Regional Operational Plan No. ROP.SF.4A.2023.01

Operational Plan: Wrangell Island Streamgage Network, 2022–2028

by

Jason Hass

February 2023

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

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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

REGIONAL OPERATIONAL PLAN NO. ROP.SF.4A.2023.01

OPERATIONAL PLAN: WRANGELL ISLAND STREAMGAGE NETWORK, 2022–2028

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February 2023

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This document should be cited as follows:
Hass, J. 2023. Operational Plan: Wrangell Island streamgage network, 2022–2028. Alaska Department of Fish and Game, Division of Sport Fish, Regional Operational Plan No. ROP.SF.4A.2023.01, Anchorage.

Signature Page

Project Title:	Wrangell Island Streamgage Network, 2022–2028
Project leader(s):	Jason Hass
Division, Region, and Area	Sport Fish, Research and Technical Services, Instream Flow Program
Project Nomenclature:	
Period Covered	
Field Dates:	10/1/2022 to 6/1/2028
Plan Type:	Category I

Approval

Title	Name	Signature	Date
Project leader	Jason Hass		
Research Coordinator	Joe Klein		

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ABSTRACT

This project will collect the streamflow data necessary to file reservation of water (ROW) applications on Pat, Salamander, Earl West, Fools, and Thoms creeks. These ROWs will protect instream flows necessary for fish habitat, migration, and propagation. Streamgages will be installed on Salamander Creek and Thoms Creek and discharge measurement stations will be established on Pat, Skip, Earl West, Long Lake, and Upper Salamander creeks. The streamgages will remain in operation until spring 2028. Instantaneous discharge measurements at the discharge stations will be regressed against corresponding discharge values at the Salamander Creek or the Thoms Creek streamgages to estimate five years of daily streamflow data within each stream reach. The streamflow data will be used to file ROW applications with the Department of Natural Resources.

Keywords: Pat Creek, Salamander Creek, Earl West Creek, Thoms Creek, Wrangell Island, reservation of water, instream flow, streamgage, discharge measurement station

PURPOSE

Alaska's rivers and lakes support some of North America's most viable and productive salmon fisheries. Over 20,000 streams, rivers, or lakes have been identified throughout the state as being important for spawning, rearing or migration of anadromous fish (Klein et al. 2022). Fish migration, spawning, rearing, and ultimately, production in these water bodies are dependent upon sufficient seasonal quantities of water. Demand for water to support hydroelectric power generation, petroleum production, mining, water supply (including out-of-state export), residential, forestry, agriculture, and other projects have the potential to modify the naturally occurring instream flows to which fish have adapted to and are dependent upon (Poff et al. 1997).

The Fish and Game Act requires the Alaska Department of Fish and Game (ADF&G) to "...manage, protect, maintain, improve, and extend the fishery resources of the state in the interest of the economy and general well-being of the state" (Alaska Statute 16.05.020; AS). One mechanism ADF&G uses to fulfill its mandate is to reserve water in rivers and lakes for fish and wildlife (AS 16.05.050). An appropriation of water that remains within a river is legally defined under Alaskan law (AS 46.15.145) and regulations (11 AAC 93.970) as a reservation of water (ROW). To reserve water, an application with supporting data and analyses must be submitted to the Alaska Department of Natural Resources (DNR). A minimum of five years of mean daily flow data is recommended by DNR to quantify instream flow requirements within an application.

The State of Alaska Legislature amended the Alaska Water Use Act in 1980 to allow instream flows to be legally reserved by a private individual, group, or government agency in order to maintain specific flow rates in a river or volumes and water levels in a lake during specified time periods for one or a combination of four types of uses:

- protection of fish and wildlife habitat, migration, and propagation;
- recreation and parks purposes;
- navigation and transportation purposes; and
- sanitary and water quality purposes.

Priority dates for ROW applications are based on the date that they are accepted by the DNR. Alaska water law is based on the doctrine of prior appropriation, also known as "first in time, first in right." According to the rules of prior appropriation, the right to the full volume of water is first given to the appropriator who has the earliest priority date to beneficially use the water. This senior water right holder has a legal standing to assert that right against conflicting uses of water from others who do not have water rights or who are junior in priority.

Historically, there has been very little streamflow data collected on Wrangell Island. Due to the lack of streamflow data, there have been no ROW applications filed to reserve streamflows on Wrangell Island. The purpose of this project is to collect the streamflow data necessary to file and adjudicate ROW applications for Pat, Skip, Salamander, Earl West, Fools, and Thoms Creeks to protect fish habitat, migration, and propagation.

