Technical Report No. 15-05

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

By

Division of Habitat Southeast Region

December 2015

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

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

TECHNICAL REPORT NO. 15-05

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 W. 3rd Street, Douglas, Alaska, 99824
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Cover Photos: Project safety training. Bottom row left to right – Joe Hitselberger, Gordon Willson-Naranjo, Johnny Zutz, Rick Hoffman, Matt Kern, Greg Albrecht, Ben Brewster. Top row left to right – Kate Kanouse, Tess Quinn, Nicole Legere, Tally Teal, Jackie Timothy.

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

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ACKNOWLEDGEMENTS

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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.

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.

Since our work revealed only about 5% of the water bodies we sampled in Southeast Alaska were accurately specified, we need to field verify and map all streams. We will update existing information and add new information to the report appendices as we complete work in the future. We do not use this report as a substitute for the AWC.

[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 2015, Southeast region staff field verified 1,292 water bodies, submitted 495 nominations, and added over 370 new stream kilometers to the AWC.

INTRODUCTION

Pacific salmon and steelhead 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 (Al Ott, Acting Director, ADF&G, Fairbanks, personal communication). Policy interpretation and implementation varied, occasionally providing protection for tributaries void of fish.

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 square km of land and 1.2 million linear 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 (Frank et al. 2000).

The Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes (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 protection under State law (Johnson 2014). 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 support from the Alaska Sustainable Salmon Fund, Division of Habitat Southeast region staff 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.

We have completed work in Angoon, Dry Bay, Excursion Inlet, Gull Cove, Gustavus, Haines, Hoonah, Icy Bay, Juneau, Ketchikan, Lynn Canal, Petersburg, Prince of Wales, Sitka, Skagway, Tenakee Springs, Wrangell and Yakutat and include this information in the appendices.

METHODS

Once on site, the survey team verifies the mainstem of each water body and all tributaries on foot, from the mouth to a suspected barrier using a Garmin Montana 650 GPS. They sample for juvenile and resident fish using baited minnow traps (Magnus et. al. 2006), backpack electrofishers (Smith-Root, Inc. 2009) and hand nets, and visually identify adults (Groot and Margolis 1991). They take 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).

The salmon species surveyors capture include coho *Onchorynchus kisutch,* pink *O. gorbuscha,* sockeye *O. nerka,* chum *O.keta,* and Chinook *O. tshawytscha.* To document anadromous use of a

newly identified stream, or to add an anadromous salmonid to the AWC, two of the same species must be captured during one sampling event. Other potential anadromous salmonid species that may be present, but cannot be used as a sole indicator of anadromy,[d] include rainbow trout *O. mykiss,* Dolly Varden char *Salvelinus malma,* and cutthroat trout *O. clarkii* (J. Johnson, Sport Fish Biologist, ADF&G, Anchorage, personal communication).

To determine a barrier to anadromy, the survey team uses the Anadromous Fish Block guide from the Alaska Forest Resources & Practices Regulations handbook (2013) that outlines maximum fall height and steep channel navigation abilities of each salmon species (Table 1). When salmon and steelhead navigability of a barrier is questionable, crews sample upstream of the barrier. Nominations to the AWC end at the most upstream capture point.

Table 1.–Anadromous Fish Block (11 AAC 95.265(g) Table A).

Species Requirements (in feet)					
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 jump 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 2), photos of fish and habitat, and a standardized map of the new or corrected stream route (Table 3). Staff generates maps in ArcGIS using GPS point and track data overlaid on aerial imagery. The information is nominated for inclusion in the AWC and submitted to the Divisions of Sportfish and Habitat for a final determination. The maps delineate water bodies that require additional investigation to determine anadromous fish use and are used to guide future fieldwork.

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

Table 2.–Survey data codes.

Code	
	Species
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 spp.
SH	steelhead trout (adult)
SB	threespine stickleback
LP	lamprey
	Lifestage
s	spawning
r	rearing
p	presence
	Sampling
EF	electrofish
VI/VL	visual identification
HN	handnet
RS	route survey
MT	minnow trap
BS	beach seine
FN	fyke net

Table 3.–Map color key.

Action	Color
route correction	ginger pink
addition	apatite blue
future investigation	solar yellow
resident fish	poinsettia red
conveyance	lepidolite lilac
AWC	lapis lazuli

REFFERENCES CITED

Alaska Forest Resources & Practices Regulations. Reprinted October 2013. Division of Forestry, Department of Natural Resources. Table A: Anadromous Fish Blockage. p.20.

ADF&G (Alaska Department of Fish and Game). 2015. Fish Resource Monitor, Anadromous Waters Catalog. Retrieved from http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=awc (Accessed June 10, 2015).

Frank, M.J., C.M. Rozen, and E.W. Weiss. 2000. Legislative history of Alaska Statutes pertaining to the protection of anadromous fish. Unpublished report. Alaska Department of Fish and Game, Division of Habitat, Anchorage, Alaska.

Groot, C. and L. Margolis. 1991. Pacific Salmon Life Histories. Department of Fisheries and Oceans, Biological Sciences Branch, Pacific Biological Station, Nanaimo, BC, Canada.

Johnson, J.D. 2014. Memo: "2015 Update to AWC"; dated 6/2/2014. Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services, Anchorage, Alaska.

Johnson, J. and V. Litchfield. 2015. Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Southeastern Region, Effective June 1, 2015. Alaska Department of Fish and Game, Special Publication No. 15-08, Anchorage.

Magnus, D. L., D. Brandenburger, K. F. Crabtree, K.A. Pahlke, and S. A. McPherson. 2006. Juvenile salmon capture and coded wire tagging manual. Alaska Department of Fish and Game, Special Publication No. 06-31, Anchorage, Alaska.

Pollard, W.R., G.F. Hartman, C. Groot, and P. Edgell. 1997. Field Identification of Coastal Juvenile Salmonids. Department of Fisheries and Oceans, Vancouver, BC, Canada.

Smith-Root, Inc. User's Manual LR-24 Backpack Electrofisher. 2009. Technology for Fisheries Conservation, #07288.05. www.smith-root.com. Vancouver, Washington.