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Goodnews River Salmon Monitoring and Assessment, 2004

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

by

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July 2005

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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The Division of Sport Fish Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Since 2004, the Division of Commercial Fisheries has also used the Fishery Data Series. Fishery Data Series reports are intended for fishery and other technical professionals. Fishery Data Series reports are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm This publication has undergone editorial and peer review.

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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 2004. A total of 4,388 Chinook *Oncorhynchus tshawytscha*, 55,926 sockeye *O. nerka*, 31,616 chum *O. keta*, 21,633 pink *O. gorbuscha*, 47,917 coho salmon *O. kisutch*, and 4,077 Dolly Varden were observed passing the weir from 21 June through 20 September. Chinook, sockeye, chum, and coho salmon sustainable escapement goals were achieved or exceeded in 2004; and escapements for these species were above 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 45.6% male and 71.0% age 1.3 fish. The chum salmon run was 48.3% male and 59.2% age 0.3 fish. The coho salmon run was 44.2 % male and 84.5% age 2.1 fish. Age, sex, and length estimates were not made for Chinook salmon because of insufficient samples.

Weir escapement, aerial survey, and commercial harvest data were combined to estimate run abundances for the Goodnews River drainage. When compared with returns over the last 10 years the 2004 return was above average for Chinook salmon and just below average for sockeye salmon. Coho and chum salmon run abundance was not estimated but commercial catch data from District W-5 and a high weir escapement suggest an above average return.

Key words: Goodnews River, Kuskokwim Area, Kuskokwim Bay, resistance-board weir, escapement monitoring, Chinook salmon, sockeye salmon, chum salmon, pink salmon, coho salmon, Dolly Varden, *Oncorhynchus tshawytscha, Oncorhynchus nerka, Oncorhynchus keta, Oncorhynchus gorbuscha, Oncorhynchus kisutch, 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 an adult salmon weir 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 Goodnews River (north fork) 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 most commonly taken 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 made 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 731 Chinook, 523 coho, 490

sockeye, and 275 chum salmon. Dolly Varden *Salvelinus malma* and Arctic Char *Salvelinus alpinus* are also harvested for subsistence use in the Goodnews Bay area although harvest estimates have not been well quantified (Wolfe et al. 1984). In 2003, 80 households fished for subsistence use in the villages of Goodnews Bay and Platinum, exceeding the 34 permit holders participating in the local commercial fishery (Whitmore et al. *In prep*).

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. Historical average commercial salmon harvests in District W-5 are 3,751 Chinook, 23,187 sockeye, 19,873 coho, and 11,494 chum salmon. The average harvests for these species from 1994 through 2003 are 2,282 Chinook, 31,771 sockeye, 17,642 coho, and 11,710 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.

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 1994 through 2003, average sport fishing harvests included 173 Chinook, 170 sockeye, 27 chum, and 570 coho salmon (Appendix A1).

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 1990's.

In the mid 1990's 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 beneath heavy water flow. The resistance-board weir has allowed the project to remain operational during higher water levels than the fixed-picket weir, and regain operation quickly after a flood event.

Extended operation of the weir has also allowed biologists to monitor the migration of smaller Dolly Varden, believed to be a pre-spawning population over wintering in the drainage (Lisac 2002). 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 2002; 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 2004).

Salmon escapement objectives for the Middle Fork counting tower were initially established in 1984 as ranges set at 3,000 to 4,000 Chinook, 35,000 to 45,000 sockeye, and 13,000 to 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 to 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 during the 2004 season. The revised SEGs are 2,000 to 4,500 Chinook salmon, greater than 12,000 chum salmon, and 23,000 to 58,000 sockeye salmon. An SEG threshold was also established for coho salmon at greater than 12,000.

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 taken as 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 pre-flight 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 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 to 3,300 Chinook salmon and 5,500 to 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 Goodnews River (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 (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 bank, 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. Record atmospheric and hydrologic conditions at the weir site.
8. Record carcasses washed up on 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 box used to collect fish for ASL sampling was installed directly upstream of the right bank passage chute. 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 Diesinger (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 aerial surveys are focused on the main river channel and larger tributaries while sockeye aerial surveys are focused on the main river channel, larger tributaries and lakes, and larger lake tributaries. 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. 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 21 June to 20 September 2004. Passage counts occurred regularly throughout the day, typically for 1–2 h periods, beginning in the morning and continuing as late as 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.

Weir escapement was 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. 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

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

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),

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

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

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

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 proportion of fish observed during the Middle Fork and North Fork aerial surveys to the weir escapement. The drainage escapement estimates account for the number of fish counted past the weir after the aerial survey date and was calculated using the following formula:

$$N_d = \left(\frac{\left(n_{a_{nf}} \times n_{w_2}\right)}{n_{a_{mf}}} \right) + n_{w_2}, \tag{3}$$

where:

N_d = total drainage escapement estimate,

$n_{a_{nf}}$ = aerial survey count from the Goodnews River (north fork),

$n_{a_{mf}}$ = 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). Intensive

sampling was conducted for 1 to 3 days followed by a few days without sampling. The goal for each pulse was to collect samples from 210 Chinook, 210 sockeye, and 200 chum 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.

The coho salmon sample design was modified from previous years to account for stability in ASL compositions through the duration of the coho salmon run. Pulse sample goals were replaced with a total run sample goal of 170 fish in 2003. The total run sample goal was divided between 3 pulse samples, each representing a third of the run.

Salmon were sampled from the 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 mid eye 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). 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, each representing a third of the total harvest. The goal for each pulse was to collect samples from 70 Chinook, 70 sockeye, 70 chum, and 70 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. 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 mid eye to tail fork. After sampling was completed, 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 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 24h; 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 2004. At the time of publication, 2004 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 2,565 Chinook, 20,922 sockeye, 6,014 chum, and 23,690 coho salmon (Table 1). No pink salmon were

commercially harvested in 2004. Exvessel value by species was $10,857 for Chinook, $50,873 for sockeye, $4,244 for chum, and $69,272 for coho salmon for a total exvessel value of $135,246. Sport fish harvest estimates for Goodnews River in 2004 have not yet been determined.

PROJECT OPERATIONS

The weir was operational from 21 June to 20 September 2004. Counts of salmon were made each day during that period. Breaches in the weir caused by dislodged weir or trap panels occurred for 5 h on 26 June, 10 h on 7 July, 2 h on 10 July, 10 h on 16 July, 2 h on 17 July, and 6 h on 22 July. Counts may or may not have been concurrent with these breach events depending on the location of the breach and time of day each breach occurred.

WEIR ESCAPEMENT

The 2004 Middle Fork Goodnews River Chinook salmon escapement was estimated to be 4,388 fish (Table 2). A total of 4,244 Chinook salmon were observed passing upstream through the weir and 144 fish (3.3%) were estimated to have passed upstream during the breach events. Chinook salmon escapement was within, and near the SEG range of 2,000–4,500 fish (Table 3). The first Chinook salmon was observed on 21 June, the first day of operation, and the last Chinook salmon was observed on 17 September. Based on the operational period and inclusive of estimated passage, the median passage date was 10 July and the central 50% of the run occurred between 1 July and 18 July (Table 4).

The 2004 Middle Fork Goodnews River sockeye salmon escapement was estimated to be 55,926 fish (Table 2). A total of 53,532 sockeye salmon were observed passing upstream through the weir and 2,394 fish (4.3%) were estimated to have passed upstream during the breach events. Sockeye salmon escapement was within and at the upper end of the SEG range of 23,000–58,000 fish (Table 3). The first sockeye salmon was observed on 21 June, the first day of operation, and the last sockeye salmon was observed on 19 September. Based on the operational period and inclusive of estimated passage, the median passage date was 6 July and the central 50% of the run occurred between 1 July and 12 July (Table 4).

The 2004 Middle Fork Goodnews River chum salmon escapement was estimated to be 31,616 fish (Table 2). A total of 30,422 chum salmon were observed passing upstream through the weir and 1,194 fish (3.8%) were estimated to have passed upstream during the breach events. Chum salmon escapement exceeded the SEG threshold of 12,000 fish (Table 3). The first chum salmon was observed on 22 June, the second day of operation, and the last chum salmon was observed on 19 September. Based on the operational period and inclusive of estimated passage, the median passage date was 16 July and the central 50% of the run occurred between 9 July and 25 July (Table 4).

The 2004 Middle Fork Goodnews River coho salmon escapement was estimated to be 47,916 fish during the period of weir operations (Table 2). No estimates were made for coho salmon in 2004 because coho salmon passage during the days a breach occurred in the weir was considered negligible. Coho salmon escapement exceeded the SEG threshold of 12,000 fish (Table 3). The first coho salmon was observed on 17 July and the last coho salmon was observed on 20 September. Coho salmon were observed migrating upstream when the weir was dismantled on 21 September. Based on the operational period, the median passage date was 8 September and the central 50% of the run occurred between 30 August and 12 September (Table 4).

The 2004 Middle Fork Goodnews River total pink salmon count was 21,633 fish (Table 5). No escapement estimate was made for pink salmon in 2004 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 23 June and the last pink salmon was observed on 20 September.

The 2004 Middle Fork Goodnews River total count of Dolly Varden was 3,492 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 22 July and the central 50% of the run occurred between 19 July and 2 August (Table 4).

Whitefish and rainbow trout were also counted passing the weir in 2004. A total of 384 whitefish and 35 rainbow trout were observed passing upstream through the weir during project operations (Table 5). No passage estimates were made for whitefish and rainbow trout in 2004 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 178 Chinook, 445 sockeye, 5,543 chum, 3,802 pink, and 78 coho salmon carcasses were counted during project operations. Additionally, 17 Dolly Varden and one Arctic Grayling carcasses were counted.

AERIAL SURVEYS

Aerial surveys of the Goodnews River drainage were conducted on 31 July 2004. Surveys were flown with a Husky A-1B aircraft and both surveys were rated as good (1) with excellent survey conditions. A total of 7,462 Chinook and 31,695 sockeye salmon were counted in the North Fork drainage and a total of 2,617 Chinook and 33,670 sockeye salmon were counted in the Middle Fork drainage (Table 3). Chinook and sockeye salmon aerial survey results in the North Fork exceeded the upper end of their respective SEG ranges. No chum or coho salmon aerial surveys were conducted in 2004.

DRAINAGE ESCAPEMENT

Goodnews River drainage escapement was estimated for Chinook and sockeye salmon in 2004. In the North Fork, Chinook salmon escapement was estimated to be 12,512 fish and sockeye salmon escapement was estimated to be 52,646 fish (Table 3). Escapement to the Goodnews River drainage was estimated to be 16,901 for Chinook salmon and 108,572 for sockeye salmon. The resulting exploitation rate was 17% for Chinook salmon and 16.6% for sockeye salmon (Table 3).

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Middle Fork Goodnews River Escapement

Scale samples, sex, and length were collected from 208 Chinook salmon at the weir in 2004. Samples were collected from 3 pulses ranging in size from 33 to 122 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 173 of the 208 fish sampled (Table 7). Escapement was partitioned into 3 temporal strata based on sample dates. Age composition of

the samples included 7 age-1.1 fish, 90 age-1.2 fish, 41 age-1.3 fish, and 35 age-1.4 fish. There were no age-1.5 fish in the sample. Sex composition of the samples included 121 males and 52 females. Overall, male lengths ranged from 360 to 1,080 mm and female lengths ranged from 535 to 995 mm (Table 8).

Scale samples, sex, and length were collected from 1,042 sockeye salmon at the weir in 2004. Samples were collected from 5 pulses ranging in size from 162 to 250 fish per pulse. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of weir escapement. Age was determined for 806 of the 1,042 fish sampled (77.4%). Escapement was partitioned into 5 temporal strata based on sample dates. Applied to escapement, age-1.3 sockeye salmon was the most abundant age class (56.2%), followed by age 1.2 (31.4%), age 1.4 (5.7%), age 2.2 (2.8%), age 2.3 (2.5%), and age 0.3 (1.4%) (Table 9). Sex composition of escapement was estimated to include 25,511 males (45.6%) and 30,415 females (54.4%). Mean male length by age class was 576 mm for age-0.3 fish, 519 mm for age-1.2 fish, 588 mm for age-1.3 fish, 535 mm for age-2.2 fish, 613 mm for age-1.4 fish, and 583 mm for age-2.3 fish (Table 10). Mean female length by age class was 558 mm for age-0.3 fish, 493 mm for age-1.2 fish, 548 mm for age-1.3 fish, 498 mm for age-2.2 fish, 568 mm for age-1.4 fish, and 549 mm for age-2.3 fish. Overall, male lengths ranged from 410 to 685 mm and female lengths ranged from 400 to 595 mm.

Scale samples, sex, and length were collected from 1,311 chum salmon at the weir in 2004. Samples were collected from 7 pulses ranging in size from 109 to 201 fish per pulse. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of weir escapement. Age was determined for 1,220 of the 1,311 fish sampled (93.1%). Escapement was partitioned into 7 temporal strata based on sample dates. Applied to escapement, age-0.3 chum salmon was the most abundant age class (59.2%), followed by age 0.4 (36.5%), age 0.2 (4.1%) and age 0.5 (0.1%) (Table 11). Sex composition of escapement was estimated to include 15,286 males (48.3%) and 16,330 females (51.7%). Mean male length by age class was 570 mm for age-0.2 fish, 596 mm for age-0.3 fish, and 613 mm for age-0.4 fish (Table 12). The one male age-0.5 fish in the sample had a length of 580 mm. Mean female length by age class was 534 mm for age-0.2 fish, 559 mm for age-0.3 fish, and 569 mm for age-0.4 fish. No female age-0.5 fish were in the sample. Overall, male lengths ranged from 490 to 695 mm and female lengths ranged from 340 to 690 mm.

Scale samples, sex, and length were collected from 238 coho salmon at the weir in 2004. Samples were collected from 4 pulses ranging in size from 25 to 72 fish per pulse. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of weir escapement. Age was determined for 197 of the 238 fish sampled (82.7%). Escapement was partitioned into 4 temporal strata based on sample dates. Applied to escapement, age-2.1 coho salmon was the most abundant age class (84.5%), followed by age 1.1 (12.2%), and age 3.1 (3.4%) (Table 13). Sex composition was estimated at 21,178 males (44.2%) and 26,738 females (55.8%). Mean male length by age class was 564 mm for age-1.1 fish and 568 mm for age-2.1 fish (Table 14). There were no age-3.1 male fish in the sample. Mean female length by age class was 582 mm for age-1.1 fish, 593 mm for age-2.1 fish, and 588 mm for age-3.1 fish. Overall, male lengths ranged from 400 to 660 mm and female lengths ranged from 460 to 660 mm.

District W-5 Commercial Harvest

Scale samples, sex, and length were collected from 138 Chinook salmon harvested in the 2004 District W-5 commercial fishery. Samples were collected from 2 pulses ranging in size from 68 to 70 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 129 of the 138 fish sampled (Table 15). Commercial harvest was partitioned into 2 temporal strata based on sample dates. Age composition included 67 age-1.2 fish, 35 age-1.3 fish, 21 age-1.4 fish, and 6 age-1.5 fish. There were no age-1.1 fish in the sample. Sex composition included 110 males and 19 females. Overall, male lengths ranged from 481 to 908 mm and female lengths ranged from 717 to 905 mm (Table 16).

Scale samples, sex, and length were collected from 220 sockeye salmon harvested in the 2004 District W-5 commercial fishery. Samples were collected from 3 pulses ranging in size from 70 to 80 fish per pulse. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of District W-5 commercial harvest. Age was determined for 182 of the 220 fish sampled (82.7%). The harvest was partitioned into 3 temporal strata based on sample dates. Applied to total harvest, age-1.3 sockeye salmon was the most abundant age class (62.6%), followed by age 1.2 (21.1%), age 2.3 (7.9%), and age 1.4 (1.7%) (Table 17). Sex composition was estimated to include 14,692 males (70.2%) and 6,230 females (29.8%). Mean male length by age class was 524 mm for age-1.2 fish, 566 mm for age-1.3 fish, 600 mm for age-1.4 fish, and 562 mm for age-2.3 fish (Table 18). Mean female length by age class was 478 mm for age-1.2 fish, 540 mm for age-1.3 fish, and 563 mm for age-2.3 fish. There were no age-1.4 female fish in the sample. Overall, male lengths ranged from 470 to 630 mm and female lengths ranged from 445 to 573 mm.

Scale samples, sex, and length were collected from 85 chum salmon harvested in the 2004 District W-5 commercial fishery. Samples were collected from 2 pulses ranging in size from 15 to 70 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 76 of the 85 fish sampled (Table 19). Commercial harvest was partitioned into 2 temporal strata based on sample dates. Age composition included 2 age-0.2 fish, 43 age-0.3 fish, and 31 age-0.4 fish. There were no age-0.5 fish in the sample. Sex composition included 50 males and 26 females. Overall, male lengths ranged from 530 to 643 mm and female lengths ranged from 510 to 600 mm (Table 20).

