

Technical Report No. 19-02

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# Fish Presence Surveys on Afognak Native Corporation Lands, Kodiak Archipelago, 2018

by

William D. Frost



*Unnamed Lake, Whale Island*

February 2019

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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 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.

<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	$H_A$
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	$e$
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, $\chi^2$ , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
<b>Weights and measures (English)</b>		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	$E$
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	$\geq$
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	$\leq$
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log <sub>2</sub> , etc.
		latitude or longitude	lat or long	minute (angular)	'
<b>Time and temperature</b>		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	$H_0$
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
<b>Physics and chemistry</b>				standard error	SE
all atomic symbols				variance	
alternating current	AC			population sample	Var
ampere	A			sample	var
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				

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LANDS, KODIAK ARCHIPELAGO, 2018**

by

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February 2019

Funding through the Alaska Sustainable Salmon Fund

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*This document should be cited as:*

*Frost, W. D. 2019. Fish presence surveys on Afognak Native Corporation lands, Kodiak Archipelago, 2018. Alaska Department of Fish and Game, Division of Habitat, Technical Report No. 19-02, Anchorage.*

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## **ACKNOWLEDGEMENTS**

The ADF&G Division of Habitat thanks the Alaska Sustainable Salmon Fund for the financial support of this Anadromous Waters Catalog project—specifically, Deborah Maas.

We thank the ADF&G, Division of Commercial Fisheries Kodiak staff for assisting with fieldwork, including Lisa Fox, Birch Foster, Mat Olson, and Keven Schaberg, as well as Hans Rinke, DNR, Division of Forestry and Kelly Kruger, Kenny Matson, and Will Licht, Sun’aq Tribe of Kodiak.

We thank Afognak Native Corporation for their in-kind financial and logistical support for the 2018 sampling effort. We specifically acknowledge the field assistance provided by Greg Harris, Andrew Christofferson, William Pyles, and Natasha Hayden.

Finally, I would like to thank Megan Marie for her guidance during the writing of this document. As well as Donna Monaghan, Al Ott, and Ron Benkert, ADF&G.

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## EXECUTIVE SUMMARY

In 2018, the Alaska Department of Fish and Game (ADF&G), Division of Habitat, sampled for the presence of anadromous fish on Kodiak Archipelago on land owned by Afognak Native Corporation. The information gathered was used to submit nominations for inclusion in the ADF&G *Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and its companion Atlas (AWC).

Inclusion in the AWC will help to conserve salmon habitat by providing the 50-foot development setback required by Kodiak Island Borough (KIB) code and the 66-foot riparian retention area protection required under the Alaska Forest Resources and Practices Act. A water body listed in the AWC also is afforded protection under Alaska Statute 16.05.871.

Water bodies were sampled using a backpack electrofisher or baited minnow traps to target juvenile fish. Sampling was terminated at barriers to fish passage when such barriers were present. Absent a barrier, the sampling team determined the most appropriate location to terminate sampling based on an assessment of available habitat, stream gradient, and a failure to capture fish at a given sampling location. Adult salmonids observed were counted and their spawning activity noted.

During the 2018 season, twenty watersheds were sampled on Kodiak Archipelago, and 35 nominations were submitted to the AWC. As a result of the sampling effort, 22 km of new anadromous fish habitat was nominated for inclusion in the AWC. The nominations include two specified water bodies that support additional life stages of anadromous fish and four specified streams whose locations were accurately mapped by Global Positioning System.

Juvenile coho salmon (*Oncorhynchus kisutch*) and Dolly Varden (*Salvelinus malma*) were the most common salmonid species captured or observed. The only other adult and juvenile salmonids captured or observed were pink salmon (*O. gorbuscha*). Additional species captured or observed were threespine stickleback (*Gasterosteus aculeatus*), ninespine stickleback (*Pungitius pungitius*), and sculpin (*Cottus* spp.).

The one year project was a successful collaboration between ADF&G and Afognak Native Corporation. Fish and fish habitat benefited from the additional riparian retention areas, and the land owner benefited by having better information to develop their future land management plans.



## INTRODUCTION

The mission of the Alaska Department of Fish and Game (ADF&G) is to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principal. The mission of ADF&G Division of Habitat is to protect Alaska's valuable fish and wildlife resources and their habitats as Alaska's population and economy continue to expand.

