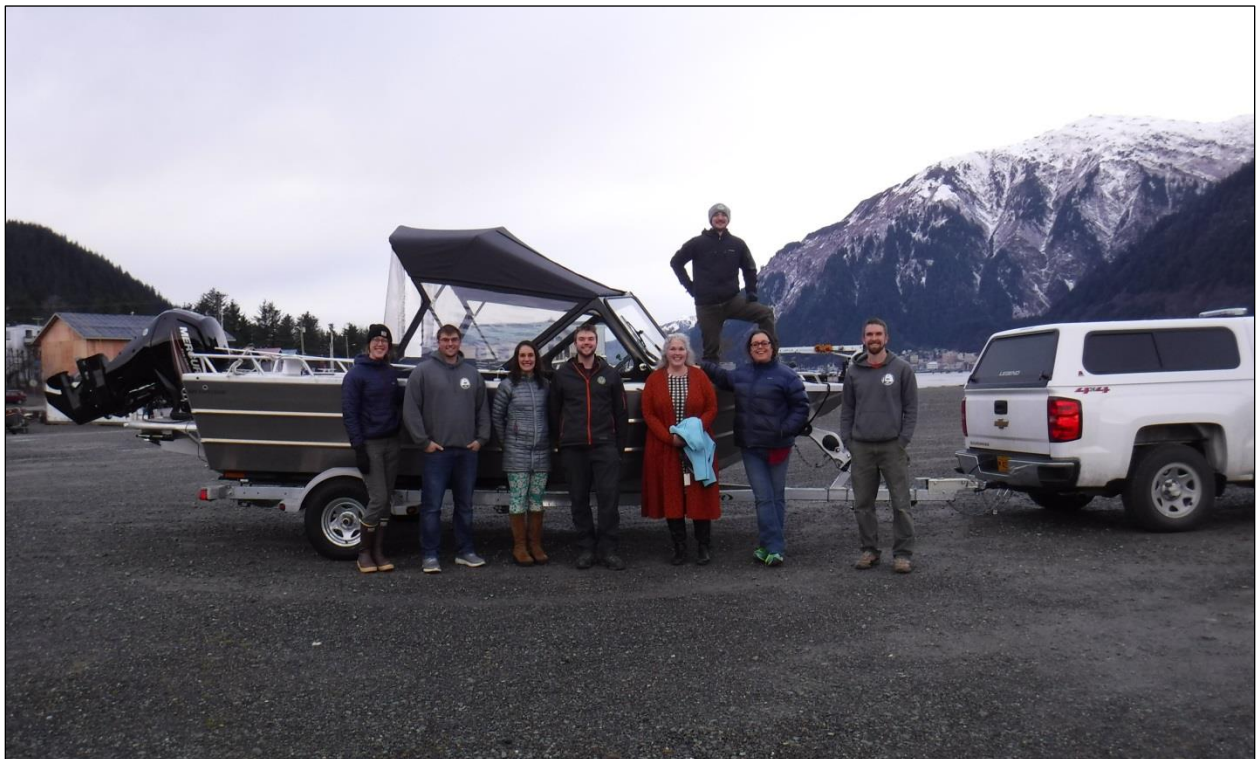
Technical Report No. 18-10

Guide to direct fieldwork for cataloging anadromous water bodies in Southeast Alaska

by

Division of Habitat Southeast Region



February 2019

Alaska Department of Fish and Game **Division of Habitat**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in reports by the Divisions of Habitat, Sport Fish, and Commercial Fisheries. 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 figures or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
no data	ND
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

TECHNICAL REPORT NO. 18-10

GUIDE TO DIRECT FIELDWORK FOR CATALOGING ANADROMOUS WATER BODIES IN SOUTHEAST ALASKA

by
Division of Habitat Southeast Region

Alaska Department of Fish and Game
Division of Habitat, Southeast Region
802 3rd Street, Douglas, Alaska, 99824-0024

February 2019

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Alaska Department of Fish and Game, Division of Habitat,
802 3rd Street, Douglas, Alaska, 99824-0024, USA

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ACKNOWLEDGEMENTS

Alaska Department of Fish and Game Division of Habitat Southeast Regional Supervisor and principle investigator Jackie Timothy secured grant funding and provided the staff support necessary to ensure Southeast Alaska water bodies were field verified and added to, or corrected, in the Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes. Habitat Biologist Nicole Legere converted anadromous waters catalog nominations into report appendices. Habitat Biologist Kate Kanouse formatted the document. Program Technician Katrina Lee provided administrative support.