These sites were selected as they will provide long-term habitat protection for fish in a time efficient and cost-effective manner. Each of the selected sites are within watersheds that support healthy populations of multiple fish species important to the local commercial, sport, and subsistence fisheries. Each of the streamgage and discharge measurement sites were also selected because they have optimal hydrologic characteristics for a streamgage and/or a discharge measurement transect.

This operational plan serves to provide project-specific information and rationale to supplement the Surface-water data manual for the Statewide Aquatic Resources Coordination Unit (Klein 2013).

OBJECTIVES

The objective of this project is to collect the streamflow data necessary to file eight ROW applications to reserve instream flows within two reaches of Salamander Creek and Pat Creek and one reach of Skip, Earl West, Long Lake and Thoms Creeks. Four tasks are necessary to complete this objective and include:

Tasks

1. Install and operate streamgages for five years on Salamander Creek and Thoms Creek.
2. Operate instantaneous discharge measurement stations on Pat, Skip, Upper Salamander, Earl West and Long Lake Creeks.
3. Assess the relationship between the streamgages and the discharge measurement stations. For those stations with robust correlations, develop five-year streamflow records.
4. Complete and file ROW applications for each creek reach with a minimum of five years of mean daily flow data.

METHODS

STUDY AREA

This project takes place on Wrangell Island, in Southeast Alaska. Wrangell Island is approximately 30 miles long, 14 miles wide, and 210 square miles, making it the 29th largest island in the United States. The island is within Southeast Alaska's coastal temperate rainforest. The climate is characterized by mild winters, cool wet summers, any year-round precipitation. The surrounding forest is composed primarily of Sitka spruce and western hemlock. The area topography is characterized by moderately steep landforms, predominantly rounded summits, elevations up to 4,500 feet and flat floored, U-shaped valleys. Most of this project area is federal land within the Tongass National Forest, with some state-owned land around Pat Creek and Thoms Creek.

The town of Wrangell, AK, with a population of about 2,300 residents, is the only community on the island (Figure 1) and the fifth largest in Southeast Alaska. The town weathered an economic downturn, losing one-third of its population between 1995 and 2005. This was the direct result of the closure of the Alaska Pulp Company sawmill. The island's logging history is evidenced by previously harvested, now second growth, timbered hillsides. After the slowdown of the timber industry, Wrangell refocused on building an economy based on its maritime resources and tourism. Like most Southeast Alaska communities, the residents of Wrangell heavily rely on sea and surrounding watersheds for food, jobs, and recreation (Rain Coast 2022).

Salamander Creek is located in the central portion of Wrangell Island. The creek flows approximately seven river miles in a northeasterly direction before emptying into saltwater at Eastern Passage, just north of The Narrows (Figure 1). There are two USFS campgrounds complete with picnic shelters, fire rings, and outhouses at the road crossings over the creek. A USFS public-use rental cabin is also located with the watershed. The anadromous waters of Salamander Creek support populations of coho salmon (*Oncorhynchus kisutch*), chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), cutthroat trout (*O. clarki*), Dolly Varden (*Salvelinus malma*) and steelhead trout (*O. mykiss*) and have been catalogued by ADF&G as Anadromous Waters Catalog (AWC) stream number 107-40-10820 (Giefer and Graziano 2022). Hatchery raised Chinook salmon (*O. tshawytscha*), likely released from nearby Earl West terminal net pens, occasionally travel up Salamander Creek but are not known to successfully reproduce (USDA 2010). The drainage area is comprised mostly muskeg lowlands and moderate elevation 2,000-foot mountain ridges. Portions of many of these wooded ridges have been previously timber harvested. The gaged reach of this creek is located within a moderate floodplain channel composed mostly large gravel and cobble substrate with a bankfull width of approximately 100 feet.

The Thoms Creek watershed is located on the southwestern portion of Wrangell Island. Thoms Creek flows southerly approximately five miles out of its headwaters at Thoms Lake, before emptying into Thoms Bay. In route to Thoms Bay, the creek widens and forms Middle Lake, then necks back down into Thoms Creek before entering saltwater. Thoms Lake is 2 mile long, 320 acres, and is surrounded by lowland muskeg on three sides. The east side of the lakes and Thoms Creek are forested, mostly unharvested hills, reaching moderate 2,000 feet elevations. Road density surrounding Thoms Creek is the lowest on the island and the fisheries value is the highest on the island (Sheinberg 2010). The anadromous waters of Salamander Creek support populations of sockeye salmon (*O. nerka*), coho salmon, chum salmon, pink salmon, cutthroat trout, Dolly Varden, and steelhead trout and have been catalogued by ADF&G as Anadromous Waters Catalog (AWC) stream number 107-30-10300 (Giefer and Graziano 2022). The robust sockeye salmon population within Thoms Creek, contributes to the subsistence fishery at its mouth. The lower section of the creek is within Thoms Place State Marine Park. The gaged portion of the creek is located within a moderate floodplain channel and is composed mostly of large gravel and cobble substrate with a bankfull with of approximately 150 feet.

