, the Goodnews River refers to all 3 drainages, and the Goodnews River upstream of its confluence with the Middle Fork will be referred to as the North Fork Goodnews River or North Fork.

SALMON FISHERIES

Subsistence and commercial fisheries occur in Goodnews Bay, and sport and subsistence fisheries occur in the Goodnews River drainage (Burkey et al. 1999). The Goodnews River is the primary salmon spawning drainage in the area and provides a vital subsistence fishery resource for residents of the communities of Goodnews Bay and Platinum. Subsistence fishing is allowed throughout the Goodnews River drainage and in Goodnews Bay. Fish are primarily harvested with drift and set gillnets. ADF&G has quantified subsistence salmon harvests in the communities of Goodnews Bay and Platinum since 1977. Harvest estimates are determined from interviews with subsistence fishers in October and November (Ward et al. 2003). Chinook salmon *Oncorhynchus tshawytscha* are the most utilized subsistence salmon species in the Goodnews Bay area followed by coho salmon *O. kisutch*, sockeye salmon *O. nerka*, and chum

salmon *O. keta* (Appendix A1). Over the last 10 years, annual subsistence harvests from the communities of Goodnews Bay and Platinum have averaged 738 Chinook, 613 coho, 493 sockeye, and 250 chum salmon. Dolly Varden *Salvelinus malma* and Arctic Char *Salvelinus alpinus* are also harvested for subsistence use, although harvest estimates have not been well quantified (Wolfe et al. 1984). The 2005 subsistence survey results were unavailable at the time this report was written; however, in 2004, 63 households were contacted for a survey of subsistence use in the villages of Goodnews Bay and Platinum. They reported 954 Chinook, 960 sockeye, 1,617 coho, and 257 chum salmon were used for subsistence purposes. The number of people using salmon for subsistence in Goodnews and Platinum exceeds the 34 permit holders participating in the local commercial fishery (Whitmore et al. 2005).

Commercial salmon fishing occurs in Goodnews Bay within the boundaries of District W-5 (Figure 2). Commercial fishing has occurred annually in District W-5 since it was established in 1968 by ADF&G. This is the southern most district in the Kuskokwim Area which includes districts in Kuskokwim Bay and the Kuskokwim River. Permit holders have unrestricted movement between commercial fishing districts within the Kuskokwim Area and fishers from distant communities often participate in the District W-5 commercial fishery. In 2004, the Alaska Board of Fisheries moved the District W-5 western boundary from a line between the northernmost tip of the north spit and the southernmost tip of the south spit to a line between regulatory markers placed outside Goodnews Bay approximately 2 mi along the edge of the north and south spit.

The commercial fishery is directed toward harvesting sockeye and coho salmon and is conducted from skiffs using hand-pulled gillnets. Chinook and chum salmon are harvested incidentally. Pink salmon *O. gorbuscha* are the least valuable species commercially and have not been targeted in recent years. ADF&G has collected harvest data from fish buyers and processors since the district was created. Average historical commercial salmon harvests in District W-5 are 3,672 Chinook, 23,124 sockeye, 20,380 coho, and 11,341 chum salmon. The average harvests for these species from 1995 through 2004 are 2,282 Chinook, 26,915 sockeye, 15,261 coho, and 9,464 chum salmon (Appendix A1). ADF&G also collects and analyzes age, sex, and length (ASL) data from commercially caught salmon in an effort to determine population characteristics and trends.

Sport fishing occurs throughout the Goodnews River drainage. Pacific salmon, rainbow trout *O. mykiss*, Dolly Varden, Arctic char, and Arctic grayling *Thymallus arcticus* are targeted. Many sport fishers take commercially guided or unguided float trips from lakes in the headwaters to the mouth at Goodnews Bay. There are currently 2 commercially operated lodges with semi-permanent camps on the drainage that offer fishing from powered skiffs. ADF&G has been estimating sport fish harvests consistently since 1991. From 1995 through 2004, average sport fishing harvests included 166 Chinook, 163 sockeye, 25 chum, and 615 coho salmon (Appendix A1). The 2005 sport fish harvest report was not available at time of publication.

PROJECT HISTORY

ADF&G's Division of Commercial Fisheries has operated a salmon escapement monitoring project on the Middle Fork Goodnews River since 1981 (Appendix B1). The project was initiated as a counting tower in 1981 and was operated through 1990 (Burkey 1989, 1990; Schultz 1982, 1984a, b, 1985, 1987; Schultz and Burkey 1989) targeting counts of Chinook, sockeye, and chum salmon. Although successful, the tower was limited by problems with species

apportionment and high labor costs (Menard 1999). In 1991, resources were redirected towards a fixed-picket weir to reduce labor costs and improve species identification. The fixed-picket weir was operated from 1991 through mid season of 1997, approximately 250 yd downstream of the former tower site. Species identification improved with the weir, as the observer was now just a few feet from fish passing upstream. Labor costs were also reduced with the weir. Fish passage could be controlled, eliminating the need for hourly monitoring and increasing the efficiency of live fish capture to collect ASL information. Personnel were reduced from 3 crew members to 2. Flood events were a problem if the weir could not be removed in time. The weir would rapidly collect debris, damming the flow until it failed and washed downstream. This occurred several times during the early 1990s.

In the mid 1990s, ADF&G began cooperating with the USFWS and the Togiak National Wildlife Refuge to build a resistance board weir and extend the project's operational period to include the coho salmon run in August and September. In July 1997, the fixed-picket weir was replaced with the resistance board weir, designed to shed debris loads by sinking under high water conditions. The resistance board weir has allowed the project to remain operational at higher water levels compared to the fixed-picket weir. The resistance board weir design can be rendered inoperable during extreme high water events, but the design can remain operational at higher water levels compared to the fixed picket weir design and can regain operations quicker if rendered inoperable once flood waters subside.

Extended operation of the weir has also allowed biologists to monitor the migration of smaller Dolly Varden, believed to be a prespawning population over wintering in the drainage (Lisac 2003). Dolly Varden contribute to the overall subsistence harvest of the residents of the Goodnews Bay area (Wolfe et al. 1984). However, information about their life history and abundance is limited. Dolly Varden runs in the Middle Fork Goodnews River have ranged from 1,800 to 6,600 fish (Lisac 2003; Estensen 2003).

ESCAPEMENT MONITORING AND ESCAPEMENT GOALS

The Middle Fork Goodnews River weir serves primarily as a management tool for the commercial and subsistence salmon fisheries in District W-5, but also generates data relevant to the Goodnews River drainage as a whole. These data are used to make inseason management decisions, estimate drainage wide escapement, and develop Sustainable Escapement Goals (SEG). The project also serves as a platform for other studies in the drainage, such as collecting samples for genetic stock identification, and tagging Dolly Varden to study run timing and seasonal distribution (Lisac *In Prep*).

Salmon escapement objectives for the Middle Fork counting tower were initially established in 1984 as ranges set at 3,000–4,000 Chinook, 35,000–45,000 sockeye, and 13,000–18,000 chum salmon (Schultz 1984b). An escapement objective was not established for coho salmon as the project typically ceased operation in mid August (the coho salmon run in the Middle Fork extends through September and into October). In 1989, the escapement objective range for sockeye salmon was lowered to 20,000–30,000 fish. An evaluation of the sockeye salmon exploitation rate in previous years indicated that historical harvest levels could be maintained with a reduced escapement objective (Burkey 1990). These ranges remained in place when the tower was replaced with the fixed-picket weir in 1991.

In 1992, SEGs based on weir counts were first established for Chinook, sockeye, and chum salmon (Buklis 1993). The respective SEGs were set as the midpoints of the tower escapement

objective ranges: 3,500 Chinook, 25,000 sockeye, and 15,000 chum salmon. Recent evaluation of Arctic-Yukon-Kuskokwim (AYK) Region escapement goals has resulted in establishment of revised SEGs for the Middle Fork Goodnews River weir (ADF&G 2004). The revised goals, which are described as ranges or thresholds, came into effect in 2004. The current SEGs are 2,000–4,500 Chinook salmon, greater than 12,000 chum salmon, and 23,000–58,000 sockeye salmon. An SEG threshold was also established for coho salmon at greater than 12,000. Through a public process, ADF&G is currently reviewing further revision to Middle Fork Goodnews River weir salmon escapement goals and will be presenting recommendations to the Alaska Board of Fish (BOF) during the upcoming AYK Region BOF meeting in January 2007.

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

Aerial surveys are best directed at indexing spawning populations of sockeye and Chinook salmon because these species are typically more visible than chum and coho salmon. Chum salmon have protracted run timing requiring multiple surveys throughout their runs to ensure accuracy of the index. 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, Goodnews River coho salmon have been difficult to survey because of recurrent poor fall weather conditions. Coho salmon aerial surveys have been conducted when funding and weather conditions allow.

North Fork Goodnews River aerial survey escapement goals were initially established in 1992 and set at 1,600 Chinook, 15,000 sockeye, 17,000 chum, and 15,000 coho salmon (Buklis 1993). Middle Fork Goodnews River aerial survey escapement goals were also initially established in 1992 at 800 Chinook, 5,000 sockeye, 4,000 chum, and 2,000 coho salmon. Recent evaluation of AYK Region escapement goals has resulted in establishment of revised SEGs for Goodnews River aerial surveys (ADF&G 2004). The revised SEGs represent ranges or thresholds and were set at 640–3,300 Chinook salmon and 5,500–19,500 sockeye salmon on the North Fork Goodnews River only. The North Fork chum and coho salmon aerial survey escapement goals set in 1992 were discontinued because of poor data quality. The aerial survey escapement goals set for the Middle Fork Goodnews River in 1992 were discontinued in deference to the revised SEGs set for the Middle Fork Goodnews River weir.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Salmon ASL information has been collected from the weir project since 1984 and from District W-5 commercial harvest since 1985. Annual ASL composition estimates of escapement are used to develop stock-recruitment models, in turn providing information used for projecting future run

sizes. Historical summaries of existing ASL information for salmon returning to the Goodnews River drainage can be found in DuBois and Molyneaux (2000) and Folletti (*Unpublished*).

SITE DESCRIPTION

The Middle Fork parallels the North Fork and flows a distance of approximately 45 river miles (72.4 river kilometers) before joining the main stem. The weir project is located approximately 10 river miles (16.1 river kilometers) from the village of Goodnews Bay on the Middle Fork latitude N 59 09.595 W 161 23.287 (Figure 1). The weir is located at the downstream end of an approximately 150 yd (137.2 m) long stretch of straight channel. The channel at the weir location is 200 ft (61.0 m) wide, has a regular profile from 1 to 4 ft deep which tapers to low cut banks on either side and flows 2 to 4 ft per second during average water conditions. The river substrate is primarily cobblestone, gravel, and sand. The upstream half of the channel is characterized by deep water along a steep cut bank approximately 20 ft (6.1 m) in height on the left bank (as looking downstream) tapering to a gravel bar on the right bank. The project camp site is located on the left bank approximately 50 yd (45.7 m) upstream and 30 yd (27.4 m) inland from the weir location. Weir materials are stored over the winter on the left and right banks, approximately 30 yd (27.4 m) inland and parallel to the weir location.

OBJECTIVES

The annual objectives for the Middle Fork Goodnews River weir project are to:

1. Estimate Chinook, sockeye, chum, and coho salmon escapement in Middle Fork Goodnews River.
2. Estimate run timing of Chinook, sockeye, chum, and coho salmon and Dolly Varden to the Middle Fork Goodnews River.
3. Estimate escapement of Chinook, sockeye, chum, and coho salmon to Goodnews River drainage.
4. Estimate Chinook, sockeye, chum, and coho salmon ASL composition of Middle Fork Goodnews River escapement.
5. Estimate Chinook, sockeye, chum, and coho salmon ASL composition in the District W-5 commercial fishery.
6. Estimate Dolly Varden passage at the Middle Fork Goodnews River weir.
7. Serve as a platform to collect genetic samples of salmon stocks at the Middle Fork Goodnews weir.
8. Serve as a platform for tagging Dolly Varden at the Middle Fork Goodnews weir.
9. Record atmospheric and hydrologic conditions at the weir site.
10. Record carcasses washed up on the weir and passed downstream.

METHODS

RESISTANCE BOARD WEIR

Methods for the design, construction, and installation of the resistance board weir follow those described in Stewart (2002, 2003), and Tobin (1994). The approximately 200 ft (60.9 m) weir used at the Middle Fork Goodnews River site is comprised of 2 principle components: the substrate rail and the resistance board panel sections. 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 interval of the Middle Fork Goodnews River weir is 2.6 in,

which leaves a gap of 1.3 in between pickets. The picket spacing allows smaller fish such as pink salmon and other non salmon species to pass upstream and downstream through the weir between pickets. Further details of the resistance board weir components used for the Goodnews River weir are described in Stewart (2004).

Two fish passage chutes were installed on the weir, one approximately 50 ft (15.2 m) from the left bank (as looking downstream), the other approximately 15 ft (4.57 m) from the left bank. A 10 ft (3 m) by 15 ft (4.6 m) live trap used to collect fish for ASL sampling was installed directly upstream of the passage chute located closest to the left bank. Gates were attached on both chutes to control fish passage.

Boats passed at a designated boat gate located in the center of the weir and boat operators were able to pass with little or no involvement by the weir crew. The boat gate consisted of boat passage panels described in Estensen and Diesigner (2004). Weight of a passing boat temporarily submerged the boat passage panels, allowing boats to pass over the weir. Boats with jet-drive engines were common and could pass upstream and downstream over the boat gate at reduced speed. Rafts could pass downstream by submerging the boat passage panels and drifting over the weir. Boats with propeller-drive engines were uncommon and were towed across the weir by crew members when passing upstream.

AERIAL SURVEYS

Aerial surveys are flown 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 a scale of 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 and good (1 and 2) that are conducted within the peak spawning period are included as part of the Goodnews River aerial survey data base.

Chinook and coho salmon aerial surveys are focused on the main river channel and larger tributaries while sockeye salmon aerial surveys are focused on the main river channel, larger tributaries and lakes, and larger lake tributaries. Aerial survey counts are tallied to derive a total count of observable fish in the North Fork and Middle Fork of the Goodnews River. These counts are used along with Middle Fork Goodnews River weir escapement estimates to derive drainage escapement estimates for the Goodnews River.

ESCAPEMENT MONITORING AND ESTIMATES

To determine salmon escapement past the weir, fish passage counts were made daily during the operational period of the project, from 26 June to 8 September 2005. Passage counts occurred regularly throughout the day, typically for 1–2 h periods, beginning in the morning and continuing as late as the light permitted. During counting periods, the passage chute gate was opened to pass fish through the weir. Crew members identified and enumerated all fish by species as they exited the passage chute. Any fish observed traveling downstream through the fish passage chutes were subtracted from the count tally. Spawned out salmon and carcasses of dead salmon (both hereafter referred to as carcasses) that washed up on the weir were counted by species and passed downstream.

For various reasons, fish sometimes migrated downstream and required an avenue for safe passage over the weir. This behavior was especially common among non salmon species such as

rainbow trout, Dolly Varden, and whitefish species *Coregonus spp.* The resistance board weir provided a means of accommodating downstream fish passage through incorporation of downstream passage chutes. Each chute consisted of a single panel set to allow some water to flow 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 set during periods of active downstream fish migration. Downstream passage chutes were not used during periods of strong upstream salmon passage. Downstream fish passage over these chutes was not enumerated.

Salmon escapements were estimated for periods when a breach occurred in the weir. Estimates were assumed to be zero if passage was considered negligible based on historical data and run timing indicators. Breach event estimates were calculated as the average observed passage 2 days before and after the day a breach occurred multiplied by the hourly proportion of the breach duration in a 24 h day using the following formulas:

$$\hat{n}_d = n_d \cdot \frac{t_b}{T_d} \tag{1}$$

and

$$n_d = \left(\frac{\left(\bar{n}_{d-1 \to d-2}\right) + \left(\bar{n}_{d+1 \to d+2}\right)}{2} \right) \tag{2}$$

where:

$\hat{n}_d$ = passage estimate for the day a weir breach occurred,

n_d = average passage from the 2 days before and after the day a weir breach occurred,

t_b = time period (in hours) the weir was breached,

T_d = number of hours in a day (24),

$\bar{n}_{d-1 \to d-2}$ = average passage from 2 days before the day a weir breach occurred, and

$\bar{n}_{d+1 \to d+2}$ = average passage from 2 days after the day a weir breach occurred.

Daily estimated salmon passage then became the sum of any observed passage from the day the weir breach occurred and is estimated from the above equation.

Weir escapement was also estimated for periods when the weir was not operational but within its targeted operational dates. Estimates were calculated based on the proportional relationship between observed weir counts at the Middle Fork Goodnews River weir and weir counts from a model data set. The model data set could be from a different year at Goodnews River or from the same year at a neighboring weir project. The model data set was selected based on the strongest (Pearson) correlation between observed passage during the operational period at Middle Fork Goodnews 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:

$$\breve{n}_d = \frac{\left(n_{d\,c} \times \left(\sum_{d_z}^{d_a} y_e\right)\right)}{\left(\left(\sum_{d_z}^{d_a} y_c\right) - n_{d_e}\right)} \tag{3}$$

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 from the model data set,

$\sum_{d_z}^{d_a} y_e$ = 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 from the model data set, and

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

Drainage escapement was estimated by summing the weir escapement count with the estimated escapement of fish in the North Fork. North Fork escapement was calculated by applying the recent 5-year average proportion of fish observed during Middle Fork and North Fork aerial surveys to the weir escapement. Drainage escapement estimates account for the number of fish counted past the weir after aerial surveys were conducted and were calculated using the following formula:

$$N_d = \left(\left[\frac{n_{a_{nf}}}{n_{a_{mf}}}\right] n_{w_2}\right) + n_{w_2} \tag{4}$$

where:

N_d = total drainage escapement estimate,

$n_{a_{nf}}$ = aerial survey count from the North Fork Goodnews River,

$n_{a_{mf}}$ = aerial survey count from the Middle Fork Goodnews River, and

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

AGE, SEX, AND LENGTH ESCAPEMENT SAMPLING

Escapement sampling for Chinook, sockeye, and chum salmon ASL composition estimates was conducted based on the pulse sampling design of DuBois and Molyneaux (2000). Each pulse consisted of intensive sampling for 1 to 3 day intervals followed by a few days without sampling. The goal for each pulse was 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.

Salmon were sampled from a fish trap installed in the weir. The general practice was to open the entrance gate and leave the exit gate closed allowing 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.

Scales were removed from the preferred area of the fish (INPFC 1963). A minimum of 3 scales were taken from each fish and mounted on numbered and labeled gum cards. Sex was determined by visually examining external morphology, keying on the development of the kype, roundness of the belly, and the presence or absence of an ovipositor. Length was measured to the nearest millimeter from mideye to tail fork. After each fish was sampled, it was released into a recovery area upstream of the weir. After sampling was completed, relevant information such as sex, length, date, and location was copied from hardcopy 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. Further details of sampling procedures can be found in DuBois and Molyneaux (2000) and Stewart (2004).

AGE, SEX, AND LENGTH COMMERCIAL HARVEST SAMPLING

Commercial catch sampling for Chinook, sockeye, chum, and coho salmon ASL composition estimates was conducted based on the pulse sampling design of DuBois and Molyneaux (2000). Each pulse sample was taken from a single commercial period, which was determined based on the number of commercial periods that occurred in a given week. The primary goal was to characterize the ASL composition of the entire commercial harvest for each species. Pulse samples were collected from a minimum of 3 commercial openings per species, each representing a third of the total harvest per species. The goal for each pulse was to collect samples from 210 Chinook, 210 sockeye, 200 chum, and 170 coho salmon.

Salmon were sampled from the Quinhagak dock area where a tender from District W-5 unloaded the catch to the on-site processor. ADF&G partnered with Coastal Villages Region Fund (CVRF) staff in 2005 to hire and train student interns in District W-4 and W-5 commercial ASL and genetics sample collection. This partnership was pursued in an effort to mitigate recurring logistical difficulties in achieving adequate commercial ASL samples. An area was set aside for the sampling crew and processor workers supplied the crew with totes of iced fish for sampling. Fish were sampled as efficiently and carefully as possible to reduce processing delays and prevent bruising. Sampled fish were returned to iced totes in an ongoing effort to preserve quality.

Scales were removed from the preferred area of the fish (INPFC 1963). A minimum of 3 scales were taken from each fish and mounted on numbered and labeled gum cards. All sampled fish were sex determined by visual inspection of internal gonads. Length was measured to the nearest millimeter from mideye to tail fork. The completed gum cards and data forms were returned to the Bethel ADF&G offices for data transfer to computer mark-sense forms and sample processing. Further details of sampling procedures can be found in DuBois and Molyneaux (2000).