Alaska Department of Fish and Game Divisions of Habitat and Sport Fish staffs completed fieldwork, including: Habitat Biologists Greg Albrecht, Ben Brewster, Katie Eaton, Evan Fritz, Joe Hitselberger, Caroline Jezierski, Kate Kanouse, Matt Kern, Dylan Krull, Nicole Legere, Jesse Lindgren, Mark Minnillo, Tally Teal, Jackie Timothy, Gordon Willson-Naranjo, and Johnny Zutz; Fish and Wildlife Technicians Conner Fish, Rick Hoffman, Maddie Kombrink, Ben Landes, David Leonard, Kris S'Gro, Trace Strahle, and Tess Quinn; and Student Interns Nolin Ainsworth and Zoey Kriegmont.

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EXECUTIVE SUMMARY

Alaska Statutes require the Alaska Department of Fish and Game (ADF&G) specify anadromous water bodies so they can be properly protected during fish habitat permitting.[a] After regulatory review and approval, anadromous water bodies are specified in the Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes (AWC)[b] and its associated Atlas (Johnson and Blossom 2018).

In Southeast Alaska, there are anadromous streams not specified or incorrectly specified. Since the Division of Habitat's workload priorities include updating the AWC and Atlas, Southeast Region staff used state general funds and Alaska Sustainable Salmon funds to field verify anadromous water bodies on foot using global positioning systems (GPS) up to an anadromous barrier, and sampling for salmonids using minnow traps, hand nets, visual identification, and a backpack electrofisher.[c] Staff digitized the data with ArcGIS mapping software and the information is available in the AWC.

This technical report includes all nominations Division of Habitat staff submitted 2010 through 2017 and updates Technical Report No. 15-05.

INTRODUCTION

Pacific salmon and steelhead *Oncorhynchus mykiss* habitats in Alaska have been protected since 1889, with territorial laws implemented in 1919. In 1962, the State imitated the territorial laws and passed the Anadromous Fish Act. The Anadromous Fish Act required ADF&G to specify anadromous water bodies so they would be properly protected. Initially, ADF&G did not compile a list as the law required, and asserted authority to regulate all water bodies up to the tributary of a tributary of a known anadromous water body (A. Ott, Acting Director, ADF&G Division of Habitat, Fairbanks, personal communication).

In 1980, the legislature directed ADF&G to specify the water bodies that contained any life stage of anadromous fish, as the law required, and imposed a two-year deadline. ADF&G was tasked to complete the list, covering 1,717,856 km^2 of land and 1.2 million km of streams, in just two years. To complete the work, ADF&G relied heavily on the experience of biologists throughout the State, but there was not time to field verify nominations.[d]

The AWC and its companion Atlas are the documents ADF&G uses to specify water bodies important to anadromous fish. Fish habitat in undocumented water bodies is not afforded

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[a] AS 16.05.871.

[b] The AWC is a numerically-ordered list and with the Atlas is adopted by reference at 5 AAC 95.011.

[c] Between 2010 and 2017, Southeast region staff field verified about 2,010 water bodies, submitted about 590 nominations, and added over 373 new stream kilometers to the AWC.

[d] Frank, M. J., C. M. Rozen, and E. W. Weiss. 2000. Legislative history of Alaska Statutes pertaining to the protection of anadromous fish. Alaska Department of Fish and Game, Division of Habitat, Anchorage, AK. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Division of Habitat, 802 3rd St, Douglas, AK.

protection under State law.[e] Even so, many water bodies in Southeast Alaska remain undocumented or are listed incorrectly in the AWC. This is not surprising given a biologist in the early 1980s would have been in the cockpit of a small aircraft, required by the Federal Aviation Administration to remain 153 m above a dense forest canopy, while drawing stream courses by hand on paper maps.

Field surveys and modern technology improve ADF&G's ability to accurately collect and report habitat data. With both general funds and support from the Alaska Sustainable Salmon Fund, Division of Habitat Southeast Region staffs have recently been able to field verify, correct, and add water bodies to the AWC in Southeast Alaska. We initially targeted water bodies in communities with roads where development is most likely. However, we also were able to pair our sustainable salmon funds with other funds allowing us to work in off-road areas with development potential.

To date, we have completed work in Angoon, Bradfield Canal, Cleveland Peninsula, Coffman Cove, Craig, Crittenden Creek, Dall Island, Dry Bay, Etolin Island, Excursion Inlet, Gravina Island, Gull Cove, Gustavus, Haines, Heceta Island, Hoonah, Hydaburg, Icy Bay, Juneau, Kake, Kasaan, Ketchikan, Klawock, Kosciusko Island, Kruzof Island, Kuiu Island, Kupreanof Island, Lynn Canal, Mitkof Island, Naukati, Petersburg, Prince of Wales Island, Revillagigedo Island, Saxman, Sitka, Skagway, Suemez Island, Tenakee Springs, Thorne Bay, Tuxekan Island, Whale Pass, Wrangell Island, Yakutat, and Zarembo Island and include this information in the appendices.

METHODS

In preparation for surveying, surveyors pack the items listed in Table 1.

Table 1.–Field gear needed to document anadromous water bodies.