Pat Creek is located on the east side of Wrangell Island. The creek has a partial USGS gage record between 2003 and 2013. The anadromous portion of the creek is approximately 4 miles long and supports populations of sockeye, coho, chum, pink salmon, Dolly Varden, and cutthroat trout. ADF&G has catalogued this creek as AWC stream number 108-10-10050 Giefer and Graziano 2022).

Long Lake Creek is an unnamed creek that drains out of Long Lake but is locally and will herein be referred to as Long Lake Creek. The Creek is located on the south side of Wrangell Island. The

anadromous portion of the creek is approximately 3 miles long and supports populations of coho salmon, chum salmon, pink salmon, and Dolly Varden. ADF&G has catalogued this creek as AWC stream number 107-20-10700 (Giefer and Graziano 2022).

Skip Creek is located on the west side of Wrangell Island. The anadromous portion of the creek is approximately 6 miles long and supports populations of coho salmon, pink salmon, Dolly Varden, and steelhead trout. ADF&G has catalogued this creek as AWC stream number 107-30-10200 (Giefer and Graziano 2022).

Skip Creek is located on the west side of Wrangell Island. The anadromous portion of the creek is approximately 6 miles long and supports populations of coho salmon, pink salmon, Dolly Varden, and steelhead trout. ADF&G has catalogued this creek as AWC stream number 107-30-10200 (Giefer and Graziano 2022).

STUDY DESIGN

Following the approach and guidelines set forth in Klein (2013) and the DNR Handbook (Alaska Department of Natural Resources 1985), two reaches of Salamander and Pat creeks; and one reach of Thoms, Earl West, Fools, and Skip creeks (Figures 2-4) were selected for instream flow protection.

Pat Creek Reach A begins at saltwater where it enters Zimovia Strait and extends upstream approximately 0.5 river miles to the outlet of Pat Lake. Pat Creek Reach B begins just above Pat Lake and extends upstream approximately .7 river miles to the confluence with AWC stream number 108-10-10050-2047. Salamander Creek Reach A begins at saltwater where it enters Eastern Passage and extends upstream approximately 3.4 river miles to the confluence with AWC stream number 107-40-10820-2018. Salamander Creek Reach B begins just upstream of Reach A and extends upstream approximately 2.5 river miles to the confluence with AWC 107-40-10820-2031 (Figure 2). Thoms Creek Reach A begins at saltwater where it enters Thoms Place Bay and extends upstream approximately 3.4 river miles to the outlet of Middle Lake. Earl West Creek Reach A begins at saltwater where it enters Earl West Cove and extends upstream approximately 3.5 river miles to the upper extent of the AWC (Figure 2). Long Lake Creek Reach A begins at saltwater where it enters Fools Inlet and extends upstream approximately 3.1 river miles to the upper extent of the AWC (Figure 2). Skip Creek Reach A begins at saltwater where it enters Zimovia Strait and extends upstream approximately 5.4 river miles to the upper extent of the AWC (Figure 2).

To collect the hydrologic data necessary for reservation of water applications, a streamgage network is being established. A streamgaging network consists of one or more index streamgage stations that is operated continuously over a long period of time and an associated network of semi-permanent discharge measurement stations operated concurrently on nearby waterbodies that are hydrologically similar. Instantaneous discharge data collected at the discharge measurement stations will be regressed against corresponding discharge values from an index streamgage. Given a robust relationship between the streamflows at a discharge measurement station and the streamflows at a streamgage, a synthetic period of record for the discharge measurement station can be estimated from the data collected at the streamgage (Klein 2013). For this project, we will utilize two index streamgages and six discharge measurement stations.

Index streamgages are being established on Salamander Creek (ADF&G 16501; Figure 3) and Thoms Creek (ADF&G 16601; Figure 4). The Salamander Creek streamgage is located on the mainstem of Salamander Creek, near the upstream end of Salamander Creek Reach A. The Thoms Creek streamgage will be approximately ¼ mile downstream of the Thoms Creek Road bridge near the middle of Thoms Creek Reach A. The Salamander Creek streamgage was installed on Oct 6, 2022 and the Thoms Creek streamgage will be installed during Spring 2023. Both streamgages will remain in operation until fall of 2027 or until five years of streamflow data have been collected.

