Regional Operational Plan CF.4K.2017.03

Alaska Peninsula Salmon Enumeration and Escapement Sampling Procedures, 2017–2018

by

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and

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February 2017

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

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SIGNATURE PAGE

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PURPOSE

In the Alaska Peninsula Management Area (Area M), weirs are a primary mode of enumeration for sockeye salmon *Oncorhynchus nerka* escapements into some area streams. Annually, the Alaska Department of Fish and Game (ADF&G) samples adult sockeye salmon escapements at the Nelson, Bear, Sandy, Ilnik, Orzinski rivers, and McLees lake weirs for age, sex, and length (ASL) data. Out-migrating juvenile sockeye salmon (smolt) are also sampled for age, weight, and length (AWL) at Bear and Orzinski river weirs. The biological information collected from salmon escapement, combined with catch sampling information, provide the foundation for preseason run forecasts, escapement goal evaluation, and accurate assignment of the run to stock-of-origin (run reconstruction) to some Alaska Peninsula systems. The use of this data assists with long-term management of sockeye salmon stocks while daily monitoring of the sockeye salmon escapements helps ensure that escapement goals are met. Operation guidelines for the 6 Area M ADF&G weir camps are presented, including weir installation instructions, salmon enumeration and sampling procedures, and general camp policies.

Key words: Alaska Peninsula, Area M, commercial salmon harvest, escapement, sampling, weir, operational plan, Chinook salmon, *Oncorhynchus tshawytscha*, sockeye salmon, *Oncorhynchus nerka*, coho salmon, *Oncorhynchus kisutch*, pink salmon, *Oncorhynchus gorbuscha*, chum salmon, *Oncorhynchus keta*

BACKGROUND

The basic function of Alaskan salmon management is to ensure sufficient spawning escapement while allowing the harvest of available surpluses, consistent with the maximum sustainable yield principle and subject to allocations established through public regulatory processes. Annually, the Alaska Department of Fish and Game (ADF&G) crews enumerate and sample salmon escapement at 6 weirs on the Alaska Peninsula and Aleutian Islands; Bear, Nelson, Sandy, Ilnik, Orzinski rivers, and McLees Lake (Figure 1). Sockeye salmon smolt samples are also collected weekly at Bear and Orzinski rivers, serving as indices of outmigration, age composition, and smolt condition. A brief description and history of each weir site is provided in this document. Guidelines for installation of each weir are provided in the A appendices. General camp protocols are provided in Appendix B1. Guidelines for identification of salmon smolt are provided in Appendix C1.

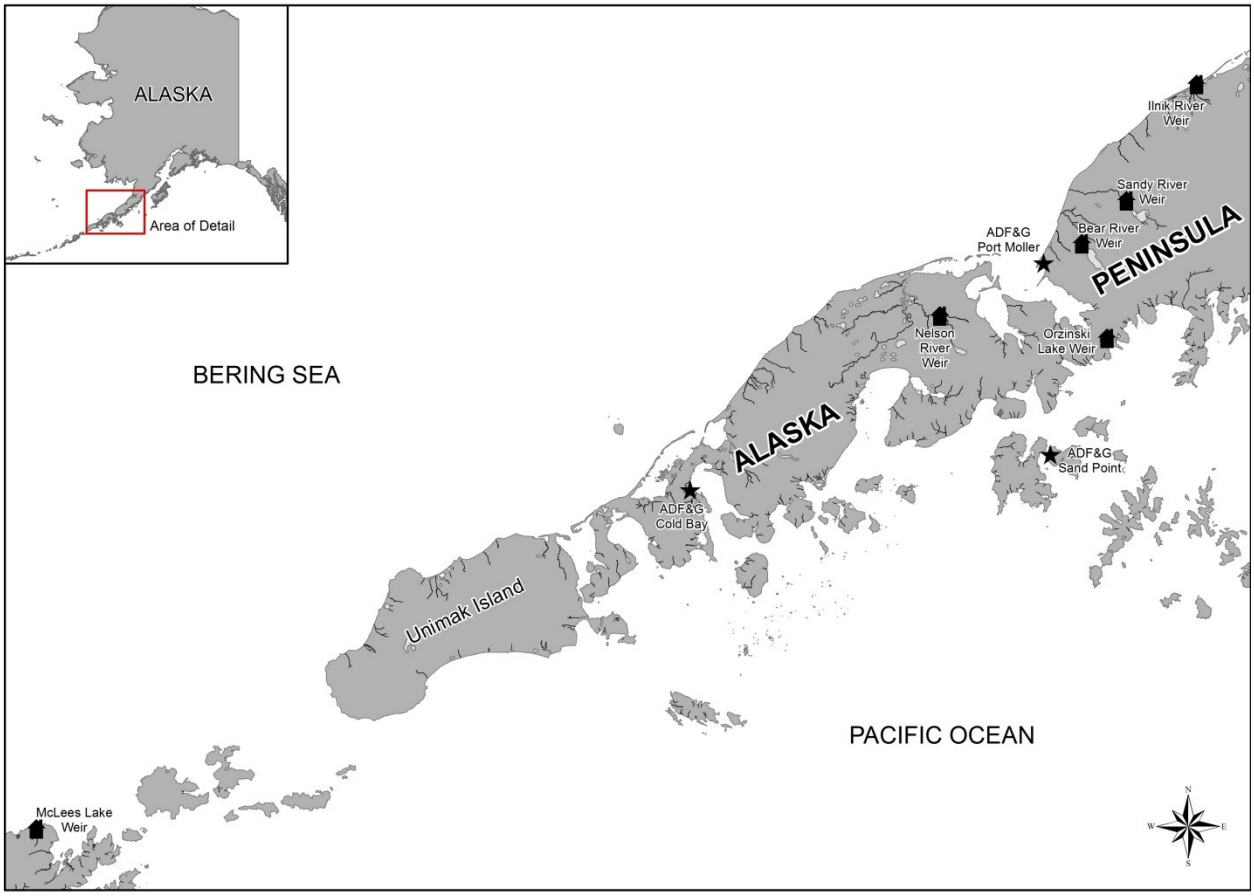

Figure 1.–Map of the Area M ADF&G seasonal offices and weir locations.

OBJECTIVES

LONG TERM

- Management of the salmon resources in the Alaska Peninsula Management Area for maximum sustainable yield by achievement of annual escapement objectives, forecasting improvement, development of stock-recruitment relationships to assess escapement requirements, and accurate assessment of stock composition.
- Develop a history of biological attributes and samples that may be used for genetic and long-term age studies.

SHORT TERM

- Enumerate salmon escapement by species and ensure interim escapement objectives are met throughout the season.
- Determine the sockeye salmon ASL composition for Bear, Sandy, Ilnik, Nelson, Orzinski rivers, and McLees Lake.
- Determine the AWL composition of sockeye salmon smolt from Bear and Orzinski rivers.

METHODS

GENERAL WEIR PROTOCOLS

The main responsibility of a weir crew is to install, maintain, and operate a salmon weir for the purpose of escapement enumeration and sampling. Two ADF&G personnel will be assigned to each project and additional assistance, if needed, will be provided during weir installation and removal.

Weir counts should be performed as needed. On days during which large numbers of fish are passing, counts may need to be done once an hour and a weir crew may perform between 10 and 12 counts throughout the day. At the start and end of the sockeye salmon runs, counts may only need to be performed as few as 4 or 5 times a day. Large amounts of fish (>200) should not be allowed to build up behind the weir.

Fish will be visually identified as they pass through the weir gates and enumerated by crew members using handheld tally counters. The crew will record each fish by species, as well as the number of net-marked and "jack" sockeye salmon (a fish which has spent only one year in salt water before returning to spawn). A sockeye salmon less than 16 inches (<400 mm) in length (mid-eye to tail fork) will be considered a jack salmon. The numbers of jack and net-marked salmon, as well as the ratio of males to females, are important factors when evaluating escapement quality. Typically the number of jack salmon passing the weir through any given time period is less than 10%. If the number of jack salmon (on a daily basis or for the season) is above 10%, the escapement objective may be increased to improve quality of escapement. Escapement objectives may also be increased if the number of net-marked fish becomes excessive, or if the ratio of males to females becomes skewed. The crew should report to their supervisor if they are recording high numbers of net-marked or jack salmon.

The daily and cumulative escapement form will be used to record the daily escapement counts (Figure 2). On the daily counting form, note the time period when the weir gate is opened, and daily and cumulative counts for adult sockeye, jack sockeye, and other salmon species. Remarks such as weather, percentage of net marked fish, water levels, holes in the weir, approximate numbers of Dolly Varden *Salvelinus malma* or Steelhead *O. mykiss* passed, and other comments should be included in the remarks column to the right of the page. Additional comments can be included at the bottom of the page.

A minimum of 240 adult sockeye salmon will be sampled for ASL data in a live trap installed on the weir each statistical week throughout the season. Bear River has a late-run of sockeye salmon which traditionally starts August 1; because of this an effort should be made to sample on August 1 at the Bear River weir. At Bear and Orzinski rivers, 200 sockeye salmon smolt will also be sampled each statistical week. An additional dip net sample of 100 adult sockeye salmon will be taken daily at the Nelson River weir. The dip net sample is conducted to determine male to female ratios, no lengths or scales will be collected. Detailed procedures for sampling adult and smolt sockeye salmon can be found in the Kodiak Management Area salmon catch and escapement sampling operation plan (Wattum and Foster, 2016).

In addition to enumerating and sampling salmon, the crew will maintain the weir to prevent holes from forming or the weir washing out. The weir must be kept clean of debris and the river substrate must be checked periodically throughout the day. In deeper channels a dry suit and diving mask will be needed to visually inspect the weir for holes. A complete inspection of the weir and a full cleaning must be done at least once a day. During high water the weir should be checked and cleaned multiple times a day as needed.

Weather Ceiling: 1,500-2,000 ft
Vis: 4 miles
Wind: Ø

Date: 08-09-16 Location: Bear River

Gate Time		Adult Sockeye		Jack Sockeye		Total Sockeye	Other Salmon				Comments: water levels, holes in the weir, weather, etc.
Opened	Closed	Hourly Count	Daily Cumulative	Hourly Count	Daily Cumulative	Daily Cumulative	Chinook	Pink	Chum	Coho	
07:30	07:50	1,208	1,208	79	79	1,287	—	9	6	—	Foggy
10:02	10:12	1,177	2,385	68	147	2,532	—	6	6	—	Fog lifted
12:57	13:12	1,252	3,637	99	246	3,883	—	4	1	—	
Sample		79	3,716	7	253	3,969	—	1	—	—	
15:13	15:28	1,136	4,852	53	306	5,158	—	8	4	—	
17:47	18:02	1,033	5,885	71	377	6,262	—	7	3	—	
21:22	21:37	905	6,790	55	432	7,222	—	6	7	—	
Daily Total			6,790		432	7,222	—	41	27	—	
Previous Day's Total			319,844		23,042	342,885	37	1,495	143	—	
Season Cumulative			326,634		23,474	350,108	37	1,536	170	—	

Notes:

Smolts AvW: 12.8g AvL: 109 mm

Adults AvL: 510 mm M: 59% J: 9% NM: Ø%
F: 32% C: Ø%

Figure 2.–Sample of daily escapement reporting form used at Bear, Nelson, Sandy, Ilnik, Orzinski rivers, and McLees Lake weirs.

The weir crews at Nelson, Bear, Sandy, and Ilnik rivers will relay total daily counts and cumulative seasonal counts for each species to Port Moller during the normal radio or satellite phone schedule at 8:20 AM and 7:20 PM. The weir crews at Orzinski River and McLees Lake will provide this information to Sand Point during the same schedule. When the project is completed all forms will be forwarded to Port Moller or Sand Point, as well as daily counting forms, camp log books, and sampling log books containing raw data.

Procedures for Daily Escapement Form

- Begin a new reporting form every day. Each day, copy the season cumulative totals for adults, jacks, sockeye total, and other species over from the previous day's sheet and enter them into the appropriate fields marked "Previous Day's Total" at the page bottom.
- After each count, record the time interval when the fish pass gate was opened under the "Gate Time".
- After each count, add the count from that period (under "Hourly Counts") to the running daily cumulative columns for both sockeye adults and jacks, then total all sockeye and record them under "Total Sockeye Daily Cumulative".
- Record other species counts in the appropriate columns.
- After the last count of the day sum all categories into the "Daily Total" row at the bottom of the sheet. Add the "Daily Total" row to the "Previous Day's Total" row to calculate the season cumulative for that day.
- Enter any notes such as water level, net marks, holes in the weir, etc., into the "comments" field on the right.
- Double-check all computations before reporting numbers to the Area Management Biologist during radio schedules.