Ammunition	Inreach
Batteries	Minnow traps
Bear Spray	Multitool
Camera with cord, batteries, and SD cards	Net with depth increment markings
Clinometer	Pencils
Disinfected salmon roe	Polarized glasses
Electrofisher with batteries	Rain gear and hat
First aid kit	Range finder
Fish identification book	Rite in the Rain notebooks
Fish photarium	Stream maps (property boundaries & contours)
FRPA fish block table	Tape measure or digital rangefinder
Gloves	Tide book
GPS with batteries	Waders and boots
Gun with cleaning kit	

[e] J. Johnson, Fisheries Biologist, ADF&G Division of Sport Fish to Distribution. Memorandum: 2018 update to AWC; dated 6/12/2017. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Division of Habitat, 802 3rd St, Douglas, AK.

Once on site, we verify the mainstem of each water body and all tributaries on foot, from the mouth to a suspected barrier using a recreational-grade handheld GPS. We sample for fish using baited minnow traps (Magnus et. al. 2006), backpack electrofishers and hand nets, and visually identify adult salmon and steelhead (Groot and Margolis 1991). With the GPS track feature on, we record GPS waypoints at each sampling site, record species and life stage, and then photograph and release the fish. Juvenile salmonids that can't be identified in the field are preserved and identified under a laboratory dissecting microscope (Pollard et al. 1997).

When we capture coho salmon *O. kisutch*, pink salmon *O. gorbuscha*, sockeye salmon *O. nerka*, chum salmon *O. keta*, or Chinook salmon *O. tshawytscha* or observe adult steelhead, the documentation is used to nominate a new stream to the AWC, extend the upper limit of use, or add an anadromous salmonid species to an existing AWC stream. Two of the same species and age class must be documented during sampling. Other potential anadromous salmonid species that may be present, but cannot be used as a sole indicator of anadromy,[f] include rainbow trout *O. mykiss*, Dolly Varden char *Salvelinus malma*, and cutthroat trout *O. clarkii* (J. Johnson, Habitat Biologist, ADF&G Division of Sport Fish, Anchorage, personal communication).

To determine a barrier to anadromy, we use the Anadromous Fish Block guide from the Alaska Forest Resources & Practices Regulations (2017) handbook that outlines maximum fall height and steep channel navigation abilities of each salmon species (Table 2). When salmon and steelhead navigability of a barrier is questionable, we sample upstream of the barrier.

Table 2.–Anadromous fish block (11 AAC 95.265(g) Table A).

Species Requirements (ft)					
Criterion	Coho	Steelhead	Sockeye	Chinook	Pink/Chum
Maximum Fall Height. A blockage may be presumed if fall height in feet exceeds:	11	13	10	11	a) 4 with deep pool b) 3 without pool
Pool Depth. A blockage may be presumed if the unobstructed water column depth in feet within the pool is less than:	1.25 × jump height, except that no minimum pool depth exists for falls as follows: a) less than 4 in the case of coho and steelhead; and b) less than 2 in the case of other anadromous fish species.				
Steep Channel. A blockage may be presumed at the upper end of the reach if channel steepness in feet is equal to or greater than the following without resting places for fish:	>225 at 12 percent gradient >100 at 16 percent gradient >50 at 20 percent gradient >25 at 24 percent gradient				>100 at 9% gradient

Stream survey documentation includes the stream location, a table of survey data (Table 3), photos of fish and habitat, and a standardized map of the new or corrected stream route (Table 4). We generate the maps in ArcGIS using GPS track and waypoint data overlaid on aerial imagery. The information is submitted for inclusion in the AWC through the Divisions of Sport Fish and Habitat

[f] The life history of individuals and populations may be completed in fresh water without a salt water phase.

Table 3.–Abbreviations used in nominations.

K	Chinook salmon
CH	chum salmon
CO	coho salmon
CT	cutthroat trout (anadromous and resident juveniles and adults)
DV	Dolly Varden char
OU	eulachon
S	sockeye salmon
P	pink salmon
RT	rainbow trout (unknown juvenile or resident adult)
SC	sculpin sp.
SH	steelhead trout (adult)
SB	threespine stickleback
s	spawning
r	rearing
p	presence
EF	electrofish
VI	visual identification
HN	handnet
RS	route survey
MT	minnow trap
BS	beach seine
FN	fyke net

Table 4.–Colors used in ArcMAP.

Color	Action
(ginger pink)	route correction
(apatite blue)	addition
(solar yellow)	future investigation
(poinsettia red)	resident fish
(lepidolite lilac)	conveyance
(electron gold)	deletion
(lapis lazuli)	AWC
(lapis lazuli)	overflow channel
(electron gold)	barrier

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Alaska Forest Resources and Practices Regulations. March 2017. Department of Natural Resources Division of Forestry. Table A: Anadromous Fish Blockage.

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