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

ADF&G staff in Bethel and Anchorage aged scales, processed the ASL data, and generated data summaries (DuBois and Molyneaux 2000). These procedures generated 2 types of summary tables for each species; one described the age and sex composition and the other described length statistics. 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 and 2005 reduced the ability to estimate changes in ASL composition through the season in favor of estimating ASL composition for the entire run or harvest.

Ages were reported in 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 by the juvenile fish 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. For example, a Chinook salmon described as an age 1.4 fish under European notation has a total age of 6 years.

The original ASL gum cards, acetates, and mark-sense forms were 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 hydrological conditions were recorded around noon each day. Cloud cover was judged from clear to overcast; wind speed was recorded in miles per hour (mph) and direction was noted; precipitation was measured in mm per 24 h. Daily high and low air and water temperature were recorded in degrees Celsius. The river gauge height was recorded daily and was pegged to a benchmark established in 1997 representing a river stage of 150 cm. The benchmark is a 0.75 in diameter steel length of rebar driven into the bank along a steep grade downstream of the field camp. The river gauge is a steel rule installed near shore in the river and is set level with the top of the benchmark at 150 cm.

RESULTS

SALMON FISHERIES

Subsistence, commercial, and sport fishing activities occurred in District W-5, Goodnews Bay, or Goodnews River in 2005. At the time of publication, 2005 subsistence harvest estimates for the communities of Goodnews Bay and Platinum were not final though discussions with participants inseason indicated subsistence needs were met and catches were average. A total of 29 permit holders fished commercially in District W-5 for total harvests of 2,035 Chinook, 23,933 sockeye, 2,568 chum, and 11,735 coho salmon (Table 1). No pink salmon were

commercially harvested in 2005. Exvessel value by species was $16,696 for Chinook, $91,135 for sockeye, $1,454 for chum, and $25,010 for coho salmon for a total exvessel value of $134,295. Sport fish harvest estimates for Goodnews River in 2005 were not available for this report.

PROJECT OPERATIONS

The weir was operational from 26 June to 12 September 2005. A breach in the weir caused by dislodged weir and trap panels occurred for 8.5 hrs on 5 July. A high water event beginning on 8 September rendered the weir inoperable periodically through 12 September. High water continued to render the weir inoperable through 18 September and the decision was made to discontinue operations for the reminder of the season. The weir crew began weir disassembly and camp closure once water levels receded to a workable level on 18 September. For the purposes of this report, the target operational period is defined as 26 June through 20 September.

WEIR ESCAPEMENT

The 2005 Middle Fork Goodnews River Chinook salmon escapement was estimated to be 4,633 fish during the target operational period (Table 2). A total of 4,534 Chinook salmon were observed passing upstream through the weir and 99 fish (2.1%) were estimated to have passed upstream during breach events and inoperable periods. Chinook salmon escapement exceeded the upper end of the SEG range of 2,000–4,500 fish (Table 3). The first Chinook salmon was observed on 26 June, the first day of operation, and the last Chinook salmon was observed on 6 September. Based on the target operational period and inclusive of estimated passage, the median passage date was 7 July and the central 50% of the run occurred between 2 July and 15 July (Table 4).

The 2005 Middle Fork Goodnews River sockeye salmon escapement was estimated to be 113,809 fish during the target operational period (Table 2). A total of 111,422 sockeye salmon were observed passing upstream through the weir and 2,387 fish (2.1%) were estimated to have passed upstream during breach events and inoperable periods. Sockeye salmon escapement exceeded the upper end of the SEG range of 23,000–58,000 fish (Table 3). The first sockeye salmon was observed on 26 June, the first day of operation, and the last sockeye salmon was observed on 7 September. Based on the target operational period and inclusive of estimated passage, the median passage date was 4 July and the central 50% of the run occurred between 1 July and 11 July (Table 4).

The 2005 Middle Fork Goodnews River chum salmon escapement was estimated to be 26,690 fish during the target operational period (Table 2). A total of 26,408 chum salmon were observed passing upstream through the weir and 282 fish (1.1%) were estimated to have passed upstream during breach events and inoperable periods. Chum salmon escapement exceeded the SEG threshold of 12,000 fish (Table 3). The first chum salmon was observed on 26 June, the first day of operation, and the last chum salmon was observed on 7 September. Based on the target operational period and inclusive of estimated passage, the median passage date was 14 July and the central 50% of the run occurred between 8 July and 24 July (Table 4).

The 2005 Middle Fork Goodnews River coho salmon escapement was estimated to be 15,683 fish (Table 2). A total of 13,938 Coho salmon were observed passing upstream through the weir and 1,745 fish (11.1%) were estimated to have passed upstream during breach events and inoperable periods. Coho salmon escapement exceeded the SEG threshold of 12,000 fish

(Table 3). The first coho salmon was observed on 11 July and the last coho salmon was observed on 8 September the last day of operation. Based on the target operational period and inclusive of estimated passage, the median passage date was 2 September and the central 50% of the run occurred between 29 August and 6 September (Table 4).

The 2005 Middle Fork Goodnews River total pink salmon count was 5,926 fish (Table 5). No escapement estimate was made for pink salmon in 2005 because spacing between the weir panel pickets allows all but the largest pink salmon to pass through the weir unobserved and they are not a species targeted for escapement estimation. The first pink salmon was observed on 27 June and the last pink salmon was observed on 7 September.

The 2005 Middle Fork Goodnews River total count of Dolly Varden was 2,128 fish (Table 5). No escapement estimate was made for Dolly Varden because spacing between the weir panel pickets allows smaller Dolly Varden to pass through the weir unobserved. Dolly Varden were observed throughout project operations. The median passage date was 14 July and the central 50% of the run occurred between 10 July and 22 July (Table 4).

Whitefish and rainbow trout were also observed passing the weir in 2005 but were not enumerated. No passage estimates were made for whitefish and rainbow trout in 2005 because spacing between the weir panel pickets allows smaller fish of these species to freely pass through the weir unobserved.

CARCASS COUNTS

Fish carcasses were cleaned off the weir each day during weir operations (Table 6). A total of 151 Chinook, 470 sockeye, 4,234 chum, 1,184 pink, and 35 coho salmon carcasses were counted during project operations. Additionally, 25 Dolly Varden carcasses were counted.

AERIAL SURVEYS

Aerial surveys of the Goodnews River drainage were not conducted in 2005 because no aircraft or pilots were available during peak spawning periods.

DRAINAGE ESCAPEMENT

Goodnews River drainage escapement was estimated for Chinook and sockeye salmon in 2005. North Fork escapement was estimated based on the recent 5-year average proportion between North Fork and Middle Fork aerial survey counts (1.38 for Chinook, 0.80 for Sockeye). North Fork Chinook salmon escapement was estimated to be 6,399 fish and North Fork sockeye salmon escapement was estimated to be 90,835 fish (Table 3). Escapement to the Goodnews River drainage was estimated to be 11,032 for Chinook salmon and 204,644 for sockeye salmon. The resulting exploitation rate was 22% for Chinook salmon and 12% for sockeye salmon (Table 3).

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Middle Fork Goodnews River Escapement

Scale samples, sex, and length were collected from 181 Chinook salmon at the weir in 2005 (Table 7). Samples were collected from 3 pulses ranging in size from 21 to 116 fish per pulse. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of weir escapement. Age was determined for 155 of the 181 fish sampled (85.6 %). Escapement was partitioned into 3 temporal strata based on sample dates.

Mean male length of the samples by age class was 353 mm for age-1.1 fish, 572 mm for age-1.2 fish, 714 mm for age-1.3 fish, and 859 mm for age-1.4 fish (Table 8). Mean female length of the samples by age class was 493 mm for age-1.2 fish, 763 mm for age-1.3 fish, and 823 mm for age-1.4 fish. There were no age-1.5 male or female fish in the sample. Overall, male sample lengths ranged from 350 to 985 mm and female sample lengths ranged from 430 to 945 mm.

Scale samples, sex, and length were collected from 1,261 sockeye salmon at the weir in 2005 (Table 9). Samples were collected from 6 pulses ranging in size from 210 to 211 fish per pulse. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of weir escapement. Age was determined for 955 of the 1,261 fish sampled (75.7%). Escapement was partitioned into 6 temporal strata based on sample dates. Applied to escapement, age-1.3 sockeye salmon were the most abundant age class (79.0%), followed by age-1.2 (13.5%), age-2.3 (3.6%), age-2.2 (2.7%), age-1.4 (1.1%), and age-0.3 (0.1%) fish. Sex composition of escapement was estimated to include 51,979 males (45.7%) and 61,830 females (54.3%). Mean male length by age class was 597 mm for age-0.3 fish, 534 mm for age-1.2 fish, 574 mm for age-1.3 fish, 532 mm for age-2.2 fish, 605mm for age-1.4 fish, and 592 mm for age-2.3 fish (Table 10). Mean female length by age class was 538 mm for age-0.3 fish, 487 mm for age-1.2 fish, 538 mm for age-1.3 fish, 484 mm for age-2.2 fish, 547 mm for age-1.4 fish, and 514 mm for age-2.3 fish. Overall, male lengths ranged from 470 to 750 mm and female lengths ranged from 405 to 595 mm.

Scale samples, sex, and length were collected from 1,058 chum salmon at the weir in 2005 (Table 11). Samples were collected from 5 pulses ranging in size from 200 to 258 fish per pulse. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of weir escapement. Age was determined for 907 of the 1,058 fish sampled (85.7 %). Escapement was partitioned into 5 temporal strata based on sample dates. Applied to escapement, age-0.3 chum salmon was the most abundant age class (83.4%), followed by age-0.4 (15%), age-0.2 (1.5%) and age-0.5 (0.1%) fish. Sex composition of escapement was estimated to include 12,579 males (47.1%) and 14,111 females (52.9%). Mean male length by age class was 531 mm for age-0.2 fish, 589 mm for age-0.3 fish, and 614 mm for age-0.4 fish (Table 12). The 1 male age-0.5 fish in the sample had a length of 635 mm. Mean female length by age class was 525 mm for age-0.2 fish, 551 mm for age-0.3 fish, and 574 mm for age-0.4 fish. No female age-0.5 fish were in the sample. Overall, male lengths ranged from 480 to 700 mm and female lengths ranged from 425 to 690 mm.

Scale samples, sex, and length were collected from 448 coho salmon at the weir in 2005 (Table 13). Samples were collected from 3 pulses ranging in size from 71 to 197 fish per pulse. The samples did not achieve minimum sample objectives and were not adequate for estimating ASL composition of weir escapement. Age was determined for 328 of the 448 fish sampled (73.2 %). Mean male length of the samples by age class was 577 mm for age-1.1 fish, 590 mm for age-2.1 fish, and 602 mm for age-3.1 fish (Table 14). Mean female length of the samples by age class was 576 mm for age-1.1 fish, 585 mm for age-2.1 fish, and 597 mm for age-3.1 fish. Overall, male sample lengths ranged from 430 to 670 mm and female sample lengths ranged from 460 to 645 mm.

District W-5 Commercial Harvest

Scale samples, sex, and length were collected from 226 Chinook salmon harvested in the 2005 District W-5 commercial fishery (Table 15). Samples were collected from 2 pulses ranging in size from 110 to 116 fish per pulse. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of District W-5 commercial harvest. Age was determined for 208 of the 226 fish sampled (92.0 %). Mean male length of the samples by age class was 563 mm for age-1.2 fish, 706 mm for age-1.3 fish, and 803 mm for age-1.4 fish (Table 16). There was on age-1.1 male fish in the sample with a length of 400 mm and there were no age-1.5 male fish in the sample. Mean female length of the samples by age class was 768 mm for age-1.3 fish and 820 mm for age-1.4 fish. There were no age-1.1, -1.2, or -1.5 female fish in the sample. Overall, male sample lengths ranged from 486 to 1,013 mm and female sample lengths ranged from 695 to 1,200 mm.

Scale samples, sex, and length were collected from 251 sockeye salmon harvested in the 2005 District W-5 commercial fishery (Table 17). Samples were collected from 2 pulses ranging in size from 124 to 127 fish per pulse. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of District W-5 commercial harvest. Age was determined for 191 of the 251 fish sampled (76.1 %). Mean male length of the samples by age class was 523 mm for age-1.2 fish, 571 mm for age-1.3 fish, 547 mm for age-2.2 fish, 567 mm for age-1.4 fish, and 602 mm for age-2.3 fish (Table 18). There was 1 age-0.3 male fish in the sample with a length of 556 mm. Mean female length of the samples by age class was 506 mm for age-1.2 fish, 546 mm for age-1.3 fish, 524 mm for age-2.2 fish, and 568 mm for age-2.3 fish. There were no age-0.3 or -1.4 female fish in the sample. Overall, male sample lengths ranged from 432 to 638 mm and female sample lengths ranged from 465 to 599 mm.

Scale samples, sex, and length were collected from 244 chum salmon harvested in the 2005 District W-5 commercial fishery (Table 19). Samples were collected from 2 pulses ranging in size from 96 to 148 fish per pulse. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of District W-5 commercial harvest. Age was determined for 105 of the 244 fish sampled (43.0 %). Commercial harvest was partitioned into 2 temporal strata based on sample dates. Mean male length of the samples by age class was 563 mm for age-0.3 fish and 581 mm for age-0.4 fish (Table 20). There was 1 male age-0.2 fish in the sample with a length of 526 mm. There were no age-0.5 male fish in the sample. Mean female length of the samples by age class was 556 mm for age-0.3 fish and 544 mm for age-0.4 fish. There were no female age-0.2 or -0.5 fish in the sample. Overall, male sample lengths ranged from 500 to 640 mm and female sample lengths ranged from 498 to 595 mm.

Scale samples, sex, and length were collected from 87 coho salmon harvested in the 2005 District W-5 commercial fishery (Table 21). Samples were collected from 1 pulse of 87 fish. The samples did not achieve the minimum sample objectives and were not adequate for estimating ASL composition of District W-5 commercial harvest. Age was determined for 69 of the 87 fish sampled (79.3 %). Mean male length of the samples by age class was 570 mm for age-1.1 fish, 576 mm for age-2.1 fish, and 586 mm for age-3.1 fish (Table 22). Mean female length of the samples by age class was 582 mm for age-1.1 fish and 592 mm for age-2.1 fish. There was 1 female age-3.1 fish in the sample with a length of 561 mm. Overall, male sample lengths ranged from 470 to 654 mm and female sample lengths ranged from 522 to 643 mm.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrological observations were recorded daily from 22 June through 22 September (Table 23). Air temperatures ranged from 4 to 24˚ C. Water temperature was more consistent ranging from 8 to 17˚ C. Several rain events resulted in daily accumulations from trace amounts up to 70 mm in a 24 h period. Water level ranged from 18 to 115 cm.

DISCUSSION

PROJECT OPERATIONS

Operation of the weir in 2005 was successful with a nearly complete enumeration of Chinook, sockeye, chum, and coho salmon escapement, and Dolly Varden migration past the weir. The majority of project objectives were achieved with the exception of Chinook and coho salmon escapement ASL estimates and commercial ASL estimates for all salmon species. The project continues to add to the long-term escapement, run timing, and ASL database for salmon runs at the Goodnews River and serves as a platform for the study of other anadromous and resident freshwater species.

In 2005, the Kuskokwim Area experienced a second consecutive year of below average water levels, and the Goodnews River drainage was no exception to this trend. Below average water levels through July and the first half of August contributed towards uninterrupted weir operations in 2005 and did not appear to hamper fish passage through the weir. However, from mid August thought the end of September the Goodnews River drainage experienced persistent rain events which raised water levels and caused inoperable periods in early September and the premature termination of project operations on September 12.

Achieving the Chinook salmon ASL sample objectives continues to be problematic. Low abundance, migration patterns, and behavior at the weir have made sample collection difficult over the years. Even with the higher relative abundance seen in 2005, the Chinook salmon sample objectives were not achieved. Chinook salmon tend to migrate through the weir in large pulses so that passage will be slow for a period of days then suddenly peak. Coordinating ASL sampling to coincide with these pulses is difficult because timing of the pulses cannot be accurately predicted. An active sampling strategy of capturing Chinook salmon individually or in small groups as other species are allowed to pass freely through the trap has improved sample sizes. This strategy works well but is time intensive and Chinook salmon are often hesitant to approach the weir during increased activity around the trap. In an effort to achieve Chinook salmon sample objectives, active sampling will continue to be conducted at the weir and an additional live trap should be employed to allow for increased sampling opportunity.

Achieving the District W-5 commercial ASL sample objectives has continued to prove problematic. Although the partnership between ADF&G and CVRF to collect commercial ASL samples in Quinhagak met with overall success, achieving sample goals for District W-5 commercial harvest remained difficult. The commercial catch is tendered from Goodnews Bay to Quinhagak and does not arrive until the day following each commercial opening. The tender's arrival at the Quinhagak dock is dependent upon tidal cycles at the mouth of the Kanektok River. Although the CVRF sampling crew was based in Quinhagak, coordinating sample crew availability with tender arrival in Quinhagak remained difficult. Delays between sampling crew implementation and tender arrivals coupled with the relatively small District W-5 commercial

harvest typically resulted in the catch being processed before sampling could occur. ADF&G plans to work closer with CVRF staff and the Quinhagak processing plant manager in the future to better coordinate District W-5 commercial ASL sample collection.

ESCAPEMENT MONITORING AND ESTIMATES

Chinook Salmon

The 2005 Chinook salmon weir escapement of 4,633 fish was the fourth highest escapement since 1981 (Figure 3; Appendix B1). Chinook salmon escapement was 2.87% above the upper end of the SEG range and was 21.8% higher than the recent 10-year average from 1995 through 2004. The general trend of Chinook salmon escapement in the Middle Fork Goodnews River since 1981 indicate fluctuations of abundance and a recent higher relative abundance since 1992; however, it should be noted that the later trend may be affected by the 1991 change in methodology from counting tower to weir-based escapement estimates.

Sockeye Salmon

The 2005 sockeye salmon weir escapement of 113,809 fish was the highest escapement since Middle Fork Goodnews River escapement assessment projects were initiated in 1981 (Figure 3; Appendix B1). Sockeye salmon escapement in 2005 was 48.7% higher than the next highest escapement of 58,290 in 1996, and was 64.3% higher than the recent 10-year average of sockeye salmon escapement from 1995 through 2004. Sockeye salmon escapement in 2005 exceeded the upper end of the SEG range by 49%. The general trend of Middle Fork Goodnews River sockeye salmon escapement since 1981 indicates fluctuations of abundance and a higher relative abundance over the last 3 years. Similar to Chinook salmon, these trends may be affected by the 1991 change in methodology from counting tower to weir based escapement estimates; however, the sockeye salmon escapement in 2005 was unprecedented and indicates a high level of production compared to prior year escapements.

Chum Salmon

The 2005 chum salmon weir escapement of 26,690 fish was the eighth highest escapement since 1981 (Figure 3; Appendix B1). Chum salmon escapement was 45% above the SEG threshold of 12,000 fish and was inline with recent 10-year average of 26,403 fish from 1995 through 2004. The general trend of chum salmon escapement into the Middle Fork Goodnews River since 1981 suggest fluctuations in abundance and a higher relative abundance since 1992; however, it should be noted, again, that the 1991 change in methodology from counting tower to weir-based escapement estimates may have caused inaccuracies in chum salmon escapement estimates prior to 1991.

Coho Salmon

The 2005 coho salmon weir escapement of 15,683 fish was below the average escapement since the project was extended to count coho salmon in 1997 (Figure 3; Appendix B1). Weir escapement in 2005 was 34.5% lower than the historical average from 1997 through 2004. Coho salmon aerial surveys were not conducted in 2005 because of poor weather and water conditions in late September. The weir discontinued operations on September 12 because of high water. Historically, this time period has coincided with a high abundance of coho salmon counted through the weir; however, the historical median passage has achieved the 90% point by this date (Table 4; Figure 4). Alternatively, coho salmon migration timing has been shown to coincide

with rising water levels (Linderman et al. 2003a). During their inriver spawning migration, coho salmon typically move in pulses that are triggered by even small increases in water level. Water levels were very low throughout much of August in 2005, which may have reduced the frequency of pulses in migration that coho salmon typically exhibit resulting in delayed overall run timing. Coho salmon run timing in 2005 was delayed by approximately 2 days compared to the historical median. Additionally, the fish were moving through the weir in large pulses lasting from 1 to 2 days and would then taper off. Given this trend and the relationship between coho salmon migration and water level, another pulse may have coincided with the weir becoming inoperable for the remainder of the season. The weir escapement estimate reported here should be viewed as an index of coho salmon escapement in 2005. Actual escapement past the weir may have been higher.