As part of this streamgage network, ADF&G has also established six discharge measurement stations. The Lower Pat Creek station (16701) is located below the Zimovia Highway bridge, near the middle of Pat Creek Reach A. The Upper Pat Creek station (16702) is located on the mainstem of Pat Creek above Pat Lake, near the top of Pat Creek Reach B. The Upper Salamander Creek station (16502) is located just above the USFS Road 6265 Bridge, near the middle of Salamander Creek Reach B. The Earl West Creek station (16901) is located just above the USFS Road 6265 Bridge, near the middle of Earl West Creek Reach A. The Long Lake Creek station (17001) is located just above the USFS Road 6270 Bridge, near the middle of Long Lake Creek Reach A. The Skip Creek station (16801) is located just above the USFS Road 6267, near the middle of Skip Creek Reach A.

Table 1.–Summary of ROW reaches and respective data collection stations.

Reach Name	Reach Length (RM)	Station Type	Station Number	Comment
Pat Creek Reach A	0.5	DM	16701	
Pat Creek Reach B	0.7	DM	16702	
Salamander Cr Reach A	3.4	Streamgage	16501	Installed October 2022
Salamander Cr Reach B	2.5	DM	16502	
Earl West Cr Reach A	3.5	DM	16901	
Long Lake Cr Reach A	3.1	DM	17001	
Skip Cr Reach A	5.4	DM	16801	
Thoms Cr Reach A	3.4	Streamgage	16601	To be installed Spring 2023

Note: DM = discharge measurement station.

The streamgages and discharge measurement stations are all located within close proximity to roads and easily accessed by foot. Each location will be selected to ensure the station represents hydrologic conditions within the respective reach. The discharge transects at the stations will have fairly uniform depth, velocity, and angle of flow (Rantz 1982).

ADF&G employees Jason Hass and Jarrod Sowa will perform all field duties.

DATA COMPILATION AND COLLECTION

Biologic Data Compilation

Fish distribution and periodicity data will be compiled and summarized from scientific literature, local ADF&G biologists, and the *Catalog of Waters Important for the Spawning, Rearing or*

Migration of Anadromous Fishes (Giefer and Graziano 2022). A fish periodicity chart that includes fish species present and the timing of their life history phases will be finalized and included in each ROW application.

Hydrologic Data Collection

Hydrologic data collection will follow U.S. Geological Survey (USGS) standards as described in Klein (2013). The Salamander Creek streamgage (16501) is located near the middle of Salamander Creek Reach A, quarter of a mile upstream of the USFS Road 50050 bridge (Figure 2). The Thoms Creek streamgage (16601) will be located near the middle of Thoms Creek Reach A, half a mile downstream of the Thoms Creek Road Bridge (Figure 2). These sites were chosen during a field reconnaissance trip in July 2022. Both sites have stable banks, one confined stream channel, a stable downstream hydraulic control, are out of public view, and is within close proximity to a suitable stream discharge measurement transect.

Streamgages

ADF&G Streamgage 16501 was installed on October 6, 2022. Stage and water temperature are being measured at the streamgages using an In-Situ© Level Troll 700H pressure transducer housed in a 1-1/4" pipe that is secured to the streambank with custom pipe brackets and ½" galvanized lag bolts. The pressure transducer has been programmed to measure stage and water temperature every fifteen minutes on the quarter hour.

Water surface elevations (WSE) were surveyed using an auto level and will continue to be surveyed during each field visit. Three survey reference marks (RMs) were established near each streamgage to establish the gage datum. At the time of the installation, the WSE in relation to RM 1 was measured using differential surveying techniques. At this time, the transducer was set to read the surveyed water surface elevation. Two additional RMs (named RM2 and RM3) were established near the gage site to monitor possible changes in the elevation of RM1. The differences in the elevations of these RMs in relation to RM1 was measured using standard differential surveying techniques following USGS protocols (Kenney 2010). The RM2 and RM3 elevations will be surveyed at least once a year and at the time of gage removal. The transducer and surveyed WSE are compared at each site visit to determine if the surveyed WSE is being represented correctly by the transducer. If a discrepancy is identified, protocols described in Klein (2013) or manufacturer guidelines will be followed to correct the problem. During late fall of 2022, when water conditions permit, ADF&G streamgage 16601 will be installed on Thoms Creek using similar methods and techniques.