BEAR RIVER WEIR

The Bear River weir (lat 56°02′24″ N, long 160°16′10″ W) is located approximately 600 m downstream of the outlet of Bear Lake, on the north side of the Alaska Peninsula (Figure 1). Bear River is home to the largest sockeye salmon run on the North Alaska Peninsula. The weir is roughly 53 m in length with water depth varying between 1.0 m and 1.5 m.

The weir on Bear River is installed on approximately May 31 and is removed approximately August 25. The Bear River weir is located approximately 600 m downstream of the lake in roughly the same location as 2016. Care is taken not to interfere with the approach of airplanes landing at the Bear Lake Lodge landing strip upstream of the weir, and mooring opportunities are offered on the riverbank for lodge skiffs behind the weir. Detailed weir installation instructions for Bear River can be found in Appendix A1.

Two distinct runs of sockeye salmon, an early run and a late run, characterize the Bear River escapement (Table 1). The escapement goal for the early run, June 1 through July 31, is 176,000 to 293,000 sockeye salmon. The late-run escapement objective from August 1 through August 25 is a minimum of 87,000 sockeye salmon. The late-run total goal, including the post-weir estimate

of 30,000 fish, is 117,000 to 195,000 sockeye salmon. The goal for the entire season including the post-weir estimate is 293,000 to 488,000 sockeye salmon (Schaberg et al. 2015). Escapements may be increased if escapement quality is poor because of a high percentage of jack or net-marked salmon.

Table 1.–Bear River weir sockeye salmon escapement management objectives.

Date	Escapement for period			Cumulative escapement		
Early-run component:						
15-Jun	4,000	–	8,000	4,000	–	8,000
20-Jun	11,000	–	22,000	15,000	–	30,000
25-Jun	15,000	–	25,000	30,000	–	55,000
30-Jun	30,000	–	60,000	60,000	–	115,000
5-Jul	30,000	–	50,000	90,000	–	165,000
10-Jul	25,000	–	35,000	115,000	–	200,000
15-Jul	15,000	–	30,000	130,000	–	230,000
20-Jul	10,000	–	20,000	140,000	–	250,000
25-Jul	20,000	–	20,000	160,000	–	270,000
31-Jul	16,000	–	23,000	176,000	–	293,000
Total early-run goal	176,000	–	293,000			
Late-run component:						
5-Aug	15,000	–	30,000	191,000	–	323,000
10-Aug	20,000	–	35,000	211,000	–	358,000
15-Aug	17,000	–	35,000	228,000	–	393,000
20-Aug	15,000	–	30,000	243,000	–	423,000
25-Aug	20,000	–	35,000	263,000	–	458,000
Total late-run objective:	87,000	–	165,000			
Post-weir objective	30,000					
Total late-run goal	117,000	–	195,000			
Season total escapement goal	293,000	–	488,000			

Note: Escapement occurring during the July 26–31 period that results in the escapement exceeding the 23,000 fish upper escapement objective will be applied to the late-run escapement objective beginning August 1. However, no more than 15,000 fish shall be applied to the late-run escapement objective. This will aid the ADF&G in managing the late Bear River sockeye salmon run more effectively when the run is earlier than expected.

NELSON RIVER WEIR

The Nelson River weir (lat 55°48′99″ N, long 161°14′05″ W) is located approximately midway between the head of Nelson Lagoon and Sapsuk Lake (Figure 1). The weir is approximately 40 m in length with water depth varying between 0.6 m and 1.0 m.

The floating weir on Nelson River is installed around June 1 and operates until July 25. The location is the same as previous years and is indicated by the railroad rails located in the river about 100 m upstream of the ADF&G cabin. Detailed weir installation instructions for Nelson River can be found in Appendix A2.

The sockeye salmon escapement goal range for the Nelson River system is 97,000 to 219,000 fish (Table 2; Schaberg et al. 2015). Escapements may be increased if escapement quality is poor because of a high percentage of net-marked fish, a high percentage of jack salmon, or a low female to male sex ratio. Nelson River has a female sockeye salmon escapement objective of 50,000 to 100,000 fish by July 25. Management staff in Port Moller can direct the crew at the Nelson River weir to sample the escapement as needed to determine the female to male sex ratio of fish passing the weir. A daily dip-net sample of 100 fish is typical. The escapement goal range for Chinook salmon in the Nelson River system is 2,400 to 4,400 fish, though the actual number of Chinook salmon is generally estimated through aerial surveys.

Table 2.–Nelson River weir sockeye salmon escapement management objectives.

Date	Escapement for period			Cumulative Escapement		
30-Jun	30,000	–	60,000	30,000	–	60,000
5-Jul	20,000	–	45,000	50,000	–	105,000
10-Jul	20,000	–	50,000	70,000	–	155,000
15-Jul	15,000	–	30,000	85,000	–	185,000
20-Jul	10,000	–	25,000	95,000	–	210,000
25-Jul	2,000	–	9,000	97,000	–	219,000
Total	97,000	–	219,000			

SANDY RIVER WEIR

The Sandy River weir (lat 56°11′94″ N, long 160°01′53″ W) is located approximately 5 km below Sandy Lake (Figure 1). The weir is roughly 61 m in length with water depth varying between 0.6 m and 1.5 m.

The weir is typically installed around June 5 and operates until about July 25. The weir is installed in roughly the same location as it was in the previous year after assessing the quality of the site in terms of river depth, channel development, and substrate stability.

Due to the notable fluctuations in water level and debris load that Sandy River experiences, extra precautions are taken during installation to secure the tripods from being washed out. After the stringers and catwalk are in place, sufficient sandbags are stacked on the tripod platforms and against the back legs to hold the tripods securely when the panels are installed. A rope is also run through the tripods and fastened to a secure point on both banks to prevent the tripods from being washed down stream and damaged. Weir maintenance is especially important at Sandy River to minimize the force of the river on the weir. The weir is kept clean of debris and checked as often as needed to ensure there are no holes for fish to escape through. Dry suits and diving masks are needed to visually inspect the weir at least once a day to make certain that it is fish tight. Detailed weir installation instructions for Sandy River can be found in Appendix A3.

The Sandy River sockeye salmon annual escapement goal is 34,000 to 74,000 fish (Table 3; Schaberg et al. 2015). If weir counts are unavailable due to difficulties with the weir such as a high water event, aerial survey data is used to estimate the escapement.

Table 3.–Sandy River weir sockeye salmon escapement management objectives.

Date	Escapement for period	Cumulative escapement
20-Jun	2,000 – 3,000	2,000 – 3,000
25-Jun	4,000 – 8,000	6,000 – 11,000
30-Jun	7,000 – 17,000	13,000 – 28,000
5-Jul	8,000 – 19,000	21,000 – 47,000
10-Jul	5,000 – 13,000	26,000 – 60,000
15-Jul	3,000 – 7,000	29,000 – 67,000
20-Jul	3,000 – 4,000	32,000 – 71,000
25-Jul	2,000 – 3,000	34,000 – 74,000
Total	34,000 – 74,000	

ILNIK RIVER WEIR

The Ilnik River weir (lat 56°36′73″ N, long 159°34′28″ W) is located approximately 3 km downriver from the Ilnik Village site (Figure 1). The weir is the longest in Alaska at approximately 152 m in length with water depth varying between 0.2 m and 2.5 m.

The Ilnik River weir is installed on approximately May 27 and operates until approximately July 20. The floating weir is installed in the same location as in previous years. Weir maintenance is extremely important at Ilnik River to decrease the likelihood of the weir washing out or being submerged due to debris loading. The large amount of algae washing down from Ilnik Lake accumulates on panels and forces the weir to sink, allowing fish to escape over the top of the panels. The weir is kept clean of debris and checked often to ensure there are no holes for fish to escape. A dry suit and diving mask are needed to visually inspect the weir to ensure that it is fish tight, especially in deeper channels. For a detailed discussion of the installation of the Ilnik River weir, refer to Appendix A4.

The Ilnik River sockeye salmon annual escapement goal is normally 40,000 to 60,000 fish (Table 4; Schaberg et al. 2015). In 1972–1975, 1986–1987, 2005–2010, 2012–2013, and 2016, Ocean River, a tributary to the Ilnik River system, flowed directly into the Bering Sea rather than into Ilnik Lake. When this occurs, many of the fish bound for Ocean River do not pass through the Ilnik River system, and therefore do not pass the weir. For the years noted above, an average of 20% of the Ilnik River system escapement spawned in Ocean River. If Ocean River were to flow directly into the Bering Sea over a given summer, the Ocean River escapement objective of 8,000–12,000 sockeye salmon would be subtracted from the total Ilnik River escapement goal (Table 5; Schaberg et al. 2015).

Table 4.–Ilnik River sockeye salmon escapement management objectives if Ocean River flows into Ilnik Lake.

Date	Escapement for period			Cumulative escapement		
20-Jun	5,000	–	8,000	5,000	–	8,000
25-Jun	5,000	–	7,000	10,000	–	15,000
30-Jun	5,000	–	10,000	15,000	–	25,000
5-Jul	5,000	–	10,000	20,000	–	35,000
10-Jul	10,000	–	10,000	30,000	–	45,000
15-Jul	5,000	–	5,000	35,000	–	50,000
20-Jul	3,000	–	7,000	38,000	–	57,000
25-Jul	2,000	–	3,000	40,000	–	60,000
Total	40,000	–	60,000			

Table 5.–Ilnik River sockeye salmon escapement management objectives if Ocean River flows directly into the Bering Sea.

Date	Escapement for Period			Cumulative escapement		
20-Jun	4,000	–	6,400	4,000	–	6,400
25-Jun	4,000	–	5,600	8,000	–	12,000
30-Jun	4,000	–	8,000	12,000	–	20,000
5-Jul	4,000	–	8,000	16,000	–	28,000
10-Jul	8,000	–	8,000	24,000	–	36,000
15-Jul	4,000	–	4,000	28,000	–	40,000
20-Jul	3,000	–	5,600	31,000	–	45,600
25-Jul	1,000	–	2,400	32,000	–	48,000
Total	32,000	–	48,000			

ORZINSKI RIVER WEIR

The Orzinski River weir (lat 55°43′78″ N, long 160°05′70″ W) is located near the outlet of Orzinski Lake, approximately 1 km upstream of the river's terminus in Orzinski Bay (Figure 1). It is approximately 26 m in length with water depth varying between 0.3 m to 0.6 m.

The Orzinski River weir project is operated in the same location as in recent years, approximately 50 m below the lake outlet, from about June 7 to August 5. For a detailed discussion of the installation of the Orzinski River weir refer to Appendix A5.

Sockeye salmon usually begin entering Orzinski River in mid-June. The Orzinski River sockeye salmon annual escapement goal is 15,000 to 20,000 fish (Table 6; Schaberg et al. 2015).

Table 6.–Orzinski River sockeye salmon escapement management objectives.

Date	Escapement for period			Cumulative escapement		
1-Jul	1,500	–	2,000	1,500	–	2,000
9-Jul	2,250	–	3,000	3,750	–	5,000
16-Jul	3,750	–	5,000	7,500	–	10,000
23-Jul	3,750	–	5,000	11,250	–	15,000
7-Aug	3,750	–	5,000	15,000	–	20,000
Season total goal	15,000	–	20,000			

MCLEES LAKE WEIR

The McLees Lake weir (lat 54°0′1.54″ N, long 166°43′44″ W) is located at the outlet of McLees Lake, approximately 100 m upstream of the river's terminus in Reese Bay (Figure 1). It is approximately 26 m in length with water depth varying between 0.2 m to 0.5 m.

The McLees Lake weir project has operated in the same location since 2001, from about June 5 to August 1. For a detailed discussion of the installation of the McLees Lake weir refer to Appendix A6.

Sockeye salmon usually begin entering McLees Lake in early-June. The McLees Lake sockeye salmon annual escapement goal is 10,000 to 60,000 fish (Schaberg et al. 2015).

GENERAL CAMP PROTOCOLS

Field crews are required to read and become familiar with section 700 of the ADF&G standard operating procedures: General Safety. Appendix B1 provides general information including radio schedules, ordering food and supplies, compliance with ADF&G regulations, equipment/maintenance, procedures regarding fish and wildlife violation reporting, emergencies, firearms, bears, garbage, boating, fire and first aid safety, drinking water, personal gear, compatibility of field personnel, and cleanliness of cabin.