Dolly Varden

Complete Dolly Varden counts at the Middle Fork Goodnews River weir date back to 1997 (Appendix B1). The 2005 Dolly Varden count of 2,128 fish was slightly below the average of 2,964 from 1997 to 2004. Dolly Varden passage in 2005 exhibited a bell shaped curve versus the bimodal separation between passage in July and August in 2004 (Figure 5). Passage in 2000 and 2001 also indicated a bimodal separation between July and August while passage in 1997, 1998, 1999, 2002, and 2003 did not. Additional details and analysis of Goodnews River Dolly Varden populations can be found in Lisac (2003) and Lisac (*In prep*).

The Dolly Varden counts generated by the weir project represent an unknown proportion of the overall Dolly Varden migration within the Middle Fork Goodnews River. The current spacing between weir panel pickets was chosen for optimal weir operations during high water events and for generating escapement counts of Chinook, sockeye, chum, and coho salmon. Findings from Lisac (2003) suggest that the weir count is size selective for larger Dolly Varden and it is believed younger and smaller fish pass through the weir unobserved. The Dolly Varden counts generated at the weir should continue to be considered an index of Dolly Varden populations in the Middle Fork Goodnews River.

RUN TIMING ESTIMATES

Chinook salmon run timing in 2005 was earlier than the historical median by approximately 3 to 4 days (Table 4; Figure 4). Sockeye salmon run timing in 2005 was earlier by 4 to 5 days compared to the historical median. Chum salmon run timing was also early by approximately 2 to 3 days compared to the historical median. Coho salmon run timing in 2005 was later compared to the historical median by approximately 1 to 2 days. The inter-annual run timing pattern between these species has varied. For example, in 2004 Chinook and sockeye were slightly early compared to the historical median, chum salmon started out early and became late, and coho salmon were late overall. Dolly Varden Run timing in 2005 was a week early overall compared to the historical median (Figures 4 and 5).

CARCASS COUNTS

The use of carcass counts for estimating stream life of Chinook and chum salmon has been abandoned because this analysis is believed unreliable (Linderman et al. 2003a, b). Stream life estimates from carcass counts are unreliable because of the small percentage of carcasses recovered relative to total escapement, annual variability of carcass to escapement percentages, and potential biases in sex ratios between carcasses and escapement. The small percentage of

carcasses at the weir has positive ramifications for aerial stream surveys because most observable spawning salmon and their carcasses remain in the river when surveys are typically flown. Another benefit is protracted retention of carcasses on the spawning grounds enhances absorption of marine derived nutrients within Goodnews River (Cederholm et al. 1999; 2000).

RUN ABUNDANCE

Salmon spawn primarily in the North Fork and Middle Fork Rivers of the Goodnews River drainage and their associated lakes. It is thought that less than 10% of salmon returning to the Goodnews River spawn in the South Fork and no estimate is made for this portion of the drainage. Chinook and sockeye salmon escapements were estimated for the North Fork in 2005; however, because aerial surveys were not flown for Chinook and sockeye salmon in 2005, the recent 5-year average proportion between North Fork and Middle Fork aerial surveys was used to estimate North Fork escapement (Table 3). The combined escapement estimates from the North Fork and Middle Fork weir are used to characterize Goodnews River drainage escapement (Table 3; Figure 6). Harvest and escapement estimates are combined to estimate total run abundance and exploitation for the Goodnews River drainage (Table 3; Appendix D1). Data are not available to estimate the productivity of salmon stocks in the Goodnews River drainage and place 2005 estimates of exploitation in perspective. ADF&G staff generally use 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 9 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 Goodnews River Chinook and sockeye salmon has historically been below the level providing MSY and given the strong runs of salmon and the low commercial catch, it is believed that exploitation in 2005 was below the level providing MSY.

It is difficult to assess the quality or any directional bias of the estimates of total abundance and exploitation. Three main issues affect these estimates: 1) lack of 2005 estimates of subsistence and sport fish harvests, 2) lack of escapement monitoring in the South Fork of the Goodnews River drainage, and 3) the comparability of aerial surveys between the middle and north forks. Use of 10-year average sport and subsistence harvests should not have a large affect on estimates of total abundance and exploitation. Sockeye salmon subsistence and sport harvest represent only 3% of the total and use of a historic mean will have little effect on the estimate. In contrast, on average 30% of the Chinook harvest is taken by subsistence and sport fishers and the coefficient of variation for these Chinook harvests are 22% and 60% respectively.

The direction of the bias in total abundance and exploitation rates is known for the omission of South Fork Chinook and sockeye salmon. The estimates of total abundance will be biased low and the exploitation will be biased high. The bias is thought to be small and in a direction that leads managers to take a precautionary approach to fishery management.

An assumption necessary for an unbiased estimate of total escapement, abundance, and exploitation is that the proportion of observable salmon is equal between aerial surveys conducted upriver from the weir on the Middle Fork and on the North Fork. Differences could

arise with differences in environmental conditions or salmon run timing. If a higher proportion of observable salmon are counted above the weir compared to the North Fork, total escapement and abundance will be underestimated and exploitation will be biased high. The reverse will occur if a lower proportion of observable salmon are counted during the aerial survey above the weir compared to the North Fork survey.

Experienced staff have not described any gross differences affecting aerial surveys between forks. Overall depth, water color, riparian vegetation, and substrate type is nearly identical between them, although the Middle Fork drainage is shorter than the North Fork. Aerial surveys of the North Fork and Middle Fork are typically conducted on the same day so conditions and methods used during each survey are also similar. Additionally, it is likely that surveys would be conducted by the same observer on each fork in a given year. These factors combined reduce the possibility of bias caused by differences in environmental conditions, methods, or different observers employed between both forks.

A different proportion of observable fish between forks may arise if spawning time is not the same or the area surveyed differs. For Chinook and coho salmon, these factors are not as pronounced because they are primarily main channel spawners, their peak spawning period is consistent between areas, and similar areas are surveyed. In contrast, sockeye salmon are primarily lake and lake tributary spawners. The time frame when sockeye salmon enter the lakes and later move into lake tributaries to spawn is a critical factor for sockeye salmon aerial surveys. If few sockeye salmon are observed in the Middle Fork lakes and the lake tributaries are not surveyed, it will be unknown whether abundance was actually low or if the majority of sockeye salmon had already moved into the lake tributaries to spawn. Alternatively, if large numbers of sockeye salmon were observed in North Fork lakes and lake tributaries were not surveyed, it will be unknown whether abundance was high compared to the Middle Fork lakes or if North Fork sockeye salmon had not yet moved into 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 a consistent annual basis for both forks. Historically, it is unclear whether sockeye aerial surveys of the Goodnews 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 and the inclusion of lake spawning tributaries in all sockeye salmon aerial surveys.

An additional potential for directional bias of exploitation rate in 2005 was the use of average aerial survey proportions to estimate North Fork escapement. The current methodology employed to estimate North Fork escapement uses aerial survey counts to determine the proportion of fish escaping to each fork and applying that proportion to the known Middle Fork weir escapement. In the absence of aerial survey proportions in 2005, an average aerial survey proportion was applied to weir escapement to generate the North Fork escapement estimate. If the average aerial survey proportion was lower than the actual proportion, exploitation would be biased high. Conversely, if the average aerial survey proportion was higher than the actual proportion, exploitation would be biased low. It is unclear in what direction average aerial survey proportions may be biasing total abundance and exploitation. However, it can be assumed that 2005 returns were not overexploited given the relatively high escapements of Chinook and most notably sockeye salmon in 2005 and the relatively low trends in exploitation rates of Goodnews River stocks. On the contrary, any classification of Goodnews River salmon exploitation in 2005 would most likely be underutilized.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

The following discussion focuses on describing ASL trends seen within Middle Fork Goodnews River weir escapement and District W-5 commercial harvest during 2005. Some comparisons are made indicating similarities and differences between the weir escapement and commercial harvest ASL estimates both for 2005 and historical ASL data. Given District W-5 samples were not adequate to estimate ASL composition of commercial harvest in 2005, additional comparisons were made between the commercial samples collected and ASL composition of weir escapement estimates. 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). This information can also be used for forecasting future runs, and to illustrate long-term trends in ASL composition (for example, Bigler et al. 1996).

Chinook Salmon

Although sample objectives were not achieved for both the escapement and commercial Chinook salmon ASL estimates in 2005, some inferences can be made based on the samples that were collected. Age-1.3 Chinook salmon were the dominant age class for both the aged escapement and aged commercial ASL samples (Tables 7 and 15). This is consistent with the majority of age-1.2 Chinook salmon in 2004. This trend in age composition is also encouraging for future returns as such high percentages of age-1.3 fish in 2005 combined with an above average Chinook salmon escapement in 2005 indicates a good return of larger age-1.4 fish in 2006. Males were dominant in both the weir and commercial samples in 2005 which is consistent with historical trends in Chinook salmon sex ratios (Folletti *Unpublished).*

Sockeye Salmon

Age-1.3 sockeye salmon were the dominant age class in the 2005 escapement ASL estimates (Tables 9 and 17; Figure 7). This is consistent with the aged commercial samples, although commercial ASL sample goals were not achieved. Age class percentages between ASL escapement estimates and aged commercial samples were relatively consistent across all age classes. This indicates that 2005 escapement ASL estimates could be used as a surrogate for commercial samples if necessary. Male to female percentages for 2005 escapement ASL estimates were 45.7% for males and 54.3% for females which is relatively consistent with total escapement and commercial ASL estimates with an approximate 50-50 split between male and female percentages. Males did not exhibit length partitioning by age class for escapement ASL estimates in 2005, which was again consistent with the aged commercial ASL samples (Figure 8). Mean male lengths by age class were similar between shared age classes in the escapement ASL estimates and aged commercial samples. These age and length trends are consistent with the total for both escapement ASL estimates and aged commercial samples. Females also did not exhibit mean length partitioning by age class in 2005 (Figure 9). This is consistent with the aged commercial samples; however, unlike escapement ASL estimates, the aged female commercial samples did not span all age classes. Mean female length by age class was similar between shared age classes in the escapement ASL estimates and overall mean length did not increase appreciably with age class. These age and length trends are again consistent with totals for both the escapement and commercial ASL estimates.

Chum Salmon

Age-0.3 chum salmon were the dominant age class for escapement ASL estimates in 2005 (Tables 11 and 19; Figure 7). This is consistent with the aged commercial samples, although commercial ASL sample goals were not achieved. Age class percentages between ASL escapement estimates and aged commercial samples were relatively consistent across all age classes. This indicates that 2005 escapement ASL estimates could be used as a surrogate for commercial samples if necessary. Male to female percentages were approximately 50-50 for the escapement ASL estimates in 2005 which is consistent with totals for escapement and commercial ASL estimates. Mean male lengths by age class in the 2005 escapement ASL estimates and the aged commercial samples indicated length partitioning by age class which is again consistent with totals for both escapement and commercial ASL estimates (Figure 8). Females also exhibited mean length partitioning by age class in the 2005 escapement estimates which is also consistent with totals for both the escapement and commercial ASL estimates (Figure 9). It should be noted; however, that the aged commercial samples did not span the same number of age classes as the 2005 escapement ASL estimates.

Coho Salmon

Although sample objectives were not achieved for both the escapement and commercial Chinook salmon ASL estimates in 2005, some inferences can be made based on the samples that were collected. Age-2.1 coho salmon were the dominant age class for the aged escapement ASL samples which is consistent with totals for both escapement and commercial ASL estimates (Tables 13 and 21). No inferences can be made about male to female coho salmon sex ratios in 2005 because of the lack of adequate sample sizes. The aged escapement and commercial ASL samples indicate length partitioning by age class for male fish. Female aged escapement samples also indicate length partitioning by age class; however, the aged commercial samples do not which may be attributed to the inadequate sample size.

CONCLUSIONS

WEIR OPERATIONS

Since the extension of project operations into the coho season in 1997 the project has:

1. Demonstrated the ability to successfully install and operate a weir in Middle Fork Goodnews River during the targeted time frame.
2. Demonstrated the ability to achieve its annual objectives with the exception of ASL sample objectives in specific years.
3. Provided escapement, run timing, and passage information for Middle Fork Goodnews River salmon and Dolly Varden populations.
4. Provided a platform for the collection of ASL information from the salmon escapement and Dolly Varden migration past the weir.

ESCAPEMENT AND RUN ABUNDANCE

Salmon escapement at the weir achieved or exceeded all SEGs in 2005.

Estimated Chinook, sockeye, and chum salmon weir escapements were above the recent 10-year averages. Estimated coho salmon weir escapement was below the historical average since coho operations were fully implemented in 1997.

Aerial surveys were unsuccessful in 2005 and chum salmon aerial surveys have been discontinued. Goodnews River Chinook and sockeye drainage escapement and run abundance were estimated based on the recent 5-year average aerial survey proportions.

AGE, SEX, AND LENGTH COMPOSITION

Chinook and coho salmon escapement, and commercial Chinook, sockeye chum, and coho salmon commercial ASL samples did not achieve sample objectives and no ASL estimates were made for these categories in 2005.

Sockeye and chum salmon escapement ASL estimates were consistent with 2005 and historical escapement and commercial ASL estimates and trends. Aged Chinook and coho salmon escapement and commercial samples and aged sockeye and chum salmon commercial samples were also consistent with 2005 and historical ASL estimates and trends.

RECOMMENDATIONS

Annual operation of the Middle Fork Goodnews River weir should continue indefinitely. As the only ground based monitoring project in District W-5 (Goodnews Bay District), the project provides valuable inseason and postseason information about Chinook, sockeye, chum, and coho salmon that are critical for sustainable salmon management practices.

WEIR OPERATIONS AND ASL SAMPLING

After the season, the substrate rail should be left in the deeper portion of the channel to speed spring installation and startup and be removed from the shallower portion to avoid scouring over the winter. The shallow portion currently extends 80 ft from the north bank. This portion of the river goes dry in the winter and is subject to frost heaving, which displaces the rail and causes scouring during the spring flood.

Active sampling for Chinook salmon should continue in order meet ASL sample size goals and additional livetraps should be deployed when time and funding allows to accommodate additional Chinook salmon ASL sample collection.

FISH PASSAGE AND ESCAPEMENT ESTIMATION

Additional efforts are recommended to obtain aerial survey information for coho salmon on the Middle Fork and North Fork Rivers of the Goodnews drainage to estimate total escapement.

Additional efforts are recommended to generate more accurate Dolly Varden weir counts. This is difficult to achieve as the current spacing between weir panel pickets was chosen for optimal weir operations during high water events and escapement counts of Chinook, sockeye, chum, and coho salmon which are larger in size overall compared to Dolly Varden. Major modifications to the weir would be required that will reduce its effectiveness during higher water levels. A methodology supplementing the current weir is needed to achieve more accurate assessments of Middle Fork Goodnews River Dolly Varden populations.

Implementing a target operational period and developing methods for estimating salmon passage missed during this period as described in Linderman et al. (2004) is also recommended.

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TABLES AND FIGURES

Table 1.–District W-5 Commercial Harvest by period and exvessel value, 2005.

Date	Permits	Chinook		Sockeye		Chum		Coho	
Caught	Fished	Harvest	Pounds	Harvest	Pounds	Harvest	Pounds	Harvest	Pounds
6/21	16	584	7,196	1,196	8,511	237	1,668	0	0
6/23	16	481	6,136	2,229	15,740	395	2,942	0	0
6/28	21	332	4,453	3,756	26,521	790	5,992	0	0
6/30				NO COMMERCIAL HARVEST/ NO TENDER					
7/05	19	122	1,929	3,080	21,415	96	656	0	0
7/07	19	76	1,195	2,805	19,595	61	439	0	0
7/12	18	71	1,206	2,991	20,593	239	1,654	0	0
7/14	19	82	1,318	3,059	20,987	232	15,740	0	0
7/19	20	60	1,136	1,456	10,062	215	1,582	1	7
8/01	16	34	528	580	3,985	84	504	54	372
8/03	16	44	677	495	3,447	84	559	191	1,471
8/05	14	27	443	462	3,265	28	208	248	2,009
8/08	16	21	320	341	2,455	17	125	503	3,989
8/10	13	16	276	188	1,384	15	93	712	6,182
8/12	16	24	394	285	2,055	24	154	994	8,370
8/15	17	12	169	225	1,566	5	31	791	6,676
8/17	16	11	136	253	1,820	8	55	1,469	12,622
8/19	18	11	177	231	1,599	22	147	2,461	21,107
8/22	15	10	139	104	736	5	31	1,852	16,023
8/26	16	14	187	143	929	9	57	2,015	17,378
8/30	11	3	41	54	373	2	13	444	3,739
Total	29	2,035	28,056	23,933	167,038	2,568	18,480	11,735	99,945
Avg. Wt.			13.8		7.0		7.2		8.5
Avg. Price			$0.60		$0.55		$0.08		$0.25
Exvessel value			$16,696		$91,135		$1,454		$25,010
						Total Fish			40,271
						Total Pounds			313,519
						Total Exvessel Value			$134,295

Table 2.–Daily and cumulative Chinook, sockeye, chum, and coho salmon passage, Middle Fork Goodnews River weir, 2005.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/26	59	59	473	473	22	22	0	0
6/27	171	230	4,034	4,507	125	147	0	0
6/28	340	570	5,503	10,010	238	385	0	0
6/29	268	838	4,165	14,175	384	769	0	0
6/30	177	1,015	4,911	19,086	581	1,350	0	0
7/01	63	1,078	11,421	30,507	236	1,586	0	0
7/02	124	1,202	9,154	39,661	528	2,114	0	0
7/03	288	1,490	9,891	49,552	935	3,049	0	0
7/04	274	1,764	8,595	58,147	836	3,885	0	0
7/05	279[a]	2,043	6,142[a]	64,289	1,086[a]	4,971	0[a]	0
7/06	240	2,283	4,008	68,297	569	5,540	0	0
7/07	317	2,600	4,469	72,766	843	6,383	0	0
7/08	130	2,730	4,304	77,070	1,176	7,559	0	0
7/09	250	2,980	4,131	81,201	1,105	8,664	0	0
7/10	74	3,054	3,370	84,571	836	9,500	0	0
7/11	41	3,095	2,564	87,135	414	9,914	1	1
7/12	86	3,181	4,294	91,429	832	10,746	0	1
7/13	78	3,259	3,965	95,394	1,135	11,881	0	1
7/14	179	3,438	2,992	98,386	2,136	14,017	0	1
7/15	365	3,803	2,374	100,760	912	14,929	0	1
7/16	75	3,878	1,174	101,934	799	15,728	0	1
7/17	36	3,914	1,267	103,201	378	16,106	0	1
7/18	51	3,965	1,637	104,838	815	16,921	0	1
7/19	6	3,971	414	105,252	342	17,263	0	1
7/20	17	3,988	602	105,854	510	17,773	0	1
7/21	31	4,019	506	106,360	398	18,171	0	1
7/22	41	4,060	800	107,160	668	18,839	0	1
7/23	88	4,148	660	107,820	943	19,782	0	1
7/24	14	4,162	611	108,431	999	20,781	0	1
7/25	48	4,210	538	108,969	1,018	21,799	0	1
7/26	27	4,237	56	109,025	127	21,926	0	1
7/27	16	4,253	68	109,093	121	22,047	0	1
7/28	26	4,279	101	109,194	201	22,248	4	5
7/29	35	4,314	155	109,349	435	22,683	4	9
7/30	2	4,316	81	109,430	178	22,861	0	9
7/31	19	4,335	402	109,832	589	23,450	2	11
8/01	42	4,377	359	110,191	412	23,862	2	13
8/02	19	4,396	194	110,385	357	24,219	1	14
8/03	13	4,409	494	110,879	419	24,638	0	14

-continued-

Table 2.–Page 2 of 3.