To define the stage-discharge relationship, discharge measurements will be taken near each streamgage five or six times a year, over a range of low to high flows, and during different seasons for the period that the gage is operational. When the creeks are wadeable, a wading rod with an Acoustic Doppler Velocimeter (ADV) along with a tagline will be used to measure streamflow. During high water conditions when the creeks cannot be waded, a Teledyne-RDI Streampro© Acoustic Doppler Current Profiler (ADCP) will be used to measure streamflow. The road bridges near the gage sites provide access to both banks. The Streampro© will be tethered and towed back and forth across the creek to take the discharge measurement. All scientific equipment will be calibrated and maintained according to manufacturer specifications and USGS standards.

Discharge Stations

Similar to the index gage, streamflow at each discharge station will be measured using a wading rod with an ADV meter and tag line when wadable or a Teledyne-RDI Steampro© ADCP when the streams are not wadable.

Access

To access the streamgage network, a fixed wing commercial flight will be taken from Juneau to Wrangell, AK. A vehicle will be rented in Wrangell and driven to the streamgages and discharge stations. At times, data collection and routine maintenance will require two days. In these cases, lodging will be booked in Wrangell, AK or at the Salamander Creek Campground.

Data Reduction

Stage and water temperature data will be transferred from the transducers to a ruggedized tablet then uploaded to a personal desktop computer. The stage data will then be converted to Excel or comma delimited text files and entered into the Water Information System Kisters Inc. (WISKI©) hydrologic software package. Discharge measurements and observed staff gage readings will be entered into the BIBER© component of WISKI©. Electronic copies of field notes, photographs, discharge, and level summary records will be stored in folders associated with the gaging station name and number on the WISKI© dedicated server. Further data reduction details are provided in Klein (2013).

Data Analysis

Analyses of the Salamander and Thoms creeks streamgage data will be performed using the WISKI© hydrological software package following USGS standards and protocols and will include: development of a stage-discharge rating, discharge measurement summaries, associated shift analysis (if applicable), a table of applied datum and gage-height corrections, mean daily flow computations for each day of record, mean monthly flow for each month of record, and a station description and manuscript (a synopsis that describes the gage site, mechanics and other pertinent information regarding operation of the gaging station).

Streamflow at each discharge measurement stations will be compared to streamflow at the index streamgages to determine which index streamgage it is most hydrologically similar to. After a minimum of 10 discharge measurements have been collected at the discharge station, a simple linear regression model will be used to estimate the relationship between streamflow at the discharge measurement station and streamflow at the corresponding index streamgage. The results of the model will be used to determine the next step:

1) If the regression results in a robust correlation, discharge measurements may cease on that waterway and further analysis will continue (see below).
2) If the regression indicates a poor relationship between flows at the discharge measurement station and flows at the index gage, discharge measurements and further analysis will cease. In this case, it will not be possible to produce the necessary data for a reservation of water application for this waterway.
3) If the regression results are inconclusive in regard to the strength of the correlation, additional discharge measurements may be collected to further refine the regression model.

For all waterways with a robust relationship (Klein 2013) between the discharge measurement station and the corresponding index streamgage, the estimated regression parameters will be used to calculate a five-year period of record. From that record, annual, monthly, mean daily, and flow duration summaries will be calculated using Statistical Analysis Systems© (SAS) software.

Table 2.–Method used to determine streamflow within each ROW reach.

ROW Reach	Method used to Determine Streamflow
Pat Creek Reach A	Relationship between the Discharge Station 16701 and hydrologically similar streamgage
Pat Creek Reach B	Relationship between the Discharge Station 16702 and hydrologically similar streamgage
Salamander Creek Reach A	Streamflow data from Streamgage 16501
Salamander Creek Reach B	Relationship between the Discharge Station 16502 and Streamgage 16501
Skip Creek Reach A	Relationship between the Discharge Station 16801 and hydrologically similar streamgage
Earl West Creek Reach A	Relationship between the Discharge Station 16901 and hydrologically similar streamgage
Long Lake Creek Reach A	Relationship between the Discharge Station 17001 and hydrologically similar streamgage
Thoms Creek Reach A	Streamflow data from Streamgage 16601

Reservations of water

For the ROW applications, reservation flow requests will be determined using the flow duration method (Annear et al. 2004) combined with available fish use information. Requested flows will typically be within the 25 to 75% exceedance range, which are normal hydrologic conditions providing habitat to which fish have adapted (USGS 2009). In addition to the hydrologic data (discussed above), ROW applications will include biological data based on the AWC and the expertise of the local management biologists. The final deliverables for this project will be hydrologic data summaries prepared for the purpose of submitting ROW applications to DNR.