In the event of a life threatening emergency or injury field crew members should immediately contact the US Coast Guard either by using a satellite phone or a SSB radio. In an emergency the Coast Guard can be reached at 1-800-478-5555 on a satellite phone, or at 4.125 Mhz. on a SSB radio. Emergency calls over the radio start with "Mayday! Mayday! Mayday!" followed by declaring your location, name, nature of emergency, people involved in the emergency, and who you work for. The same information should be relayed to the US Coast Guard when using a satellite phone during an emergency. Page 40 of this document provides guidelines for the use of radios and satellite phones during an emergency. Supervisors should only be contacted after help has been dispatched and the emergency is no longer immediately threatening to life and safety.

Well-maintained camps and facilities allow projects to be accomplished comfortably and efficiently. Maintenance can usually be accomplished during slow periods of the season. As soon as the camp is established, facilities are looked over and a list is made of projects that need to be accomplished. The supervisor is notified of any materials needed and field crew attempt to anticipate needs before they become a problem.

SCHEDULE AND DELIVERABLES

The schedule of activities for the weir operation season is as follows:

Date:	Activity:
May 26–May 29	Open Ilnik camp and install weir
May 28–May 30	Open Bear camp and install weir
June 1–June 4	Open Nelson camp and install weir
June 1–June 4	Open McLees Lake camp and install weir
June 4–June 7	Open Sandy camp and install weir
June 4–June 10	Open Orzinski camp and install weir
Daily	Enumerate salmon and report escapement numbers to supervisors at morning and evening radio schedule. Camp chores and maintenance.
Daily	Dip net sample 100 adult sockeye at Nelson River for male/female ratio.
Weekly	Sample 240 adult sockeye salmon
Weekly	Sample 200 smolt sockeye salmon (Bear and Orzinski)
As flights are available	Send in collected samples and thumb drives to field office (Port Moller or Sand Point)
July 15–August 7	Close Ilnik, Sandy, Nelson, and McLees camps, remove weirs
August 4–August 10	Close Orzinski camp, remove weir
August 25–August 28	Close Bear camp, remove weir
End of each camp field season	Return all necessary camp equipment and weir logbooks/samples to supervisor
Post field season	Take escapement data and samples back to Kodiak, age scales, complete management reports

RESPONSIBILITIES

Fisheries Biologist III	Overall Project Leader
Fishery Biologist II	Supervise project, assist in field sampling as needed, coordinate logistics
Fishery Biologist I	Crew leader, training of new personnel in sampling and assist in field sampling as needed, assist in office and with maintenance
Fish and Wildlife Technician III	Crew leader, responsible for daily operation and maintenance of weir, reports escapement data to supervisor, maintains logbooks/journal
Fish and Wildlife Technician II	Assists in daily operation of weir, performs tasks as assigned by crew leader

SUPERVISION

The Assistant Area Management Biologist (AAMB) Reid Johnson and Area Management Biologist (AMB) Robert Murphy, both based in Port Moller, will supervise the Nelson, Bear, Sandy, and Ilnik river weir crews. The Sand Point AAMB and AMB (Mary Beth Loewen and Lisa Fox respectively) will supervise the Orzinski River weir crew. The Cold Bay AAMB Colton Lipka will supervise the McLees Lake crew. Day to day operations, task scheduling, and ensuring work quality will be the responsibility of the crew leader designated for individual camps.

During the operation of the weir, assigned duties often take longer than 45 hours/week to accomplish. When this is expected at Bear, Sandy, Nelson, or Ilnik rivers, notify the AAMB in Port Moller, if this is expected at Orzinski River or McLees Lake notify the AAMB in Sand Point or Cold Bay prior to actually doing work in excess of 45 hours/week. They will decide what projects take priority and authorize overtime if necessary. No overtime may be worked or claimed unless it is first authorized.

DATA REPORTING

A Fishery Management Report will be completed by March of the year following the fishing season, which includes the ASL composition results of the escapement sampling season. Further escapement information and commercial fishery catch data will be described in the Alaska Peninsula Annual Salmon Management Reports authored by Robert Murphy, Lisa Fox, Reid Johnson, Colton Lipka, and Mary Beth Loewen, and will be completed by April the following year. McLees Lake weir data is summarized in the Aleutian Islands Annual Management Report authored by Colton Lipka and Lisa Fox.

The Port Moller AAMB and the Sand Point AAMB will provide daily weir counts, by species and weir, to the Kodiak office for entry into the regional escapement database. Regional AMBs are responsible for editing escapement counts by weir and species for accuracy.

REFERENCES CITED

Wattum, M. L., and M. B. Foster. 2016. Kodiak Management Area salmon catch and escapement sampling operational plan, 2016. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Operational Plan ROP.CF.4K.2016.09, Kodiak.

Schaberg, K. L., H. Finkle, M. B. Foster, D. L. Tracy, and M. L. Wattum. 2015. Review of salmon escapement goals in the Alaska Peninsula and Aleutian Islands Management Areas, 2015. Alaska Department of Fish and Game, Fishery Manuscript No. 15–03, Anchorage.

APPENDIX A. WEIR INSTALLATION PROCEDURES BY LOCATION

INSTALLATION

MATERIALS

- Framing hammer
- 2-3 lbs mallet
- Hand saw
- Wire cutters
- 16 penny nails (for attaching sandbag platform boards and catwalk boards)
- 20 penny nails (for stringer supports)
- Dock spikes (for reinforcing main tripod timbers)
- A number of 2x4's (for tripod sandbag platform)
- Bailing wire or large zip-ties
- Aluminum weir panels
- Tripods

LOCATION SELECTION

Weir location selection is critical to subsequent ease of weir maintenance, access, and safety. The weir should be installed roughly in the same location as the previous year. Walk across the river a number of times to determine where any holes, gravel bars, or channels exist which could cause problems with alignment or installation. Choose a transect that offers the smoothest, most consolidated, and most continuously uniform substrate possible. Keep in mind that the weir should run roughly perpendicular to the river's current in the deepest, fastest channel. Place a marker on each bank at either end of the chosen transect so that you have a target to work towards and a fixed reference point to sight-off of to check tripod alignment.

The Bear River camp sits in close proximity to Bear Lake Lodge. Often lodge employees run river boats downstream so an agreement should be made with lodge personnel prior to installing the weir. To prevent having to take out sections of the weir later on, ask the lodge if they want to put their skiffs below the weir before it gets installed.

Bear River water levels are generally low in spring when the weir is installed, but can be expected to rise significantly (two feet and more) over the course of the summer. In some years, two distinct peaks in water level can be observed which roughly correspond with the peaks in the salmon runs. The water can rise as much as two feet in 24 hours, usually as a result of heavy rains, warm weather melting snow and glaciers, and high winds off the lake, so be prepared for the worst early in the season. During high water events, take extra care to clean and maintain the weir to prevent it from washing out.

TRIPOD PLACEMENT

All weir installation materials are stacked on the bank of the river at the installation location. The materials are divided roughly in half on either bank. The weir generally uses 23 to 25 tripods, leaving a few spares. Begin on either side using the older, weaker tripods where the current is slack. Check the 20 penny nails in the front leg of the tripod where the stringers will rest before placing them in the water as it is hard to drive new ones when the leg is underwater.

Place the tripods so that the back legs have about four inches of gap between them (your foot's width) and mount stringers on the front leg as you work. Make sure there is 4-8 inches of overlap on either end of the stringer where it meets the tripods. Adjust the spacing of the tripods to maintain adequate stringer overlap.

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Stringers of thicker diameter should be placed in strong current areas as thin stringers can be bent in high water events. Allow more overlap where the current is stronger and the water is deeper. This will allow for tripod settling and traveling without the stringers being pulled off the front leg.

As you work, check the alignment by sighting down the stringers toward the target stake or sandbag on the far bank. Place sand bags on tripods in deeper water to keep them from moving in the current. When the tripod is in position, push it back and forth forcefully to set it in place minimizing movement later. Recheck alignment periodically. Proper tripod alignment lets the panels lay flat on the stringers and prevent gaps between panels later. A weir that is not completely straight will collect concentrated debris in crooked areas, increasing the chance of a wash out.

Once tripods and stringers are set, load the platforms with sandbags as resistance on the weir will increase dramatically once the panels are placed. If weir installation begins in the late afternoon, this is a good place to cease for the day to allow the tripods to settle into the substrate overnight before adding the resistance of the panels. Additional resistance can cause the tripods to settle back as well as down, negating much of the effort of alignment.

Keep in mind that the weir generally fails due to sandbags being washed off the tripod platforms, so sandbag placement is critical for episodes of high water. The sandbags should be wedged between the tripod legs as tightly as possible. Eventually, additional sandbags can be stacked on the wings behind the back legs, and a small platform can be added to the crown of the tripod for additional bags if needed. Nail one or two planks across the back of the rear legs above the wing support to keep sandbags from washing off the platform.

PANEL INSTALLATION

Place the panels on the weir starting on one end ensuring they are roughly perpendicular to the water's surface. You will likely have to dig into the substrate to allow the entire bottom of the panel to rest in the gravel when descending the banks or moving past irregularities in the gravel. Hop up and down on the t-angle crosspiece of the panels to sink the panel into the gravel.

Do not forget to install four gates at different water depths. Three gates will be used as fish passes, and one will lead into the sampling trap. As water level and turbidity rise, you may need to switch to a gate in shallower water, so leave yourself options (deep and shallow water gates). Think about where you want the trap and install a gate.

Put up the catwalk boards as well and use them for shuttling more sandbags onto the weir. All boards should overlap on a tripod wing. If necessary, blocks may be nailed to the tripod wings if the catwalk board does not meet the wing properly.

Line the entire front of the weir with sandbags to prevent scouring below the panels. In August, pinks will accumulate in front of the weir to spawn. While digging their redds (nests), they throw prodigious quantities of gravel up on the front of the weir, jamming gates and creating maintenance concerns. Bears will swim back and forth in front of the weir also throwing gravel up on the panels. Laying weir panels flat on the river bed in front of the weir helps keep the rocks from being kicked up. Lay the panels parallel to the weir and weigh them down with a few sandbags.

Zip ties can be used to attach the panels to the stringers and join panels where they meet, keeping the panels from shifting and bears from knocking the panels free. Another method of keeping bears from opening holes in the ends of the weir is to stack numerous panels against the weir. The bears typically will pull one or two free, then lose interest.

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TRAP ASSEMBLY

Items needed:

- 6 full-sized weir panels
- 3 half-panels (cut lengthwise)
- 2-6 fence posts
- 2-3 lb mallet or post-pounder
- Bailing wire or large zip-ties
- Wire cutters

The trap is most effective if it is installed offset to one side of the fish gate so that you can run the sampling net up a weir panel and not leave any gap through which the fish can escape past the net. Begin by laying a full sized panel on its side pointing upstream, letting the downstream end rest against the base of the weir next to one side of the fish gate. Pound two fence posts in at both ends and tie the panel to the posts to hold it. Measure the distance between the top and bottom t-angle cross pieces of a panel. Measure out this distance across the face of the weir and put another full sized panel parallel to the other panel that was just put in. Pound two more fence posts in and wire the panel to them for support. Next, stand well upstream of the open end of the trap with the last full sized panel. Holding the panel vertically on its side and parallel to the weir, in one movement sink the panel down into the water and walk forward with it as the current moves it downstream until it rests against the two existing panels jutting out from the face of the weir. You should now have a mostly enclosed box sitting in front of the gate.

The gaps at the downstream ends of the side panels of the trap can be closed using two other panels (wings). Put the wings on the outside of the side panels with one end resting on the river bottom and the long portion resting against the face of the weir perpendicular to the main weir panels. Secure everything in place using bailing wire or zip ties. Add more fence posts to reinforce the structure if needed. Place a panel on the river bottom inside the trap to improve visibility as fish can be difficult to see. Finally, place sandbags around the base of the trap to prevent scouring. The three lengthwise half panels are available to make the sides of the trap taller if needed.

SMOLT TRAP INSTALLATION

Items needed:

- Fyke net
- Smolt live box
- 2 fence posts
- Fence post pounder
- Rope
- 2 quick releases

The smolt trap is most effective when installed in a location with swift current and a 2 ft (0.6 m) water depth. The fyke net and smolt live box (located in the boat shed) are the main components of the trap. The fyke net is composed of two leaders on one end, a funnel, and a cod end on the other. The cod end will be detached and must be reattached to the fyke net using zip ties or twine. Make sure the rectangular opening is oriented horizontally and not vertically or it will not be able to connect to the live box. It is a good idea to repair any holes on land before placing the net in the water. When the fyke net is ready to be placed, there are two ropes with quick releases (also in boat shed) that will each be fastened around the leg of two

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different tripods. It is best to wrap them above the tripod's back crossbeam. The fyke net will be attached to the quick releases.