In the winter of 2017, a 1-year grant was secured through the Alaska Sustainable Salmon Fund (AKSSF) for ADF&G to sample streams and lakes within the Kodiak Archipelago and document the presence of anadromous fish in advance of future development on Afognak Native Corporation (ANC) lands. Kodiak Island is located about 390 km southwest of Anchorage, Alaska (Figure 1). The information gathered was used to submit nominations for inclusion in the *Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and its companion Atlas (AWC; ADF&G 2017). Kodiak Island Borough (KIB) Code 17.50.080(b) requires a 50-foot development setback on all waters listed in the AWC. Forested land located in the KIB may be sold for timber harvest. Many of the streams support anadromous and high value resident fish and require a 66-foot riparian retention area under the Alaska Forest Resources and Practices Act (FRPA); under Alaska Administrative Code (11 AAC 95.265(4)). A specified water body listed in the AWC also is afforded protection under State law at Alaska Statute (AS) 16.05.871 (ADF&G 2017–2018). A water body that supports anadromous fish but is not listed in the AWC is not afforded protection under AS 16.05.871.



Figure 1.–Kodiak Archipelago.

ADF&G initiated this project to document anadromous fish presence prior to future land development within the Kodiak Island Archipelago. ADF&G coordinated with ANC to prioritize sampling locations and arrange field sampling logistics.

## METHODS

ADF&G developed maps using geographic information system (GIS) mapping software to assist with locating streams in the project area. The maps were produced by using georeferenced satellite imagery with the AWC data layer. Many streams sampled within the Kodiak Archipelago in 2018 were small (< 8 m wide) first-, second-, and third-order tributaries of known anadromous streams (Strahler 1957). Sampling was prioritized by cross-referencing lands that may be developed with those water bodies likely to support anadromous fish. The length of each reach sampled was measured using the GIS measuring tool and field verified by a handheld Global Positioning System (GPS) unit.

Water bodies were sampled by a team of up to two ADF&G staff or local tribal volunteers and one ANC employee. Sampling in streams was conducted using a Smith-Root LR-24 backpack electrofisher. Output voltage was adjusted to the minimum level necessary to achieve taxis (forced swimming), and continuous DC was used to minimize fish injury (NMFS 2000). A single electrofishing pass at each sample reach was completed, starting at the downstream end and working upstream.

Lakes and ponds were sampled using Gee-type minnow traps baited with betadine treated salmon eggs. Traps soaked for a minimum of two hours. Trap size selected for smaller fish, but this outcome was considered adequate as an indicator of the presence of fish species (Bloom 1976). However, it is noted that juvenile sockeye salmon (*Oncorhynchus nerka*) may be missed by minnow trapping, potentially causing underestimation of sockeye distribution because of this species' tendency toward a planktivorous diet (Burgner 1991).

Captured juvenile salmon and Dolly Varden (*Salvelinus malma*) were identified to species and counted. Because of time constraints, only a select number of fish captured were measured to the nearest mm in fork length (FL). Threespine stickleback (*Gasterosteus aculeatus*), ninespine stickleback (*Pungitius pungitius*), and sculpin (*Cottus* spp.) were noted as present, but not measured or counted. All fish were released into a slack-water area at the point of capture. Adult salmonids observed were counted and spawning activity locations recorded using GPS.

We used existing FRPA criteria (Table 1; FRPA 2017) and professional judgment to determine the upper extent of the water body to be sampled. Absent a barrier, the sampling team determined the most appropriate location to terminate sampling, based on an assessment of available habitat, stream gradient, and failure to capture fish at a given sampling location.

Table 1.—Anadromous Fish Blockage (11 AAC 95.265(g) Table A).

Criterion	Species requirements (in feet)				
	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 x 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% gradient ≥100 at 16% gradient ≥50 at 20% gradient ≥25 at 24% gradient			≥100 at 9% gradient	

A hand-held Garmin GPS unit was used to record geographic information to verify or correct the actual location of water bodies, add barriers to fish passage, and note locations of captured salmonids. Number and length of fish captured or observed were recorded with the GPS device to allow for georeferencing. These data were used to submit nominations to the AWC. Nominations included new water bodies, upstream extensions of existing anadromous waters, addition of species or life stages, and corrections of water body locations. Nominations were completed according to the ADF&G submission guidelines and requirements (ADF&G 2017).