SCHEDULE AND DELIVERABLES

Activity	Dates
Install streamgage on Salamander Creek	Oct 2022
Install streamgage on Thoms Creek	Spring 2023
Operation of streamgages	October 2022 to Spring 2028
Visit discharge measurement stations	Each station 2 times each year
Complete gage records for preceding water year	Before March 1 of each year
Field data collection completed	November 2027
Correlate measurements and develop period of record	February 2028
Complete and submit reservation of water applications	October 2028
Complete Fishery Data Series report	December 2029

RESPONSIBILITIES

Jason Hass, Habitat Biologist II (ADF&G)

Duties: Project Manager. Responsible for study design, field logistics, data collection, analysis, and administration of project responsibilities. Responsible for preparations and review of operational plan, reservation of water application(s), reports. Maintenance and care of field equipment. Maintain project funding and budget.

Jarrod Sowa, Habitat Biologist III (ADF&G)

Duties: Assist with data collection and analysis. Maintenance and care of field equipment. Responsible for review of operational plan, reservation of water application(s), and reports.

Joe Klein, Environmental Engineer II (ADF&G)

Duties: Provide technical oversight. Submit reservations of water applications to DNR.

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FIGURES

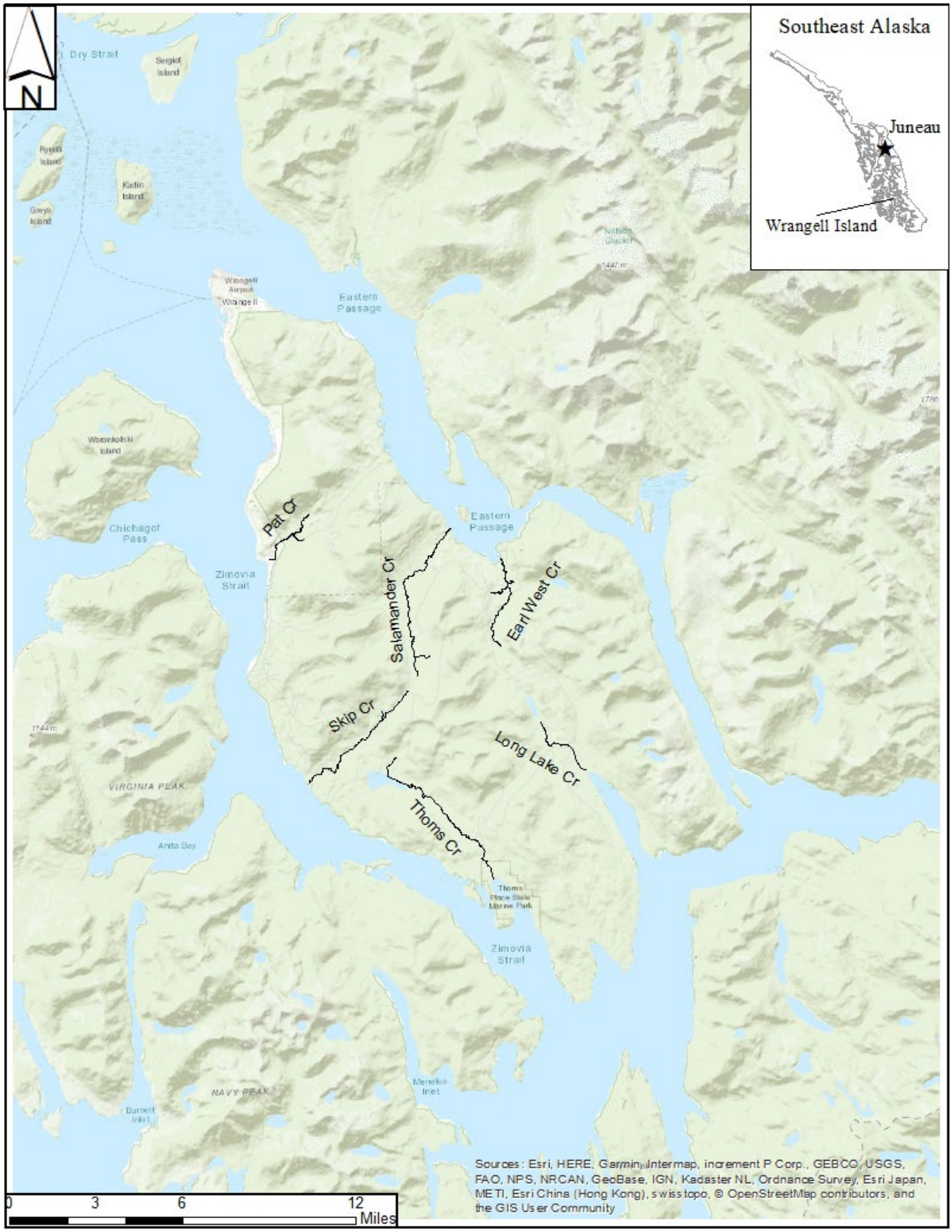

Figure 1.–Location of Wrangell Island in Southeast Alaska.