With the ropes secured, the net may be set. The easiest way to set the net is to pile it up with the cod end on the bottom building up to the leaders on top. Two people will carry the net out onto the catwalk boards. Set the net down on the boards and locate the ropes coming off of the leader rods. There will be a ring at the ends of each of the ropes; these will be connected to the quick releases. With the leaders secured, grab the net and make sure the cork side is facing down river and the lead side up river; this must be done for the fyke net to be correctly oriented in the water. When ready, take the fyke net and toss it into the river. The net will pop up into position with the corks on top and leads on the river bed. Position the rods of the leaders securely in the river bed. The smolt live box is now ready to be attached.

With two people on either side of the live box, carry it into the river behind the cod end with the rectangular opening facing upstream and connect the cod end to it. One person will hold the box steady while the other person inserts the fence posts through the two tubes on the side of the box and pounds them into the substrate. It is important that the box is held while it is free floating so the fragile netting of the fyke net is not torn. The smolt trap may be moved to more ideal locations as water level fluctuates.

MAINTENANCE

The weir needs to be cleaned thoroughly at least once a day. A dry suit, snorkel, and mask are needed for this task to clean and inspect the foot of the weir panels. During high water events the weir may need to be cleaned more than once a day. Frequently check gates for rock jams as they occur more often late in the season when pinks return and spawn in front of the weir. Consistent and thorough weir maintenance prevents major problems from forming. Holes should be patched using sandbags or extra panels if the hole is big enough to warrant. Generally, if two fingers can fit easily through a hole, so can a salmon. Holes larger than two fingers must be patched.

The fyke net should be cleaned regularly. If too much debris builds up in the cod end, the current flowing through the net will not be strong enough to prevent the smolt from exiting the live box. Also, patch any large holes that form as they provide an access point for minks to enter the live box and eat the smolt.

REMOVAL

Starting at the far end of the river, remove the sandbags from the foot of the weir, followed by panels, stringers, and eventually the sandbags weighing down the tripods. Be sure to leave enough sandbags on the tripod to keep it from floating away. The boat can be used to ferry these items back to shore to be stacked neatly. Take care not to overload the boat. The tripods should be arranged neatly for easy access during the start of the next season. All items should be stored away from the river bank, as spring flooding and ice may easily carry weir materials downriver if left on the river bank.

Once all materials are out of the river and stacked neatly they must be secured. Rope should be used to tightly bind all the tripods together, preventing bears from separating them, and preventing flood events from carrying single tripods away. The panels, stringers, and catwalk boards should be weighed down with sand bags.

INSTALLATION

MATERIALS

- Vise grips, at least 4
- Sledge hammer
- Impact mallet
- Bailing wire
- Zip ties
- Rope
- Buoys
- Fid
- A Panels
- B Panels
- Chain link fencing
- Wire cutters
- J hooks
- Rebar

PREINSTALLATION INSPECTION

- Rail
- South bank stabilization structures
- Winch stanchion and north bank deck
- Weir trap and funnel (South bank)
- Weir panel piles (North & south banks)
- Beebe winch
- Chain link fencing

The rail is embedded, straight, and roughly perpendicular to the stream banks. Some or all of it may be covered with gravel. Before installation begins, check to ensure that an erosion hole has not developed under the rail.

The south bank (far bank) should be reinforced with a two-gabion length complex just downstream of an angled gabion as well as the plywood bulkhead. The weir trap and funnel should be secured to fence posts on the south bank. They are oriented parallel to the bank and the trap is upstream of the funnel.

Check to see if the winch stanchion and north bank deck is intact and level. The stanchion should be upright and straight. The base of the stanchion should line up with the end of the rail and a pulley should be mounted where the stanchion and rail meet. The Beebe winch is on the floor of the tool shed.

The four weir panel piles should be secured to fence posts and covered with plywood and aluminum panels that protect the plastic from UV light.

The chain link fencing should cover 4-5 ft above and below the whole length of the rail. Inspect the chain for weakness and replace as needed. Directions for replacing chain link can be found at the end of this appendix.

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PREPARATION

Make repairs before anything goes into the water. The weir panels, rail, and the chain link fencing are the most time intensive to replace or repair. Clear the rail's surface, including the eyes, using a rake if needed. If the rail has been undermined, fill the hole with sand bags. Lay chain link fencing over the bags and stake it down with "J" hooks. Next, clear sediment from the rail ends in preparation for the cable.

Mount the Beebe winch to the stanchion with four bolts, washers, and nuts located in a zip lock bag in the gray plastic toolbox in the shed. The winch is bolted to the north side of the stanchion with its handle pointing downstream. Insert the bolts through the winch and attach the washers and nuts on the south (offshore) side of the stanchion.

Loosen the winch cable from the spool and pull the cable down between the stanchion and the pulley, then under the pulley and through each rail eye. One person operates the winch providing cable slack while another, in a dry suit, threads the cable end through each rail eye. If more slack is pulled out at any one time, the cable tends to get snagged on itself.

Upon reaching the south stream margin, loop the winch cable through the south bank deadman anchor cable and clamp the cable back on itself. A deadman loop will be protruding through the bulkhead over the end of the rail. Before clamping the cable on, measure the distance of the first weir panel's cable hook from the edge of the panel. The first panel is one of two unique panels stored on the south bank with "gasket" material (herring web) attached to the left side of the panel, when looking at the panel right side up from the upstream end. The loop formed when the winch cable is clamped on itself must be shorter (including all the clamps attaching the cable) than this distance to prevent interfering with installing the first panel snugly against the bulkhead. Three cable clamps are sufficient to attach the cable.

Next, prepare the panels stacked on both sides of the river. During reconstruction of the weir in 2008, panels were separated into "A" and "B" types to eliminate confusion. The cross members on the "A" panels are spaced differently than the "B" panels so the straps for the connector rods align correctly when installing the weir. The "B" panels are differentiated by the orange spray-painted end caps. The south bank should have a total of 26 panels (13 "A" panels and 13 "B" panels). The north bank should have a total of 14 panels (eight "A" panels and six "B" panels). One panel only nine pickets wide will be used as the last panel to fit between the near side bank and the weir. Do panel repair work before they are in the water.

There are four panels (far bank: three, near bank: one) with gasket material for connecting with either a stream bank or funnel opening. The four panels are "A" panels. Ensure that the gaskets are in good repair. The gasket extends along the entire length of the floating panel to which it is attached. The gasket on the panel interfacing with the north (near) bank will need especially deep web material since the shoreward attachment point is up over the bulkhead wall on the edge of the winch deck. The gaskets for panels proximate to the far bank and funnel should have an uncapped 13-foot length of PVC pipe (connector pipe) laced to the edge of the gasket opposite the side attached to the panel. If a panel needs to be repaired or rebuilt, instructions for panel assembly can be found at the end of this appendix.

The fish trap with two gates and numbered trap panels are also on the far side. Two long gang-plank boards used as a cat-walk from bank to trap are under the cabin along with the connector rods. At least 37 connector rods are needed for completing the weir. The aluminum panels the weir panels are stacked on are used as caging around the funnel frame.

INSTALLING PANELS

The weir is 40 panels wide. Panels are installed one at a time from far to near bank. Begin

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with an "A" panel that has webbing material. Install a "B" panel next, then another "A" panel with webbing. The funnel frame may now be carried down the bank and placed on the downstream side of the rail. The funnel can temporarily be stabilized with a few sand bags. Another "A" panel with webbing is installed on the other side of the funnel, then alternate B, A, B, A from this point on.

After the fourth panel, four vise grips are needed to keep the panels in place. Begin with a pair on each panel next to the funnel. For the panel south of the funnel, put the two vise grips on the cable immediately north of each of the two hook eyes. For the panel north of the funnel, put the two vise grips immediately south of each of the two hook eyes.

Panel installation requires cooperation. First, one person will unlock the winch and let out slack while a second person pulls the excess cable into a slight loop in the area where the panel will be installed. Stage the panels upstream of the rail to easily maneuver them into position. Hook the panel to the loose cable and signal the winch operator to take up slack. The foot-plate of each panel has short metal pegs (ears) on either end that will line up with the neighboring panels so that a connector pipe will slip over both ears.

Once slack is taken from the cable, use a connector pipe to connect the panel with the previously installed one. One person threads a connector pipe from the downstream side through the panel rings. Most connector pipes have small holes drilled into them. Thread the end furthest away from the holes first. The other person (preferably the lightest) straddles the adjoining panels and threads the pipe. The person not threading the pipe gently pushes while simultaneously twisting the pipe. The connector pipe should fit snugly over both ears of the adjoining panels.

After the connector pipe is installed, a pair of vice grips should be clamped tightly on the cable immediately north of each of the hook eyes on the newly installed panel. The two most recently installed panels should be clamped with vice grips to prevent slipping on the cable when slack is given for subsequent panel. Additionally, vice grips should be left holding both panels next to the funnel until the entire weir is in and the funnel installed. Vice grips can be leapfrogged to new panels as they are installed.

Once the vice grips are in place, the panel installation process is repeated. It may be necessary to use the narrower panel in the final (39^{th}) location on the rail proximate to the north bank if there is not room for the full width one with gasket material on the right side (looking at it from the bottom, right side up).

TRAP AND FUNNEL INSTALLATION

After panel installation, the trap and funnel are installed. Clean and level the trap site to ensure the trap floor (made of white sandbags) will be low enough for fish. The site should be slightly deeper than the surrounding riverbed. When ready, four people will carry the trap frame into the river. Orient the trap upstream and perpendicular to the rail with the downstream end fitting over the rail. The funnel now needs to be placed. Use sandbags to level the stream bed if needed. The funnel is placed downstream and in line with the trap perpendicular to the rail. Adjust the funnel to be flush with the trap after the trap is constructed.

The aluminum panels (south bank) are then zip tied or wired to the outside of the frame on each side. Each numbered aluminum panel is placed vertically in the spot corresponding to the same number on the frame. The bottom of each panel should fit snugly in the angle of the frame so no gaps exist where fish can get through. There should be four panels for each side. Drive six fence posts near the upright members of the frame outside the trap and attached to the frame. Just upstream of the trap, position the flash panel for counting fish and weigh it down with sand bags.

Next, line the floor of the trap with a layer of white sandbags to make it fish tight and fish easier to see. Finally the gates are installed in both ends of the trap. Make sure that the doors open and close easily.

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Each door must fit snugly to the flash panel sandbags so that fish will not pass undetected when it is closed. After the trap is in place, adjust the funnel to be flush with the trap and bolt them together. Drive fence posts around the upright members of the funnel and attach them using zip ties or wire.

GASKET INSTALLATION

After the funnel and trap are in place, the herring web gaskets need to be attached either to a bank or a side of the funnel. Attach the PVC bar to the top of the funnel. Fasten the upstream end of the gasket to the funnel, and the other PVC bar to the floating weir panel. Make sure no gaps exist for fish to swim through. On the south bank, connect the pipe of the gasket panel to the plywood bulkhead wall. On the north bank, the shoreward edge of the gasket is affixed to the edge of the winch deck by nailing 2x4s down over it. On each side of the funnel the connector pipe of the gasket panel, is fastened to the outside of the funnel. Make sure the attached gaskets allow the floating weir panels to respond to varying water levels and not let fish escape.

SECURING CONNECTOR PIPES

After the gaskets are installed, secure the connector pipes to the floating weir panels. Most connector pipes, if already used, will have small holes drilled about one third of the way upstream from the downstream end of the connector pipe if installed properly. A six-inch piece of wire is threaded through these holes and twisted back over itself two or three times. Create a new hole if needed. Do not drill hole while standing in the water! Any holes in connector pipes should be drilled on shore or from the bow of a skiff. Do a final inspection to look for any possible fish holes. Patch any holes wider than two fingers. Scouring could develop into a problem especially just after the weir is installed so look for developing holes under the rail. Add sandbags to the foot of the weir at panel junctions as fish can slip through.

BUOY INSTALLATION

The buoys are in the attic of the cabin. After the weir is installed, buoys are tied off underneath the panels to elevate the floating end. The buoys are tied off around the second cross member from the downstream end to prevent slipping. Pass the rope under the panel, through the pickets, and back through to tie a quick half-hitch. It is extremely important to not lift the panels too high. If they must be lifted, the connector rods and/or the pickets could break. Once the weir is fully installed, remove and store any vise grips left on the cable.

A CAUTIONARY NOTE

It is important to be cognizant of safety issues. Weir installation can involve difficult tasks done in inclement weather. If someone is not sure of the exact steps necessary to complete a task or if current conditions do not allow them to be done safely, it is best to ask someone with more experience before attempting to accomplish a goal. The weir installation process is progressively more difficult as water levels get higher. At some point (around 2.8 feet on the water level gauge as it is currently set at the weir site) weir installation becomes impossible due to high stream velocities. Even at lower stream levels, visibility can sometimes prevent weir installation.