	Chinook		Sockeye		Chum		Coho	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**
8/04	18	4,427	147	111,026	336	24,974	1	15
8/05	10	4,437	129	111,155	120	25,094	2	17
8/06	9	4,446	158	111,313	166	25,260	0	17
8/07	0	4,446	100	111,413	37	25,297	0	17
8/08	26	4,472	420	111,833	286	25,583	4	21
8/09	41	4,513	275	112,108	240	25,823	14	35
8/10	5	4,518	82	112,190	90	25,913	5	40
8/11	2	4,520	165	112,355	149	26,062	22	62
8/12	8	4,528	176	112,531	62	26,124	21	83
8/13	2	4,530	127	112,658	69	26,193	39	122
8/14	14	4,544	58	112,716	81	26,274	57	179
8/15	24	4,568	105	112,821	34	26,308	147	326
8/16	6	4,574	86	112,907	36	26,344	215	541
8/17	14	4,588	84	112,991	20	26,364	193	734
8/18	8	4,596	124	113,115	98	26,462	289	1,023
8/19	3	4,599	55	113,170	26	26,488	58	1,081
8/20	2	4,601	28	113,198	11	26,499	39	1,120
8/21	0	4,601	86	113,284	13	26,512	29	1,149
8/22	0	4,601	31	113,315	7	26,519	1	1,150
8/23	13	4,614	91	113,406	77	26,596	1,094	2,244
8/24	2	4,616	25	113,431	18	26,614	279	2,523
8/25	2	4,618	14	113,445	6	26,620	37	2,560
8/26	0	4,618	29	113,474	3	26,623	43	2,603
8/27	5	4,623	38	113,512	4	26,627	37	2,640
8/28	3	4,626	86	113,598	19	26,646	434	3,074
8/29	5	4,631	92	113,690	20	26,666	1,712	4,786
8/30	0	4,631	18	113,708	6	26,672	2,063	6,849
8/31	0	4,631	12	113,720	0	26,672	538	7,387
9/01	0	4,631	31	113,751	1	26,673	254	7,641
9/02	0	4,631	6	113,757	1	26,674	163	7,804
9/03	0	4,631	11	113,768	4	26,678	1,623	9,427
9/04	1	4,632	8	113,776	0	26,678	1,410	10,837
9/05	0	4,632	9	113,785	2	26,680	825	11,662
9/06	1	4,633	16	113,801	3	26,683	1,352	13,014
9/07	0	4,633	3	113,804	1	26,684	608	13,622
9/08	0[a]	4,633	0[a]	113,804	0[a]	26,684	84[a]	13,706
9/09	0[b]	4,633	0[b]	113,804	0[b]	26,684	195[b]	13,902
9/10	0[a]	4,633	0[a]	113,804	0[a]	26,684	99[a]	14,001
9/11	0[a]	4,633	5[a]	113,809	6[a]	26,690	283[a]	14,284
9/12	0[a]	4,633	0[a]	113,809	0[a]	26,690	281[a]	14,566

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Table 2.–Page 3 of 3.

	Chinook		Sockeye		Chum		Coho	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**
9/13	0[b]	4,633	0[b]	113,809	0[b]	26,690	119[b]	14,684
9/14	0[b]	4,633	0[b]	113,809	0[b]	26,690	309[b]	14,994
9/15	0[b]	4,633	0[b]	113,809	0[b]	26,690	36[b]	15,030
9/16	0[b]	4,633	0[b]	113,809	0[b]	26,690	55[b]	15,085
9/17	0[b]	4,633	0[b]	113,809	0[b]	26,690	300[b]	15,384
9/18	0[b]	4,633	0[b]	113,809	0[b]	26,690	97[b]	15,481
9/19	0[b]	4,633	0[b]	113,809	0[b]	26,690	86[b]	15,567
9/20	0[b]	4,633	0[b]	113,809	0[b]	26,690	115[b]	15,683
Total	4,633		113,809		26,690		15,683	
Observed	4,534		111,422		26,408		13,938	
Estimated	99		2,387		282		1,745	
% Observed	97.9		97.9		98.9		88.9	

[a] Daily passage was estimated because of a breach in the weir.

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

Table 3.–Escapement summary for the Goodnews River, 2005.

Middle Fork Goodnews River escapement estimate				
	Chinook	**Sockeye**	**Chum**	**Coho**
2005 weir count	4,633	113,809	26,691	15,683
Weir (SEG)	2,000–4,500	23,000–58,000	>12,000	>12,000
10-year average (1995–2004)	2,282	26,915	9,464	15,261[a]
2005 aerial survey count	[b]	[b]	[b]	[b]

North Fork Goodnews River escapement estimate				
	Chinook	**Sockeye**	**Chum**	**Coho**
2005 escapement estimate [c]	6,399	90,835	[b]	[b]
10-year average (1995–2004)	6,960	63,613	[b]	[b]
2005 aerial survey count	[b]	[b]	[b]	[b]
Aerial Survey (SEG)	640–3,300	5,500–19,500	[d]	[d]

Goodnews River (total drainage) escapement estimate				
	Chinook	**Sockeye**	**Chum**	**Coho**
2005	11,032	204,644	[b]	[b]
10-year average (1995–2004)	10,666	110,554	[b]	[b]

Total Run and Exploitation				
	Chinook	**Sockeye**	**Chum**	**Coho**
District W-5 Commercial Harvest	2,035	23,933	2,568	11,735
Subsistence Harvest [e]	738	493	250	613
Sport Fishing Harvest [e]	166	163	25	615
Total Run Estimate	13,971	229,233	[b]	[b]
Harvest Exploitation (%)	21.0	10.7	[b]	[b]

[a] Average of last 8 years (1997–2004).

[b] No estimate was made.

[c] Escapement goal discontinued in 2004.

[d] Because aerial surveys were not conducted in 2005, the North Fork Goodnews River escapement estimate is based on the recent 5-year average proportion between Middle Fork and North Fork Goodnews River aerial survey counts.

[e] Official estimates not available at time of publication, numbers shown are the recent 10-year averages (1995-2004) of Goodnews Bay area subsistence and Goodnews River sport fishing harvest.

Table 4.–Chinook, sockeye, chum, and coho salmon and Dolly Varden cumulative percent passage, Middle Fork Goodnews River weir, 2005 and historical median.

	Chinook Salmon		Sockeye Salmon		Chum Salmon		Coho Salmon		Dolly Varden	
Date	2005	Median[a]	2005	Median[b]	2005	Median[c]	2005	Median[d]	2005	Median[e]
6/26	1	4	0	8	0	1	0	0	0	0
6/27	5	7	4	11	1	2	0	0	1	0
6/28	12	8	9	13	1	3	0	0	2	1
6/29	18	10	12	17	3	3	0	0	2	1
6/30	22	13	17	21	5	4	0	0	3	1
7/01	23	16	27	25	6	5	0	0	4	1
7/02	26	21	35	28	8	6	0	0	7	2
7/03	32	24	44	28	11	7	0	0	10	3
7/04	38	26	51	33	15	9	0	0	11	4
7/05	44	30	56	39	19	11	0	0	12	5
7/06	49	34	60	44	21	12	0	0	15	7
7/07	56	37	64	49	24	14	0	0	17	9
7/08	59	41	68	55	28	16	0	0	22	10
7/09	64	45	71	57	32	18	0	0	24	12
7/10	66	49	74	63	36	23	0	0	27	16
7/11	67	53	77	67	37	25	0	0	28	19
7/12	69	59	80	73	40	29	0	0	38	21
7/13	70	61	84	75	45	33	0	0	47	24
7/14	74	67	86	78	53	38	0	0	56	28
7/15	82	69	89	80	56	41	0	0	64	29
7/16	84	73	90	82	59	45	0	0	67	32
7/17	84	74	91	84	60	50	0	0	67	35
7/18	86	77	92	87	63	53	0	0	70	38
7/19	86	80	92	88	65	60	0	0	73	40
7/20	86	82	93	89	67	62	0	0	74	44
7/21	87	83	93	91	68	64	0	0	74	48
7/22	88	84	94	93	71	69	0	0	76	52
7/23	90	85	95	94	74	72	0	0	78	55
7/24	90	88	95	94	78	74	0	0	80	59
7/25	91	90	96	95	82	76	0	0	82	62
7/26	91	91	96	96	82	80	0	0	82	64
7/27	92	91	96	96	83	82	0	0	82	67
7/28	92	93	96	97	83	83	0	0	83	69
7/29	93	94	96	97	85	86	0	0	86	71
7/30	93	95	96	98	86	89	0	0	87	72
7/31	94	96	97	98	88	91	0	0	90	74
8/01	94	96	97	98	89	92	0	0	91	75
8/02	95	97	97	98	91	93	0	0	93	77
8/03	95	97	97	98	92	94	0	0	93	78
8/04	96	98	98	98	94	95	0	0	94	79
8/05	96	98	98	99	94	96	0	0	95	79
8/06	96	98	98	99	95	97	0	0	95	79
8/07	96	98	98	99	95	97	0	1	95	80
8/08	97	98	98	99	96	97	0	1	96	80
8/09	97	99	99	99	97	98	0	1	96	80
8/10	98	99	99	99	97	98	0	1	96	80

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Table 4.–Page 2 of 2.

	Chinook Salmon		Sockeye Salmon		Chum Salmon		Coho Salmon		Dolly Varden	
Date	2005	Median[a]	2005	Median[b]	2005	Median[c]	2005	Median[d]	2005	Median[e]
8/11	98	99	99	99	98	98	0	1	97	81
8/12	98	99	99	99	98	99	1	2	97	81
8/13	98	99	99	99	98	99	1	2	97	81
8/14	98	99	99	99	98	99	1	3	97	81
8/15	99	99	99	99	99	99	2	3	97	81
8/16	99	99	99	99	99	99	3	5	97	82
8/17	99	100	99	99	99	99	5	6	97	82
8/18	99	100	99	99	99	99	7	6	97	82
8/19	99	100	99	99	99	100	7	7	97	83
8/20	99	100	99	99	99	100	7	10	97	83
8/21	99	100	100	100	99	100	7	11	98	84
8/22	99	100	100	100	99	100	7	12	98	85
8/23	100	100	100	100	100	100	14	13	98	85
8/24	100	100	100	100	100	100	16	15	98	85
8/25	100	100	100	100	100	100	16	20	98	85
8/26	100	100	100	100	100	100	17	25	98	86
8/27	100	100	100	100	100	100	17	27	98	87
8/28	100	100	100	100	100	100	20	34	98	87
8/29	100	100	100	100	100	100	31	36	98	88
8/30	100	100	100	100	100	100	44	42	98	88
8/31	100	100	100	100	100	100	47	52	99	89
9/01	100	100	100	100	100	100	49	57	99	91
9/02	100	100	100	100	100	100	50	59	99	92
9/03	100	100	100	100	100	100	60	62	99	93
9/04	100	100	100	100	100	100	69	66	99	94
9/05	100	100	100	100	100	100	74	71	100	94
9/06	100	100	100	100	100	100	83	74	100	95
9/07	100	100	100	100	100	100	87	81	100	95
9/08	100	100	100	100	100	100	87	82	100	96
9/09	100	100	100	100	100	100	89	83	100	97
9/10	100	100	100	100	100	100	89	85	100	98
9/11	100	100	100	100	100	100	91	86	100	98
9/12	100	100	100	100	100	100	93	90	100	99
9/13	100	100	100	100	100	100	94	93	100	99
9/14	100	100	100	100	100	100	96	94	100	99
9/15	100	100	100	100	100	100	96	95	100	99
9/16	100	100	100	100	100	100	96	95	100	99
9/17	100	100	100	100	100	100	98	96	100	99
9/18	100	100	100	100	100	100	99	97	100	99
9/19	100	100	100	100	100	100	99	98	100	99
9/20	100	100	100	100	100	100	100	98	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] Historical median for years: 1981, 1990 t–1997, 1999, and 2001–2004.

[b] Historical median for years: 1981, 1984, 1992–1997, 1999, and 2002–2004.

[c] Historical median for years: 1981, 1991–1997, 1999, and 2001–2004.

[d] Historical median for years: 1997–2004.

[e] Historical median for years: 1997–2004.

Table 5.–Daily and cumulative pink salmon and Dolly Varden passage, Middle Fork Goodnews weir, 2005.

	Pink Salmon		Dolly Varden	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**
6/26	0	0	4	4
6/27	15	15	13	17
6/28	102	117	15	32
6/29	62	179	3	35
6/30	97	276	39	74
7/01	76	352	6	80
7/02	66	418	78	158
7/03	254	672	64	222
7/04	263	935	20	242
7/05	123[a]	1,058	21[a]	263
7/06	68	1,126	57	320
7/07	242	1,368	34	354
7/08	328	1,696	105	459
7/09	300	1,996	60	519
7/10	185	2,181	48	567
7/11	97	2,278	30	597
7/12	82	2,360	201	798
7/13	136	2,496	192	990
7/14	304	2,800	195	1,185
7/15	302	3,102	174	1,359
7/16	279	3,381	58	1,417
7/17	75	3,456	16	1,433
7/18	110	3,566	47	1,480
7/19	5	3,571	64	1,544
7/20	78	3,649	21	1,565
7/21	77	3,726	19	1,584
7/22	77	3,803	28	1,612
7/23	89	3,892	38	1,650
7/24	75	3,967	47	1,697
7/25	193	4,160	42	1,739
7/26	38	4,198	9	1,748
7/27	35	4,233	5	1,753
7/28	80	4,313	14	1,767
7/29	153	4,466	57	1,824
7/30	83	4,549	37	1,861
7/31	154	4,703	53	1,914
8/01	81	4,784	31	1,945
8/02	83	4,867	28	1,973
8/03	80	4,947	13	1,986
8/04	52	4,999	20	2,006
8/05	48	5,047	5	2,011
8/06	24	5,071	4	2,015
8/07	16	5,087	9	2,024
8/08	51	5,138	13	2,037
8/09	138	5,276	12	2,049
8/10	52	5,328	2	2,051
8/11	66	5,394	6	2,057

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	Pink Salmon		Dolly Varden	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**
8/12	40	5,434	3	2,060
8/13	28	5,462	3	2,063
8/14	31	5,493	1	2,064
8/15	27	5,520	1	2,065
8/16	14	5,534	1	2,066
8/17	34	5,568	3	2,069
8/18	73	5,641	1	2,070
8/19	14	5,655	3	2,073
8/20	7	5,662	0	2,073
8/21	18	5,680	3	2,076
8/22	14	5,694	0	2,076
8/23	65	5,759	1	2,077
8/24	12	5,771	3	2,080
8/25	9	5,780	2	2,082
8/26	11	5,791	3	2,085
8/27	3	5,794	2	2,087
8/28	15	5,809	0	2,087
8/29	35	5,844	3	2,090
8/30	17	5,861	1	2,091
8/31	22	5,883	7	2,098
9/01	6	5,889	7	2,105
9/02	5	5,894	2	2,107
9/03	5	5,899	6	2,113
9/04	6	5,905	3	2,116
9/05	11	5,916	7	2,123
9/06	8	5,924	4	2,127
9/07	2	5,926	1	2,128
9/08	0[a]	5,926	0[a]	2,128
9/09	0[b]	5,926	0[b]	2,128
9/10	0[a]	5,926	0[a]	2,128
9/11	0[a]	5,926	0[a]	2,128
9/12	0[a]	5,926	0[a]	2,128
Total	5,926		2,128	

[a] Partial day counts because of a breach in weir; no estimates were made.

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

Table 6.–Daily fish carcass count, Middle Fork Goodnews River weir, 2005.

Date	Chinook	Sockeye	Chum	Pink	Coho	Other [a]
6/27	0	8	0	0	0	0
6/28	0	1	1	2	0	0
6/29	0	1	1	2	0	0
6/30	0	0	0	0	0	0
7/01	0	6	0	0	0	0
7/02	0	2	3	6	0	0
7/03	0	2	3	6	0	1DV
7/04	0	2	0	0	0	0
7/05	1	1	1	0	0	0
7/06	0	4	1	0	0	0
7/07	0	10	1	0	0	0
7/08	0	7	3	3	0	0
7/09	0	9	6	0	0	0
7/10	0	8	9	0	0	0
7/11	0	1	7	1	0	1DV
7/12	0	2	7	0	0	0
7/13	0	5	13	0	0	2DV
7/14	1	1	9	0	0	1DV
7/15	0	1	8	0	0	0
7/16	1	2	44	0	0	0
7/17	0	3	32	1	0	0
7/18	0	2	58	2	0	5DV
7/19	0	2	47	0	0	1DV
7/20	0	4	69	1	0	3DV
7/21	0	0	34	1	0	0
7/22	0	2	78	0	0	0
7/23	1	4	141	0	0	0
7/24	0	2	89	2	0	0
7/25	0	5	192	7	0	0
7/26	0	2	76	3	0	0
7/27	0	1	106	5	0	0
7/28	2	4	204	8	0	1DV
7/29	1	1	208	12	0	0
7/30	4	2	163	8	0	0
7/31	2	3	206	25	0	1DV
8/01	3	5	205	33	0	2DV
8/02	6	1	227	41	0	0
8/03	5	3	190	44	0	2DV
8/04	3	1	221	52	0	0
8/05	4	5	148	55	0	1DV
8/06	6	5	167	46	0	0

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Table 6.–Page 2 of 2.

Date	Chinook	Sockeye	Chum	Pink	Coho	Other [a]
8/07	1	4	122	58	0	0
8/08	1	3	122	53	0	0
8/09	4	3	142	62	0	0
8/10	8	4	117	55	0	1DV
8/11	10	4	117	75	0	0
8/12	5	4	109	98	0	0
8/13	4	14	80	49	0	0
8/14	4	4	76	62	0	0
8/15	3	6	51	42	0	0
8/16	6	27	57	29	0	0
8/17	6	11	44	39	0	0
8/18	3	8	20	15	1	0
8/19	5	12	24	9	0	0
8/20	2	11	17	12	0	0
8/21	3	14	18	8	0	0
8/22	1	9	9	7	0	0
8/23	12	11	67	39	0	1DV
8/24	17	30	19	21	0	0
8/25	3	20	9	5	17	0
8/26	2	10	6	12	0	0
8/27	3	9	11	10	3	1DV
8/28	3	12	8	11	2	1DV
8/29	1	7	1	6	3	0
8/30	1	12	5	11	2	0
8/31	2	22	1	3	1	0
9/01	1	15	1	3	2	0
9/02	0	22	1	8	4	0
9/03	0	7	0	1	0	0
9/04	0	10	0	5	0	0
9/05	0	7	0	3	0	0
9/06	0	8	2	7	0	0
Total	151	470	4,234	1,184	35	25DV

[a] DV - Dolly Varden.

Table 7.–Age and sex composition of Chinook salmon escapement, Middle Fork Goodnews River weir, 2005.

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 %	Total Esc.	Total %
7/4,16	44	39	M	0	0.0	517	13.0	1,724	43.5	402	10.2	0	0.0	2,643	66.7
(6/26-7/18)			F	0	0.0	58	1.5	747	18.8	517	13.0	0	0.0	1,322	33.3
			Subtotal	0	0.0	575	14.5	2,471	62.3	919	23.2	0	0.0	3,965	100.0
7/21,26	116	68	M	6	1.5	55	13.2	97	23.5	73	17.6	0	0.0	230	55.9
(7/19-8/1)			F	0	0.0	6	1.5	103	25.0	66	16.2	0	0.0	182	44.1
			Subtotal	6	1.5	61	14.7	200	48.5	139	33.8	0	0.0	412	100.0
8/5	21	18	M	-	-	-	-	-	-	-	-	-	-	-	-
(8/2-9/20)			F	-	-	-	-	-	-	-	-	-	-	-	-
			Subtotal											256	
Season [a]	181	155	M												
			F												
			Total											4,633	
Grand		1,083	M	123	0.8	4,137	26.3	3,377	21.4	2,398	15.2	74	0.5	10,117	64.2
Total [b]			F	0	0.0	56	0.4	1,129	7.2	4,238	26.9	231	1.5	5,642	35.8
			Total	123	0.0	4,193	26.6	4,505	28.6	6,636	42.1	305	1.9	15,760	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] Samples did not achieve minimum sample objectives and were not applied to sample totals.

[b] The number of fish in "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1995, 1997, 2000, and 2002–2003.

Table 8.–Mean length (mm) of Chinook salmon escapement, Middle Fork Goodnews River weir, 2005.