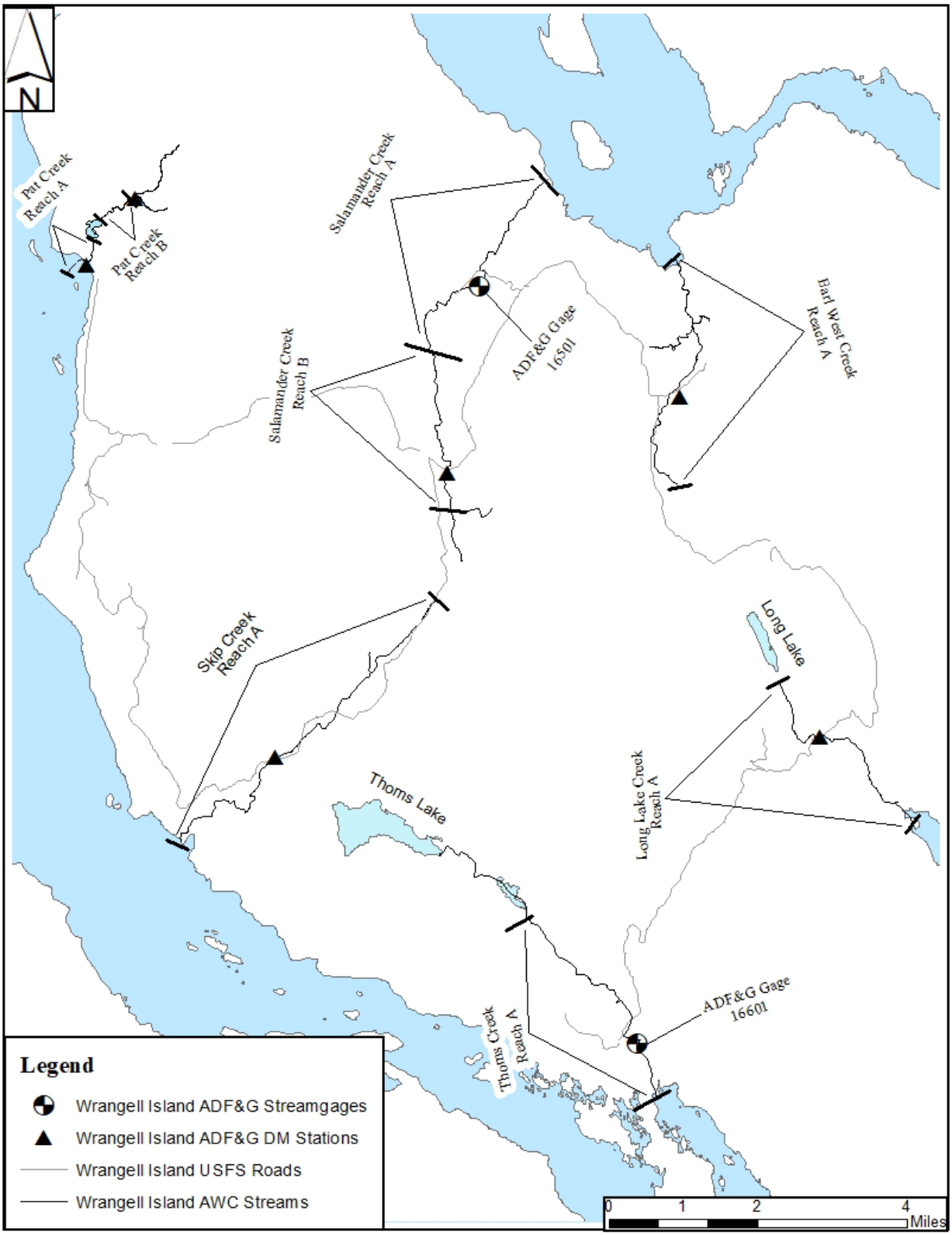

Figure 2.–Location of Wrangell Island streamgage and discharge measurement stations.

Figure 3.–Salamander Creek Streamgage, after installation on October 6, 2022.