NELSON RIVER WEIR PANEL ASSEMBLY

- 5 cross members per panel (UV resistant plastic decking material)
- “A” panels = 36” apart between each cross member
- “B” panels (spray paint end caps orange) = 30” apart between the “hooking end” and 1st cross member, then 36” apart between the rest of the cross members

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TOOLS NEEDED FOR WEIR PANEL ASSEMBLY

- 1 1/8" spade bit (for counter sinking holes for eyebolt washers)
- 3/4" spade bit (for counter-sinking holes for cross member bolts & washers)
- 1/4" drill bit (for all hex head bolts)
- 3/8" drill bits (for hook bolts)
- 7/16" socket head with drill attachment
- 9/16" socket head with socket wrench
- 7/16" open end wrench
- 9/16" open end wrench
- Lots of C-clamps (bigger ones for clamping header, smaller ones for clamping cross members)
- Cordless drill guns with 18 volt batteries and charger
- Tape measure
- Hammer

HARDWARE USED FOR WEIR PANEL ASSEMBLY

- 4 1/2" hex head bolts (for the hooking end or "header piece")
- 3" hex head bolts (for securing the two cross members together)
- 3 1/2" hex head bolts (these were used for pre-assembly layout, not needed for final assembly)
- 7/16" washers and nyloc nuts
- 9/16" hook bolts (anchors panels to cable)
- 9/16" washer and nyloc nuts
- Aluminum plated "dog ears"
- Hypalon strapping

To construct a panel, take 21 capped pickets and five cross members. Place the pickets in the slots of the cross members and space the cross members. The "A" panels will be 36" apart and the "B" panels will be 30" apart between the "hooking end" and 1st cross member, then 36" apart between the rest of the cross members. Drill 12 holes through the cross members drilling every other picket. Begin on one end and drill six deep then switch to the other and drill six deep. 3" hex head bolts will be used to connect the cross members.

Drill two holes into the base of the first cross member that will attach to the cable, the 9/16" hook bolts will be inserted here. The hook bolts will anchor the panel to the cable so have them evenly spaced. Place aluminum plated "dog ears" on the ends of the first cross member and hypalon strapping on the ends of every other cross member. One end of the strapping will be inserted in the middle of the cross member and the other end fitted onto the bolt and secured using a nut and washer. Spray paint the ends of the caps if a "B" panel.

MAINTENANCE

The weir should be thoroughly cleaned and inspected at least once a day. During high water events it may be necessary to clean the weir more than once due to extra debris buildup. To inspect the weir requires a snorkel, mask, and dry suit, as not all holes may be visible from the surface. Clean the panels and buoys using a brush to remove algae build up. Cleaning and inspecting the weir simultaneously will save time and effort. During high water events, the weir may be pushed under water due to fast current. Extra buoys should be added preemptively to keep the ends above water as it is exponentially harder to add

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buoys to the weir when in high water conditions. If potential snow melt is or heavy rains occur, do not wait for the water level to rise before taking action.

REMOVAL

Remove and store all buoys. Remove and store the gangplank boards, sampling station, and gasket panels, freeing the trap and live box. Detach the live box from the funnel by removing the connecting bolts. Remove the aluminum panels, fence posts, and sandbags stacking them away from the river onshore. Carry the funnel and then the trap on shore to the rest of the gear on the far bank, driving fence posts around them and securing them with rope.

Remove all connecting pickets and zip ties or hose clamps. From this point forward there should not be anything attaching the weir panels together. Loosen the cable slightly and have one person stand downstream of the panel and the other upstream starting at one end of the river. When the signal is given, the downstream person will push the panel upstream so that the upstream person has enough slack to unhook the panel from the cable. This should be one fluid motion. The boat may be used to shuttle panels to shore. Six to eight panels may be stacked on the boat at a time.

The panels should be stacked neatly on shore, away from the river bank in case of flooding; any panels not secured properly will end up downriver after winter and spring flooding. Drive posts around the panel stacks and use rope to secure the panels.

INSTALLATION

MATERIALS

Items needed for installation and tripod repair:

- Framing hammer
- 2-3lb mallet
- Hand saw
- Wire cutters
- 16 penny nails (for sandbag platform boards and catwalk boards)
- 20 penny nails (for stringer supports)
- Dock spikes (for reinforcing main tripod timbers)
- 2x4's (for tripod sandbag platform)
- Bailing wire/zip ties
- Dry suit, mask, and snorkel

LOCATION SELECTION

In 2016, the Sandy River weir was relocated approximately 100 yards upriver from its previous location. While most of the weir equipment was moved up to the new location, the tripods remain in the old storage site. The current weir bank is not ideal for moving tripods so the bank where the weir was previously located will be used for loading and unloading tripods. The weir is to be placed at the panel/sandbag pile and not at the tripods as the river bed is no longer suitable for weir placement.

The presence of a weir can significantly affect the deposition of river substrate. A trough often forms just upstream of the panels over the course of a summer, and deep channels will form where sections of the weir have washed out in the past. Over the course of the winter, some of these voids will partially fill with loose and poorly consolidated gravel. If the weir is installed over these areas, the loose fill will once again erode easily and put the integrity of the weir in jeopardy. It is important to recognize these features, as they will have a large impact on how well the installation proceeds and how the weir weathers high, fast water. Walk transects across the river to find the most uniform and level substrate. Moving ten feet up or down stream can make a large difference in terms of encountering depressions, gravel bars, or poorly consolidated substrate.

Sandy River water levels are generally low in spring when the weir is installed, but can be expected to rise significantly over the summer. The water can rise as much as two feet in a few hours, usually as a result of heavy rains and/or high winds off the lake and melting glaciers, so be prepared for the worst early in the season.

TRIPOD PLACEMENT

Set a marker on each bank of the chosen transect so that you have a target to work toward and a fixed reference point to check tripod alignment. Begin on the near (northeast) bank with the older, weaker tripods where the current is slower. Check the 20-penny nails in the front leg of the tripod where the stringers will rest before placing them in the water. Use an ATV and trailer to move tripods and sandbags to the riverbank. Be gentle with the tripods so as not to split or part the timbers or bend the nails on the front leg. Do not overload the ATV trailer with sandbags, there is only one ATV provided. Make sure to check the oil before using the ATV and check the tires as well as those of the trailer.

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Place the tripods so that the back legs have about four inches of gap between them (the width of your foot) for the shorter tripods and no gap for the larger ones. Mount stringers on the front leg as you work to aid in tripod alignment. Make sure there are 6-8 inches of overlap on either end of the stringer where it meets the tripods. Adjust the spacing of the tripods to maintain adequate stringer overlap. Allow more overlap where the current is stronger and the water is deeper to allow tripods to settle without the stringers being pulled off the front leg. The tripods placed in deeper water will require some sandbags to keep them from moving in the current.

The most efficient way to set tripods is by skiff. Two people will shuttle tripods down to the river with the ATV while two others use the skiff to run tripods upstream. Begin by moving tripods out into the river enough to where the skiff can drive up to them. Load tripods onto the bow of the skiff and drop them off slightly upstream of the desired location. It is good to move tripods in groups of five, taking time to align them after five. In deeper sections, load a few sandbags into the boat before grabbing a tripod so they may be placed on the tripod after it is flipped into the water. Be sure not to swamp the skiff with the heavy load.

If no skiff is available, carry the tripod upstream some distance and roll it into the river allowing it to float down to about ten feet upstream of the spot where it will be placed then stand it up. Slowly walk the tripod back into position and have someone hold it while others go back for sandbags to secure it.

Push the tripod back and forth forcefully to set it in place when it is in the correct position. This will minimize movement later. Recheck alignment periodically as improper alignment prevents the panels from lying flat on the stringers and makes gaps between panels later. A little extra care and effort at this stage can save countless hours of weir maintenance.

Once the tripods and stringers are set, load the platforms with sandbags as the resistance will increase dramatically once the weir panels are put on. The tripods in shallow water need fewer sand bags than deeper tripods. Loading tripods down with as many sandbags as possible should be done after installation since tripods in slow moving water have blown out in previous years. If weir installation begins in the late afternoon, this is a good place to stop for the day to allow the tripods to settle down into the substrate overnight before adding the resistance of the panels. This additional resistance can cause the tripods to settle back as well as down, negating much of the effort devoted to alignment.

Keep in mind that the weir generally fails due to sandbags being washed off the tripod platforms, so sandbag placement is critical for episodes of high water. The sandbags should be wedged between the tripod legs as tightly as possible. Additional sandbags can be stacked on the wings behind the back legs, and on a platform that can be added to the crown of the tripod. Nail one or two planks across the back of the rear legs above the wing support to keep sandbags from washing off the platform. Sandbags that are underwater are not as useful as those above the water as they “lose” weight when submerged, and increase drag in the water. As most of the deep water tripods will have their sandbag platforms under water during flooding events, stacking as many sandbags as possible on accessory platforms added to the crown of the tripod can mean the difference between washout and surviving the high water event.

PANEL INSTALLATION

Place the panels on the weir starting on one end making sure that the panels are roughly perpendicular to the water current. You will likely have to dig into the substrate to allow the entire bottom of the panel to rest in the gravel. Hop up and down on the t-angle crosspiece of the panels to push the panel down into the gravel. In the past, longer panels were installed in the deeper sections of the river, but using shorter panels across the river may let water flow over the panels at high water reducing the resistance. Fish have not been observed escaping over the top of the panels in these instances.

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Do not forget to install the three gates at intervals that cover different water depths. Two gates will be used as fish passes, and one will lead into the sampling trap. As water level and turbidity rise, you may need to switch to a gate in shallower water, so leave yourself options (a deep water and shallow water gate). Think about where you want the trap and install a gate.

FINAL INSTALLATION PROCEDURES

After panel installation, catwalk boards will be placed across the weir. Use them for shuttling more sandbags onto the weir. All boards should overlap on a tripod wing. If necessary, blocks can be nailed to the tripod wings if the catwalk board does not meet the wing properly. During high water events, the catwalk will likely be underwater. The boards wash off easily so remove them if their loss seems imminent.

Finally, line the entire front of the weir with sandbags to prevent scouring below the panels. It may be necessary to place sandbags behind the panels as well as in areas that are more susceptible to erosion. Run a rope through the tripods and fastened to a secure point on both banks to prevent the tripods from being washed down stream and damaged in a wash out.

Zip ties can be used to attach the panels to the stringers and join panels where they meet, keeping the panels from shifting and bears from knocking the panels free. While this preempts some minor holes from forming, it also makes it more difficult to push panels down or move them relative to each other when gaps do form. Wiring the panels in the shallow water only could be a safe compromise. Bears also cause damage in shallow water near the banks. Another method for keeping bears from making holes is to stack numerous panels against the weir. The bears typically will pull one or two free, then lose interest.

TRAP ASSEMBLY

Items needed:

- 6 full-sized weir panels
- 3 half-panels (cut lengthwise)
- 2-6 fence posts
- 2-3 lb hand maul or post-pounder
- Bailing wire or large zip-ties
- Wire cutters

The trap is most effective if it is installed offset to one side of the fish gate so the sampling net can run up a weir panel and not leave any gap through which the fish can escape past the net. Begin by laying a full sized panel on its side pointing upstream, letting the downstream end rest against the base of the weir next to one side of the fish gate. Pound two fence posts in at both ends and tie the panel to the posts to hold it. Measure the distance between the top and bottom t-angle cross pieces of a panel. Measure out this distance across the face of the weir and put another full sized panel parallel to the other panel that was just put in. Pound two more fence posts and wire the panel to them for support.

The trap end panel will be installed next. Stand upstream of the trap and hold the panel upright on its side and parallel to the weir. In one movement, sink the panel down into the water and walk forward with it as the current moves it downstream until it rests against the two existing panels jutting out from the face of the weir. Interlock the end pickets of the side panels with those of the front panel. You should now have a mostly enclosed box sitting in front of the gate. The gaps at the downstream ends of the side panels of the trap can be closed using two other panels (wings). Put the wings on the outside of the side panels with one end resting on the river bottom and the long portion resting against the face of the weir perpendicular

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to the main weir panels. Secure everything in place using bailing wire or zip ties. Add more fence posts to reinforce the structure as needed. Place a panel on the river bottom inside the trap to make the fish more visible. Finally, set sandbags around the base of the trap to prevent scouring. The three lengthwise half panels are available to make the sides of the trap taller if the water level rises.

MAINTENANCE

The weir should be cleaned at least once a day. During high water events it may be necessary to clean the weir more than once a day. Sandy River can have a lot of debris wash down river. If care is not taken to keep the weir clean it will wash out.