Sample Dates			Age Class				
(Stratum Dates)	Sex		1.1	1.2	1.3	1.4	1.5
7/4,16	M	Mean Length		584	715	854	
(6/26-7/18)		Std. Error		18	10	13	
		Range		505- 665	630- 835	800- 895	
		Sample Size	0	9	30	7	0
	F	Mean Length		500	759	823	
		Std. Error		-	18	10	
		Range		500- 500	620- 870	790- 890	
		Sample Size	0	1	13	9	0
7/21,26	M	Mean Length	355	537	724	851	
(7/19-8/1)		Std. Error	-	19	13	15	
		Range	355- 355	460- 640	630- 825	790- 955	
		Sample Size	1	9	16	12	0
	F	Mean Length		430	794	830	
		Std. Error		-	8	23	
		Range		430- 430	715- 845	695- 945	
		Sample Size	0	1	17	11	0
8/5	M	Mean Length	350	415	673	891	
(8/2-9/20)		Std. Error	-	15	32	43	
		Range	350- 350	400- 430	555- 770	740- 985	
		Sample Size	1	2	6	5	0
	F	Mean Length				821	
		Std. Error				21	
		Range				790- 880	
		Sample Size	0	0	0	4	0
Season	M	Mean Length	353	572	714	859	
		Range	350- 355	400- 665	555- 835	740- 985	
		Sample Size	2	20	52	24	0
	F	Mean Length		493	763	823	
		Range		430- 500	620- 870	695- 945	
		Sample Size	0	2	30	24	0
Grand	M	Mean Length	386	546	714	852	886
Total [a]		Range	240-550	445-850	550-910	680-1,035	700-990
		Sample Size	12	233	260	157	6
	F	Mean Length		610	788	858	898
		Range		540-670	560-880	470-1,005	705-990
		Sample Size	0	3	90	302	18

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1991, 1995, 1997, 2000, and 2002–2003.

Table 9.–Age and sex composition of sockeye salmon escapement, Middle Fork Goodnews River weir, 2005.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.3 Esc.	0.3 %	1.2 Esc.	1.2 %	1.3 Esc.	1.3 %	2.2 Esc.	2.2 %	1.4 Esc.	1.4 %	2.3 Esc.	2.3 %	Total Esc.	Total %
6/30-7/3	211	170	M	0	0.0	2,812	4.1	25,310	37.0	402	0.6	402	0.6	1,607	2.3	30,533	44.7
(6/26-7/6)			F	0	0.0	5,223	7.7	31,336	45.9	0	0.0	401	0.6	803	1.2	37,764	55.3
			Subtotal	0	0.0	8,035	11.8	56,646	82.9	402	0.6	803	1.2	2,410	3.5	68,297	100.0
7/12-13,15-16	210	177	M	0	0.0	2,890	7.9	13,006	35.6	826	2.3	207	0.6	1,032	2.8	17,961	49.2
(7/7-18)			F	0	0.0	3,097	8.5	13,832	37.8	1,032	2.8	206	0.5	413	1.2	18,580	50.8
			Subtotal	0	0.0	5,987	16.4	26,838	73.4	1,858	5.1	413	1.1	1,445	4.0	36,541	100.0
7/19-22, 7/24	210	166	M	44	1.2	173	4.8	1,104	30.7	87	2.4	0	0.0	22	0.6	1,429	39.8
(7/19-24)			F	43	1.2	238	6.6	1,558	43.4	281	7.8	0	0.0	43	1.2	2,164	60.2
			Subtotal	87	2.4	411	11.4	2,662	74.1	368	10.2	0	0.0	65	1.8	3,593	100.0
7/25-29, 7/31	210	166	M	12	0.6	106	5.4	683	35.0	47	2.4	24	1.2	12	0.6	883	45.2
(7/25-8/2)			F	12	0.6	282	14.5	612	31.3	141	7.2	0	0.0	12	0.6	1,071	54.8
			Subtotal	24	1.2	388	19.9	1,295	66.3	188	9.6	24	1.2	24	1.2	1,954	100.0
8/5-6,8	210	144	M	0	0.0	36	2.1	419	24.3	24	1.4	0	0.0	0	0.0	479	27.8
(8/3-9)			F	12	0.7	263	15.3	754	43.8	96	5.5	12	0.7	108	6.3	1,244	72.2
			Subtotal	12	0.7	299	17.4	1,173	68.1	120	6.9	12	0.7	108	6.3	1,723	100.0
8/11-13,16-17	210	132	M	0	0.0	64	3.8	541	31.8	39	2.3	13	0.8	39	2.3	696	40.9
(8/10-9/20)			F	13	0.8	168	9.8	735	43.2	77	4.5	0	0.0	13	0.7	1,005	59.1
			Subtotal	13	0.8	232	13.6	1,276	75.0	116	6.8	13	0.8	52	3.0	1,701	100.0
Season	1,261	955	M	55	0.0	6,082	5.3	41,063	36.1	1,424	1.3	645	0.6	2,711	2.4	51,979	45.7
			F	80	0.1	9,271	8.2	48,827	42.9	1,628	1.4	620	0.5	1,392	1.2	61,830	54.3
			Total	135	0.1	15,353	13.5	89,890	79.0	3,052	2.7	1,265	1.1	4,103	3.6	113,809	100.0
Grand		6,613	M	6,350	1.3	27,665	5.8	171,628	36.3	4,726	1.0	7,285	1.5	11,155	2.4	229,539	48.5
Total [a]			F	2,853	0.6	46,972	9.9	173,572	36.7	6,009	1.3	4,986	1.1	8,828	1.9	243,918	51.5
			Total	9,203	1.9	74,637	15.8	345,200	72.9	10,735	2.3	12,271	2.6	19,983	4.2	473,454	100.0

Note: The numbers of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The numbers of fish in "Season" 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. Years included are 1987, 1990, 1995, 1997, and 1999–2005.

Table 10.–Mean length (mm) of sockeye salmon escapement, Middle Fork Goodnews River weir, 2005.

Sample Dates			Age Class					
(Stratum Dates)	Sex		0.3	1.2	1.3	2.2	1.4	2.3
6/30-7/3	M	Mean Length		544	574	530	615	604
(6/26-7/6)		Std. Error		8	3	-	-	7
		Range		515- 565	500- 625	530- 530	615- 615	590- 620
		Sample Size	0	7	63	1	1	4
	F	Mean Length		486	539		550	505
		Std. Error		7	2		-	25
		Range		430- 530	480- 585		550- 550	480- 530
		Sample Size	0	13	78	0	1	2
7/12-13,15-16	M	Mean Length		525	574	534	590	574
(7/7-18)		Std. Error		10	2	13	-	11
		Range		470- 630	525- 615	510- 570	590- 590	545- 610
		Sample Size	0	14	63	4	1	5
	F	Mean Length		486	536	473	540	520
		Std. Error		6	2	14	-	15
		Range		455- 530	490- 575	425- 510	540- 540	505- 535
		Sample Size	0	15	67	5	1	2
7/20-22	M	Mean Length	555	524	570	540		585
(7/19-24)		Std. Error	20	5	4	17		-
		Range	535- 575	505- 545	490- 635	500- 585		585- 585
		Sample Size	2	8	51	4	0	1
	F	Mean Length	543	494	536	507		530
		Std. Error	8	8	2	5		5
		Range	535- 550	465- 550	495- 580	480- 545		525- 535
		Sample Size	2	11	72	13	0	2
7/26-31	M	Mean Length	750	533	580	506	585	590
7/25-8/2		Std. Error	-	11	3	17	15	-
		Range	750- 750	495- 605	515- 670	475- 535	570- 600	590- 590
		Sample Size	1	9	58	4	2	1
	F	Mean Length	495	500	531	496		520
		Std. Error	-	5	3	6		-
		Range	495- 495	445- 555	450- 575	465- 535		520- 520
		Sample Size	1	24	52	12	0	1
8/5-6,8	M	Mean Length		522	576	528		
(8/3-9)		Std. Error		15	3	3		
		Range		495- 545	525- 605	525- 530		
		Sample Size	0	3	35	2	0	0

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Sample Dates (Stratum Dates)	Sex		Age Class 0.3	1.2	1.3	2.2	1.4	2.3
8/5-6,8	F	Mean Length	555	495	538	507	555	546
(8/3-9)		Std. Error	-	7	2	7	-	6
(cont.)		Range	555- 555	405- 540	505- 565	470- 525	555- 555	525- 570
		Sample Size	1	22	63	8	1	9
8/11-13,16-17	M	Mean Length		520	575	520	590	570
(8/10-9/20)		Std. Error		11	3	5	-	9
		Range		485- 550	525- 615	515- 530	590- 590	555- 585
		Sample Size	0	5	42	3	1	3
	F	Mean Length	545	497	541	490		570
		Std. Error	-	9	3	9		-
		Range	545- 545	435- 535	490- 595	470- 520		570- 570
		Sample Size	1	13	57	6	0	1
Season	M	Mean Length	597	534	574	532	605	592
		Range	535- 750	470- 630	490- 670	475- 585	570- 615	545- 620
		Sample Size	3	46	312	18	5	14
	F	Mean Length	538	487	538	484	547	514
		Range	495- 555	405- 555	450- 595	425- 545	540- 555	480- 570
		Sample Size	5	98	389	44	3	17
Grand	M	Mean Length	583	532	581	538	604	580
Total [a]		Range	465-650	525-610	425-630	560-645	470-700	499-602
		Sample Size	35	413	2321	69	107	148
	F	Mean Length	547	495	547	491	555	535
		Range	470-570	429-597	415-595	575-595	438-635	450-545
		Sample Size	32	835	2312	118	84	109

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1987, 1990, 1995, 1997, and 1999–2005.

Table 11.–Age and sex composition of chum salmon escapement, Middle Fork Goodnews River weir, 2005.

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 %
7/4-7	200	169	M	0	0.0	3,179	36.7	1,025	11.9	0	0.0	4,204	48.5
(6/26-7/9)			F	51	0.6	3,947	45.5	462	5.3	0	0.0	4,460	51.5
			Subtotal	51	0.6	7,126	82.2	1,487	17.2	0	0.0	8,664	100.0
7/12-13,16	200	162	M	0	0.0	2,447	29.6	1,172	14.2	0	0.0	3,619	43.8
(7/10-18)			F	0	0.0	4,128	50.0	510	6.2	0	0.0	4,638	56.2
			Subtotal	0	0.0	6,575	79.6	1,682	20.4	0	0.0	8,257	100.0
7/20-22	200	180	M	22	0.5	1,759	45.6	279	7.2	21	0.6	2,080	53.9
(7/19-24)			F	64	1.7	1,565	40.5	150	3.9	0	0.0	1,780	46.1
			Subtotal	86	2.2	3,324	86.1	429	11.1	21	0.6	3,860	100.0
7/26-29	200	189	M	16	0.5	1,500	48.7	163	5.3	0	0.0	1,679	54.5
(7/25-8/1)			F	82	2.7	1,239	40.2	82	2.6	0	0.0	1,402	45.5
			Subtotal	98	3.2	2,739	88.9	245	7.9	0	0.0	3,081	100.0
8/5-6,8,11	258	207	M	41	1.5	847	29.9	109	3.9	0	0.0	997	35.3
(8/2-9/20)			F	123	4.3	1,653	58.5	55	1.9	0	0.0	1,831	64.7
			Subtotal	164	5.8	2,500	88.4	164	5.8	0	0.0	2,828	100.0
Season	1,058	907	M	79	0.3	9,730	36.4	2,749	10.3	21	0.1	12,579	47.1
			F	320	1.2	12,534	47.0	1,257	4.7	0	0.0	14,111	52.9
			Total	399	1.5	22,264	83.4	4,006	15.0	21	0.1	26,690	100.0
Grand		6,519	M	1,205	0.5	76,002	32.2	40,850	17.3	1,070	0.5	119,124	50.4
Total [a]			F	1,856	0.8	80,775	34.2	34,357	14.5	228	0.1	117,219	49.6
			Total	3,061	1.3	156,777	66.3	75,206	31.8	1,298	0.5	236,343	100.0

Note: The numbers of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The numbers of fish in "Season" 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. Years included are 1990–1991, 1997–1999, and 2001–2005.

Table 12.–Mean length (mm) of chum salmon escapement, Middle Fork Goodnews River weir, 2005.

Sample Dates			Age Class			
(Stratum Dates)	Sex		0.2	0.3	0.4	0.5
7/4-7	M	Mean Length		595	616	
(6/26-7/9)		Std. Error		4	8	
		Range		510- 670	530- 680	
		Sample Size	0	62	20	0
	F	Mean Length	540	556	569	
		Std. Error	-	3	13	
		Range	540- 540	485- 690	530- 645	
		Sample Size	1	77	9	0
7/12-13,16	M	Mean Length		587	620	
(7/10-18)		Std. Error		5	8	
		Range		535- 670	535- 700	
		Sample Size	0	48	23	0
	F	Mean Length		551	584	
		Std. Error		3	9	
		Range		490- 640	550- 630	
		Sample Size	0	81	10	0
7/20-22	M	Mean Length	525	591	606	635
(7/19-24)		Std. Error	-	4	11	-
		Range	525- 525	530- 660	540- 650	635- 635
		Sample Size	1	82	13	1
	F	Mean Length	508	551	564	
		Std. Error	9	4	9	
		Range	495- 525	485- 625	535- 595	
		Sample Size	3	73	7	0
7/26-29	M	Mean Length	510	592	610	
(7/25-8/1)		Std. Error	-	3	15	
		Range	510- 510	480- 660	515- 680	
		Sample Size	1	92	10	0
	F	Mean Length	544	547	554	
		Std. Error	5	3	14	
		Range	530- 555	480- 625	505- 580	
		Sample Size	5	76	5	0
8/5-6,8,11	M	Mean Length	542	567	549	
(8/2-9/20)		Std. Error	30	4	11	
		Range	500- 600	485- 635	490- 580	
		Sample Size	3	62	8	0

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Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
8/5-6,8,11	F	Mean Length	514	541	566	
(8/2-9/20)		Std. Error	7	3	10	
(cont.)		Range	480- 545	425- 620	540- 590	
		Sample Size	9	121	4	0
Season	M	Mean Length	531	589	614	635
		Range	500- 600	480- 670	490- 700	635- 635
		Sample Size	5	346	74	1
	F	Mean Length	525	551	574	
		Range	480- 555	425- 690	505- 645	
		Sample Size	18	428	35	0
Grand	M	Mean Length	556	590	614	629
Total [a]		Range	495-585	480-685	515-710	605-640
		Sample Size	44	1930	1105	29
	F	Mean Length	534	558	577	608
		Range	510-560	475-640	470-675	640-645
		Sample Size	84	2172	949	6

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1990–1991, 1997–1999, and 2001–2005.

Table 13.–Age and sex composition of coho salmon escapement, Middle Fork Goodnews River weir, 2005.

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 %
7/28,8/16	71	50	M								
(6/26-8/22)			F								
			Subtotal							1,150	
8/26-29	197	144	M	563	9.0	2,296	36.8	130	2.1	2,989	47.9
(8/23-31)			F	433	7.0	2,555	41.0	260	4.2	3,248	52.1
			Subtotal	996	16.0	4,851	77.8	390	6.3	6,237	100.0
9/2-4	180	134	M	1,134	20.2	2,561	45.5	210	3.7	3,905	69.4
(9/1-6)			F	210	3.7	1,428	25.4	84	1.5	1,722	30.6
			Subtotal	1,344	23.9	3,989	70.9	294	5.2	5,627	100.0
9/7-20	0	0	M								
			F								
			Subtotal							2,669	
Season [a]	448	328	M								
			F								
			Total							15,683	
Grand		2,999	M	8,075	3.9	98,607	47.0	4,654	2.2	106,545	50.8
Total [b]			F	6,823	3.3	98,653	47.1	4,960	2.4	103,108	49.2
			Total	14,898	7.1	197,080	94.0	9,614	4.6	209,653	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] Samples did not achieve minimum sample objectives and were not applied to sample totals.

[b] The number of fish in "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1998–2004.

Table 14.–Mean length (mm) of coho salmon escapement, Middle Fork Goodnews River weir, 2005.

Sample Dates (stratum Dates)	Sex		Age Class 1.1	2.1	3.1
7/28,8/16	M	Mean Length	527	564	645
(6/26-8/22)		Std. Error	15	16	-
		Range	440- 625	490- 665	645- 645
		Sample Size	13	15	1
	F	Mean Length	580	571	620
		Std. Error	-	10	-
		Range	580- 580	460- 630	620- 620
		Sample Size	1	19	1
8/26-29	M	Mean Length	573	596	563
(8/23-31)		Std. Error	14	6	45
		Range	470- 630	500- 670	485- 640
		Sample Size	13	53	3
	F	Mean Length	573	585	598
		Std. Error	13	4	10
		Range	505- 630	495- 640	560- 620
		Sample Size	10	59	6
9/2-4	M	Mean Length	593	588	622
(9/1-6)		Std. Error	8	6	14
		Range	465- 650	430- 665	585- 665
		Sample Size	27	61	5
	F	Mean Length	583	590	590
		Std. Error	19	5	20
		Range	510- 625	515- 645	570- 610
		Sample Size	5	34	2
Season	M	Mean Length	577	590	602
		Range	440- 650	430- 670	485- 665
		Sample Size	53	129	9
	F	Mean Length	576	585	597
		Range	505- 630	460- 645	560- 620
		Sample Size	16	112	9
Grand	M	Mean Length	558	587	599
Total [a]		Range	467-658	435-707	575-675
		Sample Size	93	1,412	61
	F	Mean Length	592	598	595
		Range	518-677	400-680	420-625
		Sample Size	64	1,312	57

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1998–2004.

Table 15.–Age and sex composition of Chinook salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum)	Pulse Sample Size	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 %	1.5 Catch	1.5 %	Total Catch	Total %
6/23	110	101	M	11	1.0	380	35.6	516	48.5	74	6.9	0	0.0	981	92.1
(6/21-23)			F	0	0.0	0	0.0	74	6.9	10	1.0	0	0.0	84	7.9
			Subtotal	11	1.0	380	35.6	590	55.4	84	7.9	0	0.0	1,065	100.0
6/28	116	107	M	0	0.0	93	20.6	233	51.4	47	10.3	0	0.0	373	82.2
(6/28-30, 7/5)			F	0	0.0	0	0.0	47	10.3	34	7.5	0	0.0	81	17.8
			Subtotal	0	0.0	93	20.6	280	61.7	81	17.8	0	0.0	454	100.0
7/7-8/30	0	0	M												
(7/7-19, 8/1-30)			F												
			Subtotal											516	
Season [a]	226	208	M												
			F												
			Total											2,035	
Grand		2,075	M	107	0.5	4,962	21.5	5,761	25	2,200	9.5	149	0.6	13,223	57.3
Total [b]			F	0	0	463	2	4,408	19.1	4,623	20.1	276	1.2	9,833	42.7
			Total	83	0.4	5,425	23.5	10,169	44.1	6,824	29.6	425	1.8	23,055	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] Samples did not achieve minimum sample objectives and were not applied to sample totals.

[b] The numbers of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. The 2005 “Season” is not included in “Grand Total.”

Table 16.–Mean length (mm) of Chinook salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5
6/23	M	Mean Length	400	557	713	803	
(6/21-23)		Std. Error	-	7	9	41	
		Range	400- 400	466- 636	588- 856	669-1011	
		Sample Size	1	36	49	7	0
	F	Mean Length			772	715	
		Std. Error			13	-	
		Range			738- 835	715- 715	
		Sample Size	0	0	7	1	0
6/28	M	Mean Length		573	698	803	
(6/28-30, 7/5)		Std. Error		10	8	35	
		Range		486- 664	523- 864	657-1013	
		Sample Size	0	22	55	11	0
	F	Mean Length			766	836	
		Std. Error			12	55	
		Range			695- 824	719-1200	
		Sample Size	0	0	11	8	0
Season	M	Mean Length	400	563	706	803	
		Range	400- 400	466- 664	523- 864	657-1013	
		Sample Size	1	58	104	18	0
	F	Mean Length			768	820	
		Range			695- 835	715-1200	
		Sample Size	0	0	18	9	0
Grand	M	Mean Length	404	541	694	837	913
Total [a]		Range	325-464	455-711	539-876	623-1,030	935-1,000
		Sample Size	10	437	442	167	8
	F	Mean Length		635	759	855	881
		Range		505-650	657-995	620-970	819-980
		Sample Size	0	12	194	361	15

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths. The 2005 "Season" is not included in "Grand Total."