## RESULTS

In 2018, monthly sampling events occurred on Kodiak Archipelago from May through October. A total of 45 reaches were sampled within 20 watersheds with a total stream survey length of 27.6 km (Table 2; Appendix A1 through A16). The total length of streams documented as containing anadromous fish and nominated to the AWC was 22 km (Table 2). The pre-project AWC status of the surveyed streams and AWC nominations resulting from 2018 sampling are graphically shown in Appendix A.

Table 2.–Kodiak Archipelago streams sampled in 2018.

Stream name	AWC number	# Reaches sampled	Total length sampled (meters)	Total new AWC length (meters)
Unnamed Lake Izhut Bay		5	610	510
McDonald Creek	252-31-10080	1	355	0
Unnamed Stream	251-40-10030-2035	7	3,321	3,249
Waskanareska Creek	251-10-10020	4	4,825	3,240
Unnamed Stream	252-35-10030	1	433	0
Unnamed Stream Fox Bay		2	2,356	2,356
Unnamed Stream Fox Bay		8	4,110	3773
Unnamed Stream Afognak Strait		1	495	0
Unnamed Stream Afognak Strait		5	3,310	3,310
Unnamed Stream Afognak Strait		1	450	0
Unnamed Stream Occident Point		1	980	980
Unnamed Stream Ostrovka Point		1	790	0
Unnamed Stream Ostrovka Point		2	3,400	3,400
Unnamed Stream	252-35-10020	2	1,000	1,000
Unnamed Stream Chernof Point		2	730	0
Unnamed Stream Whale Passage		1	312	312
Unnamed Stream Whale Passage		1	125	0
Total		45	27,602	22,130

During the 2018 sampling effort, five known anadromous streams on Kodiak Island were determined by GPS to be mapped in the wrong location. The stream mapping has been revised and corrections were submitted to the AWC (Table 3).

Table 3.–Anadromous streams on Kodiak Archipelago corrected in 2018.

Streams corrected in 2018
McDonald Creeek (252-31-10080)
Chernof Point Creek (252-35-10020)
252-35-10030
Waskanareska Creek (251-10-10020)
251-10-10020-2009

In 2018, there were 35 nominations submitted to the AWC. Nineteen of the nominations were accepted for inclusion into the 2019 AWC update and 16 are currently being reviewed for the 2020 AWC revision. Juvenile coho salmon (*O. kisutch*) and Dolly Varden were the most common salmonid species captured or observed. The other adult and juvenile salmonid species captured or observed were pink salmon (*O. gorbuscha*). Length measurements were taken for a portion of the juvenile salmon and Dolly Varden that were captured (Table 4). Stickleback and sculpin were noted as present but not measured or counted.

Table 4.–2018 Kodiak Archipelago fork length measurements, by month and species.

Month	Length range (mm)		
	Coho Salmon	Pink Salmon	Dolly Varden
May	60–85 ( <i>n</i> = 17)	40-45 ( <i>n</i> = 30)	60–70 ( <i>n</i> = 4)
June	Visual Count		Visual Count
July	65–80 ( <i>n</i> = 4)		30–140 ( <i>n</i> = 60)
August	45–75 ( <i>n</i> = 70)		45–140 ( <i>n</i> = 52)
September	50-80 ( <i>n</i> = 17)		60–80 ( <i>n</i> = 8)
October	55–70 ( <i>n</i> =24)		( <i>n</i> =0)

In 2018, two known anadromous water bodies were found to support additional species or life stages (Table 5). The streams were updated in the AWC.

Table 5.–Additional species or life stages located on Kodiak Archipelago.

Stream no.	Species added	Life stage added
252-35-10020	Coho/Dolly Varden	Rearing
251-10-10020	Coho	Rearing

## DISCUSSION

Sampling conducted in 2018 on Kodiak Archipelago identified new anadromous water bodies, extended existing anadromous streams, added species or life stages to existing anadromous waters, and corrected existing anadromous water body locations. Nominations were completed according to ADF&G submission guidelines and requirements. All nominations submitted prior to the 2018 nomination deadline have been accepted, approved, and scheduled for inclusion in the 2019 AWC revision. Fifteen nominations submitted after the 2018 deadline will be reviewed by the ADF&G and, if accepted, included in the 2020 AWC revision. This sampling year resulted in the addition of 22 km of new anadromous fish habitat nominated to the AWC, plus the addition of species and life stages.