Cleaning the weir will usually take two people 20–40 minutes depending on how high the water and debris load are. Dry suits are required to clean the weir, as many large pieces of turf tend to wash onto the weir due to erosion upstream. It is impossible to get these pieces of turf off the weir without diving. It may also be convenient to carry a rake when cleaning the weir in order to work out rocks and other debris that may be caught in the weir panels.

When cleaning the weir try not to kick up rocks and gravel. The current at Sandy River is fast, any debris kicked up will have to be cleaned later. Generally when moving along the weir it is best to stay on top of the sandbags, or to crawl along the weir panels themselves.

REMOVAL

Remove the weir in small sections. Starting at the far end of the river, remove sandbags from the foot of the weir, followed by panels, stringers, and finally the sandbags weighing down the tripods. Be sure to leave enough sandbags on the tripod to keep it from floating away. Use the boat to shuttle items back to shore to be stacked neatly. Take tripods back to shore one at a time.

The tripods should be arranged neatly for easy access during the start of the next season. Store all items away from the river bank, as spring flooding and ice may carry weir materials downriver if left on the bank. The ATV and trailer should be used to move tripods and other materials away from the river bank. Take care not to overload the ATV or the trailer. Check the oil level on the ATV and the tires as well as the trailer tires.

Once all materials are out of the river and stacked neatly, they must be secured. Run rope through the tripods to tightly bind them together, preventing bears from separating them and floods from carrying them away. Weigh the panels, catwalk boards, and stringers down with sand bags.

INSTALLATION

MATERIALS

- Fence post pounder
- Crisco shortening (non-petroleum based grease) for pushing PVC pipe through rubber straps
- Hundreds of heavy duty zip ties
- Large rubber mallet
- Metal fid to guide pipe through rubber strap
- Barge and hand winch
- 50 Metal fence posts
- Chainsaw winch or hydraulic block
- Rope
- Buoys
- Anchors
- Flip boards
- Yoke

LOCATION

The weir should be installed roughly in the same location as the previous year. Walk a number of transects across the river to determine where any holes, sand bars, or channels which could cause problems with scouring or installation might exist. Choose the transect with the smoothest, best consolidated, and most continuously uniform substrate possible. Place a marker on each bank to have a fixed reference point by which to align panels. Keep in mind that the weir should run perpendicular to the river's current in the deepest, fastest channel. All materials for the weir are stacked on either side of the river bank. The materials are divided roughly in half on either bank.

PANEL INSTALLATION

There are three different lengths of panels: 5, 10, and 15 feet long measured from the herring web to the top caps. The longer panels belong in deeper water and the shorter in shallower. Budgeting panels will be necessary to have enough long ones, but care must be taken not to put too short a panel in water that may become much deeper at high tide. The river bed changes between years so walk the river to find the shallow and deep sections.

It is easiest to begin on the near (north) bank. Begin by dragging the panels into general position. When dragging panels, fold the foot chain and herring web over onto the panel so that it rests on the PVC. Pull the panel by the second PVC tube from the end, near a hypalon strap. Do not pull on the outermost tube as it may break. Laying the chain on the panel when dragging keeps the chain from being pulled loose from the webbing and the web from separating from the panel eyelets (the zip-ties break easily).

The first panel should be laid on the bank so that fish cannot escape around the weir on extremely high tides. The weight of the chain may cause it to sink down into the soft sand, making it difficult to move panels. Leave the chain on the PVC tubes until the panel is in its final position. Only bring panels out as needed. A hydraulic winch and deadman system will assist in panel placement after the first few panels are set. The hydraulic system is located in the shed. Experienced personnel will set up and demonstrate how to use the system to new employees. The hydraulic system exerts large forces; treat them accordingly. Attach the yoke to the rope of the hydraulic system and attach it to a panel two pickets deep

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so as not to break the outer picket. Place two deadmans, secured by anchors, in such a way that the panels will be pulled straight off the platforms and then moved into position.

Lay the panels side by side to be joined and line up the white, lower end caps. Pay attention to how the hypalon straps line up as well. The straps from the adjoining panels should not bind or interfere with each other. If they do not lay flat, one next to the other, driving a connector pipe through them will be difficult. If necessary, move the panels to be joined relative to each other to see if there is a better orientation for the straps, or try to slide the strap up or down its panel slightly. Place a fid in the end of a connector pipe and lubricate the pipe with a thin layer of vegetable shortening. Make sure the connector pipe has a hole drilled through the fid end; a zip-tie will be threaded later through this hole to secure the herring web to the bottom of the joint. Carefully push the connector pipe through the hypalon straps at either end of the panels to join them. Hammering the connector pipe in with a rubber mallet may be necessary. The fid fits loosely making it easy to drop and lose. The person guiding the fid through the hypalon straps will float on top of one of the panels, the gap between the panels is too small to stand in as the panels are joined. Be careful not to drive the sharp fid into the person guiding it.

After the PVC sections are joined, sew the herring web together with zip-ties. Use a zip tie to join the sutured web to the piece of connector pipe via the hole in the bottom of the pipe. Join the ends of the chain with a 6–8 foot length of light line looped twice through the chains and tied off in an overhand knot. Some sections of chain are considerably longer than the herring web or panels themselves so it may be necessary to "choke up" on the chain, or move back a few links so everything lays flat. Make sure the joined sections where the web joins the panels or chain have no holes through which a small fish could escape.

Once two panels are joined, pull the chain as taught as possible along the river bottom and pass a fence post through one loop of the doubled line joining the chain. Drive the post into the substrate so that the toothed surface faces upstream and the fluke is perpendicular to the current. The post should lean upstream at about 30 degrees to resist the downriver pull of the current. Drive the post at least three feet down into the sand with a post-pounder.

BUOY & FLIP BOARD INSTALLATION

Once all the panels are installed, tie buoys below the second hypalon strap down, to keep the top caps of the weir above water. The Ilnik Weir is prone to flipping during high tide and winds. Install flip boards across the entire length of the weir to prevent flipping. A rope should be tied to an anchor, run through the weir underneath the second strap from the top, threaded through the eyes on the flip board, and then run back under the second strap of the panel to be tied off to the next subsequent anchor. The flip board should allow the weir panel to pivot up, but not to move past 70 degrees, restricting its range of motion.

TRAP/GATE ASSEMBLY

Items needed:

- 4 large aluminum panels (1 with cut hole in center)
- Wooden winch frame
- Black netting with corks
- Gate
- 4 fence posts
- Fence post pounder
- Zip ties/bailing wire

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To install the trap, take the wooden winch frame and place it in the chosen trap location on the upstream side of the weir. Place sandbags on the cross bars at base of the legs and the basal crossbeam to secure the frame. Take two of the large aluminum panels and the panel with the cut center. The two large panels will be placed perpendicular to the weir and set upright and lengthwise. While one person holds these panels upright, another person will take the cut panel and interlock it with the upstream ends of the other panels. Use zip ties or bailing wire to fasten the corners of the trap together and drive four fences posts, two on each side of the two large panels, and zip tie them to the panels for structural support. Place a panel inside the trap, covering the river bed. The end of the panel will rest against the basal crossbeam of the wooden frame. This will prevent the sandy bottom from scouring and improve water visibility.

The black netting will now be connected to seal up the back of the trap. There are two rods on the bottom of the net that will be placed in a "V" shape on the weir with two ends touching the trap panels. Fasten the rods to the weir pickets using zip ties. Take the two ends of the cork line and connect it to the trap panels as well. Finally, zip tie the netting to the panels to close off any holes fish could escape through. Many zip ties will be used to attach the net.

Finally, center the gate in front of the opening of the cut panel. Holes drilled in the frame will be used to zip tie or wire the gate to the trap. Place a panel inside the gate to seal off the opening if there is not one there already. Lay sandbags around the base of the trap to make it fish tight and prevent scouring. Place a panel on the river bed in front of the gate to improve visibility and set a panel on top of the trap behind the gate as a platform to stand on. Connect the winch line to the chain of the weir to lift the chain for fish passage.

MAINTENANCE

The Ilnik Weir experiences tidal forces and wave action from being located close to both the Bering Sea and Ilnik Lake. If proper precautions are not taken the weir will flip resulting in gaps and damage to the weir. Preventing the weir from flipping during high tides and high wind events is the primary concern at the Ilnik Weir.

To prevent the weir from flipping, flip boards must be installed as mentioned in the buoy and flip board section of this appendix. The anchors securing the flip boards should be checked daily and reset as needed. If a particularly high tide or high winds are predicted, extra flip boards should be installed preemptively.

The weir should be cleaned on a daily basis. A dry suit is required. All debris must be removed and the chain and gasket at the foot of the weir must be inspected using a mask and snorkel. The deepest section of the weir must be dove upon. The chain and gasket in the deep channel require constant maintenance. High tides combined with wind and wave action works the chain free of the fence post anchors. The chain is free to move about during the next high tide event if this happens, meaning fish can escape when the chain lifts off the ground. Anchor fence posts and the rope securing chain to fence post need to be inspected daily. If the rope is loose it should be tightened or retied as necessary. It is easier to spend time tightening ropes than it is pulling bent fence posts and driving new ones.

REMOVAL

Remove the fish trap and sampling station first. Only detach weir panels that will be immediately removed from the river so panels are not washed downstream. When the panel is detached, lay the chain on top of the panel. Use the hydraulic winch and deadman to pull the panel to shore. Escort the panel to make sure it is not damaged in transit. Each panel should be thoroughly inspected once it is on shore, and repairs made as needed. All weir materials should be secured once on shore in case of flooding.

INSTALLATION

STAGING IN SAND POINT

Things to do:

- Make sure the skiff outboard is running properly. The outboard should be test run in Sand Point. Be familiar with outboard maintenance and operations and take necessary maintenance actions to repair equipment.
- Buy fuel: approximately 15 gallons of unleaded and 15 gallons of diesel.
- Buy three 40lbs bottles of propane. There is a standard propane oven in the cabin. There is a propane refrigerator (slightly smaller than standard) which has a small freezer.
- Buy food. Plan on going without additional supplies until July.

Things to bring:

- Firearms and ammunition
- Radios: VHF base station, hand-held VHF. Test both of these in Sand Point prior to departure
- Tools
- Float Coats
- Chain Saw
- 12 volt batteries (3)
- Spotting Scope or binoculars
- First Aid Kits
- Each person will need chest waders and rain gear
- Sampling notebook
- Scale cards
- Daily weir count forms
- Logbook
- Satellite telephone

SETTING UP CAMP

The Orzinski River weir camp is typically set up between June 3 and 7. Camp supplies and personnel will travel to Orzinski Bay in the Department aircraft. Low tide will be needed for the beach landing. If the skiff is used, arriving at a high tide is desirable for transporting supplies up the inter-tidal river. If the tide allows, store gear at a location inside the river mouth as it is much more protected and easier to access at low tides. Use the 16-foot flat-bottom Lowe skiff that is stored under the cabin to haul gear upriver to the cabin site. Pull supplies upstream without power until a safe path for jet unit operation can be identified.

INSTALLING THE WEIR

The following procedure is an efficient way to install the Orzinski River weir:

- Make 150-180 sand bags from the gravel bar just in front of the weir site
- Install the tripods in a straight line perpendicular to the water current
- Initially, place at least 15 sandbags on each tripod
- Install the stringers
- Install the panels. Panels should be wired to both stringers because of the frequent bear activity on the weir. There are two wooden gates that should be placed in the deep water

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- Line bottom of weir with sandbags. Place sandbags at base of panels on downstream side of weir
- Install the catwalk
- Place flash panel in front of the counting gate
- Install fish sampling trap

LOGS

Any logs in the lake within 150m of the weir should be moved above high water influence. This is much easier than pulling them off the weir when water rises and will reduce the risk of weir damage during high water events. There are two peaveys (logging tools) that can be used for this.

MAINTENANCE

The weir should be cleaned on a daily basis and all debris kept clear. The foot should be walked and checked for holes daily. Patch any holes bigger than two inches to prevent fish passage.

BEARS

Many bears inhabit the Orzinski Lake area. Bears eventually become accustomed to loud noises or techniques used to deter them from the weir and camp. After the salmon have arrived, personnel should always carry a firearm. Anything left unsecured is subject to destruction by bears. All gear should be safely stowed behind aluminum panels to deter bears from destroying it. Keep the cabin door closed to prevent bears from entering the cabin.

Stay alert when walking from the camp site to the bay. If you stay alert and look around every few minutes you will usually see a bear before it sees you. When returning to the cabin, particularly in the evenings, there will often be bears behind the weir and up against the bank where you cannot see. Make a lot of noise when approaching the weir so bears have time to get out of your way.

REMOVAL

All materials should be stacked neatly in their original location. Everything should be secured against both flooding and bear tampering.