Scale samples, sex, and length were collected from 210 coho salmon harvested in the 2004 District W-5 commercial fishery. Samples were collected from 3 pulses of 70 fish each. The samples achieved the minimum sample objectives and were adequate for estimating ASL composition of District W-5 commercial harvest. Age was determined for 163 of the 210 fish sampled (77.6%). The harvest was partitioned into 3 temporal strata based on sample dates. Applied to total harvest, age-2.1 coho salmon was the most abundant age class (84.2%), followed by age 1.1 (12.5%), and age 3.1 (3.3%) (Table 21). Sex composition was estimated at 14,470 males (61.1%) and 9,220 females (38.9%). Mean male length by age class was 569 mm for age-1.1 fish, 582 mm for age-2.1 fish, and 572 mm for age-3.1 fish (Table 22). Mean female length by age class was 602 mm for age-1.1 fish and 591 mm for age-2.1 fish. There was one female age-3.1 fish in the sample with a length of 648 mm. Overall, male lengths ranged from 466 to 681 mm and female lengths ranged from 526 to 657 mm.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrological observations were recorded daily from 17 June through 20 September (Table 23). Air temperatures ranged from 5 to 25˚ C. Water temperature was more consistent ranging from 8 to 18˚ C. Several rain events resulted in daily accumulations from trace amounts up to 13.4 mm in a 24 h period. Water level ranged from 0 to 38 cm.

DISCUSSION

PROJECT OPERATIONS

Operation of the weir in 2004 was successful and nearly complete enumeration of Chinook, sockeye, and chum salmon escapement, and Dolly Varden migration past the weir occurred. The majority of project objectives were achieved with the exception of Chinook salmon escapement and commercial ASL estimates and chum salmon commercial ASL estimates. The project continues to add to the long-term escapement, run timing, and ASL database for salmon at the weir and serves as a platform for the study of other anadromous and resident freshwater species.

The Kuskokwim River experienced one of the lowest water levels in 50 years and water levels throughout the Kuskokwim area, including Goodnews River, were well below average. Below average water levels throughout the season contributed towards uninterrupted weir operations in 2004 and did not appear to hamper fish passage through the weir. Additionally, low water levels contributed to successful aerial surveys in 2004 through increased water clarity, increased visibility through the water column, and by concentrating spawning fish into smaller areas because of a reduction of the river channel size. However, these conditions may have had a negative impact on fish populations. Increased water temperatures, overcrowded spawning areas, and dried up spawning beds may have reduced stream life (the temporal period fish reside in the river), spawning success, and egg survival.

Achieving the Chinook salmon 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 2004, 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 other alternatives such as beach seine sampling may be employed as well.

Achieving the District W-5 commercial ASL sample objectives has also proved problematic. The commercial catch is tendered from Goodnews Bay to Quinhagak and does not arrive until the day following each commercial opening. ADF&G staff travel from Bethel to Quinhagak to collect commercial ASL samples and are subject to the inconsistencies and delays associated with air travel to remote villages. Additionally, the tender's arrival at the Quinhagak dock is dependent upon tidal cycles at the mouth of the Kanektok River and it is difficult to coordinate sample crew travel with tender arrival in Quinhagak. These factors combined have resulted in

several missed sampling periods because of travel delays and the catch being processed before sampling could occur when the tender arrived at the dock and offloaded the catch earlier than anticipated. In an effort to achieve commercial ASL sample objectives, ADF&G has partnered with the processing plant operator, Coastal Villages Region Fund (CVRF). ADF&G staff will train and coordinate with a CVRF sampling crew living in Quinhagak to collect commercial ASL samples. Having the samplers based in Quinhagak should alleviate the sample crew travel and timing issues experienced in previous years.

ESCAPEMENT MONITORING AND ESTIMATES

Chinook Salmon

The 2004 Chinook salmon weir escapement of 4,388 fish was the fifth highest escapement since 1981 (Figure 3, Appendix B1). Chinook salmon escapement was 2.5% below the upper end of the SEG range and was 18.7% higher than the recent 10-year average from 1994 through 2003. 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.

The Middle Fork Goodnews River Chinook salmon aerial survey count of 2,617 fish was the second highest aerial survey count on record and was 26.5% below the high count of 3,561 fish in 2001 (Appendix C1). The North Fork Chinook salmon aerial survey count of 7,462 fish was the highest aerial survey count on record and was 51.6% higher then the next highest count of 3,611 fish in 1997. It should be noted that aerial survey conditions were ideal and fish visibility was optimal because of water clarity, extreme low water, and near perfect weather conditions on the day of the survey. It is possible that these conditions inflated the survey counts compared to historical surveys flown under less optimal conditions. Lastly, the North Fork aerial survey count was 64.9% higher than the Middle Fork count indicating the majority of Goodnews River drainage Chinook salmon return to the North Fork; however, in some years Middle Fork counts exceeded North Fork counts indicating the proportions of Chinook salmon between these drainages may vary between years.

Sockeye Salmon

The 2004 sockeye salmon weir escapement of 55,926 fish was the third highest escapement since 1981 (Figure 3, Appendix B1). Sockeye salmon escapement was 3.5% below the upper end of the SEG range and was 28.3% higher than the recent 10-year average of sockeye salmon escapement from 1994 through 2003. The general trend of sockeye salmon escapement into the Middle Fork Goodnews River since 1981 indicate fluctuations of abundance and a higher relative abundance the last 2 years. Similar to Chinook salmon, these trends may be affected by the 1991 change in methodology from counting tower to weir based escapement estimates. The counting tower was replaced with a fixed weir in part to address difficulties with species apportionment (Menard 1999). Given the overlap in run timing between sockeye and chum salmon and their similar appearance prior to spawning induced dimorphism, difficulties in differentiating between these two species may have caused inaccuracies in the sockeye and chum salmon escapement estimates prior to 1991.

The Middle Fork Goodnews River sockeye salmon aerial survey count of 33,670 fish was the second highest aerial survey count on record and was 2.6% below the high count of 34,585 fish

in 1987 (Appendix C1). The North Fork sockeye salmon aerial survey count of 31,695 fish was also the second highest aerial survey count on record and was 58.1% lower than the high count of 75,639 fish in 1980. Similar to Chinook salmon, aerial survey conditions were optimal and it is possible that survey counts were inflated compared to historical surveys flown under less optimal conditions. Additionally, a large number of sockeye salmon counted in the lake index areas in 2004 were observed in feeder tributaries at the east end of Goodnews Lake and Middle Fork Lake. It is unclear whether these lake tributaries are surveyed on a consistent basis. These factors combined may have inflated the aerial survey count compared to historical aerial survey results. Lastly, the North Fork aerial survey count was 5.8% lower than the Middle Fork count indicating a small majority of Goodnews River drainage sockeye salmon return to the Middle Fork; however, in some years the North Fork counts exceeded Middle Fork counts indicating the proportions of sockeye salmon between the drainages may vary between years.

Chum Salmon

The 2004 chum salmon weir escapement of 31,616 fish was the fourth highest escapement since 1981 (Figure 3, Appendix B1). Chum salmon escapement was 62% over the SEG threshold and was 15.5% higher than the recent 10-year average from 1994 through 2003. 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 again should be noted that the 1991 change in methodology from counting tower to weir based escapement estimates may have caused inaccuracies in the sockeye and chum salmon escapement estimates prior to 1991.

Aerial surveys are not an effective method for determining chum salmon escapement indices because chum salmon run timing and spawning behavior is protracted. By extension, aerial surveys may not be an accurate method for determining chum salmon drainage escapement in Goodnews River unless multiple surveys could be conducted throughout the chum salmon run. Currently, funding and personnel shortages preclude this from occurring, but a more accurate method for estimating chum salmon escapement to the Goodnews River drainage should be considered.

Coho Salmon

The 2004 coho salmon weir escapement of 47,917 fish was the second highest escapement since the project was extended to count coho salmon in 1997 (Figure 3, Appendix B1). Weir escapement in 2004 was 9.2% lower than the high escapement of 52,810 coho salmon in 2003 and 47.7% higher than the historical average from 1997 through 2003. Coho salmon aerial surveys were not conducted in 2004 because of poor weather conditions in late September. There is anecdotal evidence that coho salmon migration within Middle Fork Goodnews River may have been delayed because of prolonged low water conditions throughout August and September. 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 dropping throughout much of August and September, which may have reduced the pulses in migration that coho salmon typically exhibit and delayed overall run timing. Coho salmon run timing in 2004 was delayed by approximately 1 week compared to the historical median (Figure 4, Table 4). Additionally, approximately 2,000 and 4,000 coho salmon were counted through the weir in the 2 days prior to the end of project operations on 20 September. Large numbers of coho salmon were observed downstream of the weir prior to the end of project operations and crew members

observed large numbers of coho salmon migrating past the weir site for several days while dismantling the weir. The weir escapement estimate reported here should be viewed as an index of coho salmon escapement past the weir in 2004 as the actual escapement past the weir would have been higher.

Dolly Varden

Complete Dolly Varden counts at the Middle Fork Goodnews River weir date back to 1997 (Appendix B1). The 2004 Dolly Varden count of 3,492 fish was the third highest since 1997 and was 47.2% below the high count of 6,616 in 2000. Dolly Varden passage in 2004 exhibited a bimodal separation between passage in July and August (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. The bimodal separation in 2000 and 2001 was similar to 2004, although passage in August was earlier causing the temporal separation to be shorter in 2004. The majority of 2004 passage occurred during July, while the majority of 2000 passage occurred in August, and 2001 passage was similar between July and August. 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 be considered an index of Dolly Varden populations in the Middle Fork Goodnews River.

RUN TIMING ESTIMATES

Chinook salmon run timing in 2004 was similar to the historical median if slightly early by approximately 1 to 2 days (Figure 4, Table 4). Sockeye salmon run timing in 2004 was similar if earlier by 1 day compared to the historical median. Chum salmon run timing was also similar to the historical median and was slightly early by approximately 2 days through the 50% passage point, then shifted to approximately 1 day later than the historical median beyond the 75% passage point. Coho salmon run timing in 2004 was later compared to the historical median by approximately 1 week and coho continued to pass upstream in large numbers after the end of project operations on 20 September. 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 2004 was later overall compared to the historical median, although this analysis is complicated by the bimodal separation between passage in July and August (Figures 4 and 5). Compared to historical median percent passage, Dolly Varden run timing was earlier through the end of July and prior to the 75% passage point. This timing is consistent with increasing passage during July that trailed off into August. Run timing then shifted later beyond the 75% passage point compared to the historical median in response to the second spike in passage during August.

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. Chinook and sockeye salmon escapements were estimated for the North Fork in 2004 (Table 3). It is believed 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. The combined escapement estimates from the North Fork and Middle Fork weir are used to characterize Goodnews River drainage escapement (Figure 6, Table 3). The Goodnews River drainage escapement for Chinook salmon was the second highest on record, was 17.2% below the high drainage escapement of 20,430 fish in 1983, and was 40% above the recent 10-year average. The Goodnews River drainage escapement for sockeye salmon was the tenth highest on record, was 39.3% below the high drainage escapement of 178,896 fish in 1996, and was 7.1% below the recent 10-year average.

Harvest and escapement estimates are combined to estimate total run abundance and exploitation for the Goodnews River drainage (Table 3). Official subsistence and sport fishing harvest estimates were not available at the time of publication so the recent 10-year average harvests from 1994 through 2003 were used in generating total run abundance estimates for 2004. When compared with total run abundance over the last 10 years, the 2004 run was 34.1% above average for Chinook salmon and 12.9% below average for sockeye salmon (Table 3, Appendix D1). Exploitation was estimated to be below the 10-year average for both species at 17% for Chinook and 17% for sockeye salmon. Coho total run abundance was not estimated in 2004 because aerial surveys for coho salmon were not conducted.

Data are not available to estimate the productivity of salmon stocks in the Goodnews River drainage and place 2004 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 is well below the level providing MSY.

It is difficult to access the quality or any directional bias of the estimates of total abundance and exploitation. Three main issues affect these estimates for 2004; 1) lack of 2004 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. The 10-year average subsistence and sport fish harvest was added to the 2004 commercial harvest for an estimate of total harvest. The South Fork is thought to represent less than 10% of the spawning population and was not monitored or included in the estimate. An important assumption underlying the estimate of total drainage escapement is that the same proportion of salmon are observed during aerial surveys flown above the weir (Middle Fork) and in the North Fork.

The use of the 10-year average sport and subsistence harvest should not have a large affect on the 2004 estimates of total abundance and exploitation. For sockeye salmon subsistence and sport harvest represent 3% of the total and misrepresenting the 2004 value by a historic mean will make little difference. 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. If the actual 2004 harvest is greater than the 10-year mean then total return and exploitation will be higher and the estimate published here biased low. If the 2004 actual harvest is lower than the mean then the opposite will occur. Yet even when substituting the highest Chinook subsistence and sport harvests since 1994, the estimated exploitation rate increases to only 20% and if these harvests are ignored the exploitation rate drops to 13%, both values well below other Chinook stocks exploitation at MSY.

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 percent of salmon observed during aerial surveys upriver from the weir on the Middle Fork and on the North Fork are equal. Differences could arise with differences in environmental conditions or salmon run timing. If a higher proportion of salmon present are observed above the weir and the same relationship is assumed for the North Fork, total escapement and abundance will be underestimated and exploitation will be biased high. The reverse will occur if a lower percent of the salmon present are counted during the aerial survey above the weir than occurred on 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 percent observed during aerial surveys may arise between forks 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.

Though it is not known for certain, the 2004 estimates of exploitation rates for Chinook and chum salmon seem reasonable. No large source of bias is apparent. The exploitation percents seem low given the productivity seen in other and adjacent salmon stocks.

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 2004. Some comparisons are made indicating similarities and differences between the weir escapement and commercial harvest ASL estimates both for 2004 and historical ASL data. 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 2004, some inferences can be made based on the samples that were collected. Age-1.2 Chinook salmon were the dominant age class for both escapement and commercial ASL samples (Tables 7 and 15). This is encouraging for future returns as such high percentages of age-1.2 fish in both sets of samples in combination with an above average Chinook salmon run indicates a good return of age-1.3 fish in 2005. Males were dominant in both the weir and commercial samples in 2004 and the approximate percentages were nearly identical at 70% males and 30% females. These male percentages are elevated over the grand total for both the escapement and commercial estimates which indicate approximately 60% males for both. The higher male percentage in 2004 was likely a function of the high number of age 1.2 samples which were predominantly male.

Sockeye Salmon

Age-1.3 sockeye salmon were the dominant age class for both escapement and commercial ASL estimates in 2004 and the percentages were similar at 56.2% and 62.6% respectively (Tables 9 and 17, Figure 7). This is consistent with historical percentages with grand totals of 71% for

escapement estimates and 72.6% for commercial estimates. Male to female percentages were not consistent between the 2004 escapement and commercial ASL estimates with male escapement estimates at 45.6% and male commercial estimates at 70.2%. Grand total escapement and commercial estimates show an approximate 50-50 split between male and female percentages which indicates a male dominance in the 2004 District W-5 commercial harvest. Males did not exhibit length partitioning by age class for both escapement and commercial ASL estimates in 2004 (Figure 8). Mean male lengths by age class were nearly identical between shared age classes in the escapement and commercial estimates. Neither of these estimates indicated any appreciable increase in mean length with age class which is consistent with the grand total for both escapement and commercial estimates. Females also did not exhibit mean length partitioning by age class in 2004 (Figure 9). Mean female length by age class was nearly identical between shared age classes in the escapement and commercial ASL estimates and overall mean length did not increase appreciably with age class which is again consistent with grand totals for both the escapement and commercial estimates.

Chum Salmon

Age-0.3 chum salmon were the dominant age class for escapement estimates in 2004 but no comparisons can be made with 2004 commercial estimates because the minimum sample objectives were not achieved (Tables 11 and 19, Figure 7). Male to female percentages were approximately 50-50 for the escapement estimates in 2004 which is consistent with the grand totals for both the escapement and the commercial estimates. Mean male lengths by age class in the 2004 escapement estimates indicated a minor increase in mean length with age class which is consistent with the grand totals in both the escapement and commercial estimates (Figure 8). Females also exhibited minor mean length partitioning by age class in the 2004 escapement estimates which is also consistent with the grand totals in both the escapement and commercial estimates (Figure 9).

Coho Salmon

Age-2.1 coho salmon were the dominant age class for both escapement and commercial ASL estimates in 2004 and the percentages were nearly identical at 84.5% and 84.2% respectively for a difference of 0.3% (Tables 13 and 21, Figure 7). This is consistent with grand totals from both the escapement and commercial estimates and is typical of coho salmon age structure. Male to female percentages were not consistent between the escapement and commercial ASL estimates in 2004 with male escapement estimates at 44.2% and male commercial estimates at 61.1%. Grand total escapement and commercial estimates show an approximate 50-50 split between male and female percentages indicating a male dominance in the 2004 District W-5 commercial harvest. Mean male and female lengths by age class were nearly identical between shared age classes in the 2004 escapement and commercial estimates (Figures 8 and 9). Neither males nor females exhibited dramatic mean length partitioning by age class in 2004, although males did indicate a slight increase in mean length with age class for both the escapement and commercial estimates. This is consistent with the grand totals for both male and female escapement and commercial estimates.

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.
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 2004.

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

The estimated Goodnews River drainage Chinook salmon escapement and total run were above the recent 10-year averages in 2004 and estimated exploitation was below the recent 10-year average. The estimated Goodnews River drainage sockeye salmon escapement and total run were below the recent 10-year average in 2004 and estimated exploitation was below the recent 10-year average.

Coho salmon aerial surveys were unsuccessful in 2004 and chum salmon aerial surveys have been discontinued. Goodnews River drainage escapement and run abundance could not be estimated for these species in 2004.

AGE, SEX, AND LENGTH COMPOSITION

Chinook salmon escapement and commercial, and chum salmon commercial ASL samples did not achieve sample objectives and no ASL estimates were made for these categories in 2004.