Inclusion in the AWC affords the water body protection under AS 16.05.871 by requiring notification and ADF&G approval for proposed activities below ordinary high water, in order to provide proper protection of fish and game. Inclusion in the AWC results in a 50-foot development setback under KIB code (17.50.080(b)). Additionally, inclusion in the AWC also results in a 66-foot riparian retention area regulated by FRPA under 11 AAC 95.265.

Riparian habitat provides streambank stability, filters pollutants, and maintains water quality for fish and wildlife habitat. To function properly, buffers must have an effective vegetative cover and sufficient width and continuity along the stream. Vegetative cover filters sediment and pollutants, reducing the amount of materials that may enter a stream. The rate of surface erosion is closely correlated with vegetative cover on the soil surface, such as plant litter. Litter and the stems of

vegetation reduce the downslope movement of surface soils. Accelerated surface erosion occurs when these barriers are removed (Strahler et al. 1971).

Riparian vegetation provides shade to help maintain air and water temperatures and prevent excessive algal blooms. Reduced shade leads to increased water temperatures. Increased water temperatures can obstruct adult migration and limit spawning success, trigger early juvenile outmigration resulting in decreased survival rates, change juvenile sheltering behavior, reduce disease resistance, and increase metabolic requirements (Taylor 1988). Riparian vegetation also provides allochthonous input to the base of the food web, terrestrial insects for fish consumption, and cover for aquatic vertebrates.

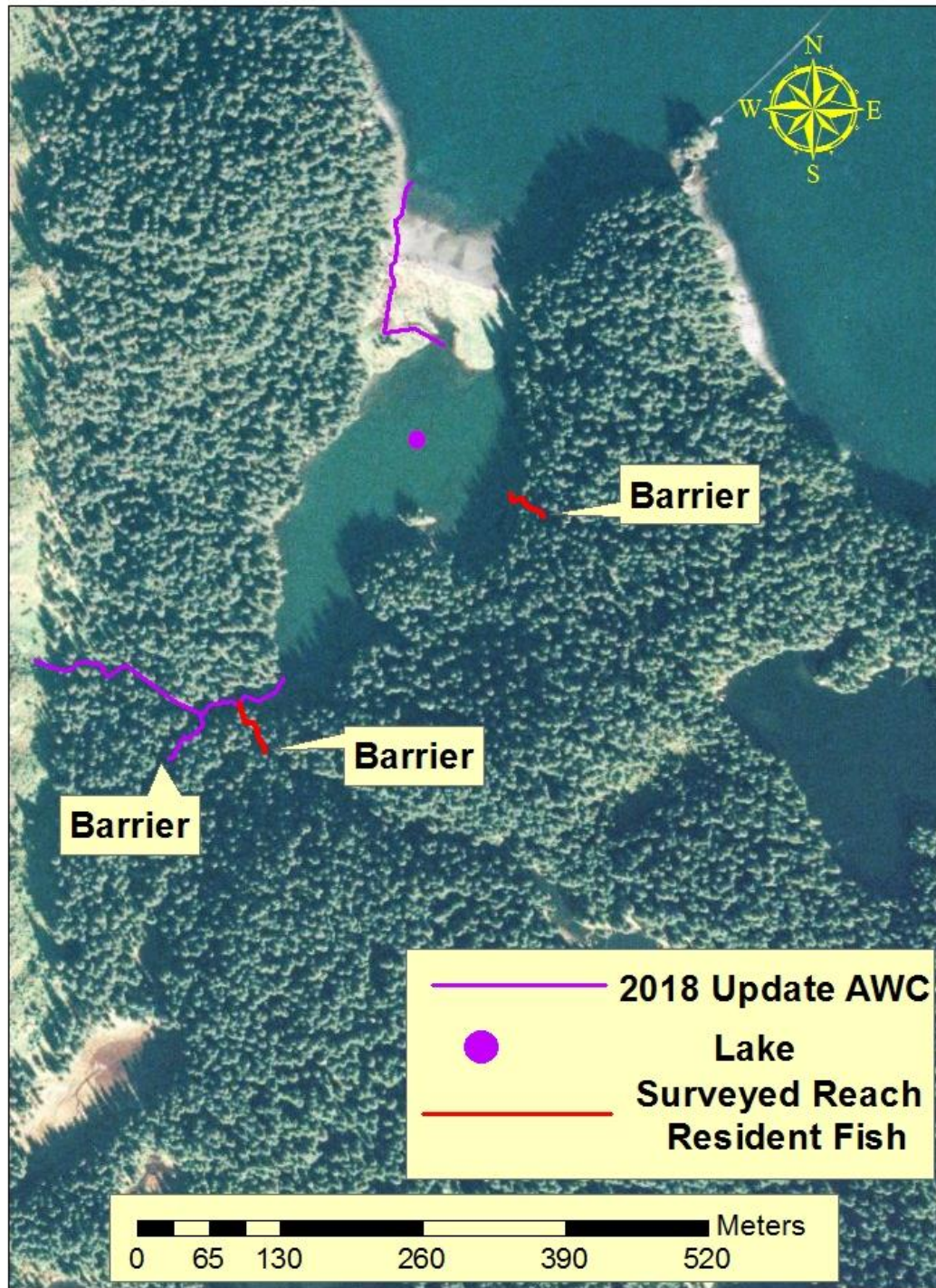
This project has been a successful example of collaboration between ANC and ADF&G. ANC support of this project has been important for identifying and prioritizing waters to sample, which has resulted in aquatic habitat protections required by ADF&G statutes and KIB zoning requirements. ANC benefited by having better information to develop their future land management plans.