INSTALLATION

STAGING IN DUTCH HARBOR

Things to do:

- Make sure the skiff outboard is running properly. The outboard should be test run in the harbor. Be familiar with outboard maintenance and operations and take necessary maintenance actions to repair equipment.
- Buy fuel: approximately 15 gallons of unleaded and 15 gallons of diesel.
- Buy three 40lbs bottles of propane. There is a standard propane oven in the cabin. There is a propane refrigerator (slightly smaller than standard) which has a small freezer.
- Buy food. Plan on going without additional supplies until July.

Things to bring:

- Radios: VHF base station, hand-held VHF. Test both of these in Sand Point prior to departure
- Tools
- Float Coats
- Chain Saw
- 12 volt batteries (3)
- Spotting Scope or binoculars
- First Aid Kits
- Each person will need chest waders, rubber boots, and rain gear
- Sampling notebook
- Scale cards
- Daily weir count forms
- Logbook
- Satellite telephone and Delorme

SETTING UP CAMP

The McLees Lake weir camp is typically set up between June 1 and 5. Camp supplies and personnel will travel to McLees Lake in the Department boat kept in Dutch Harbor. Calm wind and wave action will be needed for the beach landing. Arriving at a high tide is desirable for transporting supplies up the inter-tidal river. If the tide allows, store gear at a location inside the river mouth as it is much more protected and easier to access at low tides.

INSTALLING THE WEIR

The following procedure is an efficient way to install the McLees Lake weir:

- Make 15-20 sand bags from the beach
- Install the bipods and stringers in a straight line perpendicular to the water current across old road bed site using the ½ cable anchored to each bank.
- Initially, place at least a sandbag on each bipod
- Install the pickets firmly to stream bottom, clear rock as necessary for a flush fit
- Install the chute and sampling trap centered or to provide adequate water level throughout the season through the chute.

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- Place flash panel in front of the counting gate exiting the fish trap.

LOGS

Any logs in the lake within 150m of the weir should be moved above high water influence. This is much easier than pulling them off the weir when water rises and will reduce the risk of weir damage during high water events. There are two peaveys (logging tools) that can be used for this.

MAINTENANCE

The weir should be cleaned on a daily basis and all debris kept clear. The foot should be walked and checked for holes daily. Patch any holes bigger than two inches to prevent fish passage.

REMOVAL

All materials should be stacked neatly in their original location. Everything should be secured against both flooding and storm surge.

APPENDIX B. GENERAL EQUIPMENT, CAMP MAINTENANCE, AND CAMP POLICY

Equipment Maintenance

Equipment maintenance is one of the most important operations you will perform during the field season. The outboard motors, generators, ATVs, and other equipment must be kept in good operating condition.

It will be the crew leader's responsibility to assign the most knowledgeable member of the crew to the job of maintaining and servicing equipment. It will be this person's responsibility to see that all equipment is kept in operating condition.

Engine Care and Outboard Operation

If an outboard uses mixed fuel, the correct outboard motor fuel mixture is 50:1. The newer Precision Blend outboards mix the two-cycle oil and gas automatically, but older engines will need to have their fuels pre-mixed. Always pour the oil into the tank first, then add two or three gallons of gas and mix thoroughly, then fill tank to capacity always using a large funnel and chamois filter. Some outboards may be four-stroke engines, which need to have oil levels checked routinely. Always mix fuel tanks or equipment under cover to prevent water contamination and always use a funnel and filter. Note that chainsaws have a fuel mixture of 25:1. Chainsaw gas should be mixed in a separate can and clearly marked that it is chainsaw fuel to avoid accidentally being used in outboards. Remember to always double check all fuel jugs; they can be mislabeled.

Always place outboard motors in neutral when starting and always make sure a safety line is attached between the boat and motor. Perform a check daily of the clamp screws that hold the outboard to the transom. Also routinely check the motor for loose screws and bolts, cracks, and breaks, especially in the area of the lower unit. Never start or run an outboard in the tilted position.

In the normal operation of an outboard, a stream of water is discharged from a hole in the bottom edge of the cowling or from the back of the shaft. If this stream of water stops, the water pump may not be working and the motor should be shut off. On propeller outboards, the side plate over the water intake can be removed for cleaning as it may be plugged. If the pump continues not to function, the outboard should not be run, and a report to base camp should be made. On jet units, a cover on the side of the cylinder head through which water circulates can be removed and cleaned, and the cover over the temperature sensor (thermostat) can also be cleaned to restore flow. Take along a piece of bailing wire to dislodge sand from the small water discharge tube under the cowling.

Check the gear oil in the lower unit of the outboard once a week and drain and replace the gear oil at the end of the season and every 50 hours of operation. Jet units must be greased daily. This is crucial. Grease guns are provided at each camp.

If the skeg or jet unit hits bottom, check the screws to make sure they are still secure and there is no damage to the lower unit. Also, remove any rocks stuck between the grates on the jet unit.

All outboards are to be tilted in the up position when moored to preclude silt accumulation in the jet unit or water pump and skeg or housing damage.

If your outboard will not start, check the following:

- The kill switch is clipped to the engine properly
- The fuel line is connected properly to the motor and the tank and not pinched or kinked
- The air vent on the tank is open
- No water is water in the gasoline
- The engine is not flooded (if it is, wait five minutes for the plugs to dry and try starting it again)
- The spark plugs and spark plug wires are not fouled or defective (replace if needed)

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Boats

Boats are to be kept clean and free of loose tools and debris, and moored at locations where they are not subject to damage by wave action or through contact with the river bottom in rock laden areas. Boats must be bailed regularly of rainwater to keep them from sinking.

Each crew leader will be responsible for maintaining mooring stakes on the river bank sufficient for the boats assigned to his project plus one transient craft. Further responsibility includes maintaining a bow line on each assigned craft and ensuring that each boat is properly moored at the end of each work day to preclude possible loss or damage.

Generators

Portable generators may be supplied to field camps. Their maintenance is important. Since most of the generators have 4-cycle engines, mixed gas must not be used. The crankcase oil reservoir should be checked daily and maintained at the full level. At the end of the season, and after 25 hours of operation, the oil should be changed. Spark plugs should be checked at every oil change for fouling and gap.

Camp Maintenance

Maintaining a clean and efficient field camp is required. Maintenance of living accommodations and other installations will be performed as necessary. All materials needed for camp maintenance will be provided.

Grounds will be kept free of litter. All garbage will be bagged up and disposed of at the nearest sanitary landfill at least once a week. Special precautions should be observed to ensure that garbage does not attract bears and other scavenger species.

Upon completion of the summer season, all camp equipment will be cleaned prior to winter storage. All sampling nets, tarps and cloth items must be dry before being stored. All skiffs and ATVs will be chained and locked to a stationary object at the end of the season.

The crew leader at the end of the field season will inventory all equipment. A report detailing the equipment and storage locations will be submitted at the end of the season to the supervisor. A list of equipment needing replacement or repair will also be submitted, along with an equipment needed list for next season.

Camp Policy

The crew leader of each camp will establish a policy on living standards and personnel behavior in accordance with State guidelines. Time off for individual crew members must be scheduled by the supervisor. All employees will be required to act in a professional manner at all times and shall be especially courteous to the public. All employees, unless approved by the supervisor, are expected to remain at the camp they are assigned and are not permitted to leave the location.

It will be the responsibility of the crew leader to prevent any abuse of State equipment. The crew leader will report within 24 hours to the supervisor any damaged or lost equipment.

Food Orders

Grocery orders should be placed during the evening radio schedule beginning at 7:20 PM. For Nelson, Bear, Sandy, and Ilnik Rivers, the order is placed with Port Moller, and for Orzinski River the order is placed with Sand Point.

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Personal Gear and Pets

Please limit yourself to 100 lbs. of personal gear. Check with your supervisor first if you anticipate bringing more than that amount to your field camp. Pets are not permitted ;) in remote field camps. Pack in small bags and containers that will easily fit through small aircraft doors.

Radio or Satellite Phone Schedules

Radio or satellite phone schedules will be done twice daily to pass on pertinent information to/from the field offices. All employees will participate in these schedules or if an employee is not available the crew leader will pass on pertinent information. For Port Moller field camps, schedules are normally at 8:20 AM and 7:20 PM on the satellite phones or on the single side band on 3.230 megahertz. The morning schedule is used for passing along the current weather (visibility, ceiling, wind speed and direction, precipitation, etc.) and the previous day's escapement counts. The evening schedule is used for updated escapement counts, grocery, and supply orders, and the latest pertinent fishery announcements. All camps must complete the schedule within 15 minutes in the morning and 30 minutes in the evening, so we do not encroach upon other areas' time allotments. Therefore, conversations should be kept short and related to reporting the days numbers. Personal conversation between camps should be arranged at times that do not interfere with any ADF&G schedules and kept to a minimum. For satellite phones, a schedule will be worked out with the appropriate supervisory office. Personal use of satellite phones will be limited to a specific time that will not interfere with any radio schedules, and only be allowed if there is no cost to the state. **Emergency contact phone numbers should be clearly displayed on/near the phone and radios in the cabin.**

If a camp does not respond to two consecutive radio/phone schedules, a plane will be dispatched to check on employees. If you know that you will not be able to make a radio schedule, notify your supervisor in Sand Point or Port Moller. If you miss a morning radio schedule without prior arrangement from your supervisor, you must immediately contact your supervisor to pass on pertinent escapement numbers which are used for management of the fishery as well as passed on to other locations. In an emergency, the Coast Guard can also be summoned using frequency 4.125 MHz by saying "Mayday, Mayday, Mayday" then giving your name, who you work for, your location (field camp name on the Alaska Peninsula and approximate distance from a town, i.e. 10 miles east of Port Moller for Bear Lake or lat. /longs. if known), and the nature of the injury or emergency. Always broadcast even if you think nobody hears you. Somebody may be listening to the radio somewhere and can pass on your emergency to the appropriate people.

All personnel need to be familiar with the single sideband/phone and the operation to contact the appropriate emergency personnel. A list of sideband frequencies and phone numbers should be readily available (taped to the radio/phone) if an emergency exists. If 4.125 MHz on the single side band radio is not marked on the radio and you need assistance finding which dial number it is located on, please ask the appropriate supervisor. Listed below is the latitude and longitude of some field camps. These lat./longs. should be written on the radio or be readily accessible in an emergency.

Orzinski River, ADF&G cabin	lat. 55°43′783″ N., long. 160°05′700″ W.
Nelson River ADF&G cabin	lat. 55°48′990″ N., long. 161°14′047″ W.
Bear River ADF&G cabin	lat. 56°02′242″ N., long. 160°16′098″ W.
Sandy River ADF&G cabin	lat. 56°11′941″ N., long. 160°01′529″ W.
Ilnik River ADF&G cabin	lat. 56°36′729″ N., long. 159°34′282″ W.
Port Moller Airstrip	lat. 56°00′331″ N., long. 160°33′665″ W.

All North Peninsula field camps will standby on channel 72 and Orzinski Lake on channel 6, as do local pilots and commercial fishermen. Employees with any questions or concerns are asked to pass them on to their supervisor.

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Fish and Wildlife Violations

This is not intended as an inclusive procedure for handling violations. Below are guidelines for obtaining the necessary information and/or evidence to document a violation. It is important to be familiar with the commercial fishing, subsistence fishing, sport fishing, and hunting regulations in your area. Violation reporting procedures are printed on the back cover of the commercial fishing regulation book. Request the regulation book if your camp does not have one.

The use of the "4 W's" can greatly aid the Fish & Wildlife Protection officer in obtaining sufficient evidence for a case.

- What is the violation?
- When did the violation occur (e.g. date, time, tide condition, etc.)
- Where did the violation occur?
- Who is in violation and who are witnesses?

It is important that specifics about the event be documented so the appropriate officer can follow-up and contact those involved. If a camera is available, pictures are extremely valuable in prosecuting offenders. Collect as much information as possible and contact your supervisor or a State Trooper from the Fish and Wildlife Protection Division immediately. If you do not feel comfortable, or your personal safety may be in danger, do not pursue the violation. Contact your supervisor and they will handle the situation. Be aware that you do not have the power to arrest somebody or seize equipment. Just limit yourself to documenting the event as safely as possible.

Firearms

A State firearm will be provided at each camp. If unfamiliar with the operation and use of a firearm, inform the supervisor. Training will be provided for anyone who requests or is unfamiliar with firearms. Loaded guns are prohibited inside camp facilities. Treat all firearms as though they were loaded. Guns should be kept clean and oiled and be completely unloaded while being cleaned. Any horseplay or misuse of firearms while working for the Department of Fish and Game will not be tolerated and may be grounds for immediate dismissal. Completely unload a firearm of all rounds before entering a vessel, airplane, or ATV.