Commercial sockeye and coho salmon male percentages were higher than the 2004 escapement estimates and historical escapement and commercial estimates.

The remaining ASL categories for sockeye, chum, and coho ASL estimates were consistent with 2004 and historical escapement and commercial estimates.

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 beach seine sampling may be employed if it is evident that sample objectives are not being met.

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, 2004.

Period	Date Caught	No. Permits Fished	Chinook		Sockeye		Chum		Coho	
			Harvest	Pounds	Harvest	Pounds	Harvest	Pounds	Harvest	Pounds
1	6/24	19	791	8,992	1,873	13,684	788	6,012	0	0
2	6/29	21	373	3,983	2,938	20,635	668	4,814	0	0
3	7/1	19	310	3,821	3,512	24,426	1,060	7,656	0	0
4	7/5	21	265	3,351	3,098	21,304	710	5,094	0	0
5	7/7	21	206	2,754	2,133	15,000	522	3,728	0	0
6	7/9	20	159	2,112	2,021	13,794	455	3,216	0	0
7	7/12	20	112	1,473	1,395	9,422	1,066	7,111	0	0
8	7/14	14	104	1,323	1,063	7,012	414	2,700	0	0
9	7/16	10	78	1,044	347	2,374	161	991	0	0
10	8/2	10	35	509	400	2,746	51	339	194	1,362
11	8/4	12	39	535	305	2,021	48	316	311	2,365
12	8/6	13	24	313	295	1,988	9	60	428	3,210
13	8/9	14	12	151	167	1,093	14	83	804	6,081
14	8/11	14	22	251	287	2,012	21	137	1,335	10,896
15[a]	8/13									
16	8/16	19	8	84	255	1,763	10	67	2,752	22,524
17	8/18	18	7	93	160	1,093	4	24	2,918	23,924
18	8/20	18	8	87	162	1,096	10	68	3,240	27,173
19	8/23	17	2	19	56	363	0	0	2,860	23,830
20	8/25	18	7	102	177	1,386	3	22	4,527	37,334
21	8/27	19	3	25	278	2,179	0	0	4,321	33,556
	Total	29	2,565	31,022	20,922	145,391	6,014	42,438	23,690	192,255
Avg. Wt.				12.1		6.9		7.1		8.1
Avg. Price				$0.35		$0.35		$0.10		$0.36
Exvessel value				$10,857		$50,873		$4,244		$69,272
Total Fish										53,191
Total Pounds										411,106
Total Exvessel Value										$135,246

[a] No commercial harvest occurred on 13 August, no tender available.

Table 2.–Daily and cumulative Chinook, sockeye, chum, and coho salmon passage, Middle Fork Goodnews River weir, 2004.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/21	3	3	55	55	0	0	0	0
6/22	11	14	619	674	1	1	0	0
6/23	31	45	810	1,484	24	25	0	0
6/24	35	80	1,055	2,539	30	55	0	0
6/25	27	107	1,309	3,848	67	122	0	0
6/26	50 [a]	157	681 [a]	4,529	93 [a]	215	0 [a]	0
6/27	248	405	2,488	7,017	343	558	0	0
6/28	130	535	1,888	8,905	211	769	0	0
6/29	132	667	1,674	10,579	519	1,288	0	0
6/30	242	909	2,060	12,639	465	1,753	0	0
7/01	235	1,144	2,233	14,872	584	2,337	0	0
7/02	119	1,263	2,344	17,216	337	2,674	0	0
7/03	32	1,295	1,777	18,993	170	2,844	0	0
7/04	190	1,485	2,968	21,961	1,411	4,255	0	0
7/05	96	1,581	4,018	25,979	678	4,933	0	0
7/06	46	1,627	1,975	27,954	267	5,200	0	0
7/07	79 [a]	1,706	3,619 [a]	31,573	908 [a]	6,108	0 [a]	0
7/08	179	1,885	2,919	34,492	817	6,925	0	0
7/09	176	2,061	2,927	37,419	1,467	8,392	0	0
7/10	455 [a]	2,515	2,698 [a]	40,117	1,775 [a]	10,167	0 [a]	0
7/11	286	2,801	1,896	42,013	2,137	12,304	0	0
7/12	163	2,964	2,391	44,404	1,319	13,623	0	0
7/13	20	2,984	1,257	45,661	484	14,107	0	0
7/14	14	2,998	953	46,614	462	14,569	0	0
7/15	83	3,081	1,219	47,833	914	15,483	0	0
7/16	125 [a]	3,206	939 [a]	48,772	1,391 [a]	16,874	0 [a]	0
7/17	17 [a]	3,223	232 [a]	49,004	204 [a]	17,077	1 [a]	1
7/18	115	3,338	773	49,777	1,067	18,144	6	7
7/19	72	3,410	837	50,614	1,434	19,578	0	7
7/20	172	3,582	874	51,488	1,753	21,331	2	9
7/21	84	3,666	598	52,086	884	22,215	4	13
7/22	67 [a]	3,733	451 [a]	52,537	527 [a]	22,742	0 [a]	13
7/23	15	3,748	410	52,947	401	23,143	0	13
7/24	6	3,754	132	53,079	481	23,624	0	13
7/25	70	3,824	466	53,545	714	24,338	2	15
7/26	48	3,872	233	53,778	869	25,207	3	18
7/27	14	3,886	138	53,916	332	25,539	0	18
7/28	55	3,941	174	54,090	428	25,967	14	32
7/29	37	3,978	98	54,188	449	26,416	19	51
7/30	28	4,006	127	54,315	474	26,890	16	67
7/31	20	4,026	179	54,494	665	27,555	30	97
8/01	46	4,072	132	54,626	578	28,133	21	118
8/02	31	4,103	140	54,766	458	28,591	47	165
8/03	34	4,137	89	54,855	671	29,262	57	222
8/04	20	4,157	70	54,925	220	29,482	40	262
8/05	39	4,196	91	55,016	300	29,782	54	316
8/06	29	4,225	77	55,093	408	30,190	98	414

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Table 2.–(Page 2 of 2).

	Chinook		Sockeye		Chum		Coho	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**
8/07	18	4,243	51	55,144	223	30,413	83	497
8/08	9	4,212	26	55,170	152	30,565	36	533
8/09	3	4,215	97	55,267	157	30,722	18	551
8/10	10	4,225	57	55,324	190	30,912	159	710
8/11	15	4,240	48	55,372	95	31,007	58	768
8/12	6	4,246	25	55,397	64	31,071	91	859
8/13	29	4,275	66	55,463	114	31,185	309	1,168
8/14	7	4,282	76	55,539	65	31,250	362	1,530
8/15	7	4,289	37	55,576	46	31,296	217	1,747
8/16	2	4,291	61	55,637	83	31,379	592	2,339
8/17	6	4,297	22	55,659	42	31,421	642	2,981
8/18	7	4,304	12	55,671	32	31,453	244	3,225
8/19	4	4,308	15	55,686	19	31,472	233	3,458
8/20	4	4,312	15	55,701	29	31,501	367	3,825
8/21	3	4,315	17	55,718	25	31,526	709	4,534
8/22	1	4,316	1	55,719	6	31,532	197	4,731
8/23	5	4,321	9	55,728	8	31,540	528	5,259
8/24	5	4,326	9	55,737	10	31,550	273	5,532
8/25	1	4,327	20	55,757	13	31,563	849	6,381
8/26	5	4,332	24	55,781	6	31,569	3,917	10,298
8/27	0	4,332	11	55,792	1	31,570	80	10,378
8/28	0	4,332	5	55,797	0	31,570	34	10,412
8/29	1	4,333	15	55,812	3	31,573	801	11,213
8/30	1	4,334	8	55,820	5	31,578	1,320	12,533
8/31	3	4,337	5	55,825	3	31,581	1,491	14,024
9/01	2	4,339	3	55,828	0	31,581	1,802	15,826
9/02	1	4,340	6	55,834	4	31,585	3,583	19,409
9/03	1	4,341	2	55,836	1	31,586	361	19,770
9/04	2	4,343	4	55,840	4	31,590	616	20,386
9/05	1	4,344	13	55,853	2	31,592	426	20,812
9/06	1	4,345	4	55,857	2	31,594	1,877	22,689
9/07	0	4,345	2	55,859	3	31,597	995	23,684
9/08	0	4,345	14	55,873	3	31,600	5,142	28,826
9/09	0	4,345	6	55,879	1	31,601	4,515	33,341
9/10	0	4,345	7	55,886	1	31,602	1,354	34,695
9/11	0	4,345	6	55,892	2	31,604	699	35,394
9/12	0	4,345	3	55,895	1	31,605	1,214	36,608
9/13	0	4,345	4	55,899	1	31,606	293	36,901
9/14	1	4,346	3	55,902	0	31,606	585	37,486
9/15	0	4,346	6	55,908	1	31,607	1,789	39,275
9/16	0	4,346	4	55,912	3	31,610	1,331	40,606
9/17	2	4,348	1	55,913	3	31,613	741	41,347
9/18	0	4,348	1	55,914	2	31,615	702	42,049
9/19	0	4,348	12	55,926	1	31,616	4,033	46,082
9/20	0	4,348	0	55,926	0	31,616	1,834	47,916
Total	4,388		55,926		31,616		47,916	
Observed	4,244		53,532		30,422		47,916	
Estimated	144		2,394		1,194		0	
% Obs.	96.7		95.7		96.2		100.0	

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

Table 3.–Escapement summary for the Goodnews River, 2004.

Middle Fork Goodnews River escapement estimate

	Chinook	Sockeye	Chum	Coho
2004 weir count	4,388	55,926	31,616	47,916
Weir (SEG)	2,000–4,500	23,000–58,000	>12,000	>12,000
10-year average (1994–2003)	3,569	40,119	26,726	25,037[a]
2004 aerial survey count	2,617	33,670	[b]	[b]
Aerial Survey (SEG)	[c]	[c]	[c]	[c]

Goodnews River (north fork) escapement estimate

	Chinook	Sockeye	Chum	Coho
2004 escapement estimate	12,512	52,646	[b]	[b]
10-year average (1994–2003)	6,495	75,320	62,109	[b]
2004 aerial survey count	7,462	31,695	[b]	[b]
Aerial Survey (SEG)	640–3,300	5,500–19,500	[c]	[c]

Goodnews River (total drainage) escapement estimate

	Chinook	Sockeye	Chum	Coho
2004	16,901	108,572	[b]	[b]
10-year average (1994–2003)	10,148	116,812	88,891	[b]

Total Run and Exploitation

	Chinook	Sockeye	Chum	Coho
District W-5 Commercial Harvest	2,565	20,922	6,014	23,690
Subsistence Harvest [d]	731	490	[b]	[b]
Sport Fishing Harvest [d]	173	170	[b]	[b]
Total Run Estimate	20,369	130,153	[b]	[b]
Harvest Exploitation (%)	17.0	16.6	[b]	[b]

[a] Average of last 7 years (1997–2003).

[b] No estimate was made.

[c] Escapement goal discontinued in 2004.

[d] Official estimates not available at time of publication, numbers shown are the recent 10 year averages (1994-2003) 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, 2004 and historical median.

	Chinook Salmon		Sockeye Salmon		Chum Salmon		Coho Salmon		Dolly Varden	
Date	2004	Historical Median[a]	2004	Historical Median[b]	2004	Historical Median[c]	2004	Historical Median[d]	2004	Historical Median[e]
6/21	0	1	0	1	0	0	0	0	0	0
6/22	0	1	1	2	0	0	0	0	0	0
6/23	1	2	3	3	0	0	0	0	1	0
6/24	2	3	5	5	0	0	0	0	1	0
6/25	2	4	7	7	0	1	0	0	1	0
6/26	4	5	8	9	1	2	0	0	1	0
6/27	9	7	13	11	2	2	0	0	2	0
6/28	12	8	16	13	2	3	0	0	2	0
6/29	15	9	19	17	4	3	0	0	3	0
6/30	21	12	23	21	6	3	0	0	4	0
7/01	26	15	27	25	7	5	0	0	4	0
7/02	29	21	31	28	8	6	0	0	5	0
7/03	30	23	34	34	9	7	0	0	5	0
7/04	34	23	39	39	13	8	0	0	6	0
7/05	36	24	46	43	16	9	0	0	8	0
7/06	37	31	50	47	16	10	0	0	9	1
7/07	39	37	56	52	19	12	0	0	9	1
7/08	43	40	62	55	22	16	0	0	11	1
7/09	47	43	67	58	27	17	0	0	13	3
7/10	57	49	72	66	32	21	0	0	14	4
7/11	64	50	75	70	39	24	0	0	16	5
7/12	68	57	79	73	43	29	0	0	17	5
7/13	68	58	82	75	45	33	0	0	18	6
7/14	68	65	83	79	46	36	0	0	20	7
7/15	70	68	86	81	49	40	0	0	20	9
7/16	73	73	87	82	53	43	0	0	21	12
7/17	73	75	88	84	54	48	0	0	22	13
7/18	76	77	89	87	57	53	0	0	24	16
7/19	78	81	91	89	62	58	0	0	27	19
7/20	82	82	92	90	67	61	0	0	36	23
7/21	84	83	93	92	70	64	0	0	44	30
7/22	85	83	94	93	72	67	0	0	52	36
7/23	85	85	95	94	73	71	0	0	56	41
7/24	86	88	95	94	75	74	0	0	58	46
7/25	87	90	96	95	77	76	0	0	61	51
7/26	88	91	96	96	80	81	0	0	65	54
7/27	89	91	96	96	81	83	0	0	67	60
7/28	90	93	97	97	82	85	0	0	68	66
7/29	91	95	97	98	84	87	0	0	70	75
7/30	91	96	97	98	85	90	0	0	71	77
7/31	92	96	97	98	87	91	0	0	73	84
8/01	93	96	98	98	89	92	0	0	74	87
8/02	94	97	98	99	90	94	0	0	76	92
8/03	94	97	98	99	93	96	0	0	76	94
8/04	95	98	98	99	93	96	1	0	77	94
8/05	96	98	98	99	94	97	1	0	77	94
8/06	96	98	99	99	95	97	1	0	77	95
8/07	97	98	99	99	96	97	1	0	77	95
8/08	97	98	99	99	97	98	1	1	78	95
8/09	97	99	99	99	97	98	1	1	78	96

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Table 4.–(Page 2 of 2).

	Chinook Salmon		Sockeye Salmon		Chum Salmon		Coho Salmon		Dolly Varden	
Date	2004	Historical Median[a]	2004	Historical Median[b]	2004	Historical Median[c]	2004	Historical Median[d]	2004	Historical Median[e]
8/10	97	98	99	99	98	98	1	1	78	96
8/11	98	98	99	99	98	99	2	1	78	96
8/12	98	99	99	99	98	99	2	2	78	96
8/13	98	99	99	99	99	99	2	2	78	96
8/14	98	99	99	99	99	99	3	2	78	96
8/15	99	99	99	100	99	99	4	3	78	96
8/16	99	99	99	100	99	99	5	4	79	96
8/17	99	99	100	100	99	99	6	5	81	96
8/18	99	99	100	100	99	99	7	5	82	97
8/19	99	99	100	100	100	99	7	7	83	97
8/20	99	99	100	100	100	100	8	10	85	97
8/21	99	99	100	100	100	100	9	11	95	98
8/22	99	100	100	100	100	100	10	12	95	98
8/23	99	100	100	100	100	100	11	13	95	98
8/24	99	100	100	100	100	100	12	15	96	98
8/25	100	100	100	100	100	100	13	20	96	98
8/26	100	100	100	100	100	100	21	25	97	99
8/27	100	100	100	100	100	100	22	27	97	99
8/28	100	100	100	100	100	100	22	34	97	99
8/29	100	100	100	100	100	100	23	36	97	99
8/30	100	100	100	100	100	100	26	42	97	99
8/31	100	100	100	100	100	100	29	52	97	99
9/01	100	100	100	100	100	100	33	57	97	99
9/02	100	100	100	100	100	100	41	59	97	99
9/03	100	100	100	100	100	100	41	62	97	99
9/04	100	100	100	100	100	100	43	68	98	99
9/05	100	100	100	100	100	100	43	72	98	99
9/06	100	100	100	100	100	100	47	74	98	99
9/07	100	100	100	100	100	100	49	81	98	99
9/08	100	100	100	100	100	100	60	82	98	100
9/09	100	100	100	100	100	100	70	83	98	100
9/10	100	100	100	100	100	100	72	85	98	100
9/11	100	100	100	100	100	100	74	86	99	100
9/12	100	100	100	100	100	100	76	90	99	100
9/13	100	100	100	100	100	100	77	93	99	100
9/14	100	100	100	100	100	100	78	94	99	100
9/15	100	100	100	100	100	100	82	95	99	100
9/16	100	100	100	100	100	100	85	98	99	100
9/17	100	100	100	100	100	100	86	99	99	100
9/18	100	100	100	100	100	100	88	99	99	100
9/19	100	100	100	100	100	100	96	96	100	100
9/20	100	100	100	100	100	100	100	97	100	100
9/21	100	100	100	100	100	100	100	98	100	100
9/22	100	100	100	100	100	100	100	99	100	100
9/23	100	100	100	100	100	100	100	99	100	100
9/24	100	100	100	100	100	100	100	100	100	100

Note: The 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 through 1997, 1999, and 2001 through 2003.

[b] Historical median for years: 1981, 1984, 1992 through 1997, 1999, and 2002 through 2003.

[c] Historical median for years: 1981, 1991 through 1997, 1999, and 2001 through 2003.