## REFERENCES CITED

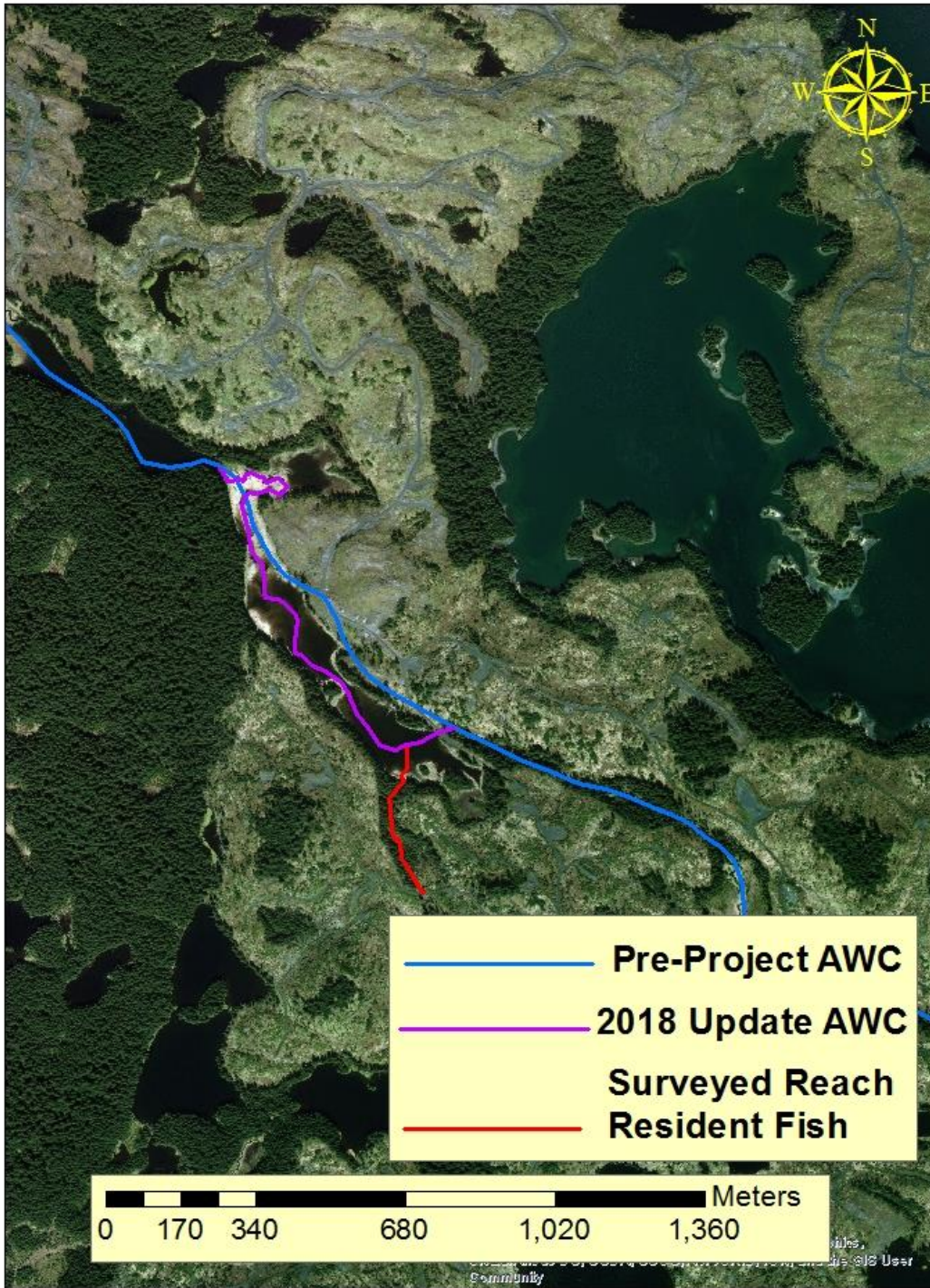
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**APPENDIX A:  
STATUS OF SURVEYED REACHES**