Table 17.–Age and sex composition of sockeye salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.3 Catch	0.3 %	1.2 Catch	1.2 %	1.3 Catch	1.3 %	1.4 Catch	1.4 %	2.3 Catch	2.3 %	Total Catch	Total %
7/7	124	91	M	0	0.0	1,723	13.2	4,595	35.1	0	0.0	287	2.2	7,466	57.1
(6/21-30, 7/5-7)			F	0	0.0	1,436	11.0	3,733	28.6	0	0.0	287	2.2	5,600	42.9
			Subtotal	0	0.0	3,159	24.2	8,328	63.7	0	0.0	574	4.4	13,066	100.0
7/12	127	100	M	109	1.0	761	7.0	5,108	47.0	217	2.0	544	5.0	6,846	63.0
(7/12-19, 8/1-30)			F	0	0.0	434	4.0	3,260	30.0	0	0.0	217	2.0	4,021	37.0
			Subtotal	109	1.0	1,195	11.0	8,368	77.0	217	2.0	761	7.0	10,867	100.0
Season [a]	251	191	M												
			F												
			Total											23,933	
Grand		9,363	M	8,576	1.6	36,349	6.8	207,009	38.9	6,604	1.2	22,253	4.2	293,044	55.1
Total [b]			F	8,329	1.6	23,926	4.5	174,473	33.7	4,955	0.9	14,639	2.8	239,088	44.9
			Total	16,905	3.2	60,275	11.3	386,483	72.6	11,559	2.2	36,892	6.9	532,132	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] Samples did not achieve minimum sample objectives and were not applied to sample totals.

[b] The numbers of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. The 2005 “Season” is not included in “Grand Total.”

Table 18.–Mean length (mm) of sockeye salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum Dates)	Sex		Age Class 0.3	1.2	1.3	2.2	1.4	2.3
7/7 (6/21-30, 7/5-7)	M	Mean Length		521	570	549		613
		Std. Error		11	4	10		26
		Range		432- 585	528- 621	523- 579		587- 638
		Sample Size	0	12	32	6	0	2
	F	Mean Length		510	547	550		571
		Std. Error		8	4	-		16
		Range		465- 539	510- 599	550- 550		555- 587
		Sample Size	0	10	26	1	0	2
7/12 (7/12-19, 8/1-30)	M	Mean Length	556	528	572	537	567	597
		Std. Error	-	7	3	-	7	5
		Range	556- 556	503- 565	518- 612	537- 537	560- 573	582- 610
		Sample Size	1	7	47	1	2	5
	F	Mean Length		491	544	489		564
		Std. Error		4	2	-		14
		Range		480- 497	524- 579	489- 489		549- 578
		Sample Size	0	4	30	1	0	2
Season	M	Mean Length	556	523	571	547	567	602
		Range	556- 556	432- 585	518- 621	523- 579	560- 573	582- 638
		Sample Size	1	19	79	7	2	7
	F	Mean Length	0	506	546	524	0	568
		Range		465- 539	510- 599	489- 550		549- 587
		Sample Size	0	14	56	2	0	4
Grand Total [a]	M	Mean Length	584	543	592	560	600	594
		Range	488-660	390-678	440-683	427-643	540-700	500-655
		Sample Size	105	664	3770	149	120	337
	F	Mean Length	552	518	561	519	573	561
		Range	490-610	350-611	440-695	452-565	511-690	482-613
		Sample Size	94	468	3231	82	111	232

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths. The 2005 "Season" is not included in "Grand Total."

Table 19.–Age and sex composition of chum salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum)	Pulse Sample Size	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 %
6/28	148	19	M										
(6/21,23,28)			F										
			Subtotal									10,602	
7/5	96	86	M	92	1.2	4,306	54.6	916	11.6	0	0.0	5,313	67.4
(6/30-8/30)			F	0	0.0	2,015	25.6	550	7.0	0	0.0	2,565	32.6
			Subtotal	92	1.2	6,321	80.2	1,466	18.6	0	0.0	7,878	100.0
Season [a]	244	105	M										
			F										
			Total									18,480	
Grand		6,641	M	470	0.3	48	26.3	39,644	21.8	1,062	0.6	89,030	48.8
Total [b]			F	249	0.1	46,982	25.8	45,309	24.9	690	0.4	93,230	51.2
			Total	720	0.4	94,839	52.0	84,954	46.6	1,752	1.0	182,255	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] Samples did not achieve minimum sample objectives and were not applied to sample totals.

[b] The numbers of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. The 2005 “Season” is not included in “Grand Total.”

Table 20.–Mean length (mm) of chum salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
6/28 (6/21,23,28)	M	Mean Length		566	581	
		Std. Error		5	30	
		Range		540- 585	547- 640	
		Sample Size	0	10	3	0
	F	Mean Length		563	533	
		Std. Error		5	-	
		Range		551- 580	533- 533	
		Sample Size	0	5	1	0
7/5 (6/30-8/30)	M	Mean Length	526	558	582	
		Std. Error	-	4	10	
		Range	526- 526	500- 625	545- 639	
		Sample Size	1	47	10	0
	F	Mean Length		546	555	
		Std. Error		5	9	
		Range		498- 595	518- 579	
		Sample Size	0	22	6	0
Season	M	Mean Length	526	563	581	
		Range	526- 526	500- 625	545- 640	
		Sample Size	1	57	13	0
	F	Mean Length		556	544	
		Range		498- 595	518- 579	
		Sample Size	0	27	7	0
Grand Total [a]	M	Mean Length	540	590	610	621
		Range	515-593	488-704	498-725	560-703
		Sample Size	21	1677	1259	23
	F	Mean Length	547	567	582	605
		Range	522-568	430-700	491-680	565-658
		Sample Size	10	1839	1486	21

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths. The 2005 "Season" is not included in "Grand Total."

Table 21.–Age and sex composition of coho salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Catch	1.1 %	2.1 Catch	2.1 %	3.1 Catch	3.1 %	Total Catch	Total %
8/10	87	69	M								63.8
(7/19-8/30)			F								36.2
			Total								100.0
Season [a]	87	69	M								
			F								
			Total							11,735	
Grand		4,220	M	10,684	4.4	112,282	46.3	5,274	2.2	128,241	52.9
Total [b]			F	7,147	2.9	102,992	42.5	4,056	1.7	114,193	47.1
			Total	17,831	7.4	215,273	88.8	9,330	3.8	242,434	100.0

[a] Samples did not achieve minimum sample objectives and were not applied to sample totals.

[b] The numbers of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. The 2005 “Season” is not included in “Grand Total.”

Table 22.–Mean length (mm) of coho salmon harvest, District W-5 commercial fishery, 2005.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
8/10	M	Mean Length	570	576	586
(7/19-8/30)		Std. Error	15	7	34
		Range	529- 597	470- 654	517- 621
		Sample Size	4	37	3
	F	Mean Length	582	592	561
		Std. Error	14	8	-
		Range	524- 619	522- 643	561- 561
		Sample Size	6	18	1
Season	M	Mean Length	570	576	586
		Range	529- 597	470- 654	517- 621
		Sample Size	4	37	3
	F	Mean Length	582	592	561
		Range	524- 619	522- 643	561- 561
		Sample Size	6	18	1
Grand	M	Mean Length	582	609	610
Total [a]		Range	511-695	471-705	570-652
		Sample Size	57	829	31
	F	Mean Length	612	606	619
		Range	549-650	471-680	555-649
		Sample Size	45	799	27

Note: When Standard error is recorded as "-" the value could not be calculated due to insufficient sample size.

[a] "Grand Total" mean lengths are simple averages of the "Season" mean lengths. The 2005 "Season" is not included in "Grand Total."

Table 23.–Daily weather and hydrological observations, Middle Fork Goodnews River weir site, 2005.

Date	Wind (Dir./Speed)	Precipitation mm/24hr	Air Temp. °C	Water Temp °C	Cloud Cover %/altitude	Water Level (cm)
6/22	NE/5	70	15	10.5	4	50
6/23	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS
6/24	CALM	0	10	9.5	4	48
6/25	NO OBS	36	NO OBS	NO OBS	NO OBS	NO OBS
6/26	CALM	10	17	11	1	47
6/27	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS
6/28	SW/5	4	21	13	1	48
6/29	S/10-15	0	20	15	3	47
6/30	SW/5-10	5	12	12	4	45
7/01	SW/5	0	19.5	15.5	1	44
7/02	S/5	0	19	14.5	2	43
7/03	S/5	0	21	13	3	41
7/04	S/5-10	0	18.5	15	3	41
7/05	S/5	0	16.5	13	4	42
7/06	NE/5	0	21.5	14.5	3	40
7/07	S/5-10	0	16.5	15	1	38
7/08	CALM	0	18.5	12.5	3	37
7/09	S/10	0	15	13	3	35
7/10	S/5-10	0	13	13	4	34
7/11	SE/5	0	14.5	13	4	33
7/12	N/5	7	22	13	3	32
7/13	NW/5	10.6	18.5	14.5	3	33
7/14	CALM	1.2	12	13	2	32
7/15	NE/5-10	0	15	13	4	30
7/16	E/5	4.5	17	12	4	32
7/17	S/10	5	13	12	4	34
7/18	SW/5	0	17	15	3	31
7/19	NW/5	0.6	16	12.5	2	30
7/20	SE/5	0	20	14	2	29
7/21	NE/5-10	46	13	13	4	28
7/22	CALM	12.4	16	11	4	30
7/23	NE/5	10.8	14	13	4	35
7/24	NE/5-10	1	17.5	12.5	4	34
7/25	CALM	7.1	11	12	3	33
7/26	NE/5	12.5	20	13	4	32
7/27	W/5	0	20.5	13.5	3	31
7/28	N/5	0	13	13	3	30
7/29	NW/5-10	0	16.5	13.5	2	28
7/30	CALM	0	12	12	2	28
7/31	CALM	0	10	13	5	27
8/01	CALM	5	15	13	4	27
8/02	E/0-5	3.6	19.5	14	3	28
8/03	CALM	4.2	20	15	2	28
8/04	SW/5	0	17.5	14	3	26
8/05	SE/5	0	15	12	4	26
8/06	S/5-10	0	13	13	4	25
8/07	CALM	1	15	12	4	25

-continued-

Table 23.–Page 2 of 2.

Date	Wind (Dir./Speed)	Precipitation mm/24hr	Air Temp. °C	Water Temp °C	Cloud Cover %/altitude	Water Level (cm)
8/08	CALM	0	5	11	2	24
8/09	NE/5	0	12	13	4	23
8/10	E/5	0	12	12	3	22
8/11	NE/5	0	13	13	4	22
8/12	CALM	0	4	13	5	21
8/13	CALM	0	11	13	5	20
8/14	CALM	0	13	14	5	20
8/15	S/5-10	0	24	17	2	18
8/16	NE/10	3.2	15	15	4	19
8/17	CALM	14	15	13	4	24
8/18	CALM	4.3	8	12	3	25
8/19	NW	0	16	12	4	23
8/20	SW/10	0.2	11	13	4	21
8/21	SW/10	1.3	15	13	3	20
8/22	NE/10	18.9	13.5	11	4	22
8/23	SE/20	22.2	10	11	4	34
8/24	W/15	3.5	12	11	3	44
8/25	E/5	0.5	13	11	4	38
8/26	N/10	1.8	13.5	11	3	36
8/27	N/10	6.2	11	10.5	4	34
8/28	W/30	8.6	11.5	11	4	37
8/29	W/30	6.4	11.5	10	4	40
8/30	N/15	7.4	12.5	10	3	48
8/31	N/10	0.2	11	9.5	2	48
9/01	NW/2	0.1	13.5	9	1	46
9/02	SW/15	14	11	10	4	47
9/03	S/10	9	13	10	4	53
9/04	W/5	3.4	14	10	3	55
9/05	E/15	4	11	10	4	53
9/06	NW/15	3.9	12.5	9.5	3	53
9/07	N/15	1.9	9	9	3	53
9/08	SW/15	16	8	8	4	50
9/09	SW/15	8.6	11	9	4	58
9/10	SW/10	4.5	6	8.5	4	61
9/11	SW/20	6.8	12	9	4	60
9/12	W/15-20	8.6	10.5	8.5	4	69
9/13	S/10	2.2	10	8.5	4	74
9/14	SE/15-20	4.4	12	9	4	76
9/15	W/20	1.8	11	10	4	90
9/16	SW/10	1.5	11	9	4	115
9/17	CALM	1.6	11.5	8.5	4	110
9/18	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS
9/19	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS
9/20	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS	NO OBS
9/21	SW/15	8.6	11	8.5	4	72
9/22	SE/25-30	15.6	11.5	8.5	4	73

Note: Cloud cover refers to 1=<10%, 2=<50%, 3=>50%, 4=100%, and 5=fog.

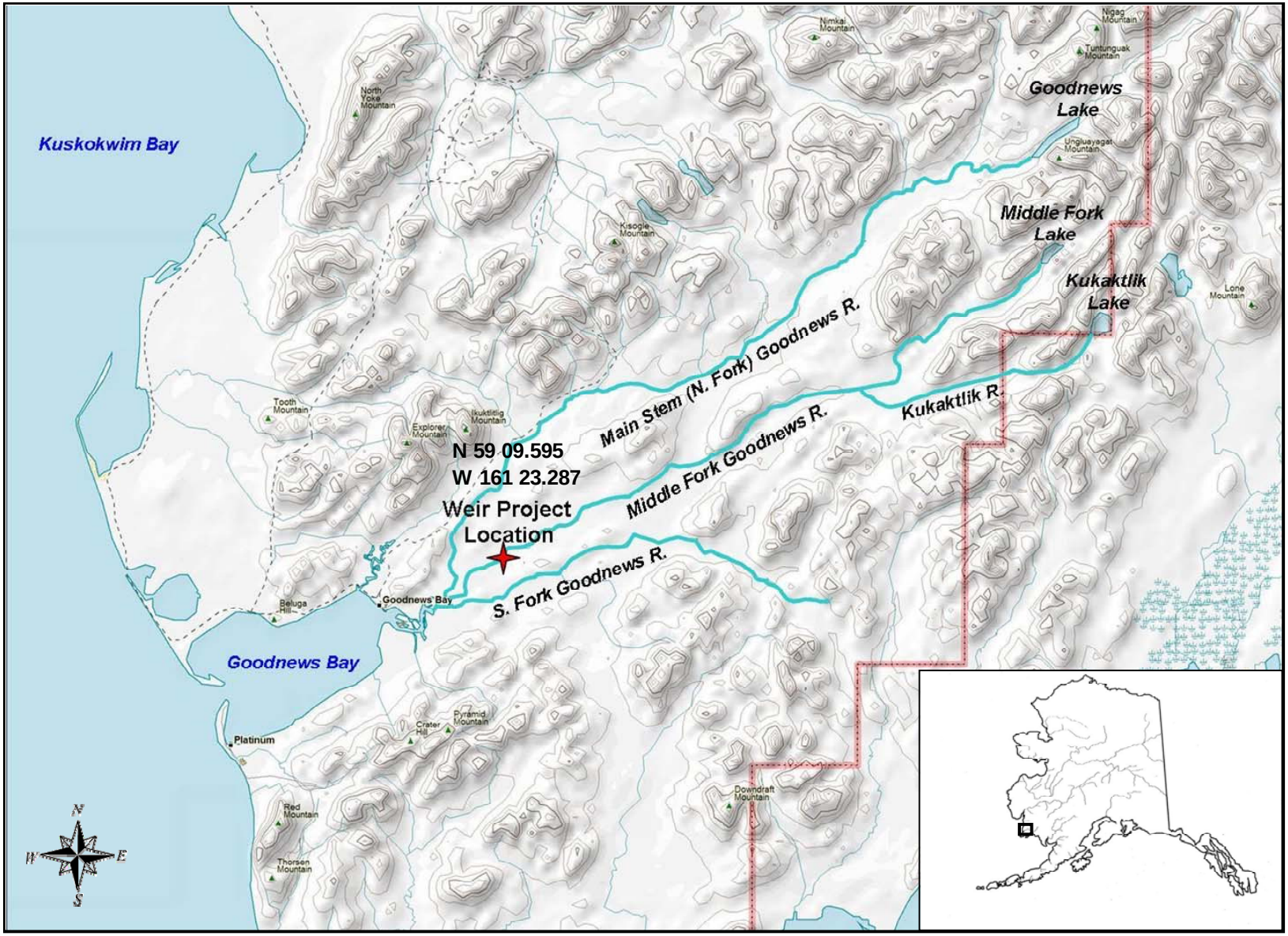


Figure 1.–Goodnews River drainage, Kuskokwim Bay, Alaska.

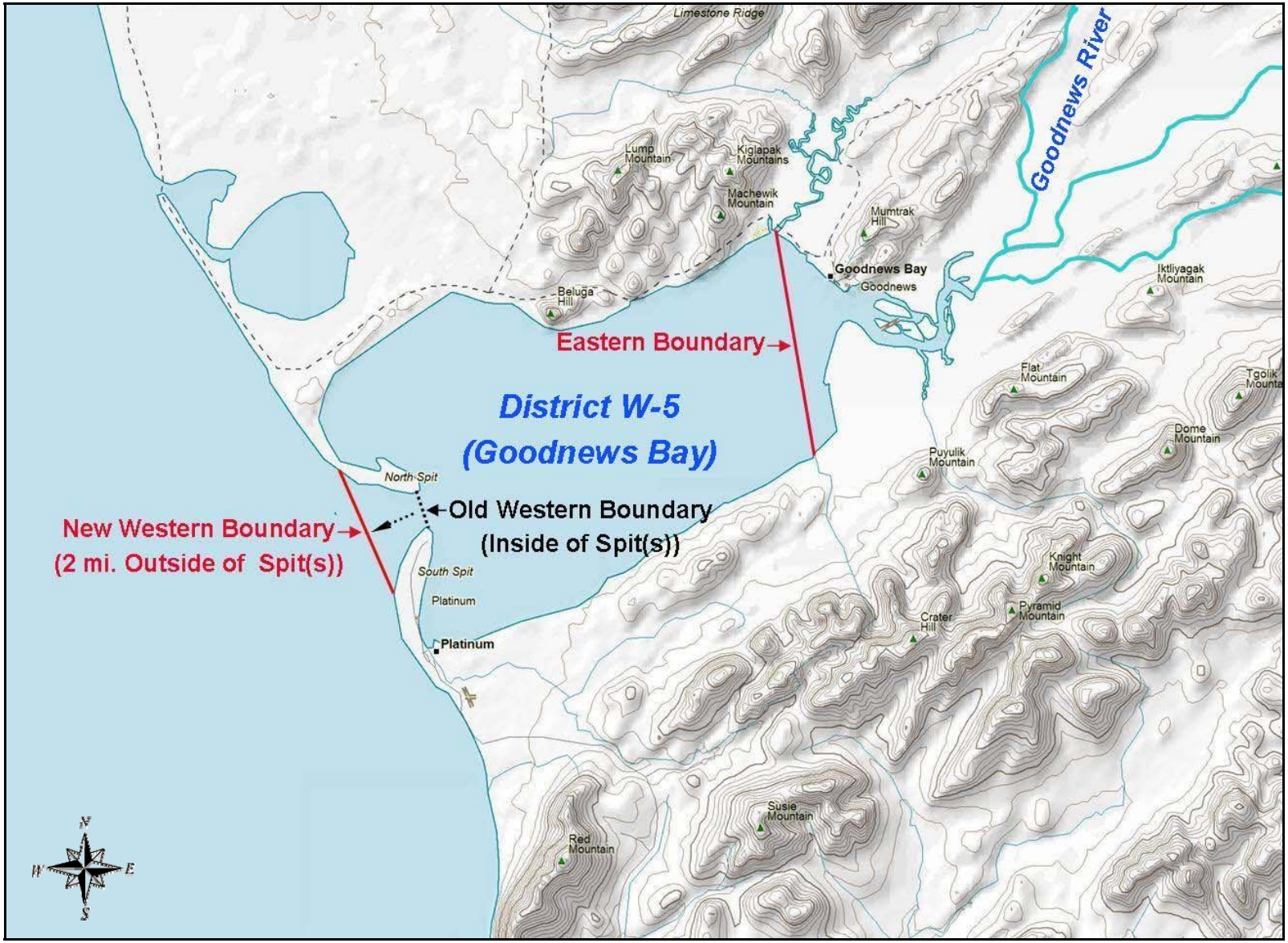


Figure 2.–Commercial fishing District W-5 (Goodnews Bay), Kuskokwim Bay, Alaska, 2005.