[d] Historical median for years: 1997 through 2003.

[e] Historical median for years: 1997 through 2003.

Table 5.–Daily and cumulative pink salmon, Dolly Varden, rainbow trout, and whitefish passage, Middle Fork Goodnews River weir, 2004.

	Pink Salmon		Dolly Varden		Rainbow Trout		Whitefish	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/21	0	0	1	1	0	0	0	0
6/22	0	0	9	10	0	0	0	0
6/23	3	3	11	21	0	0	0	0
6/24	2	5	7	28	0	0	0	0
6/25	3	8	14	42	2	2	20	20
6/26	1 [a]	9	9 [a]	51	1 [a]	3	4 [a]	24
6/27	78	87	14	65	6	9	51	75
6/28	6	93	14	79	0	9	14	89
6/29	40	133	32	111	1	10	43	132
6/30	51	184	19	130	0	10	21	153
7/01	59	243	14	144	6	16	10	163
7/02	40	283	25	169	4	20	14	177
7/03	52	335	10	179	1	21	0	177
7/04	125	460	44	223	3	24	14	191
7/05	140	600	56	279	0	24	1	192
7/06	31	631	23	302	0	24	0	192
7/07	52 [a]	683	13 [a]	315	0 [a]	24	0 [a]	192
7/08	140	823	74	389	0	24	0	192
7/09	147	970	68	457	1	25	0	192
7/10	179 [a]	1,149	33 [a]	490	5 [a]	30	0 [a]	192
7/11	204	1,353	54	544	0	30	0	192
7/12	285	1,638	42	586	0	30	5	197
7/13	209	1,847	51	637	0	30	1	198
7/14	88	1,935	52	689	0	30	0	198
7/15	77	2,012	13	702	2	32	4	202
7/16	109 [a]	2,121	20 [a]	722	2 [a]	34	65 [a]	267
7/17	81 [a]	2,202	43 [a]	765	0 [a]	34	0 [a]	267
7/18	163	2,365	56	821	0	34	0	267
7/19	184	2,549	130	951	0	34	0	267
7/20	392	2,941	307	1,258	0	34	17	284
7/21	354	3,295	283	1,541	0	34	2	286
7/22	114 [a]	3,409	274 [a]	1,815	0 [a]	34	0 [a]	286
7/23	80	3,489	150	1,965	0	34	0	286
7/24	67	3,556	76	2,041	0	34	0	286
7/25	237	3,793	101	2,142	0	34	0	286
7/26	231	4,024	128	2,270	0	34	0	286
7/27	70	4,094	69	2,339	0	34	0	286
7/28	136	4,230	47	2,386	0	34	0	286
7/29	66	4,296	47	2,433	0	34	2	288
7/30	83	4,379	34	2,467	0	34	0	288
7/31	89	4,468	73	2,540	0	34	0	288
8/01	155	4,623	45	2,585	0	34	0	288
8/02	175	4,798	53	2,638	0	34	0	288
8/03	722	5,520	24	2,662	0	34	0	288
8/04	411	5,931	12	2,674	0	34	0	288
8/05	363	6,294	8	2,682	0	34	0	288

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Table 5.–(Page 2 of 2)

	Pink Salmon		Dolly Varden		Rainbow Trout		Whitefish	
Date	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**	**Daily**	**Cum.**
8/06	237	6,531	15	2,697	0	34	6	294
8/07	266	6,797	6	2,703	0	34	6	300
8/08	281	7,078	4	2,707	0	34	2	302
8/09	280	7,358	0	2,707	0	34	0	302
8/10	529	7,887	5	2,712	0	34	0	302
8/11	321	8,208	1	2,713	0	34	3	305
8/12	254	8,462	0	2,713	0	34	1	306
8/13	1117	9,579	10	2,723	0	34	2	308
8/14	618	10,197	5	2,728	0	34	3	311
8/15	258	10,455	12	2,740	0	34	7	318
8/16	657	11,112	14	2,754	0	34	3	321
8/17	531	11,643	63	2,817	0	34	3	324
8/18	626	12,269	49	2,866	0	34	1	325
8/19	649	12,918	37	2,903	0	34	1	326
8/20	535	13,453	65	2,968	0	34	1	327
8/21	559	14,012	337	3,305	0	34	2	329
8/22	243	14,255	15	3,320	0	34	0	329
8/23	562	14,817	12	3,332	0	34	2	331
8/24	263	15,080	21	3,353	0	34	0	331
8/25	727	15,807	7	3,360	0	34	1	332
8/26	1836	17,643	16	3,376	0	34	3	335
8/27	115	17,758	1	3,377	0	34	1	336
8/28	112	17,870	12	3,389	0	34	0	336
8/29	529	18,399	5	3,394	0	34	1	337
8/30	547	18,946	3	3,397	0	34	1	338
8/31	435	19,381	4	3,401	0	34	3	341
9/01	386	19,767	2	3,403	0	34	1	342
9/02	432	20,199	0	3,403	0	34	0	342
9/03	111	20,310	1	3,404	0	34	0	342
9/04	167	20,477	1	3,405	0	34	4	346
9/05	145	20,622	1	3,406	0	34	2	348
9/06	165	20,787	2	3,408	0	34	1	349
9/07	136	20,923	5	3,413	0	34	1	350
9/08	230	21,153	4	3,417	0	34	13	363
9/09	189	21,342	10	3,427	0	34	8	371
9/10	67	21,409	7	3,434	0	34	0	371
9/11	18	21,427	6	3,440	0	34	0	371
9/12	24	21,451	5	3,445	0	34	0	371
9/13	17	21,468	0	3,445	0	34	0	371
9/14	26	21,494	4	3,449	1	35	3	374
9/15	39	21,533	1	3,450	0	35	1	375
9/16	19	21,552	4	3,454	0	35	1	376
9/17	18	21,570	7	3,461	0	35	0	376
9/18	19	21,589	6	3,467	0	35	1	377
9/19	29	21,618	9	3,476	0	35	4	381
9/20	15	21,633	16	3,492	0	35	3	384
Total	21,633		3,492		35		384	

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

Table 6.–Daily fish carcass count, Middle Fork Goodnews River weir, 2004.

Date	Chinook	Sockeye	Chum	Pink	Coho	Other [a]
6/21	0	0	0	0	0	0
6/22	0	0	0	0	0	0
6/23	0	3	0	0	0	0
6/24	0	5	0	0	0	0
6/25	0	1	0	0	0	0
6/26	0	4	2	0	0	0
6/27	1	1	1	0	0	0
6/28	0	2	0	1	0	0
6/29	0	6	2	1	0	0
6/30	1	8	5	1	0	0
7/01	0	7	3	2	0	0
7/02	0	2	4	0	0	0
7/03	0	7	7	0	0	0
7/04	0	24	9	0	0	0
7/05	0	8	14	0	0	1GR
7/06	0	11	19	1	0	0
7/07	0	12	18	0	0	0
7/08	2	11	35	1	0	0
7/09	0	7	51	5	0	0
7/10	0	9	46	5	0	0
7/11	0	6	35	1	0	2DV
7/12	0	1	64	2	0	3DV
7/13	0	3	38	3	0	0
7/14	0	12	50	1	0	0
7/15	0	7	28	8	0	0
7/16	0	3	75	2	0	0
7/17	0	2	87	0	0	0
7/18	0	4	128	1	0	0
7/19	0	8	169	1	0	0
7/20	4	5	232	5	0	0
7/21	0	3	176	4	0	0
7/22	0	7	225	3	0	0
7/23	4	4	263	2	0	2DV
7/24	0	3	260	5	0	1DV
7/25	1	5	190	5	0	3DV
7/26	11	8	240	11	0	3DV
7/27	4	4	136	10	0	1DV
7/28	8	8	105	9	0	0
7/29	4	3	211	4	0	0
7/30	1	3	167	13	0	0
7/31	1	3	69	8	0	0
8/01	1	6	193	21	0	0
8/02	5	0	153	16	0	0
8/03	6	5	171	27	0	1DV
8/04	7	5	157	63	0	0
8/05	3	5	138	61	0	0
8/06	1	2	136	68	0	0

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Date	Chinook	Sockeye	Chum	Pink	Coho	Other [a]
8/07	5	1	113	63	0	0
8/08	5	4	120	61	0	0
8/09	11	6	158	70	0	0
8/10	9	7	125	76	0	0
8/11	7	4	119	74	0	0
8/12	3	5	101	54	0	0
8/13	5	6	117	65	0	0
8/14	11	7	73	34	0	0
8/15	2	2	74	38	0	0
8/16	12	7	88	51	0	0
8/17	6	5	68	35	0	0
8/18	2	5	55	50	0	0
8/19	5	6	36	46	0	0
8/20	0	9	17	19	0	0
8/21	3	10	66	87	0	0
8/22	2	9	15	21	0	0
8/23	1	3	1	10	0	0
8/24	2	12	24	61	0	0
8/25	5	7	18	39	0	0
8/26	2	2	4	14	0	0
8/27	1	6	10	32	0	0
8/28	0	8	1	45	0	0
8/29	2	2	7	56	0	0
8/30	1	1	4	50	0	0
8/31	1	2	4	60	0	0
9/01	3	8	2	84	0	1DV
9/02	0	6	0	51	2	0
9/03	0	5	2	125	2	0
9/04	2	4	1	163	5	0
9/05	3	2	0	95	1	0
9/06	0	3	1	127	0	0
9/07	0	2	0	132	2	0
9/08	0	2	0	99	5	0
9/09	0	2	0	194	2	0
9/10	0	1	2	201	3	0
9/11	0	1	0	176	4	0
9/12	2	1	3	185	6	0
9/13	0	8	0	123	5	0
9/14	0	2	0	103	6	0
9/15	0	4	1	116	4	0
9/16	0	2	0	97	8	0
9/17	0	0	1	60	2	0
9/18	0	1	0	53	10	0
9/19	0	2	0	36	11	0
9/20	0	0	0	0	0	0
Total	178	445	5,543	3,802	78	17 DV, 1 GR

[a] DV = Dolly Varden, GR = Arctic Grayling

Table 7.–Age and sex composition of Chinook salmon escapement, Middle Fork Goodnews River weir, 2004.

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 %
6/28 - 7/1	53	49	M	61	4.1	576	38.8	273	18.4	91	6.1	0	0.0	999	67.3
(6/21 - 7/4)			F	0	0.0	212	14.3	120	8.1	151	10.2	0	0.0	486	32.7
			Subtotal	61	4.1	788	53.1	394	26.5	242	16.3	0	0.0	1,485	100.0
7/8 - 10	122	110	M	33	1.8	876	47.3	269	14.5	135	7.3	0	0.0	1,314	70.9
(7/5 - 18)			F	0	0.0	152	8.2	102	5.5	285	15.4	0	0.0	539	29.1
			Subtotal	33	1.8	1,028	55.5	371	20.0	421	22.7	0	0.0	1,853	100.0
7/29, 8/3,	33	14	M		20.0		20.0		20.0		6.7		0.0		66.7
9,8/18, 23			F		0.0		0.0		20.0		6.6		0.0		33.3
(7/19-9/20)			Subtotal		20.0		20.0		40.0		13.3		0.0		100.0
Season [a]	208	173	M												68.7
			F												31.3
			Total											4,388	100.0
Grand		1,083	M	110	0.7	4,148	26.3	3,385	21.4	2,404	15.2	74	0.5	10,143	64.2
Total [b]			F	0	0.0	56	0.4	1,131	7.2	4,249	26.9	232	1.5	5,657	35.8
			Total	110	0.7	4,204	26.6	4,517	28.6	6,653	42.1	306	1.9	15,800	100.0

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number of fish in "Season" are the strata sums; "Season" percentages are derived from the sums.

[a] Sample dates do not meet criteria for estimating escapement percentages for some of the strata; "Season" not included in the "Grand Total".

[b] The number of fish in the "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, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5
6/28 - 7/1	M	Mean Length	368	568	719	873	
(6/21 - 7/4)		Std. Error	8	12	15	9	
		Range	360- 375	475- 725	670- 790	860- 890	
		Sample Size	2	19	9	3	0
	F	Mean Length		628	813	901	
		Std. Error		16	22	29	
		Range		560- 695	765- 870	830- 995	
		Sample Size	0	7	4	5	0
7/8 - 10	M	Mean Length	403	599	770	783	
(7/5 - 18)		Std. Error	23	7	28	38	
		Range	380- 425	485- 710	625-1080	540- 895	
		Sample Size	2	52	16	8	0
	F	Mean Length		617	761	841	
		Std. Error		13	34	19	
		Range		535- 680	650- 870	590- 930	
		Sample Size	0	9	6	17	0
7/29, 8/3, 9, 18, 23	M	Mean Length	378	563	668	955	
(7/19 - 9/20)		Std. Error	10	47	26	-	
		Range	360- 395	490- 650	625- 715	955- 955	
		Sample Size	3	3	3	1	0
	F	Mean Length			797	845	
		Std. Error			29	-	
		Range			750- 850	845- 845	
		Sample Size	0	0	3	1	0
Season [a]	M	Mean Length	379	583	723	852	
		Range	360- 425	475- 725	625-1080	540- 955	
		Sample Size	7	74	28	12	0
	F	Mean Length		623	793	860	
		Range		535- 695	650- 870	590- 995	
		Sample Size	0	16	13	23	0
Grand Total [b]	M	Mean Length	386	546	714	852	886
		Range	240- 550	445- 850	550- 910	680- 1035	990- 990
		Sample Size	12	233	260	157	6
	F	Mean Length		610	788	858	898
		Range		540- 670	560- 880	470- 1005	990- 990
		Sample Size	0	3	90	302	18

[a] Sampling dates do not meet criteria for estimating escapement percentages for some or all of the strata, "Season" is not included in "Grand Total".

[b] "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, 2004.

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 %
6/24, 28-29	250	218	M	266	1.4	779	4.1	6,534	34.4	266	1.4	969	5.1	266	1.4	9,060	47.7
(6/21 - 7/3)			F	76	0.4	2,355	12.4	6,629	34.9	171	0.9	608	3.2	76	0.4	9,933	52.3
			Subtotal	342	1.8	3,134	16.5	13,162	69.3	437	2.3	1,576	8.3	342	1.8	18,993	100.0
7/6 - 8	208	169	M	138	0.6	2,578	11.2	6,952	30.2	414	1.8	668	2.9	552	2.4	11,303	49.1
(7/4 - 11)			F	276	1.2	3,959	17.2	6,538	28.4	138	0.6	552	2.4	276	1.2	11,717	50.9
			Subtotal	414	1.8	6,538	28.4	13,490	58.6	552	2.4	1,220	5.3	829	3.6	23,020	100.0
7/13 - 14	210	172	M	42	0.6	1,384	19.8	1,140	16.3	161	2.3	42	0.6	42	0.6	2,803	40.1
(7/12 - 17)			F	0	0.0	2,440	34.9	1,258	18.0	287	4.1	161	2.3	42	0.6	4,188	59.9
			Subtotal	42	0.6	3,824	54.7	2,398	34.3	447	6.4	203	2.9	84	1.2	6,991	100.0
7/20, 22-23	212	130	M	0	0.0	559	12.3	1,081	23.8	36	0.8	36	0.8	104	2.3	1,816	40.0
(7/18 - 25)			F	0	0.0	1,748	38.5	840	18.5	32	0.7	68	1.5	36	0.8	2,725	60.0
			Subtotal	0	0.0	2,307	50.8	1,921	42.3	68	1.5	104	2.3	141	3.1	4,541	100.0
7/28-29,31,	162	117	M	0	0.0	224	9.4	224	9.4	41	1.7	20	0.9	20	0.9	529	22.2
8/3,5,9,16,24			F	0	0.0	1,546	65.0	224	9.4	40	1.7	41	1.7	0	0.0	1,852	77.8
(7/26 - 9/20)			Subtotal	0	0.0	1,770	74.4	448	18.8	81	3.4	61	2.6	20	0.9	2,381	100.0
Season	1,042	806	M	446	0.8	5,524	9.9	15,930	28.5	918	1.6	1,734	3.1	985	1.8	25,511	45.6
			F	352	0.6	12,049	21.5	15,489	27.7	667	1.2	1,430	2.6	430	0.8	30,415	54.4
			Total	798	1.4	17,572	31.4	31,419	56.2	1,586	2.8	3,165	5.7	1,415	2.5	55,926	100.0
Grand Total [a]		5,658	M	6,285	1.8	21,550	6.0	130,369	36.3	3,297	0.9	6,630	1.8	8,431	2.3	177,299	49.4
			F	2,769	0.8	37,644	10.5	124,558	34.7	4,374	1.2	4,360	1.2	7,424	2.1	181,774	50.6
			Total	9,054	2.5	59,195	16.5	254,928	71.0	7,672	2.1	10,990	3.1	15,856	4.4	359,106	100.0

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number 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 through 2004.