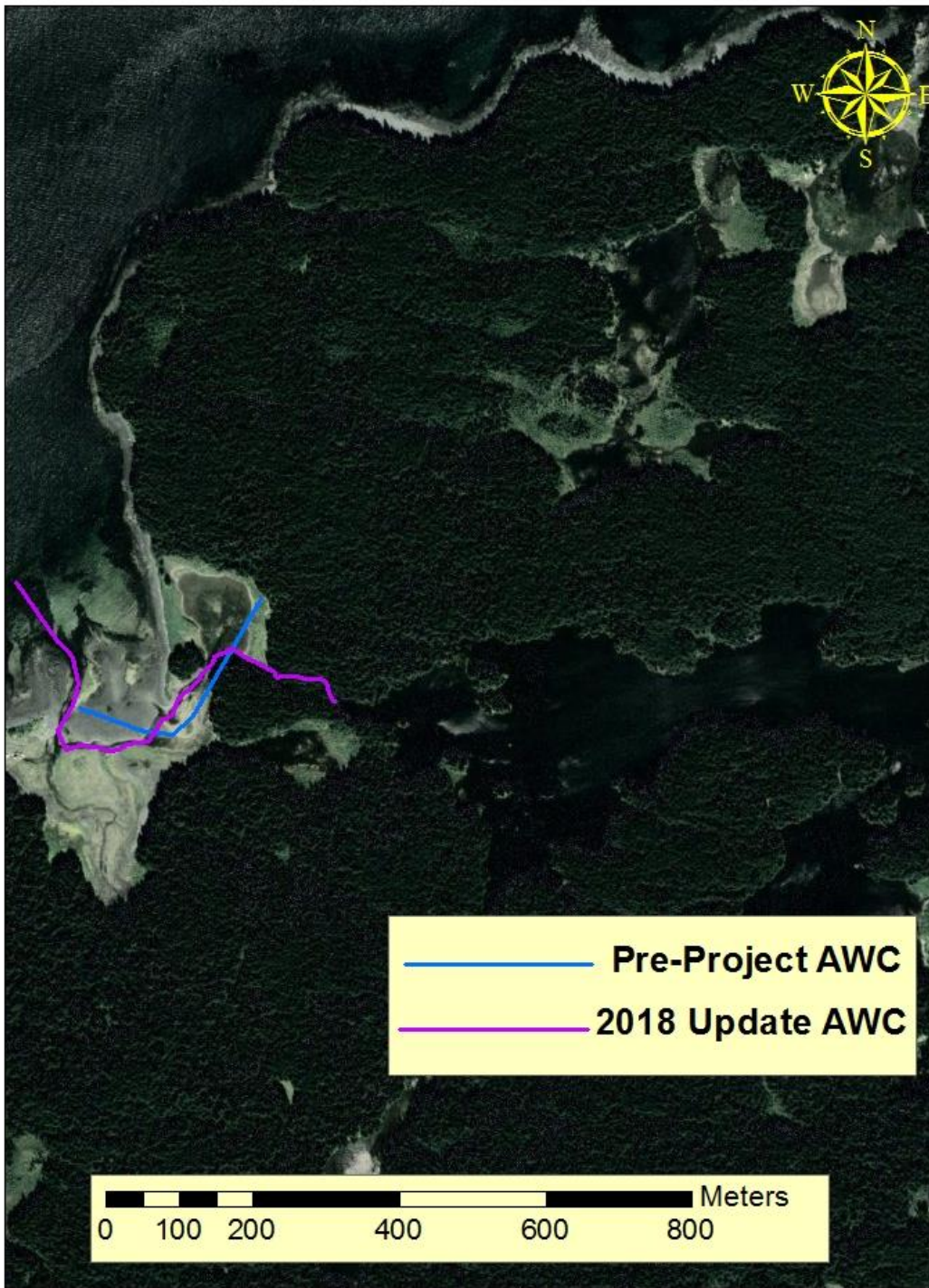
Appendix A 1.—Status of surveyed reaches unnamed lake Izhut Bay, Kodiak Archipelago.