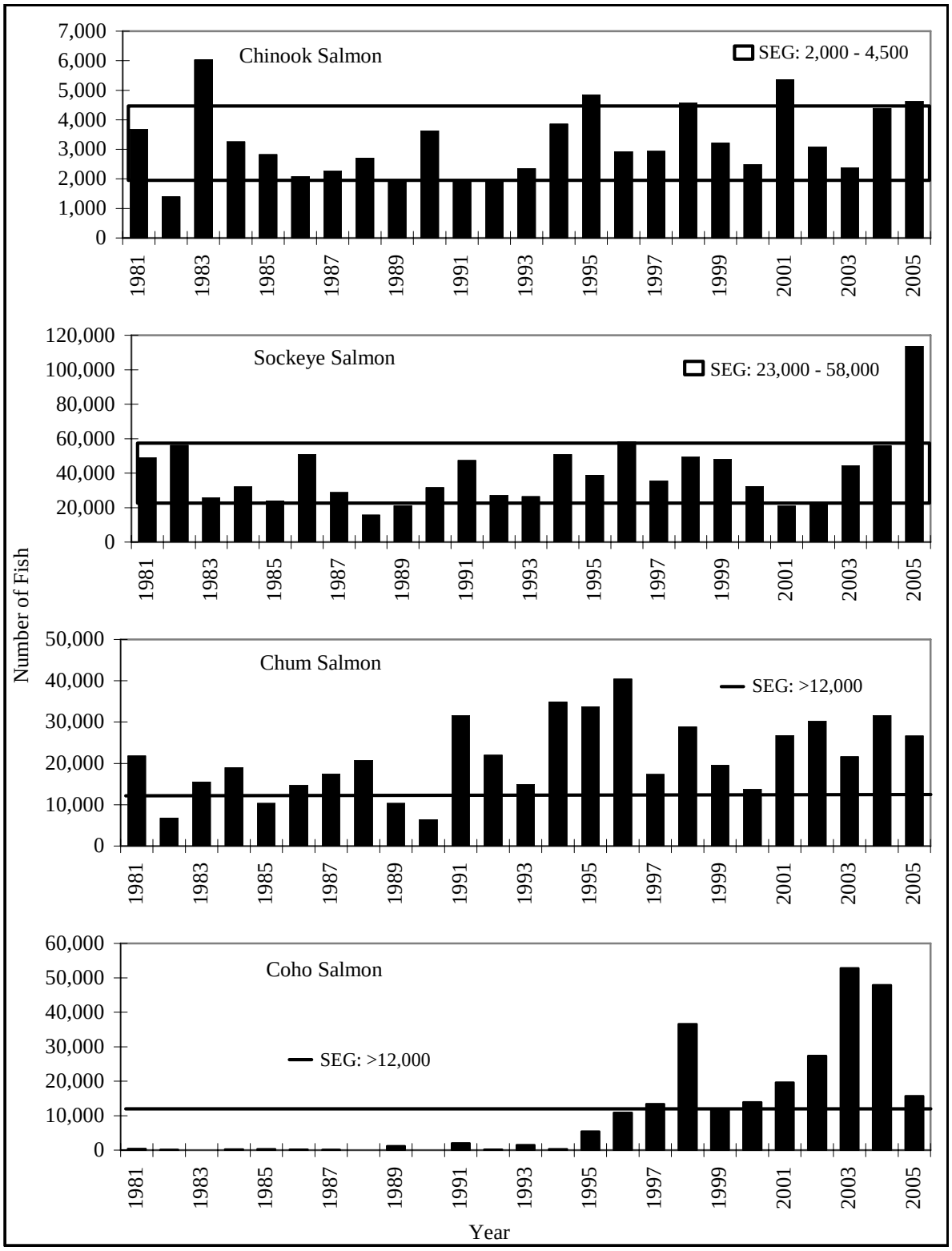


Figure 3.–Historical Chinook, sockeye, chum, and coho salmon escapement estimates, Middle Fork Goodnews River weir, 1981–2005.

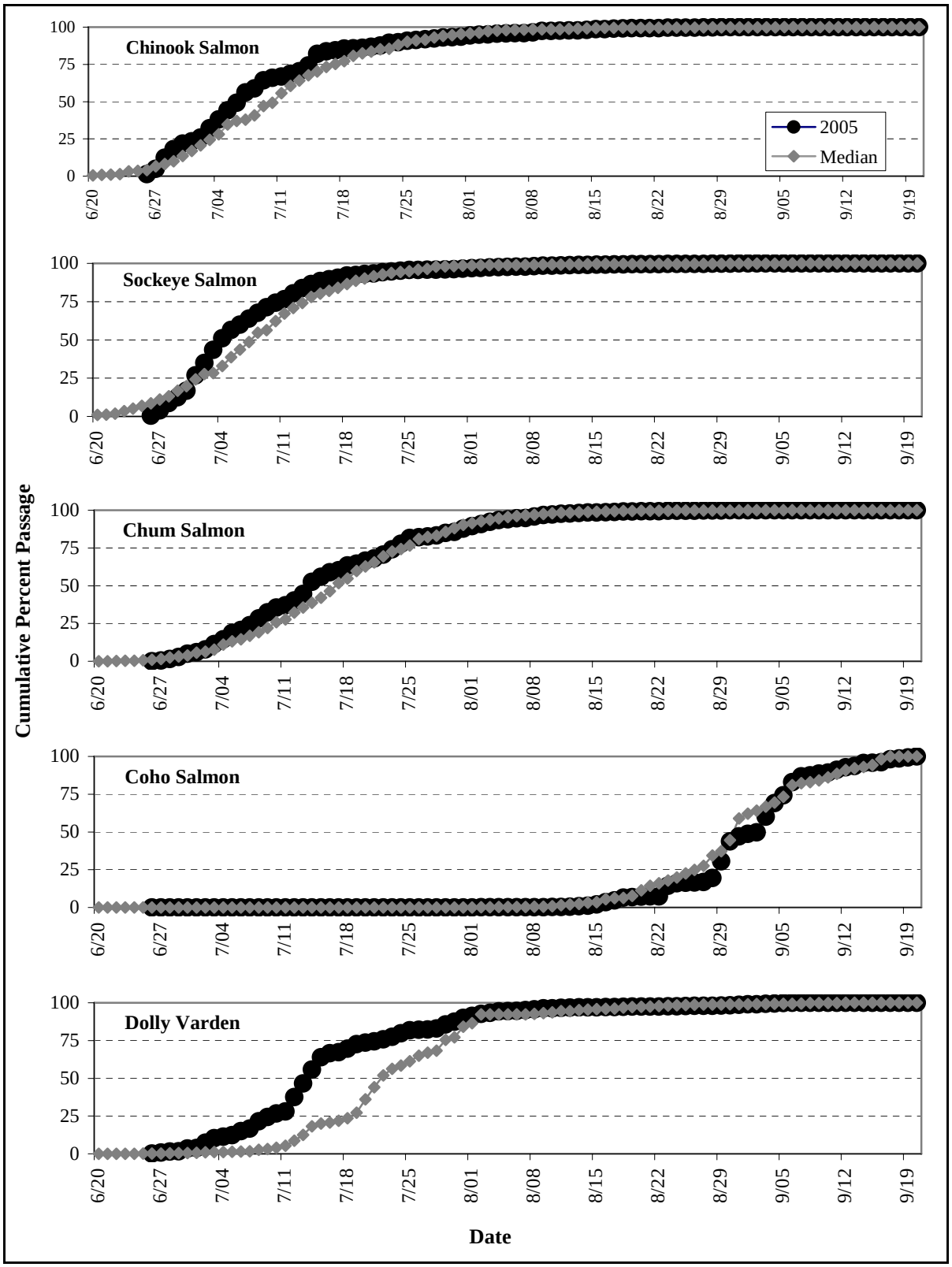


Figure 4.–Cumulative percent passage of Chinook, sockeye, chum, and coho salmon and Dolly Varden, Middle Fork Goodnews River weir, 2005 and historical median.

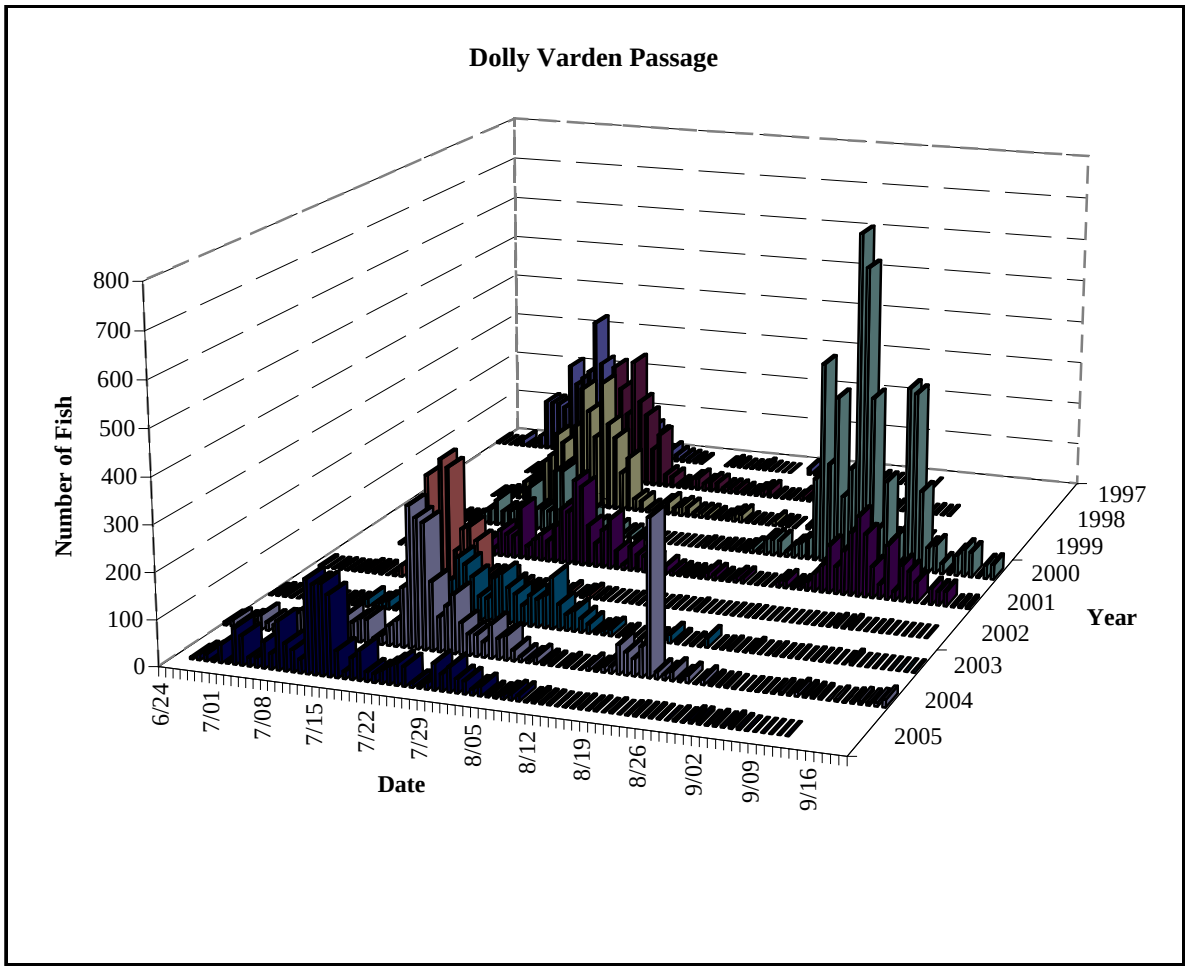


Figure 5.–Historical daily Dolly Varden passage, Middle Fork Goodnews River weir.

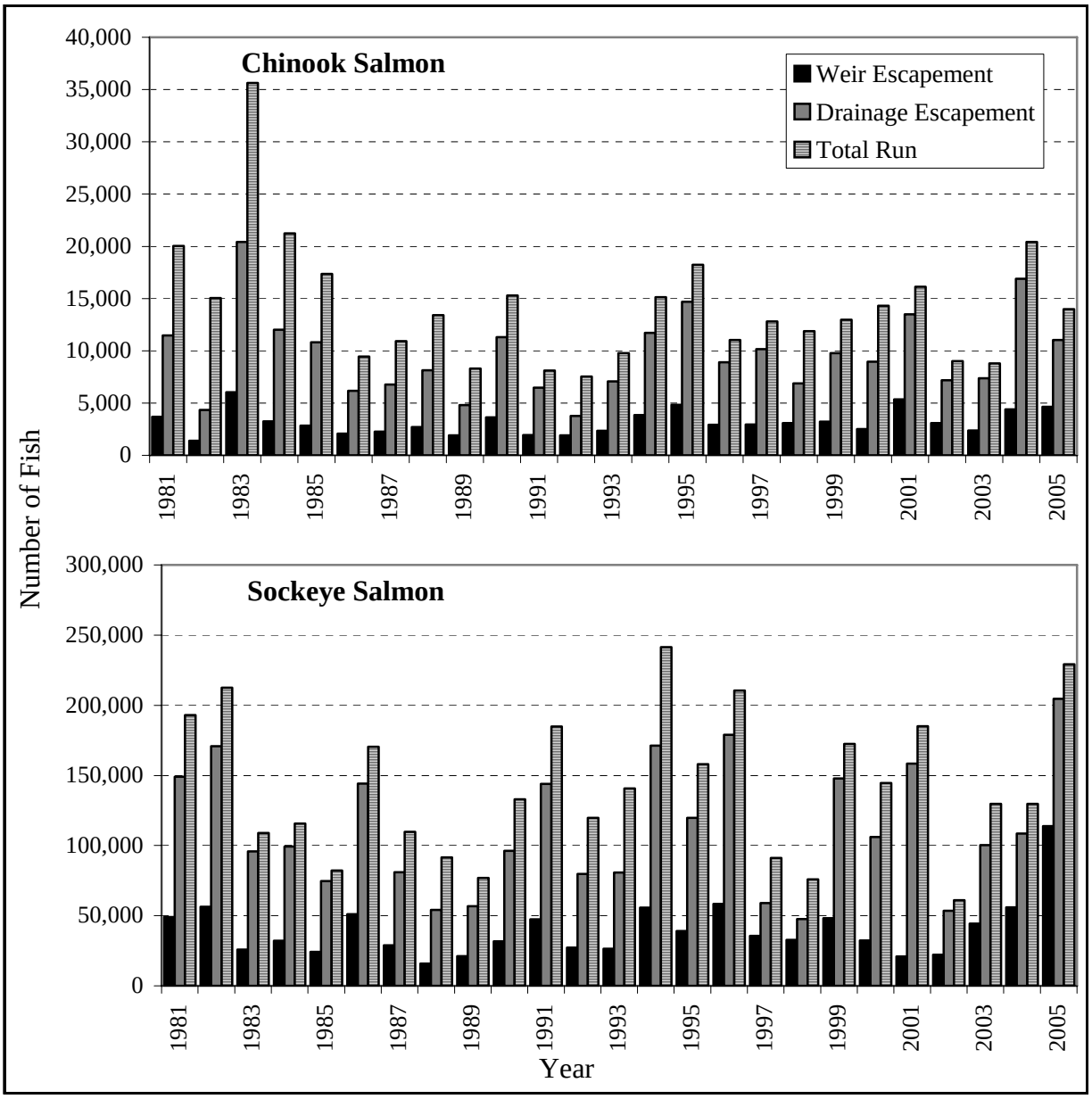
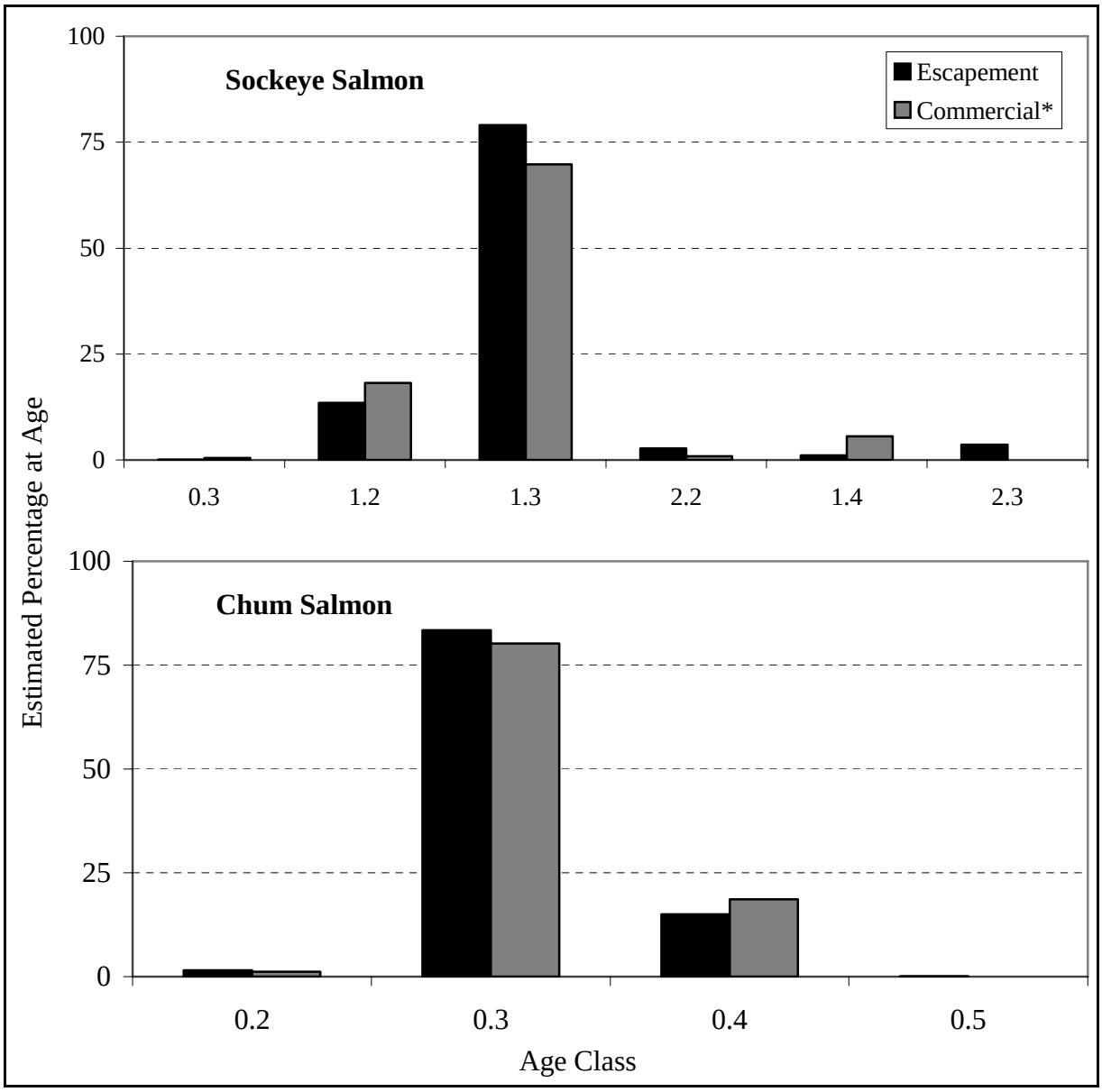
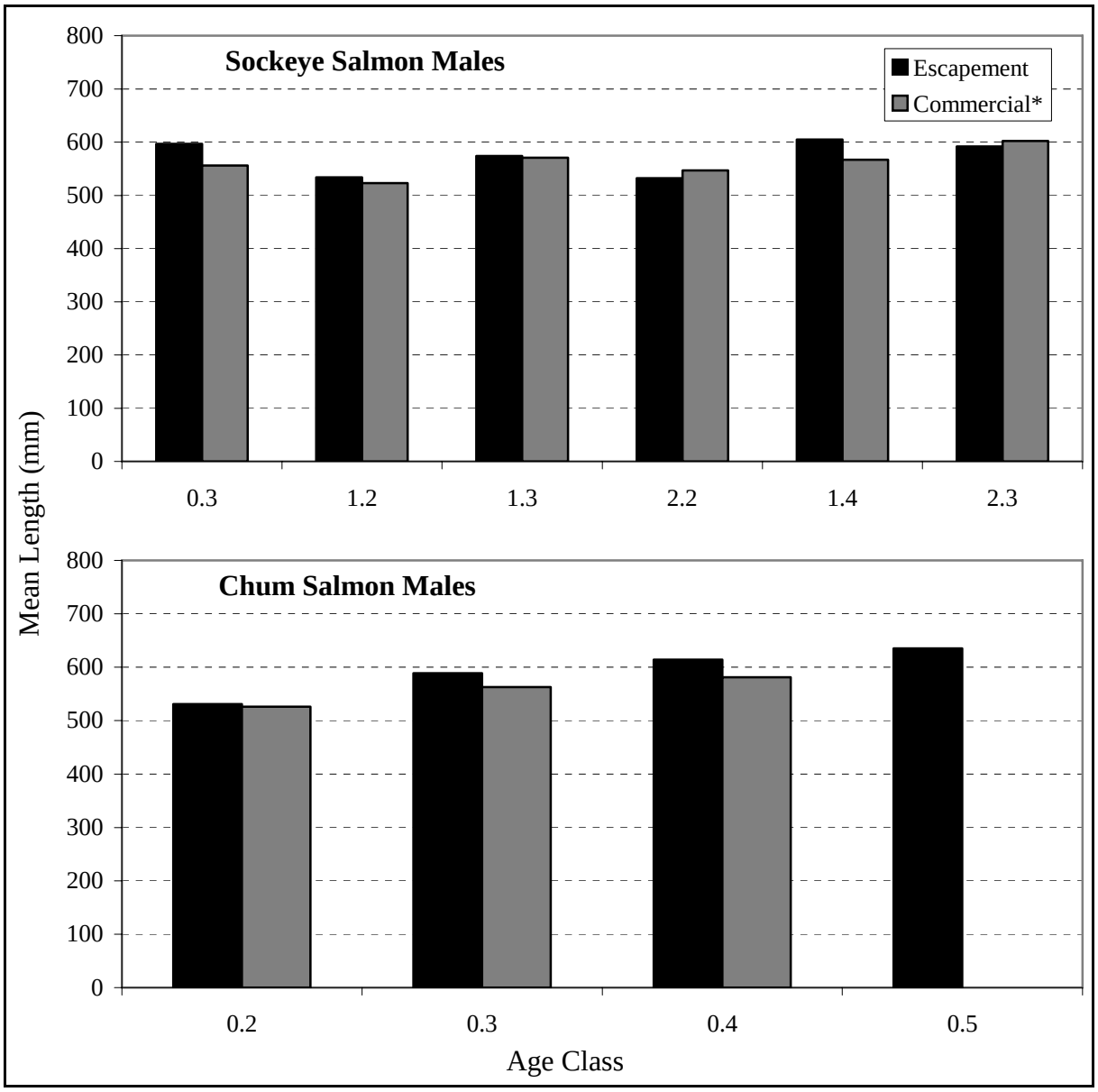


Figure 6.–Historical Chinook and sockeye salmon escapement estimates and total run, Middle Fork Goodnews River weir and Goodnews River drainage.