Table 10.–Mean length (mm) of sockeye salmon escapement, Middle Fork Goodnews River weir, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 0.3	1.2	1.3	2.2	1.4	2.3
7/6 - 11 (6/29 - 7/12)	M	Mean Length	582	522	588	543	610	597
		Std. Error	17	9	3	7	5	6
		Range	550- 610	485- 575	500- 650	530- 555	580- 635	585- 605
		Sample Size	3	9	75	3	11	3
	F	Mean Length	545	496	548	503	571	525
		Std. Error	-	6	3	8	4	-
		Range	545- 545	400- 555	480- 595	495- 510	555- 585	525- 525
		Sample Size	1	27	76	2	7	1
7/6 - 8 (7/4 - 11)	M	Mean Length	575	523	594	530	622	581
		Std. Error	-	8	5	3	5	13
		Range	575- 575	410- 575	515- 685	525- 535	605- 635	545- 605
		Sample Size	1	19	51	3	5	4
	F	Mean Length	563	497	551	475	580	565
		Std. Error	3	4	3	-	4	20
		Range	560- 565	460- 565	510- 590	475- 475	570- 585	545- 585
		Sample Size	2	29	48	1	4	2
7/13 - 14 (7/12 - 17)	M	Mean Length	545	515	574	531	630	540
		Std. Error	-	4	5	18	-	-
		Range	545- 545	450- 575	505- 625	490- 570	630- 630	540- 540
		Sample Size	1	34	28	4	1	1
	F	Mean Length		488	541	498	540	515
		Std. Error		3	5	6	11	-
		Range		445- 595	475- 595	470- 520	515- 560	515- 515
		Sample Size	0	60	31	7	4	1
7/20, 22-23 (7/18 - 25)	M	Mean Length		514	572	560	535	592
		Std. Error		8	6	-	-	17
		Range		445- 580	520- 655	560- 560	535- 535	570- 625
		Sample Size	0	16	31	1	1	3
	F	Mean Length		498	540	510	545	530
		Std. Error		3	8	-	15	-
		Range		435- 565	455- 595	510- 510	530- 560	530- 530
		Sample Size	0	50	24	1	2	1
7/28-29,31,8/3, 5,9,16,24 (7/26 - 9/20)	M	Mean Length		508	591	525	590	500
		Std. Error		8	8	15	-	-
		Range		455- 565	530- 630	510- 540	590- 590	500- 500
		Sample Size	0	11	11	2	1	1

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Table 10.–(Page 2 of 2).

Sample Dates (Stratum Dates)	Sex		Age Class 0.3	1.2	1.3	2.2	1.4	2.3
7/28-29,31,8/3,	F	Mean Length		485	529	545	545	
5,9,16,24		Std. Error		3	8	-	10	
(7/26 - 9/20)		Range		425- 570	490- 570	545- 545	535- 555	
(Cont.)		Sample Size	0	76	11	2	2	0
Season	M	Mean Length	576	519	588	535	613	583
		Range	545- 610	410- 580	500- 685	490- 570	535- 635	500- 625
		Sample Size	5	89	196	13	19	12
	F	Mean Length	558	493	548	498	568	549
		Range	545- 565	400- 595	455- 595	470- 545	515- 585	515- 585
		Sample Size	3	242	190	13	19	5
Grand	M	Mean Length	581	532	582	539	604	579
Total [a]		Range	568- 568	525- 610	425- 630	560- 645	470- 700	499- 602
		Sample Size	32	367	2,009	51	102	134
	F	Mean Length	548	496	548	491	556	537
		Range	470- 470	429- 597	415- 595	575- 595	438- 635	450- 545
		Sample Size	27	737	1,923	74	81	92

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1987, 1990, 1995, 1997, and 1999 through 2004.

Table 11.–Age and sex composition of chum salmon escapement, Middle Fork Goodnews River weir, 2004.

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 %
6/28-7/1	199	180	M	0	0.0	1,183	27.8	1,255	29.5	0	0.0	2,434	57.2
(6/21-7/4)			F	0	0.0	1,132	26.6	685	16.1	0	0.0	1,821	42.8
			Subtotal	0	0.0	2,315	54.4	1,940	45.6	0	0.0	4,255	100
7/6-9	201	211	M	40	0.5	2,592	32.2	1,908	23.7	0	0.0	4,540	56.4
(7/5-11)			F	72	0.9	1,682	20.9	1,755	21.8	0	0.0	3,509	43.6
			Subtotal	113	1.4	4,274	53.1	3,662	45.5	0	0.0	8,049	100
7/13-15	200	161	M	29	0.6	1,394	29.2	1,155	24.2	0	0.0	2,578	54.0
(7/12-17)			F	119	2.5	1,542	32.3	535	11.2	0	0.0	2,196	46.0
			Subtotal	148	3.1	2,936	61.5	1,690	35.4	0	0.0	4,774	100
7/20-22	201	185	M	196	2.7	1,924	26.5	1,096	15.1	36	0.5	3,260	44.9
(7/18-25)			F	232	3.2	2,469	34.0	1,300	17.9	0	0.0	4,001	55.1
			Subtotal	428	5.9	4,393	60.5	2,396	33.0	36	0.5	7,261	100
7/28-31	200	190	M	67	1.6	1,030	24.2	515	12.1	0	0.0	1,612	37.9
(7/26-8/2)			F	202	4.7	1,723	40.5	716	16.8	0	0.0	2,641	62.1
			Subtotal	269	6.3	2,753	64.7	1,231	28.9	0	0.0	4,253	100
8/3, 5-6	201	193	M	47	2.6	387	21.3	104	5.7	0	0.0	538	29.5
(8/3-7)			F	113	6.2	840	46.1	330	18.1	0	0.0	1,284	70.5
			Subtotal	160	8.8	1,227	67.4	434	23.8	0	0.0	1,822	100
8/9,11,	109	100	M	36	3.0	204	17.0	84	7.0	0	0.0	325	27.0
16, 23			F	156	13.0	626	52.0	96	8.0	0	0.0	878	73.0
(8/8-9/20)			Subtotal	192	16.0	830	69.0	180	15.0	0	0.0	1,203	100
Season	1,311	1,220	M	415	1.3	8,714	27.6	6,118	19.3	36	0.1	15,286	48.3
			F	895	2.8	10,014	31.7	5,416	17.1	0	0.0	16,330	51.7
			Total	1,310	4.1	18,728	59.2	11,534	36.5	36	0.1	31,616	100
Grand Total[a]		5,612	M	1,128	0.5	66,398	31.6	38,173	18.2	1,051	0.5	106,747	50.8
			F	1,539	0.7	68,370	32.5	33,163	15.8	228	0.1	103,304	49.2
			Total	2,667	1.3	134,768	64.2	71,335	34.0	1,279	0.6	210,051	100

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number 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 through 1991, 1997 through 1999, and 2001 through 2004.

Table 12.–Mean length (mm) of chum salmon escapement, Middle Fork Goodnews River weir, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
6/28 -7/1 (6/21 - 7/4)	M	Mean Length		612	624	
		Std. Error		5	4	
		Range		530- 680	550- 695	
		Sample Size	0	50	53	0
	F	Mean Length		576	589	
		Std. Error		3	4	
		Range		530- 620	535- 635	
		Sample Size	0	48	29	0
7/6 - 9 (7/5 - 11)	M	Mean Length	570	601	612	
		Std. Error	-	4	5	
		Range	570- 570	520- 690	520- 695	
		Sample Size	1	68	50	0
	F	Mean Length	543	560	574	
		Std. Error	3	3	4	
		Range	540- 545	515- 600	515- 640	
		Sample Size	2	44	46	0
7/13 - 15 (7/12 - 17)	M	Mean Length	570	597	618	
		Std. Error	-	4	5	
		Range	570- 570	520- 650	555- 680	
		Sample Size	1	47	39	0
	F	Mean Length	553	566	581	
		Std. Error	17	3	8	
		Range	530- 600	520- 630	540- 690	
		Sample Size	4	52	18	0
7/20 - 22 (7/18 - 25)	M	Mean Length	592	585	608	580
		Std. Error	17	4	8	-
		Range	540- 635	515- 665	490- 680	580- 580
		Sample Size	5	49	28	1
	F	Mean Length	535	560	561	
		Std. Error	7	3	8	
		Range	510- 550	500- 610	340- 610	
		Sample Size	6	63	33	0
7/28 - 31 (7/26 - 8/2)	M	Mean Length	545	597	596	
		Std. Error	15	4	7	
		Range	525- 575	550- 670	545- 675	
		Sample Size	3	46	23	0

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Table 12.–(Page 2 of 2).

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
7/28 - 31	F	Mean Length	537	551	554	
(7/26 - 8/2)		Std. Error	3	3	6	
(Cont.)		Range	520- 560	485- 610	445- 630	
		Sample Size	9	77	32	0
8/3, 5 - 6	M	Mean Length	538	586	604	
(8/3 - 7)		Std. Error	12	5	7	
		Range	510- 580	510- 660	565- 645	
		Sample Size	5	41	11	0
	F	Mean Length	529	549	553	
		Std. Error	6	3	4	
		Range	500- 565	490- 610	505- 600	
		Sample Size	12	89	35	0
8/9,11,16, 23	M	Mean Length	532	571	584	
(8/8 - 9/20)		Std. Error	15	8	10	
		Range	510- 560	500- 630	550- 625	
		Sample Size	3	17	7	0
	F	Mean Length	517	545	544	
		Std. Error	9	4	12	
		Range	470- 580	495- 625	505- 590	
		Sample Size	13	52	8	0
Season	M	Mean Length	570	596	613	580
		Range	510- 635	500- 690	490- 695	580- 580
		Sample Size	18	318	211	1
	F	Mean Length	534	559	569	
		Range	470- 600	485- 630	340- 690	
		Sample Size	46	425	201	0
Grand	M	Mean Length	560	590	614	628
Total [a]		Range	495- 585	480- 685	515- 710	605- 640
		Sample Size	39	1,584	1,031	28
	F	Mean Length	535	558	577	608
		Range	510- 560	475- 640	470- 675	640- 645
		Sample Size	66	1,744	914	6

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1990 through 1991, 1997 through 1999, and 2001 through 2004.

Table 13.–Age and sex composition of coho salmon escapement, Middle Fork Goodnews River weir, 2004.

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 %
8/1, 3, 9	25	23	M	75	8.7	523	60.9	0	0.0	598	69.6
(6/21-8/12)			F	0	0.0	261	30.4	0	0.0	261	30.4
			Subtotal	75	8.7	784	91.3	0	0.0	859	100
8/16-17	72	59	M	151	5.1	1,860	62.7	0	0.0	2,011	67.8
(8/13-20)			F	50	1.7	804	27.1	101	3.4	955	32.2
			Subtotal	201	6.8	2,664	89.8	101	3.4	2,966	100
8/23-24	71	56	M	156	1.8	3,421	39.3	0	0.0	3,577	41.1
(8/21-30)			F	0	0.0	4,821	55.3	311	3.6	5,131	58.9
			Subtotal	156	1.8	8,242	94.6	311	3.6	8,708	100
8/31-9/1	70	59	M	2,399	6.8	12,594	35.6	0	0.0	14,993	42.4
(8/31-9/20)			F	2,998	8.5	16,192	45.8	1,199	3.4	20,390	57.6
			Subtotal	5,397	15.3	28,786	81.4	1,199	3.4	35,383	100
Season	238	197	M	2,780	5.8	18,398	38.4	0	0.0	21,178	44.2
			F	3,049	6.4	22,078	46.1	1,611	3.4	26,738	55.8
			Total	5,829	12.2	40,476	84.5	1,611	3.4	47,916	100
Grand		2,999	M	8,075	3.6	98,607	44.5	4,654	2.1	118,216	50.8
Total [a]			F	6,823	3.1	98,653	44.5	4,960	2.2	114,424	49.2
			Total	14,898	6.7	197,080	88.9	9,614	4.3	232,640	100

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number of fish in "Season" are the strata sums; "Season" percentages are derived from the sums.

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

Table 14.–Mean length (mm) of coho salmon escapement, Middle Fork Goodnews River weir, 2004**.**

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	Age Class 2.1	Age Class 3.1
8/1, 3, 9 (6/21 - 8/12)	M	Mean Length	428	551	
		Std. Error	28	10	
		Range	400- 455	510- 610	
		Sample Size	2	14	0
	F	Mean Length		571	
		Std. Error		18	
		Range		485- 630	
		Sample Size	0	7	0
8/16 - 17 (8/13 - 20)	M	Mean Length	518	550	
		Std. Error	12	8	
		Range	495- 530	425- 645	
		Sample Size	3	37	0
	F	Mean Length	540	558	620
		Std. Error	-	12	10
		Range	540- 540	460- 600	610- 630
		Sample Size	1	16	2
8/23 - 24 (8/21 - 30)	M	Mean Length	460	562	
		Std. Error	-	11	
		Range	460- 460	465- 660	
		Sample Size	1	22	0
	F	Mean Length		581	600
		Std. Error		5	15
		Range		530- 630	585- 615
		Sample Size	0	31	2
8/31 - 9/1 (8/31 - 9/20)	M	Mean Length	578	573	
		Std. Error	39	13	
		Range	470- 640	445- 660	
		Sample Size	4	21	0
	F	Mean Length	583	599	583
		Std. Error	15	5	23
		Range	540- 625	550- 660	560- 605
		Sample Size	5	27	2
Season	M	Mean Length	564	568	
		Range	400- 640	425- 660	
		Sample Size	10	94	0
	F	Mean Length	582	593	588
		Range	540- 625	460- 660	560- 630
		Sample Size	6	81	6
Grand Total [a]	M	Mean Length	558	587	599
		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

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

Table 15.–Age and sex composition of Chinook salmon harvest, District W-5 commercial fishery, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class [a] 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 %
6/29	70	67	M	0	0.0	924	62.7	242	16.4	110	7.5	22	1.5	1,298	88.1
(6/24, 29, 7/1)			F	0	0.0	0	0.0	22	1.5	132	8.9	22	1.5	176	11.9
			Subtotal	0	0.0	924	62.7	264	17.9	242	16.4	44	3.0	1,474	100
7/7	68	62	M	0	0.0	440	40.3	370	33.9	88	8.1	0	0.0	897	82.3
(7/5-8/27)			F	0	0.0	0	0.0	35	3.2	88	8.0	70	6.5	194	17.7
			Subtotal	0	0.0	440	40.3	405	37.1	176	16.1	70	6.5	1,091	100
Season [b]	138	129	M		0.0		53.2		23.9		7.7		0.9		
			F		0.0		0.0		2.2		8.6		3.6		
			Total		0.0		53.2		26.1		16.3		4.5	2,565	
Grand		2,075	M	107	0.5	4,962	21.5	5,761	25.0	2,200	9.5	149	0.6	13,223	57.3
Total [c]			F	0	0.0	463	2.0	4,408	19.1	4,623	20.1	276	1.2	9,833	42.7
			Total	107	0.5	5,425	23.5	10,169	44.1	6,824	29.6	425	1.8	23,055	100

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number of fish in "Season" are the strata sums; "Season" percentages are derived from the sums.

[a] Age classes representing less than 1% of the Grand Total are excluded, discrepancies in sums are attributed to exclude age classes.

[b] Sample dates do not meet criteria for estimating escapement percentages for some of the strata; "Season" not included in the "Grand Total".

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

Table 16.–Mean length (mm) of Chinook salmon harvest, District W-5 commercial fishery, 2004.

Sample Dates (Stratum Dates)	Sex		Age class 1.1	1.2	1.3	1.4	1.5
6/29 (6/24, 29, 7/1)	M	Mean Length		574	687	753	908
		Std. Error		8	16	19	-
		Range		481- 666	594- 760	690- 810	908- 908
		Sample Size	0	42	11	5	1
	F	Mean Length			717	835	839
		Std. Error			-	30	-
		Range			717- 717	720- 905	839- 839
		Sample Size	0	0	1	6	1
7/7 (7/5 - 8/27)	M	Mean Length		560	690	788	
		Std. Error		9	18	20	
		Range		490- 680	540- 835	725- 835	
		Sample Size	0	25	21	5	0
	F	Mean Length			768	857	813
		Std. Error			18	22	25
		Range			750- 785	780- 900	770- 880
		Sample Size	0	0	2	5	4
Season[a]	M	Mean Length		570	689	769	908
		Range		481- 680	540- 835	690- 835	908- 908
		Sample Size	0	67	32	10	1
	F	Mean Length			748	844	819
		Range			717- 785	720- 905	770- 880
		Sample Size	0	0	3	11	5
Grand Total[b]	M	Mean Length	404	541	694	837	913
		Range	325- 464	455- 711	539- 876	623-1030	935-1000
		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

[a] Sample dates do not meet criteria for estimating escapement percentages for some of the strata; "Season" not included in the "Grand Total".

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

Table 17.–Age and sex composition of sockeye salmon harvest, District W-5 commercial fishery, 2004.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age class [a] 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 %
6/29	80	74	M	0	0.0	675	8.1	3,824	45.9	225	2.7	0	0.0	4,949	59.5
			F	0	0.0	450	5.4	2,587	31.1	0	0.0	225	2.7	3,374	40.5
(6/24,29 7/1)			Subtotal	0	0.0	1,125	13.5	6,411	77.0	225	2.7	225	2.7	8,323	100
7/7	70	58	M	0	0.0	1,626	22.4	3,126	43.1	125	1.7	250	3.4	5,251	72.4
(7/5,7,9)			F	0	0.0	375	5.2	1,625	22.4	0	0.0	0	0.0	2,001	27.6
			Subtotal	0	0.0	2,001	27.6	4,751	65.5	125	1.7	250	3.4	7,252	100
8/17	70	50	M	0	0.0	1,176	22.0	1,497	28.0	0	0.0	1,069	20.0	4,491	84.0
			F	0	0.0	107	2.0	428	8.0	0	0.0	107	2.0	856	16.0
(7/12-8/27)			Subtotal	0	0.0	1,283	24.0	1,925	36.0	0	0.0	1,176	22.0	5,347	100
Season	220	182	M	0	0.0	3,477	16.6	8,447	40.4	350	1.7	1,319	6.3	14,692	70.2
			F	0	0.0	932	4.5	4,640	22.2	0	0.0	332	1.6	6,230	29.8
			Total	0	0.0	4,409	21.1	13,087	62.6	350	1.7	1,651	7.9	20,922	100
Grand Total [b]		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
			F	8,329	1.6	23,926	4.5	179,473	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

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number of fish in "Season" are the strata sums; "Season" percentages are derived from the sums.