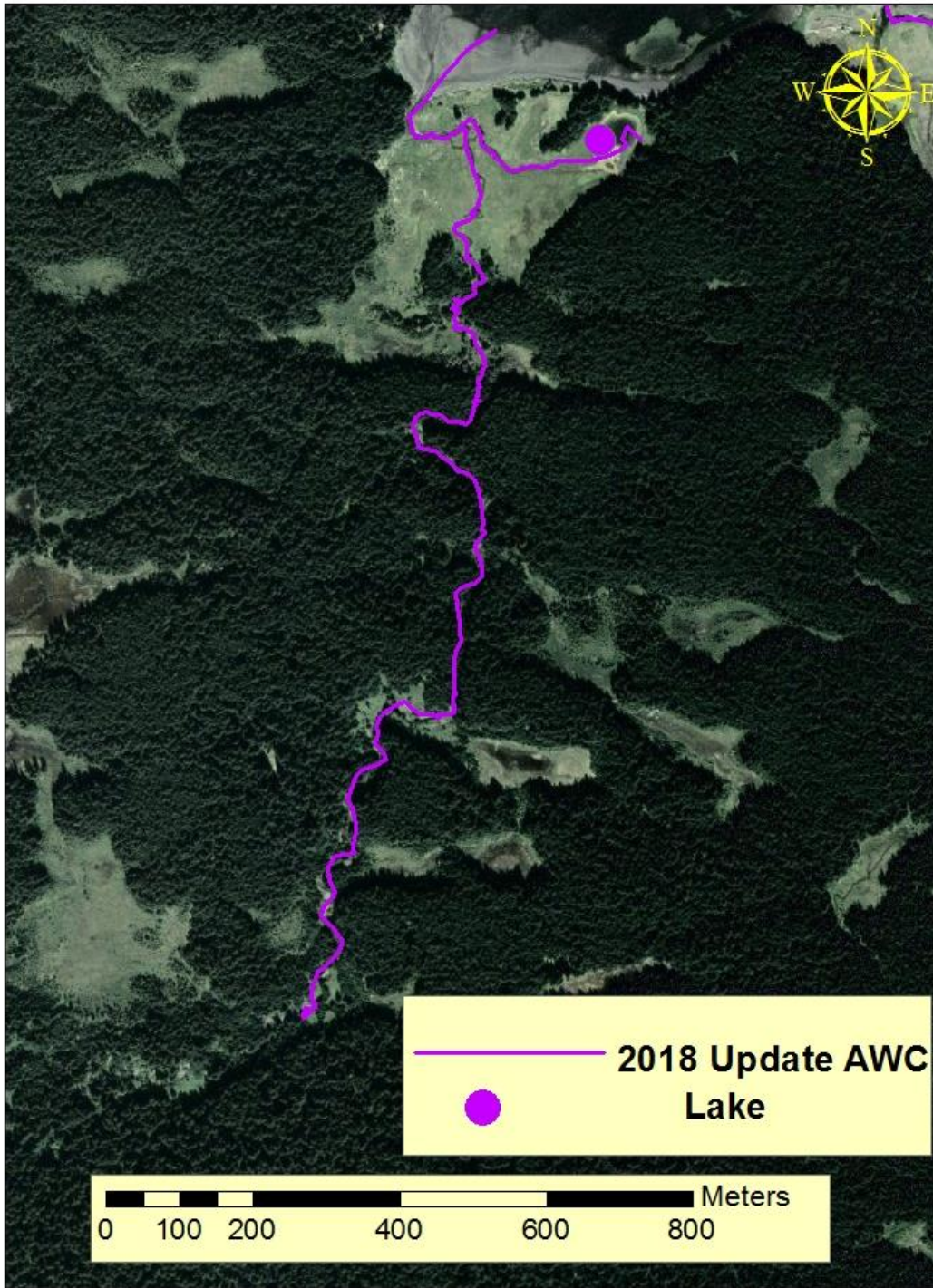
Appendix A 2.– Status of surveyed reaches McDonald Creek, Kodiak Archipelago.