Bears

Do not encourage bears to come around camp by leaving food or unburned garbage around. Do not shoot at a bear unless, in your best judgment, it is endangering someone's life or damaging personal or state property. Use your best judgment on whether to shoot a bear if property is at stake. When trying to frighten a bear away by shooting, do not fire toward it. You may wound it by pulling the shot, ricochets, etc. Do not use cracker shells at close distance (<30'). If a cracker shell hits a bear at close range, it may penetrate the body cavity and explode inside the bear, killing it. If you are having problems with a particular bear around camp, call the appropriate supervisory office and notify them of the situation. The Division of Wildlife Conservation personnel may take care of the problem.

Garbage

Burn garbage as needed to prevent bear problems (e.g. food products). A burn barrel should be used to ensure that any bear attractants are completely incinerated. If a burn barrel is not available make sure the fire burns hot enough to incinerate food. Flatten metal cans and box them for empty return flights. Be sure all burn barrels have proper grates or covers to prevent grass fires from sparks. Never leave a fire unattended and always have adequate fire extinguishing materials handy.

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Transportation

Do not endanger life or property by going out in a boat on dangerously rough water. If you are unfamiliar with marine safety, ask one of the field offices for information or advice. All personnel must wear a Coast Guard approved life jacket when out on the water. Be conservative and use good judgment; if you think it is dangerous, don't go out on the water.

Keep extra shear pins or propellers, and a tool kit including pliers, spark plugs, and a spark plug wrench, in the boat at all times as well as handheld VHF and flares. In case travel at night becomes necessary, carry a flashlight with working batteries.

Some camps may be furnished with 4-wheel all-terrain vehicles (ATV). The following safety precautions shall be observed at all times regarding Department ATV operation. Follow all safety rules listed on the vehicle and in the safety manual provided by the manufacturer. If the manual is unavailable, contact your supervisor, as they will have a copy that could be sent to you. A safety helmet is provided. An ATV may provide transport of State materials, supplies, and equipment between camp sites and supply planes or vessels. In addition, they may be used for transportation to and from assigned duties in the field such as monitoring a fishery or collecting harvest information, etc.

Review the Marine Safety and Light Aircraft Safety Manuals located at all camps before boating or flying. Do not get in a boat or plane if you feel uncomfortable with the situation. Consult the crew leader or pilot beforehand.

Fire and First Aid

All remote employees are required to have up to date 1st Aid and CPR certificates.

Make an effort to avoid intestinal parasites such as *Giardia*. When in doubt, boil your drinking water for 15 minutes.

Check your camp's fire extinguisher. Know where it is and how to use it! Inventory your camp first aid kit, replace items as needed and become familiar with basic first aid treatment.

Keep the cabin, surrounding area, and yourself clean and neat. Appearance is important. You will not always be notified of the arrival of visitors, officials, etc. Visitor impressions are often based on your appearance.

Compatibility of Field Personnel

Field work involves close contact with few people for extended periods of time. Every effort should be made to maintain positive relationships with coworkers. Employees should make genuine efforts to be cleaner, more courteous, and forgiving of their coworkers than would be necessary in normal 9 AM–5 PM working conditions. Make a genuine effort to resolve any disagreements that arise. If your camp mates are doing something that irritates you, talk to them about it politely, chances are they are unaware that they are causing a problem for you. If you find yourself absolutely unable to get along with other members at your camp despite your best effort, notify your supervisor and an attempt will be made to resolve the situation.

APPENDIX C. KEY TO FIELD IDENTIFICATION OF ANADROMOUS JUVENILE SALMONIDS IN THE PACIFIC NORTHWEST

Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

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ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish [1] that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alternative characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics —and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

[1] Especially adult smelt, family Osmeridae.

KEY

1. (47) Adipose fin and scales present. (Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

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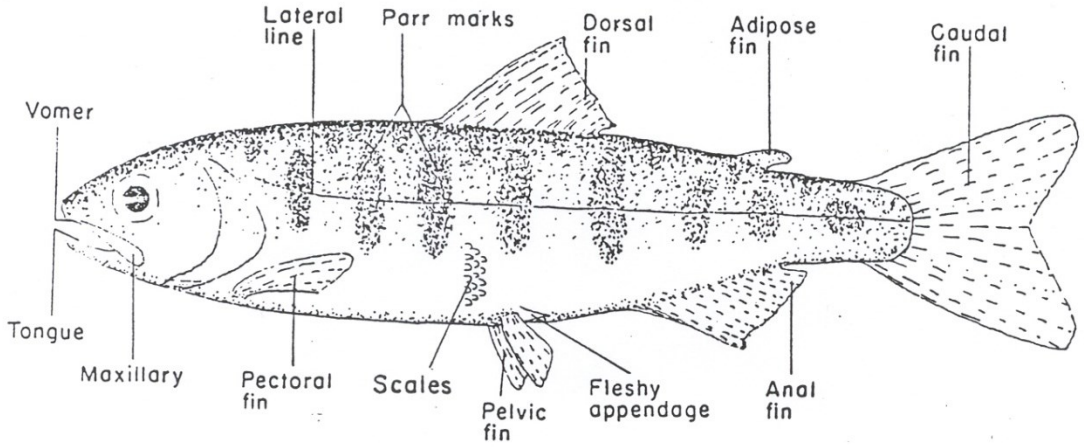

Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

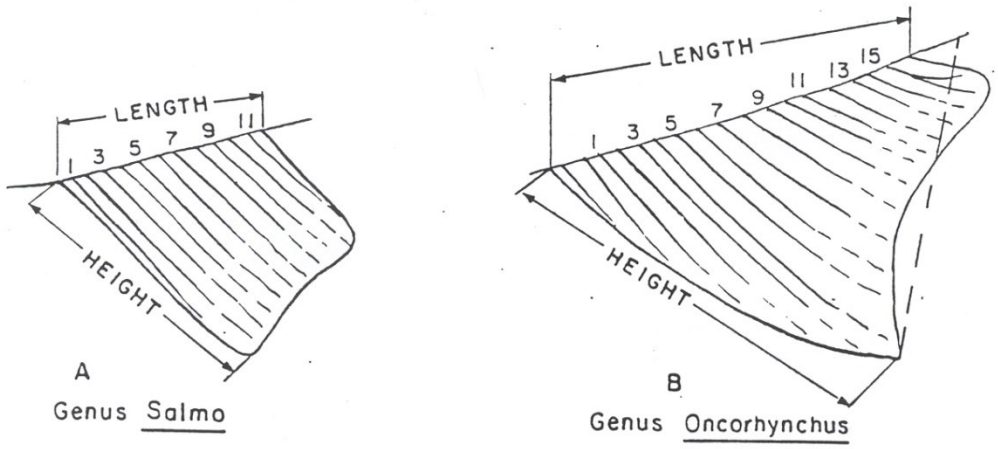

Figure 2.—Anal fins: (A) Trout, genus *Salmo;* (B) Pacific salmon, genus *Oncorhynchus.* The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

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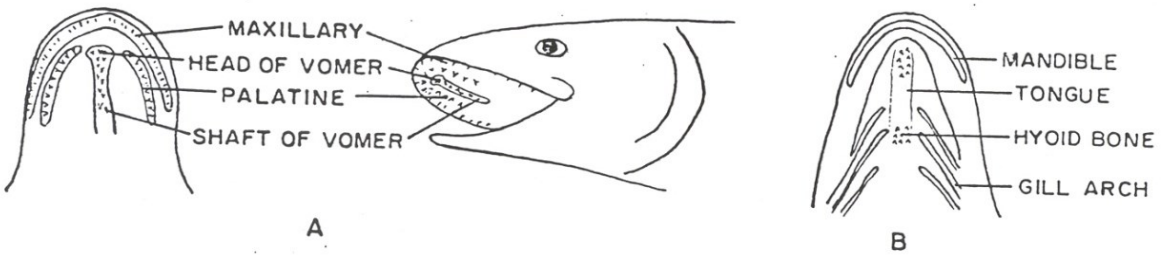
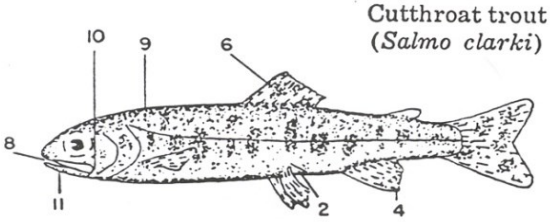


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

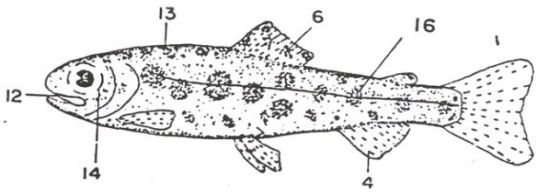
6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)



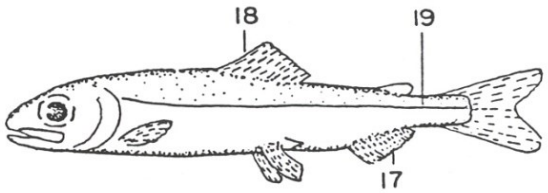
12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

16. (20) Parr marks almost round.
Rainbow or
steelhead trout
(*Salmo gairdneri*)



17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



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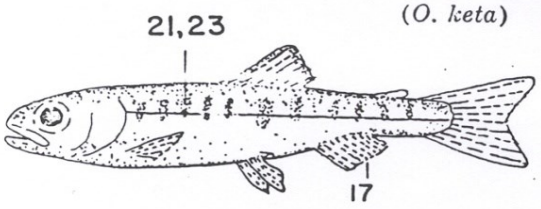
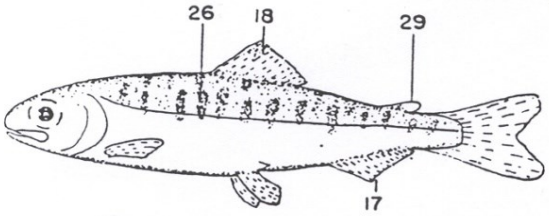
20. (16) Parr marks present as vertical bars or oval spots.
21. (30) Parr marks short, extending little, if any, below lateral line.
22. (25) Gill rakers on first arch, 19 to 26. ** Pyloric caeca, 140 to 186.
23. (26) Parr marks faint. Sides below lateral line iridescent green.
24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



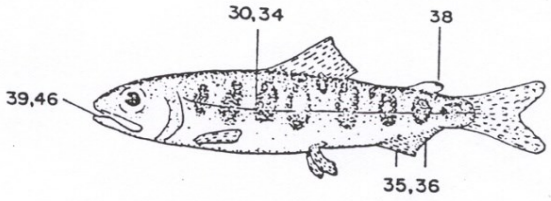
25. (22) Gill rakers on first arch, 30 to 40. **Pyloric caeca 60 to 115.
26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
28. (31) Gill rakers long and slender, more than 29 on first arch.
29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



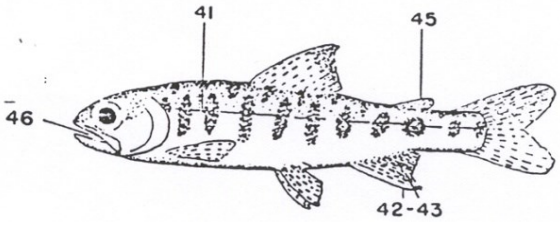
30. (21) Parr marks large, vertical bars centered by lateral line.
31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
32. (29) Adipose fin at least partially pigmented.
33. (40) **Plyloric caeca more than 90.
34. (41) Parr marks broader than interspaces.
35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
36. (43) Anal fin not pigmented.
37. (44) Black spots, when present, on both lobes of caudal fin.
38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Plyloric caeca less than 80.
41. (34) Parr marks narrower than interspaces.
42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
43. (36) Anal fin pigmented between rays, resulting in black banding.
44. (37) Black spots, when present, on upper lobe of caudal.
45. (38) Adipose fin completely pigmented.
46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



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47. (1) Adipose fin not present; scales present or lacking.

Not Salmonidae

48. (2) No fleshy appendage at base of pelvic fins.

Smelts
Family Osmeridae

49. (3) Mouth small, not reaching center of eye; teeth weak or absent.

50. (51) Depressed dorsal fin, shorter than head.

Whitefishes
Genus *Coregonus*

51. (50) Depressed dorsal fin, longer than head.

Arctic grayling
(*Thymallus arcticus*)

52. (5) **Teeth on head of vomer only.

Chars
Genus *Salvelinus*
Dolly Varden (*S. malma*)

53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.

Brown trout
(*Salmo trutta*)

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