[a] Age classes representing less than 1% of the Grand Total are excluded, discrepancies in sums are attributed to exclude age classes.

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

Table 18.–Mean length (mm) of sockeye salmon harvest, District W-5 commercial fishery, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 0.3	1.2	1.3	1.4	2.3
6/29 (6/24, 29, 7/1)	M	Mean Length		500	562	595	
		Std. Error		3	3	16	
		Range		490- 510	516- 605	579- 611	
		Sample Size	0	6	34	2	0
	F	Mean Length		472	540		573
		Std. Error		13	3		1
		Range		450- 510	495- 564		572- 573
		Sample Size	0	4	23	0	2
7/7 (7/5, 7, 9)	M	Mean Length		522	572	610	543
		Std. Error		8	5	-	33
		Range		470- 575	520- 630	610- 610	510- 575
		Sample Size	0	13	25	1	2
	F	Mean Length		482	534		
		Std. Error		10	8		
		Range		465- 500	445- 565		
		Sample Size	0	3	13	0	0
8/17 (7/12 - 8/27)	M	Mean Length		542	562		567
		Std. Error		12	11		9
		Range		474- 611	492- 617		520- 601
		Sample Size	0	11	14	0	10
	F	Mean Length		490	562		544
		Std. Error		-	8		-
		Range		490- 490	538- 573		544- 544
		Sample Size	0	1	4	0	1
Season	M	Mean Length		524	566	600	562
		Range		470- 611	492- 630	579- 611	510- 601
		Sample Size	0	30	73	3	12
	F	Mean Length		478	540		563
		Range		450- 510	445- 573		544- 573
		Sample Size	0	8	40	0	3
Grand Total [a]	M	Mean Length	584	543	592	600	594
		Range	488- 660	390- 678	440- 683	540- 700	500- 655
		Sample Size	105	664	3770	120	337
	F	Mean Length	552	518	561	573	561
		Range	490- 610	350- 611	440- 695	511- 690	482- 613
		Sample Size	94	468	3231	111	232

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

Table 19.–Age and sex composition of chum salmon harvest, District W-5 commercial fishery, 2004.

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 %
6/29	70	63	M	51	1.6	1,229	38.1	922	28.6	0	0.0	2,202	68.3
(6/24–7/5)			F	0	0.0	614	19.0	409	12.7	0	0.0	1,024	31.7
			Subtotal	51	1.6	1,843	57.1	1,331	41.3	0	0.0	3,226	100.0
7/7	15	13	M										
(7/7–8/27)			F										
			Subtotal									2,788	
Season [a]	85	76	M										
			F		4.4		31.1		26.0		0.0		61.6
			Total		0.0		24.5		14.0		0.0		38.4
					4.4		55.6		40.0		0.0	6,014	100.0
Grand		6,641	M	470	0.3	47,857	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 number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number of fish in "Season" are the strata sums; "Season" percentages are derived from the sums.

[a] Sample dates do not meet criteria for estimating escapement percentages for some of the strata; "Season" not included in the "Grand Total".

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

Table 20.–Mean length (mm) of chum salmon harvest, District W-5 commercial fishery, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
6/29 (6/24 - 7/5)	M	Mean Length	559	574	584	
		Std. Error	-	5	7	
		Range	559- 559	537- 640	532- 643	
		Sample Size	1	24	18	0
	F	Mean Length		556	567	
		Std. Error		5	5	
		Range		533- 590	550- 600	
		Sample Size	0	12	8	0
7/7 (7/7 - 8/27)	M	Mean Length	530	580	572	
		Std. Error	-	6	32	
		Range	530- 530	570- 590	530- 635	
		Sample Size	1	3	3	0
	F	Mean Length		566	538	
		Std. Error		18	28	
		Range		515- 600	510- 565	
		Sample Size	0	4	2	0
Season [a]	M	Mean Length	536	576	579	
		Range	530- 559	537- 640	530- 643	
		Sample Size	2	27	21	0
	F	Mean Length		562	552	
		Range		515- 600	510- 600	
		Sample Size	0	16	10	0
Grand Total [b]	M	Mean Length	540	590	610	621
		Range	515- 593	488- 704	498- 725	560- 703
		Sample Size	21	1,677	1,259	23
	F	Mean Length	547	567	582	605
		Range	522- 568	430- 700	491- 680	565- 658
		Sample Size	10	1,839	1,486	21

[a] Sample dates do not meet criteria for estimating escapement percentages for some of the strata; "Season" not included in the "Grand Total".

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

Table 21.–Age and sex composition of coho salmon harvest, District W-5 commercial fishery, 2004.

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 %
8/6	70	51	M	301	9.8	1,506	49.0	301	9.8	2,108	68.6
(8/2, 6, 9, 11)			F	0	0.0	964	31.4	0	0.0	964	31.4
			Subtotal	301	9.8	2,470	80.4	301	9.8	3,072	100.0
8/16	70	55	M	486	5.5	5,184	58.2	324	3.7	5,994	67.3
			F	324	3.6	2,430	27.3	162	1.8	2,916	32.7
(8/13, 16, 18, 20)			Subtotal	810	9.1	7,614	85.5	486	5.5	8,910	100.0
8/25	70	57	M	1,233	10.5	5,135	43.9	0	0.0	6,368	54.4
(8/23, 25, 27)			F	616	5.3	4,724	40.3	0	0.0	5,340	45.6
			Subtotal	1,849	15.8	9,859	84.2	0	0.0	11,708	100.0
Season	210	163	M	2,020	8.5	11,825	49.9	625	2.6	14,470	61.1
			F	940	4.0	8,118	34.3	162	0.7	9,220	38.9
			Total	2,960	12.5	19,943	84.2	787	3.3	23,690	100.0
Grand		4,220	M	10,684	4.4	112,282	46.3	5,274	2.2	128,241	52.9
Total [a]			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

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The number 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.

Table 22.–Mean length (mm) of coho salmon harvest, District W-5 commercial fishery, 2004.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
8/6	M	Mean Length	559	573	588
(8/2, 6, 9, 11)		Std. Error	24	8	24
		Range	466- 594	514- 658	519- 646
		Sample Size	5	25	5
	F	Mean Length		592	
		Std. Error		8	
		Range		526- 643	
		Sample Size	0	16	0
8/16	M	Mean Length	556	577	558
(8/13, 16, 18, 20)		Std. Error	30	9	31
		Range	515- 614	466- 681	526- 589
		Sample Size	3	32	2
	F	Mean Length	585	579	648
		Std. Error	26	8	-
		Range	558- 611	538- 628	648- 648
		Sample Size	2	15	1
8/25	M	Mean Length	576	589	
(8/23, 25, 27)		Std. Error	18	8	
		Range	520- 637	515- 645	
		Sample Size	6	25	0
	F	Mean Length	611	597	
		Std. Error	5	6	
		Range	603- 620	533- 657	
		Sample Size	3	23	0
Season	M	Mean Length	569	582	572
		Range	466- 637	466- 681	519- 646
		Sample Size	14	82	7
	F	Mean Length	602	591	648
		Range	558- 620	526- 657	648- 648
		Sample Size	5	54	1
Grand Total [a]	M	Mean Length	582	609	610
		Range	511- 695	471- 705	570- 652
		Sample size	57	829	31
	F	Mean Length	612	606	619
		Range	549- 650	471- 680	555- 646
		Sample size	45	799	27

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

Table 23.–Daily weather and hydrological observations, Middle Fork Goodnews River weir site, 2004.

		Wind	Precipitation		Air Temp. °C		River	
Date	**Cloud Cover**	**(Dir./Speed)**	**condition**	**mm/24hr**	**current**	**daily hi/lo**	**level (cm)**	**temp. °C**
17-Jun	broken	V 5-15	light rain	3.5	12	-	35	-
18-Jun	broken	0		0.0	14	-	36	12.0
19-Jun	broken	S-15		0.0	11	-	36	12.0
20-Jun	overcast	S-10	light rain	1.5	14	-	35	12.0
21-Jun	overcast	S-10	light rain	1.0	10	-	35	9.0
22-Jun	overcast	S-15	light rain	1.5	9	-	37	9.0
23-Jun	overcast	SW-8	light rain	1.2	8	-	38	8.0
24-Jun	broken	SW 11		0.1	10	-	37	8.5
25-Jun	clear	0		0.0	14	26/3	37	10.0
26-Jun	clear	0		0.0	22	28/3	34	12.5
27-Jun	broken	0	light rain	0.2	19	26/10	33	13.0
28-Jun	broken	E-11		0.0	18	21/9	32	13.0
29-Jun	broken	SW-7		0.0	25	26/5	31	13.0
30-Jun	broken	W-6		0.0	18	20/7	30	13.0
1-Jul	overcast	SW-10		0.0	16	20/7	29	13.0
2-Jul	overcast	SE-11		0.0	14	16/10	28	12.0
3-Jul	overcast	S-8		0.0	17	23/10	22	12.0
4-Jul	clear	0	light rain	2.9	16	19/10	24	12.0
5-Jul	broken	W-7-10	light rain	0.2	11	20/7	23	12.0
6-Jul	broken	W 7-10		0.0	18	25/11	21	14.0
7-Jul	broken	SW 10		0.0	17	11/25	20	14.0
8-Jul	clear	SW 5		0.0	19	5/3	19	17.0
9-Jul	clear	NS 10		0.0	25	7/28	17	18.0
10-Jul	clear	0		0.0	16	7/29	16	15.0
11-Jul	clear	W 10		0.0	18	6/28	15	18.0
12-Jul	broken	S 9		0.0	18	6/23	15	16.0
13-Jul	overcast	E 19	light rain	3.0	12	10/16	15	15.0
14-Jul	broken	SE 5	light rain	1.0	13	-	14	13.0
15-Jul	broken	SE 5		0.0	13	-	14	13.0
16-Jul	broken	S 7-10	light rain	0.3	13	11/17	14	14.0
17-Jul	overcast	E 5	light rain	1.0	13	11/15	15	13.0
18-Jul	overcast	E 4	light rain	0.6	15	-	19	13.0
19-Jul	broken	NW 5	light rain	7.8	15	-	18	13.0
20-Jul	broken	0		3.8	17	-	18	14.0
21-Jul	overcast	SE 5	light rain	0.3	16	-	15	15.0
22-Jul	broken	0	light rain	2.2	15	15/14	14	15.0
23-Jul	overcast	SE 8	light rain	2.8	14	7/14	13	14.0
24-Jul	broken	E 17		0.0	17	-	13	15.0
25-Jul	overcast	NE 10	light rain	2.1	12	-	12	14.0
26-Jul	broken	E15	light rain	2.0	14	-	11	15.0
27-Jul	overcast	NE 4	light rain	2.1	13	-	12	14.0
28-Jul	overcast	0	light rain	1.8	13	-	15	13.0
29-Jul	overcast	E 6	light rain	0.2	13	-	14	14.0
31-Jul	clear	S 6		0.0	15	-	13	13.0

-continued-

Table 23.–(Page 2 of 2)

		Wind	Precipitation		Air Temp. °C		River	
Date	**Cloud Cover**	**(Dir./Speed)**	**condition**	**mm/24hr**	**current**	**daily hi/lo**	**level (cm)**	**temp. °C**
1-Aug	broken	SW -10		0.0	15	-	12	14.0
2-Aug	clear	0		0.0	15	-	12	14.0
3-Aug	overcast	SW -7	light rain	10.7	9	-	12	15.0
4-Aug	overcast	0	light rain	0.0	13	-	12	13.0
5-Aug	broken	N-6	light rain	5.0	14	-	11	13.0
6-Aug	clear	N-5	light rain	1.4	17	-	12	14.0
7-Aug	overcast	S-10		0.0	12	-	10	15.0
8-Aug	overcast	S-13	light rain	0.1	16	-	10	14.0
9-Aug	broken	S-8		0.0	17	-	9	15.0
10-Aug	overcast	0	light rain	0.6	15	-	8	15.0
11-Aug	overcast	SW-6	light rain	2.5	14	-	8	14.0
12-Aug	overcast	SE-10	light rain	8.5	14	-	9	14.0
13-Aug	overcast	E 8-20	light rain	8.2	13	-	11	13.0
14-Aug	overcast	E-17		0.0	16	-	10	14.0
15-Aug	broken	E-10		0.0	17	-	9	14.0
16-Aug	broken	0		0.0	17	-	8	14.0
17-Aug	clear	0		0.0	18	-	7	14.0
18-Aug	broken	10-5		0.0	16	-	7	15.0
19-Aug	overcast	0		0.0	17	-	6	15.0
20-Aug	clear	SW-5		0.0	17	-	6	15.0
21-Aug	broken	E-14		0.0	17	-	5	15.0
22-Aug	overcast	E-10		0.0	16	-	5	14.0
23-Aug	overcast	E-9		0.0	15	-	4	13.0
24-Aug	broken	E-6	light rain	0.2	14	-	4	13.0
25-Aug	overcast	SW-7	light rain	0.9	14	-	4	14.0
26-Aug	broken	N-9	light rain	1.2	13	-	4	14.0
27-Aug	broken	N-5		0.0	11	-	4	12.0
28-Aug	clear	N-5		0.0	10	-	3	11.0
29-Aug	broken	0		0.0	13	10/17	3	11.0
30-Aug	broken	0		0.0	15	6/18	2	12.0
31-Aug	overcast	E-11	light rain	0.2	11	7/12	2	12.0
1-Sep	overcast	SE-5	light rain	1.0	15	-	2	13.0
2-Sep	broken	0	light rain	1.6	13	-	2	12.0
3-Sep	broken	NW-5	light rain	3.0	15	-	1	11.0
4-Sep	overcast	0	light rain	0.2	14	-	0	10.0
5-Sep	overcast	VAR-5	light rain	0.0	17	-	1	11.0
6-Sep	broken	S-5	light rain	0.0	14	-	1	11.0
7-Sep	overcast	E-20	light rain	1.2	12	-	1	11.0
8-Sep	broken	ESE-5	light rain	10.5	14	-	2	10.5
9-Sep	broken	E-10	light rain	4.4	14	-	8	10.5
10-Sep	overcast	E-10	light rain	4.0	12	-	7	11.0
11-Sep	broken	CALM	light rain	3.2	13	-	7	10.5
12-Sep	broken	N-20		0.0	10	-	5	10.0
13-Sep	clear	CALM	light rain	0.2	9	-	4	8.0
14-Sep	overcast	CALM	light rain	1.6	8	-	3	8.0
15-Sep	broken	NW-15	light rain	13.4	9.5	-	5	9.0
16-Sep	broken	E-5		0.0	8	-	4	9.0
17-Sep	broken	SE-10		0.0	9	-	3	8.0
18-Sep	overcast	E-10	light rain	2.4	5	-	2	8.0
19-Sep	overcast	CALM	light rain	7.6	9	-	3	8.5
20-Sep	broken	CALM	light rain	1.6	7.5	-	5	8.0

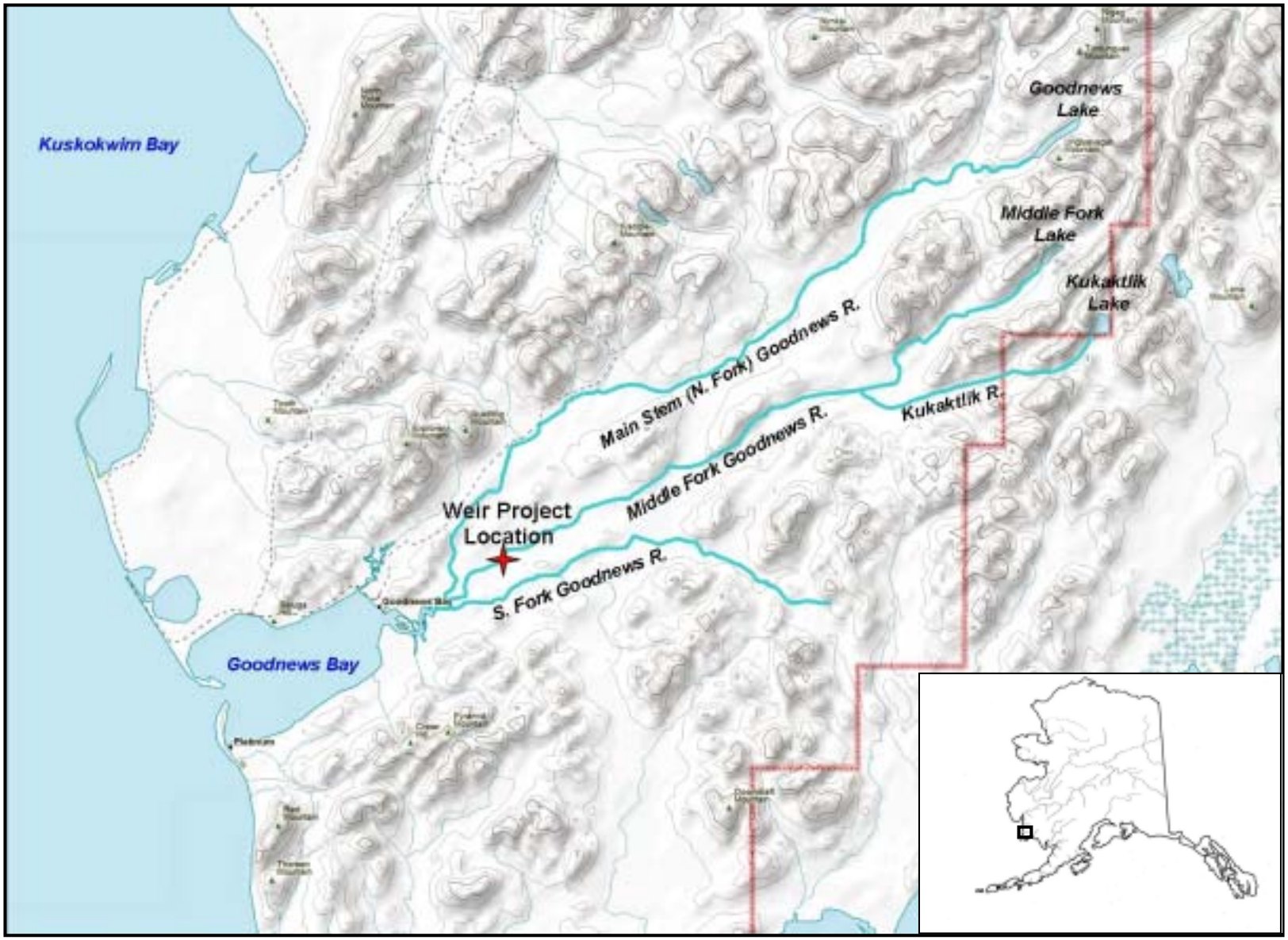

Figure 1.–Goodnews River drainage, Kuskokwim Bay, Alaska.