Figure 4.–Thoms Creek future streamgage site, on July 19, 2022.

APPENDIX A: FISH PERIODICITY TABLE

Appendix A1.–Example of fish periodicity table.

Coho Salmon	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage					XX	XXXX						
Adult Passage								X	XXXX	XXXX		
Spawning									XX	XXXX	XXXX	
Incubation	XXXX	XXXX	XXXX	XXXX					XX	XXXX	XXXX	XXXX
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

Sockeye Salmon	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage					XXXX	XXXX	X					
Adult Passage							X	XXXX	XXXX	XX		
Spawning							X	XXXX	XXXX	XX		
Incubation	XXXX	XXXX	XXXX	XXXX			X	XXXX	XXXX	XXXX	XXXX	XXXX
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

Pink Salmon?	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage					XX	XXXX						
Adult Passage								XXXX	XXX			
Spawning								XX	XXXX			
Incubation	XXXX	XXXX	XXXX	XXXX				XX	XXXX	XXXX	XXXX	XXXX
Rearing					XX							

Dolly Varden	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult Passage						XXXX	XXXX	XXXX	XXXX	XXXX	X	
Smolt Passage					XXXX	XXXX						
Spawning									XXXX	XXXX	X	
Incubation	XXXX	XXXX	XXXX						XXXX	XXXX	XXXX	XXXX
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

Based on professional judgment of ADF&G biologists

Smolt passage is for juvenile emigration to estuarine/marine environment

Adult passage: for salmon is immigration: for trout, char, and other species, immigration and emigration.

Incubation life phase includes time of egg deposition to fry emergence

? = Data not available or timing is incomplete

APPENDIX B: GAGE SITE CHECKLIST

Appendix B1.–Gage site visit checklist.

Pre-Site Visit Checklist

- ❑ Charge Batteries: camera, Rugged Reader, Satt phone
- ❑ Read last Field Trip Report
- ❑ Review stage data, rating curves, rating table, discharge summary sheet

Equipment Checklist

- ❑ Tape measure
- ❑ Notebook
- ❑ Discharge Measurement Sheets
- ❑ Camera
- ❑ Rating Table
- ❑ Stadia Rod
- ❑ Auto Level
- ❑ Tripod
- ❑ Ipad
- ❑ VuSitu
- ❑ Desiccant x2
- ❑ Pipe wrenches, ADCP screwdriver, misc tools
- ❑ Calculator
- ❑ ADCP
- ❑ ADCP Batteries x2
- ❑ Throw rope
- ❑ Laptop
- ❑ ADCP rope
- ❑ FlowTracker
- ❑ FlowTracker Rod
- ❑ Spare FlowTracker battery pack

Site Visit Checklist

- ❑ Survey WSE.
- ❑ Inspect site for changes to control, staff gage, channel, etc.
- ❑ Take discharge measurement and record exact start/end time on discharge measurement notes sheet.
- ❑ Take photos upstream/downstream, across discharge measurement.

-continued-

- ❑ Survey WSE after discharge measurement.
- ❑ Take picture of control.
- ❑ Download datalogger data. Check battery level and memory.
- ❑ Take instantaneous probe reading and compare to staff gage.
- ❑ Make sure probe test is running (Running Man)
- ❑ Record all pertinent information on discharge measurement sheet i.e.; weather, site conditions, equipment problems, changes to channel, changes to control, differences between staff gage and probe, work that needs to be completed at next visit, wildlife seen (especially fish activity), etc.
- ❑ Survey benchmarks/staff gage/control/WSE at installation, yearly, at decommission, and if staff gage is suspected to have moved. Make sure to move level and survey all stations again. Check data in the field before leaving and compare with old survey data.

Post Visit Checklist

- ❑ Download streamflow data from FlowTracker or WinRiver.
- ❑ Download stage data from WinSitu.
- ❑ Compare discharge data from FlowTracker to discharge measurement sheet.
- ❑ Make sure all pertinent information is posted to discharge measurements notes sheet.
- ❑ Post discharge measurement data to Shift Analysis sheet.
- ❑ Plot discharge measurement to rating curve.
- ❑ Post discharge measurement data to Flow Summary sheet.
- ❑ Convert stage, water temperature, observed staff gage, discharge measurement data into WISKI compatible format. Import data into WISKI.
- ❑ Review stage data to make sure probe is operating correctly.
- ❑ Post observed staff gage readings and probe readings to Gage Height Corrections Sheet.
- ❑ Complete Field Trip Report.
- ❑ Download and label pictures.