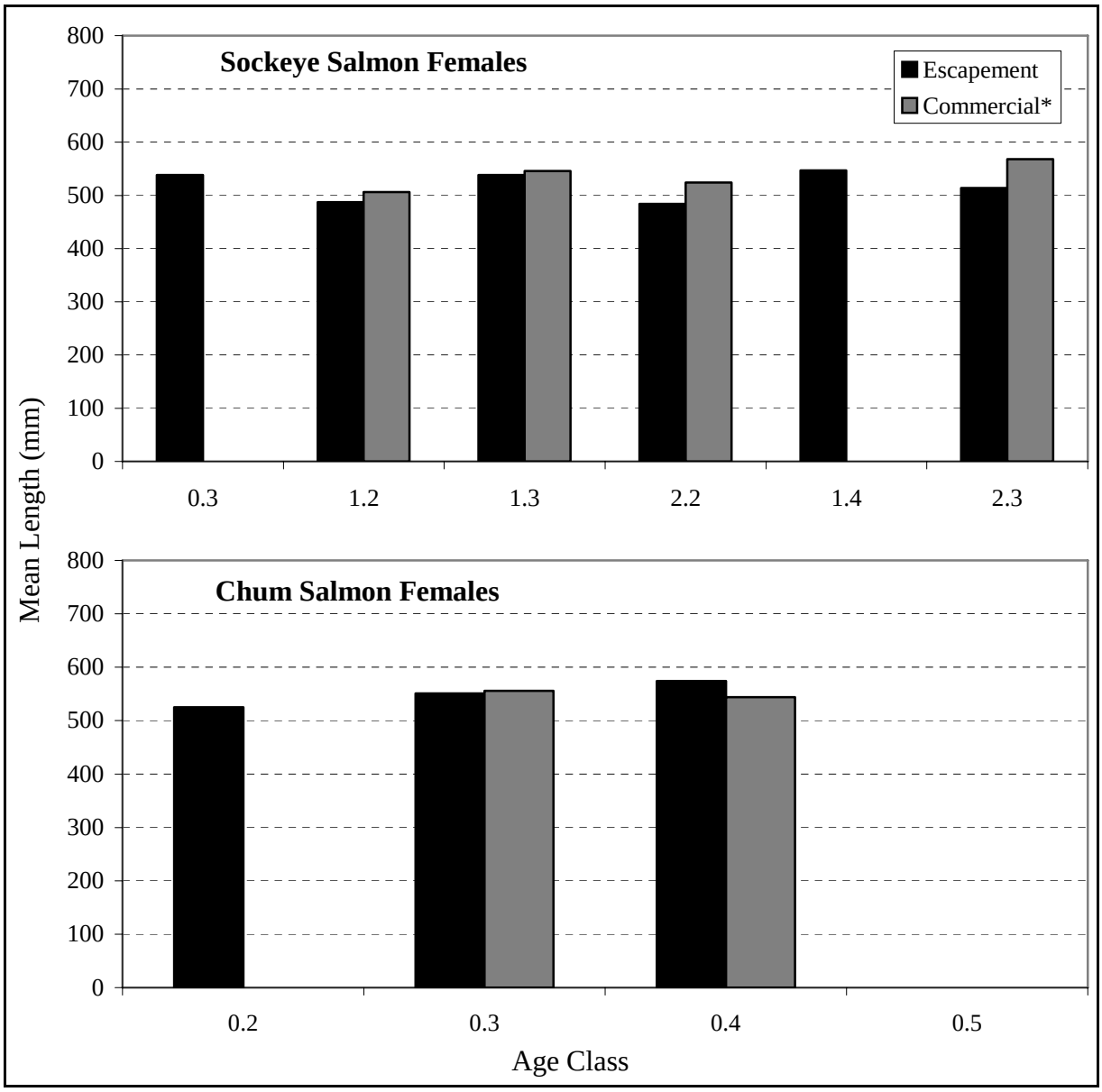
Note: Percentages do not represent total commercial catch as the number of samples collected was inadequate.

Figure 7.–Estimated age class percentages for sockeye and chum salmon from Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2005.



Note: Mean lengths do not represent total commercial catch as the number of samples collected was inadequate.

Figure 8.–Mean length by age class for male sockeye and chum salmon, Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2005.



Note: Mean lengths do not represent total commercial catch as the number of samples collected was inadequate.

Figure 9.–Mean length by age class for female sockeye and chum salmon, Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2005.

APPENDIX A. SALMON HARVESTS OF GOODNEWS BAY AREA

Appendix A1.–Historical commercial, subsistence, and sport fishing harvest of Chinook, sockeye, coho, and chum salmon, Goodnews Bay area, 1968–2005.

Year	Chinook			Sockeye			Coho			Chum		
	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
1968							5,458					
1969	3,978			6,256			11,631			5,006		
1970	7,163			7,144			6,794			12,346		
1971	477			330			1,771			301		
1972	264			924			925			1,331		
1973	3,543			2,072			5,017			15,781		
1974	3,302			9,357			21,340			8,942		
1975	2,156			9,098			17,889			5,904		
1976	4,417			5,575			9,852			10,354		
1977	3,336	574[a]		3,723			13,335			6,531		
1978	5,218			5,412			13,764			8,590		
1979	3,204	338		19,581			42,098			9,298		
1980	2,331	690		28,632			43,256			11,748		
1981	7,190	1,409		40,273			19,749			13,642		
1982	9,476	1,236		38,877			46,683			13,829		
1983	14,117	1,066	31	11,716		14	19,660		168	6,766		10
1984	8,612	629		15,474			71,176			14,340		
1985	5,793	426	323	6,698	704	75	16,498	221	386	4,784	348	124
1986	2,723	555		25,112	943	122	19,378	8[b]		10,355	191	
1987	3,357	816		27,758	955	266	29,057	43[b]		20,381	578	
1988	4,964	310		36,368	1,065		30,832	1,162		33,059	448	
1989	2,966	467	68	19,299	861	146	31,849	907	224	13,622	784	0
1990	3,303	539		35,823	1,123		7,804	1,646		13,194	332	
1991	912	917	26	39,838	1,282	63	13,312	1,828	297	15,892	149	189
1992	3,528	374	23	39,194	827	8	19,875	1,353	138	18,520	1,006	0
1993	2,117	708	81	59,293	835	53	20,014	1,226	189	10,657	188	156
1994	2,570	784	163	69,490	770	70	47,499	512	170	28,477	470	15
1995	2,922	883	41	37,351	253	34	17,875	305	114	19,832	155	0
1996	1,375	415	157	30,717	352	87	43,836	352	466	11,093	219	0
1997	2,039	449	86	31,451	397	61	2,983	397	855	11,729	133	24
1998	3,675	718	431	27,161	331	502	21,246	331	574	14,155	316	50
1999	1,888	871	223	22,910	582	561	2,474	582	789	11,562	281	47

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Year	Chinook			Sockeye			Coho			Chum		
	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
2000	4,442	703	243	37,252	517	82	15,531	517	795	7,450	364	12
2001	1,519	895	147	25,654	616	108	9,275	616	822	3,412	226	21
2002	979	857	224	6,304	297	149	3,041	297	429	3,799	407	99
2003	1,412	737	10	29,423	783	42	12,658	1,319	681	5,593	176	0
2004	2,565	851	100	20,922	805	0	23,690	1411	622	6,014	221	0
2005	2,035	[c]	[c]	23,933	[c]	[c]	11,735	[c]	[c]	2,568	[c]	[c]
10-Year Average[d]	2,282	738	166	26,915	493	163	15,261	613	615	9,464	250	25
Historical Average	3,672	717 [e]	140	23,124	715 [e]	129	20,380	832 [e]	454	11,341	350 [e]	44

Note: Commercial harvest from District W-5, combined subsistence harvest by the communities of Goodnews Bay and Platinum, and subsistence harvest estimates prior to 1988 are based on a different formula and are not comparable with estimates from 1988 to present.

[a] Subsistence harvest estimate in 1977 was for Goodnews Bay only.

[b] Subsistence harvest estimates are for the community of Platinum only.

[c] Not available at time of publication.

[d] Ten year average, 1995–2004.

[e] Historical average of subsistence harvest, 1988–2004.

APPENDIX B. GOODNEWS ESCAPEMENT

Appendix B1.–Historical escapement, Middle Fork Goodnews River escapement projects, 1981–2005.

Year	Method	Dates of Operation	Chinook	Sockeye	Chum	Pink[a]	Coho	Dolly Varden
1981	Counting Tower[b]	6/13 - 8/9	3,688	49,108	21,827	[e]	356 [d]	[e]
1982	Counting Tower[b]	6/23 - 8/3	1,395	56,255	6,767	[e]	91 [d]	[e]
1983	Counting Tower[b]	6/11 - 7/28	6,032	25,816	15,548	[e]	0 [d]	[e]
1984	Counting Tower[b]	6/15 - 7/31	3,260	32,053	19,003	[e]	249 [d]	[e]
1985	Counting Tower[b]	6/27 - 7/31	2,831	24,131	10,367	[e]	282 [d]	[e]
1986	Counting Tower[b]	6/16 - 7/24	2,080	51,069	14,764	[e]	163 [d]	[e]
1987	Counting Tower[b]	6/22 - 7/30	2,272	28,871	17,517	[e]	62 [d]	[e]
1988	Counting Tower[b]	6/23 - 7/30	2,712	15,799	20,799	[e]	6 [d]	[e]
1989	Counting Tower[b]	6/27 - 7/31	1,915	21,186	10,380	[e]	1,212 [d]	[e]
1990	Counting Tower[b]	6/20 - 7/31	3,636	31,679	6,410	[e]	0 [d]	[e]
1991	Fixed Picket Weir[c]	6/29 - 8/23	1,952	47,397	31,644	1,428	1,978 [d]	[e]
1992	Fixed Picket Weir[c]	6/21 - 8/4	1,905	27,268	22,023	22,601	150 [d]	[e]
1993	Fixed Picket Weir[c]	6/23 - 8/18	2,349	26,452	14,952	318	1,451 [d]	[e]
1994	Fixed Picket Weir[c]	6/23 - 8/9	3,856	50,801	34,849	38,705	309 [d]	[e]
1995	Fixed Picket Weir[c]	6/19 - 8/28	4,836	39,009	33,699	330	5,415 [d]	[e]
1996	Fixed Picket Weir[c]	6/19 - 8/23	2,931	58,290	40,450	20,105	10,869 [d]	1829 [d]
1997	Fixed/R. Board Weir	6/12 - 9/17	2,937	35,530	17,369	940	13,413	2,808
1998	R. Board Weir	7/4 - 9/17	4,584 [d]	49,513 [d]	28,832 [d]	10,376	36,596	2,915
1999	R. Board Weir	6/25 - 9/26	3,221	48,205	19,513	914	11,545	1,761
2000	R. Board Weir	7/2 - 8/27	2,500 [d]	32,341 [d]	13,791 [d]	0	13,907	6,616
2001	R. Board Weir	6/26 - 9/30	5,351	21,011	26,820	5,405	19,626	3,535
2002	R. Board Weir	6/25 - 9/18	3,085	22,101	30,300	0	27,364	1,770
2003	R. Board Weir	6/18 - 9/18	2,389	44,387	21,637	1,921	52,810	1,949
2004	R. Board Weir	6/21 - 9/20	4,388	55,926	31,616	21,633	47,917	3,492
2005	R. Board Weir	6/26-9/8	4,633	113,809	26,690	5,926	15,683	2,128
10-year average (1995-2004)			3,622	40,631	26,403	6,162	27,897	2,964
Historical Average			3,230	40,320	21,503	8,707	10,458	2,880

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

[b] Project located approximately 500 yards upriver from the current weir location.

[c] Fixed picket weir operated in the same location as the current weir.

[d] No counts or incomplete counts as the project was not operational during a large portion of species migration. These years not included in the historical average.

[e] Species not enumerated during project operations.

APPENDIX C. GOODNEWS AERIAL SURVEYS

Appendix C1.–Historical aerial survey counts by species, Goodnews River drainage, 1980–2005.

	North Fork Goodnews River and Lakes				Middle Fork Goodnews River and Lakes			
Year	**Chinook**	**Sockeye**	**Chum**	**Coho**	**Chinook**	**Sockeye**	**Chum**	**Coho**
1980	1,228	75,639	1,975	[a]	1,164	18,926	3,782	[a]
1981	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1982	1,990	19,160	9,700	[a]	1,546	2,327	6,300	[a]
1983	2,600	9,650	[a]	[a]	2,500	5,900	[a]	[a]
1984	3,245	9,240	17,250	43,925	1,930	12,897	9,172	[a]
1985	3,535	2,843	4,415	[a]	2,050	5,470	3,593	[a]
1986	1,068	8,960	11,850	[a]	1,249	16,990	7,645	[a]
1987	2,234	19,786	12,103	11,122	2,222	34,585	9,696	[a]
1988	637	5,820	3,846	[a]	1,024	5,831	5,814	[a]
1989	651	3,605	[a]	[a]	1,277	8,044	2,922	[a]
1990	626	27,689	[a]	[a]	[a]	[a]	[a]	[a]
1991	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1992	875	10,397	1,950	[a]	1,012	7,200	3,270	[a]
1993	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1994	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1995	3,314	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1996	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1997	3,611	12,610	[a]	[a]	1,447	19,843	[a]	[a]
1998	578	3,497	2,743	[a]	731	11,632	3,619	[a]
1999	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2000	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2001	2,799	12,383	6,945	[a]	3,561	29,340	7,330	[a]
2002	1,195	2,626	1,208	[a]	1,470	3,475	3,075	[a]
2003	2,015	27,380	3,370	[a]	1,210	21,760	2,310	[a]
2004	7,462	31,695	[a]	[a]	2,617	33,670	[a]	[a]
2005	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
SEG	640– 3,300	5,500– 19,500	[b]	[b]	[b]	[b]	[b]	[b]
10-Year Average	2,996	15,032	3,567		1,839	19,953		

[a] Survey was either not flown or not rated as acceptable.

[b] Aerial survey SEG was discontinued in 2004.

[c] Recent 10-year average from 1994–2003.

APPENDIX D. GOODNEWS TOTAL RUN AND EXPLOITATION

Appendix D1.–Historical Chinook, sockeye, chum, and coho salmon total run and exploitation rate, Goodnews River drainage, 1994–2005.

Year	Species	MFGR Tower/weir Escapement	North Fork Escapement	Subsistence Harvest	Commercial Harvest	Sport Harvest	Total Run Size	Exploitation (%)
1994	Chinook	3,856	7,866 [a]	657	2,570	175	15,124	22
	Sockeye	55,751	115,405 [a]	652	69,490	80	241,378	29
	Chum	34,849	91,653 [a]	402	28,477	34	155,415	19
1995	Chinook	4,836	9,865 [a]	552	2,922	55	18,230	19
	Sockeye	39,009	80,749 [a]	787	37,351	53	157,949	24
	Chum	33,699	88,628 [a]	329	19,832	16	142,504	14
1996	Chinook	2,930	5,977 [a]	526	1,375	213	11,021	19
	Sockeye	58,264	120,606 [a]	763	30,717	143	210,493	15
	Chum	40,450	106,384 [a]	326	11,093	18	158,271	7
1997	Chinook	2,937	7,216	449	2,039	164	12,641	20
	Sockeye	35,530	23,462	609	31,451	142	91,052	35
	Chum	17,296	45,488 [a]	133	11,729	80	74,646	16
	Coho	9,611	[b]	397	2,983	855	13,846	[b]
1998	Chinook	4,584	3,797	718	3,675	590	13,364	37
	Sockeye	47,951	14,693	508	27,161	672	90,985	31
	Chum	28,905	24,940	316	14,155	198	68,514	21
	Coho	34,441	[b]	331	21,246	574	56,592	[b]
1999	Chinook	3,221	6,565 [a]	871	1,888	414	12,959	24
	Sockeye	48,205	99,727 [a]	872	22,910	661	172,375	14
	Chum	19,533	51,361 [a]	281	11,562	425	83,162	15
	Coho	11,545	[b]	582	2,474	789	15,390	[b]
2000	Chinook	3,295	6,458 [a]	601	4,442	319	15,115	35
	Sockeye	42,197	73,845 [a]	1,028	37,252	132	154,454	25
	Chum	14,720	35,475 [a]	280	7,450	224	58,149	14
	Coho	19,676	[b]	517	15,531	795	36,519	[b]
2001	Chinook	5,404	8,128	853	1,519	285	16,189	16
	Sockeye	22,495	137,364	914	25,654	164	186,591	14
	Chum	26,829	33,902	181	3,412	130	64,454	6
	Coho	19,626	[b]	616	9,275	822	30,339	[b]

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Year	Species	MFGR Tower/weir Escapement	North Fork Escapement	Subsistence Harvest	Commercial Harvest	Sport Harvest	Total Run Size	Exploitation (%)
2002	Chinook	3,076	4,096	857	979	429	9,437	24
	Sockeye	21,127	31,476	1,050	6,304	80	60,037	12
	Chum	29,905	110,215	407	3,799	0	144,326	3
	Coho	27,364	[b]	297	3,041	149	30,851	[b]
2003	Chinook	2,389	4,985	649	1,412	681	10,116	27
	Sockeye	44,387	55,877	672	29,423	0	130,359	23
	Chum	21,637	33,039	126	5,593	59	60,454	10
	Coho	52,810	[b]	1,110	12,658	42	66,620	[b] [b]
2004	Chinook	4,388	12,512	851	2,565	100	20,416 [d]	17
	Sockeye	55,926	52,646	221	20,922	0	129,715 [d]	17
	Chum	31,616	[b]	805	6,014	0	[b]	[b]
	Coho	47,916	[b]	1,411	23,690	622	[b]	[b]
2005	Chinook	4,633	6,399	[c]	2,035 [c]		13,971	21
	Sockeye	113,809	90,835	[c]	23,933 [c]		229,233	11
	Chum	26,690	[b]	[c]	2,568 [c]		[b]	[b]
	Coho	15,683	[b]	[c]	11,735 [c]		[b]	[b]

[a] Average Middle Fork/Goodnews River escapement estimate ratio for 1983–1989 used to estimate Goodnews River escapement in years when no aerial survey of the Goodnews River was flown.

[b] No estimate was made for this species.

[c] Unavailable at the time of publication.

[d] Because official estimates were not available at the time of publication, the recent 10-year averages (1995-2004) of Goodnews Bay area subsistence and Goodnews River sport fishing harvest were used for generating total run size estimates in 2005.