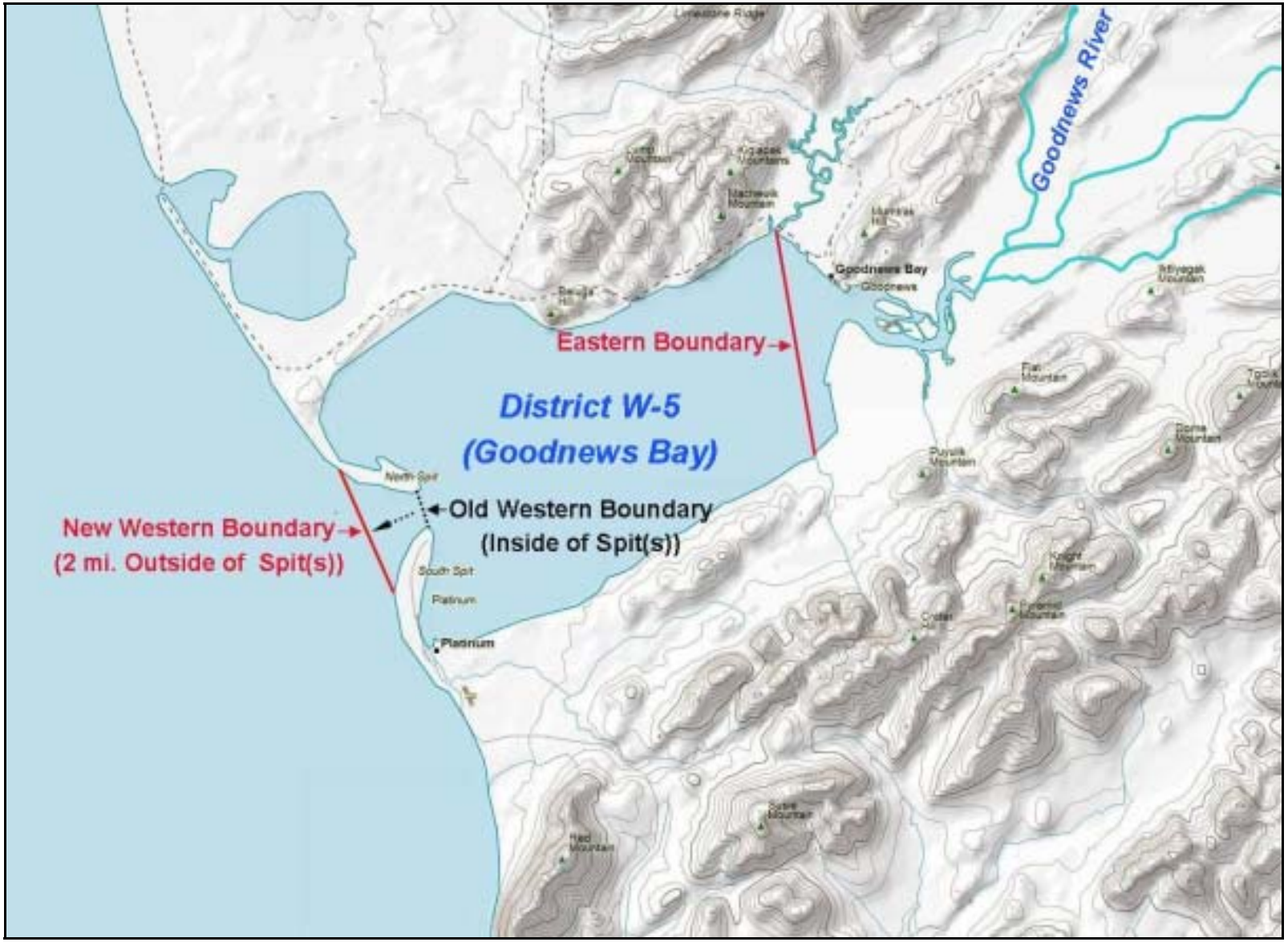

Figure 2.–Commercial fishing District W-5 (Goodnews Bay), Kuskokwim Bay, Alaska, 2004.

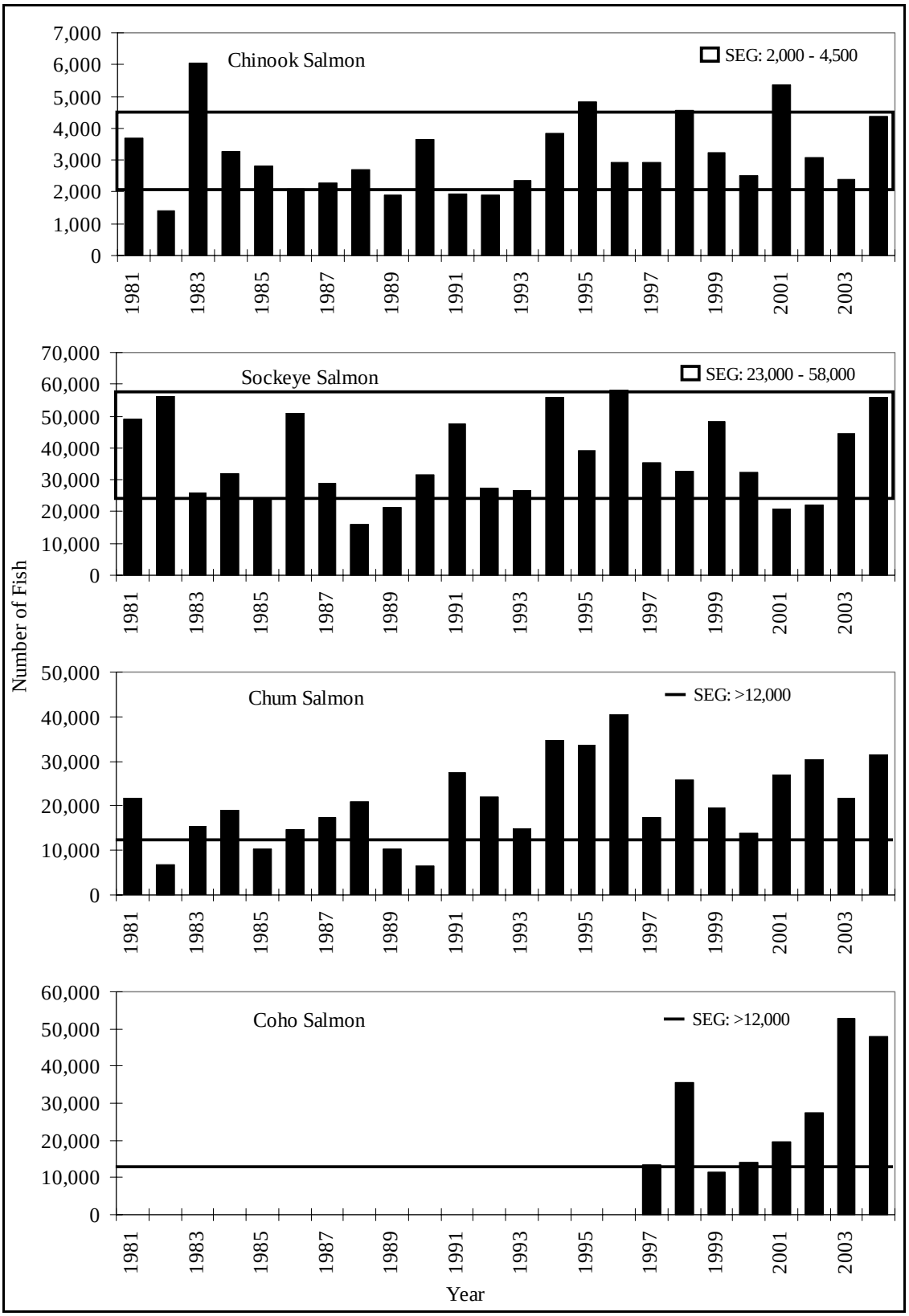

Figure 3.–Historical Chinook, sockeye, chum, and coho salmon escapement estimates, Middle Fork Goodnews River weir, 1981 through 2004.

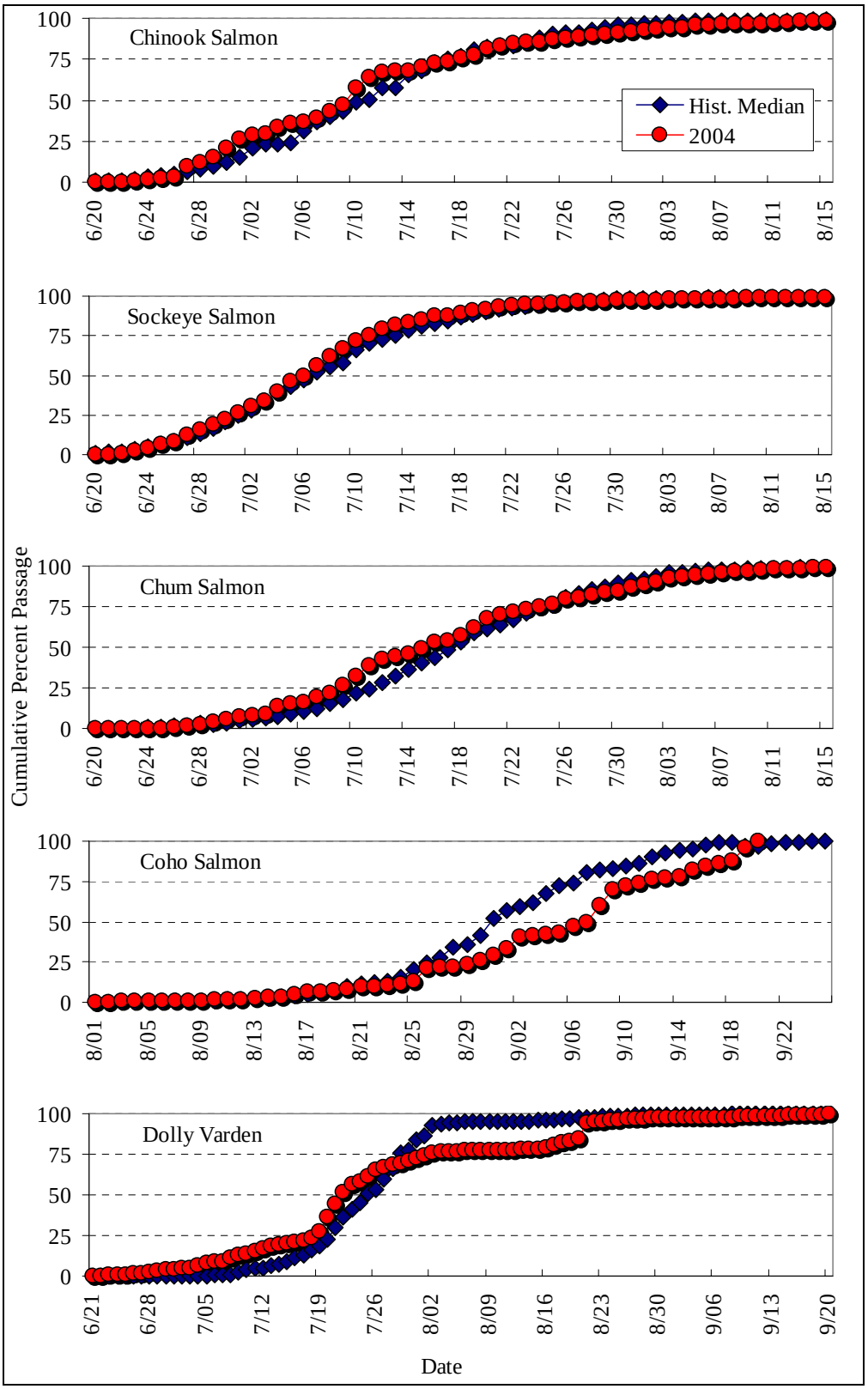

Figure 4.–Cumulative percent passage of Chinook, sockeye, chum, and coho salmon and Dolly Varden, Middle Fork Goodnews River weir, 2004 and historical median.

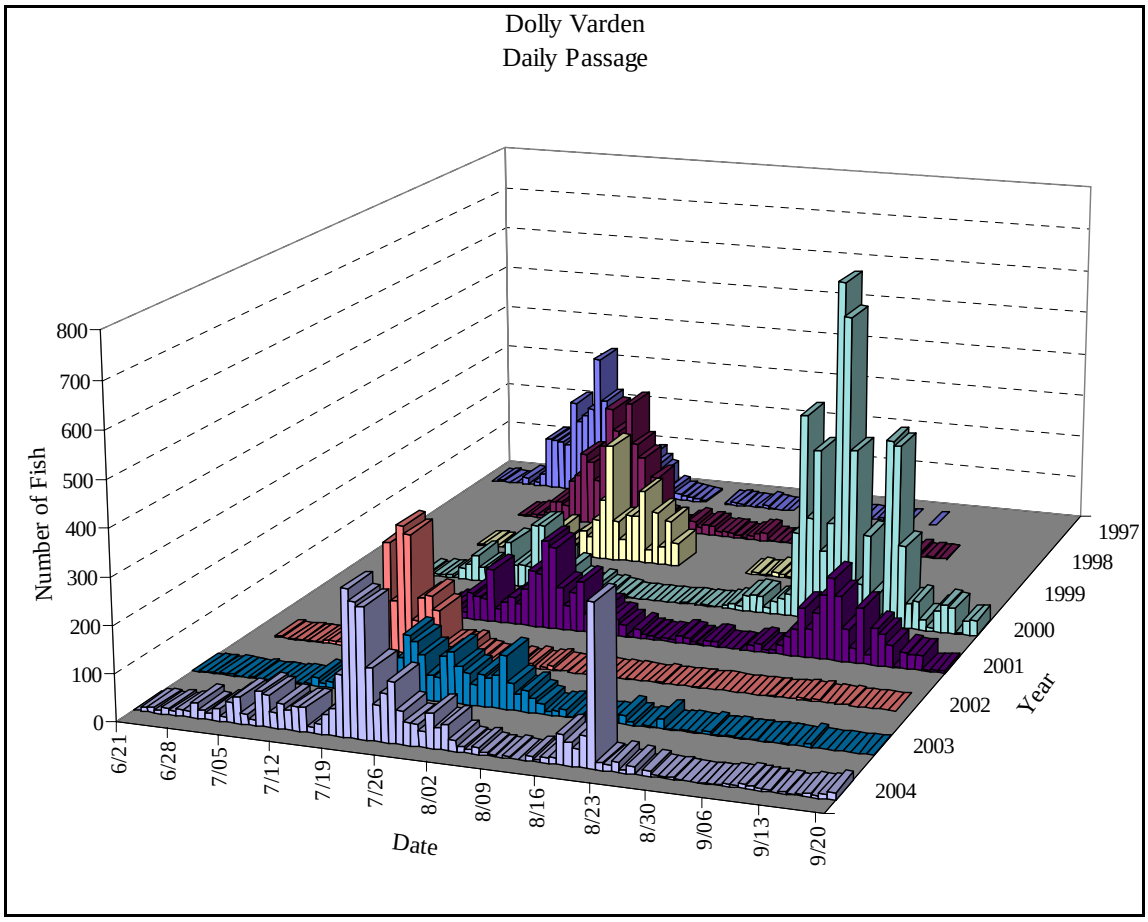

Figure 5.–Historical daily Dolly Varden passage, Middle Fork Goodnews River weir, 1997 through 2004.

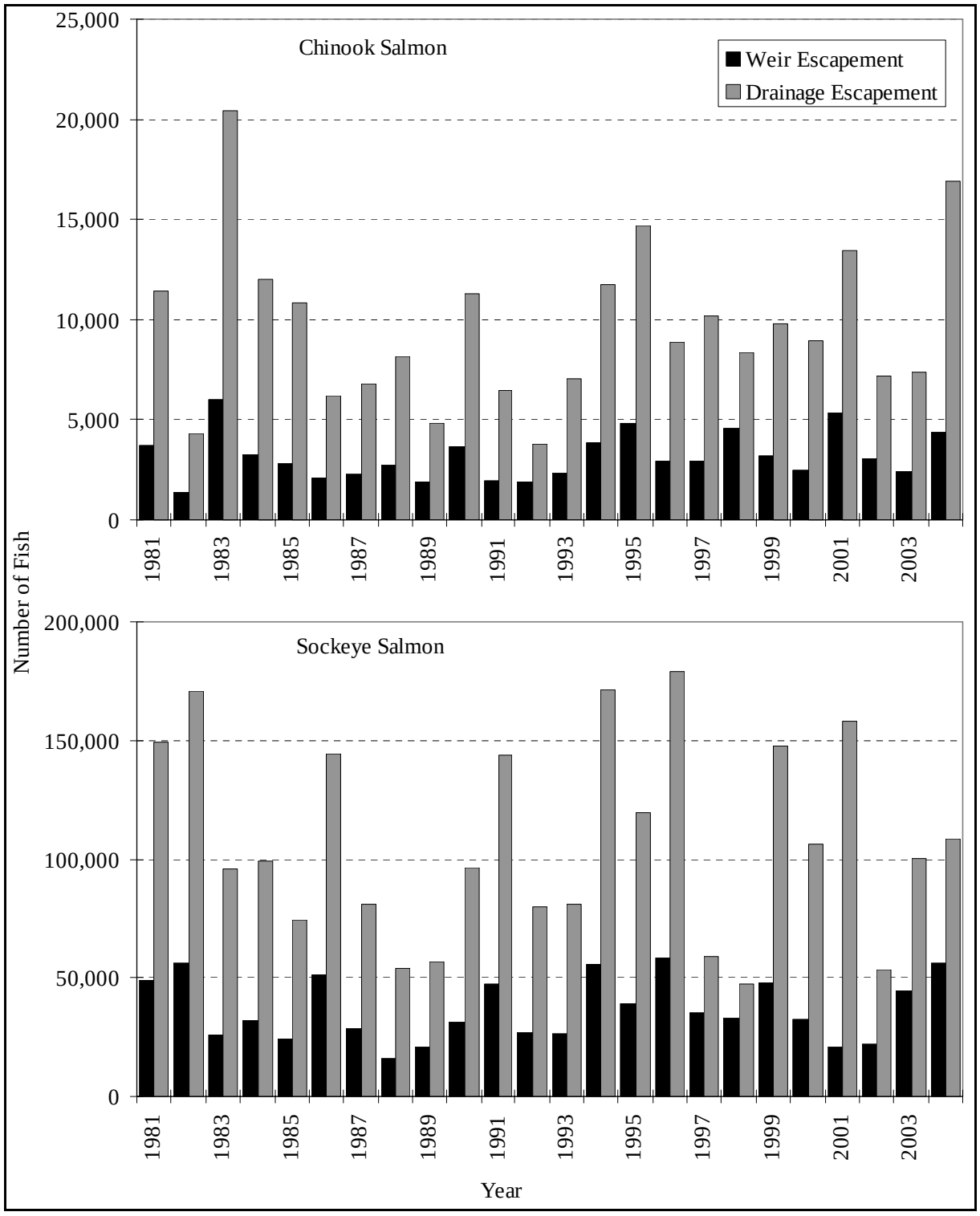

Figure 6.–Historical Chinook and sockeye salmon escapement estimates, Middle Fork Goodnews River weir and Goodnews River drainage, 1981 through 2004.

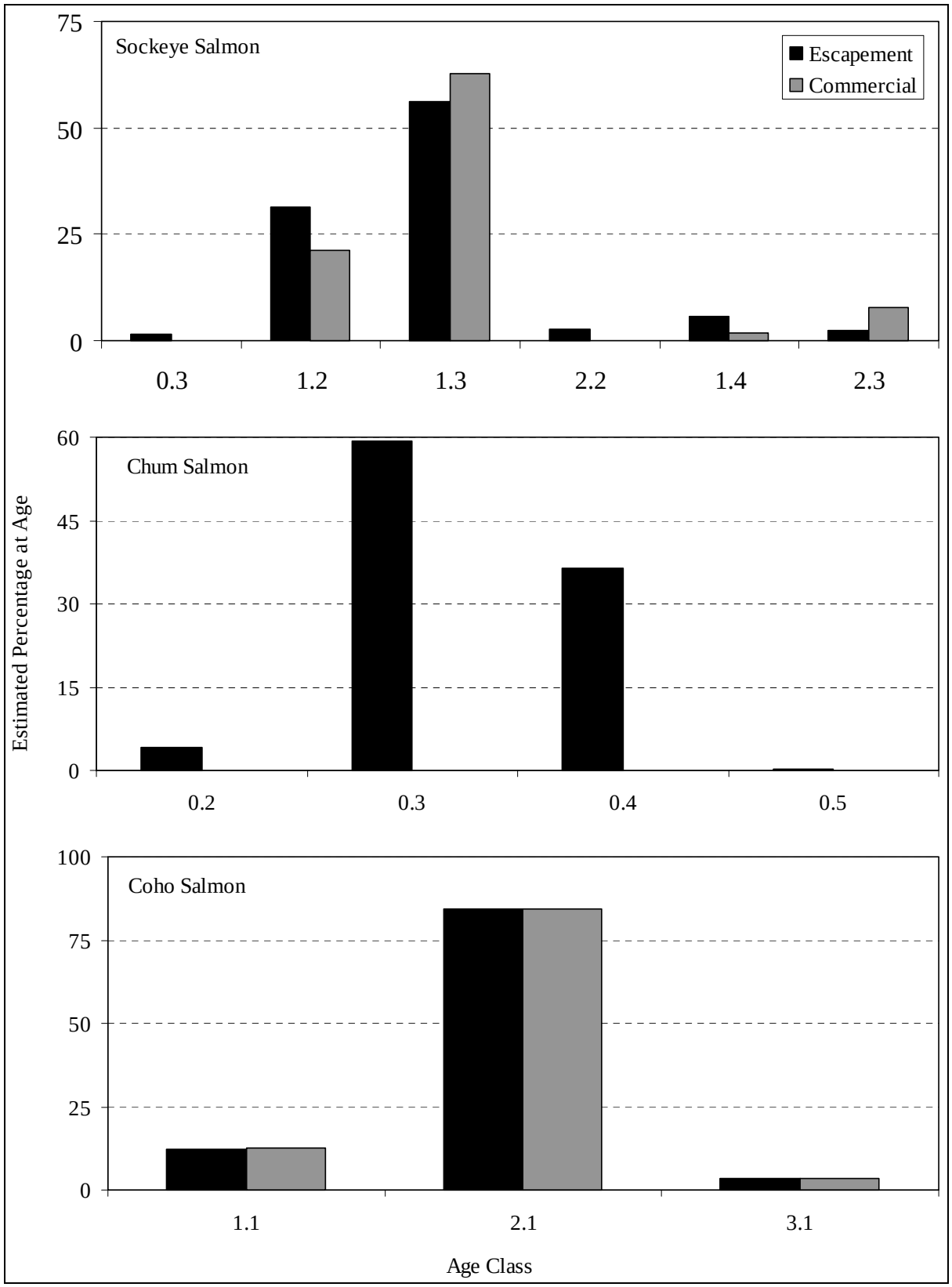

Figure 7.–Estimated age class percentages for sockeye, chum, and coho salmon, Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2004.

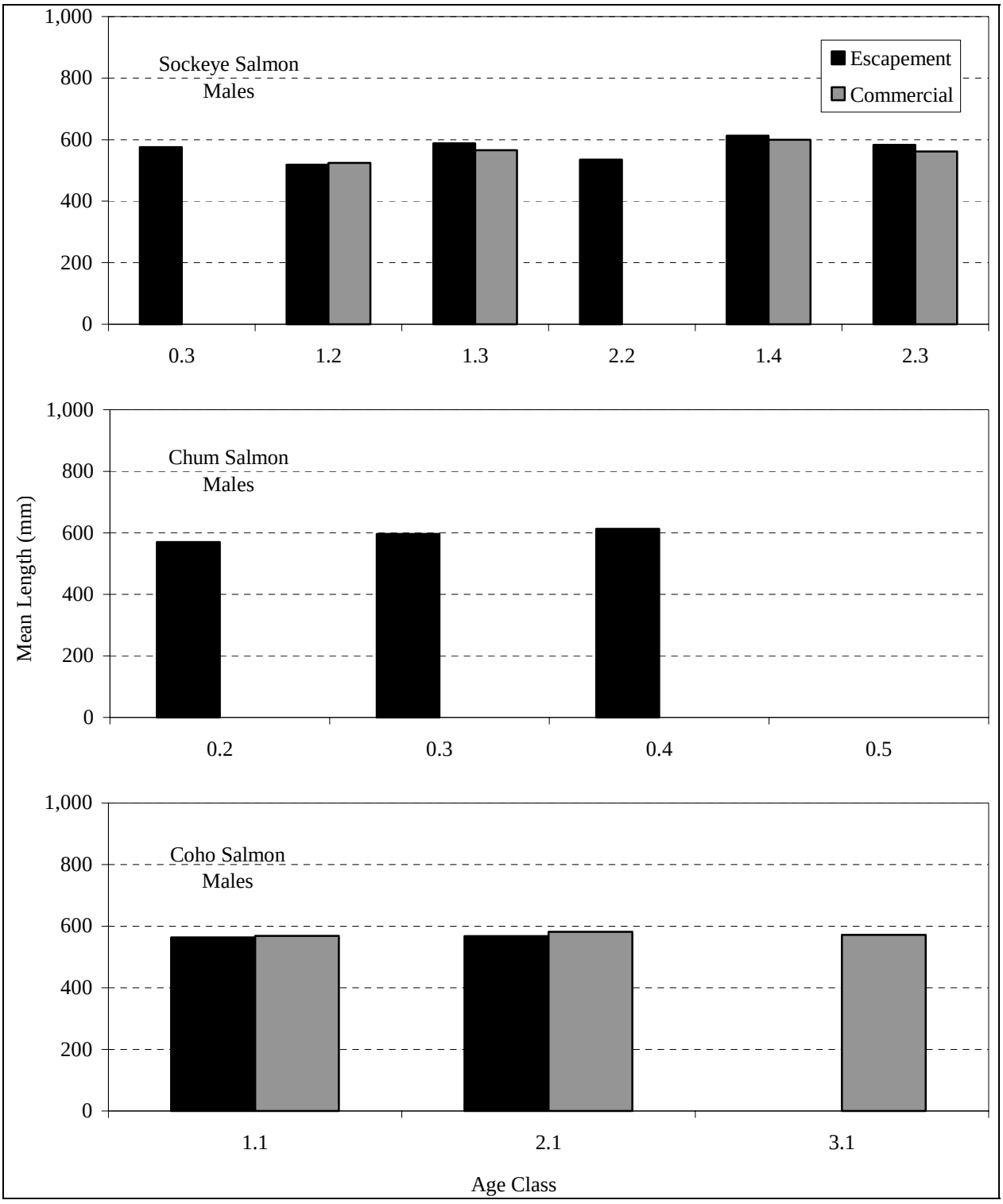

Figure 8.–Mean length by age class for male sockeye, chum, and coho salmon, Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2004.

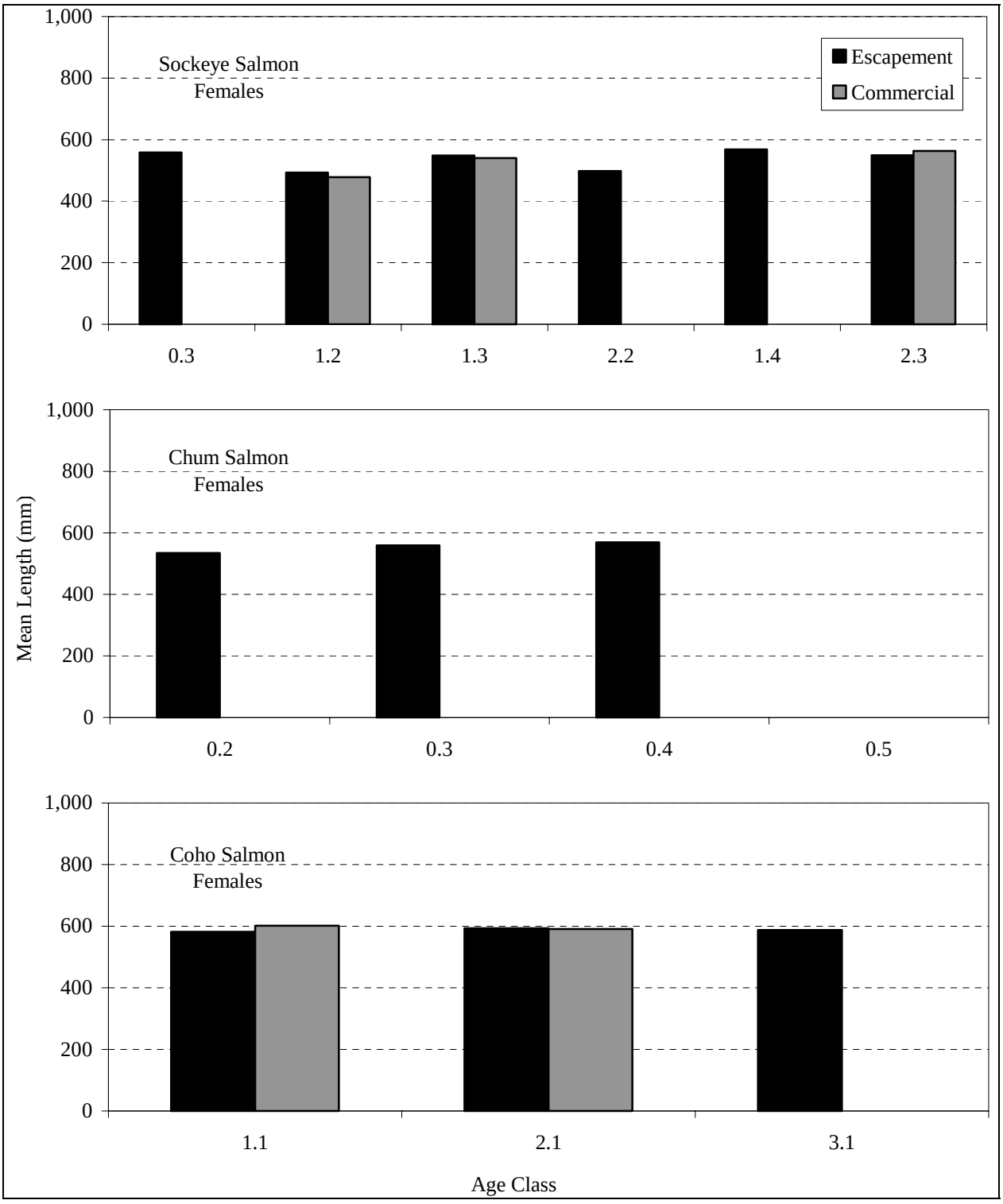

Figure 9.–Mean length by age class for female sockeye, chum, and coho salmon, Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2004.

APPENDIX A. SALMON HARVESTS OF GOODNEWS BAY AREA

Appendix A1.–Historical commercial, subsistence, and sport fishing harvests of Chinook, sockeye, coho and chum salmon, Goodnews Bay area, 1968 through 2004.

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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Appendix A1.–(Page 2 of 2).

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	[c]	[c]	20,922	[c]	[c]	23,690	[c]	[c]	6,014	[c]	[c]
10 Year Average[d]	2,282	731	173	31,771	490	170	17,642	523	570	11,710	275	27
Historical Average	3,751	664[e]	142	23,187	681[e]	136	19,873	834[e]	444	11,494	353[e]	47

Note: Commercial harvest from District W-5, combined subsistence harvest by the communities of Goodnews Bay and Platinum, subsistence harvest estimates prior to 1988 are based on a different formula and are not comparable with estimates from 1988 to present. Source: Whitmore et al. (*In prep*).

[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 from 1994 through 2003.

[e] Historical average of subsistence harvest from 1988 through 2003.

APPENDIX B. GOODNEWS ESCAPEMENT

Appendix B1.–Historical escapement, Middle Fork Goodnews River escapement projects, 1981 through 2004.

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]	1,829 [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
Historical Average			3,137	36,925	21,284	8,905	27,897	2,964

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

[b] Project located approximately 500 yd 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 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 through 2004.

	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]
SEG	640–3,300	5,500–19,500	[b]	[b]	[b]	[b]	[b]	[b]
10 Year Avg [c]	2,996	15,032			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 through 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 through 2004.

Year	Species	MFGR Tower/weir Estimate	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	210493	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]
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]

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Year	Species	MFGR Tower/weir Estimate	North Fork Escapement	Subsistence Harvest	Commercial Harvest	Sport Harvest	Total Run Size	Exploitation (%)
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]
2004	Chinook	4,388	12,512	[c]	2,565	[c]	20,369 [d]	17
	Sockeye	55,926	52,646	[c]	20,922	[c]	130,153 [d]	17
	Chum	31,616	[b]	[c]	6,014	[c]	[b]	[b]
	Coho	47,916	[b]	[c]	23,690	[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 the official estimates were not available at the time of publication, the recent 10 year averages (1994–2003) of Goodnews Bay area subsistence and Goodnews River sport fishing harvest were used for generating total run size estimates in 2004.