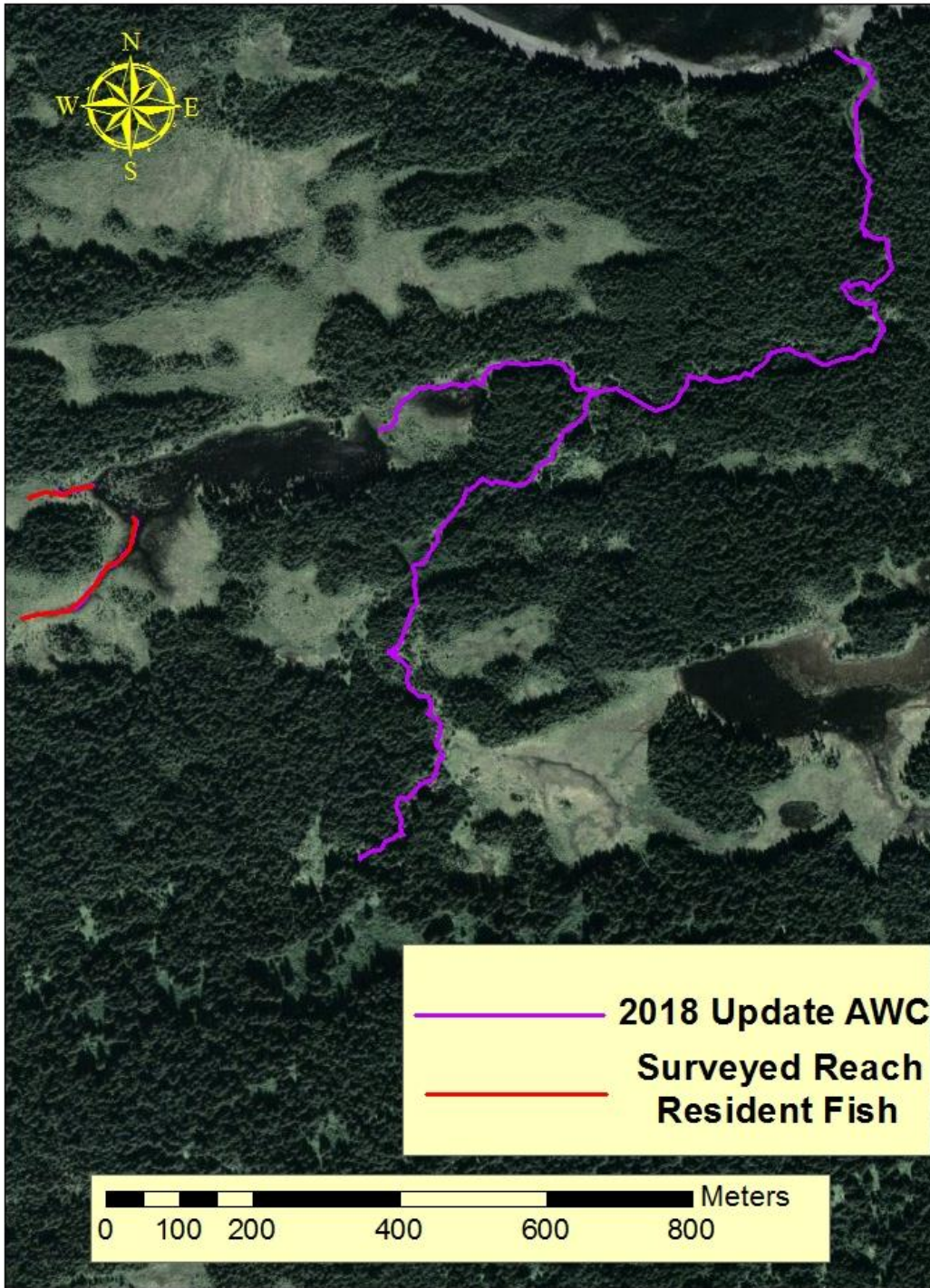
Appendix A 3.– Status of surveyed reaches Waskanareska Creek, Kodiak Archipelago.



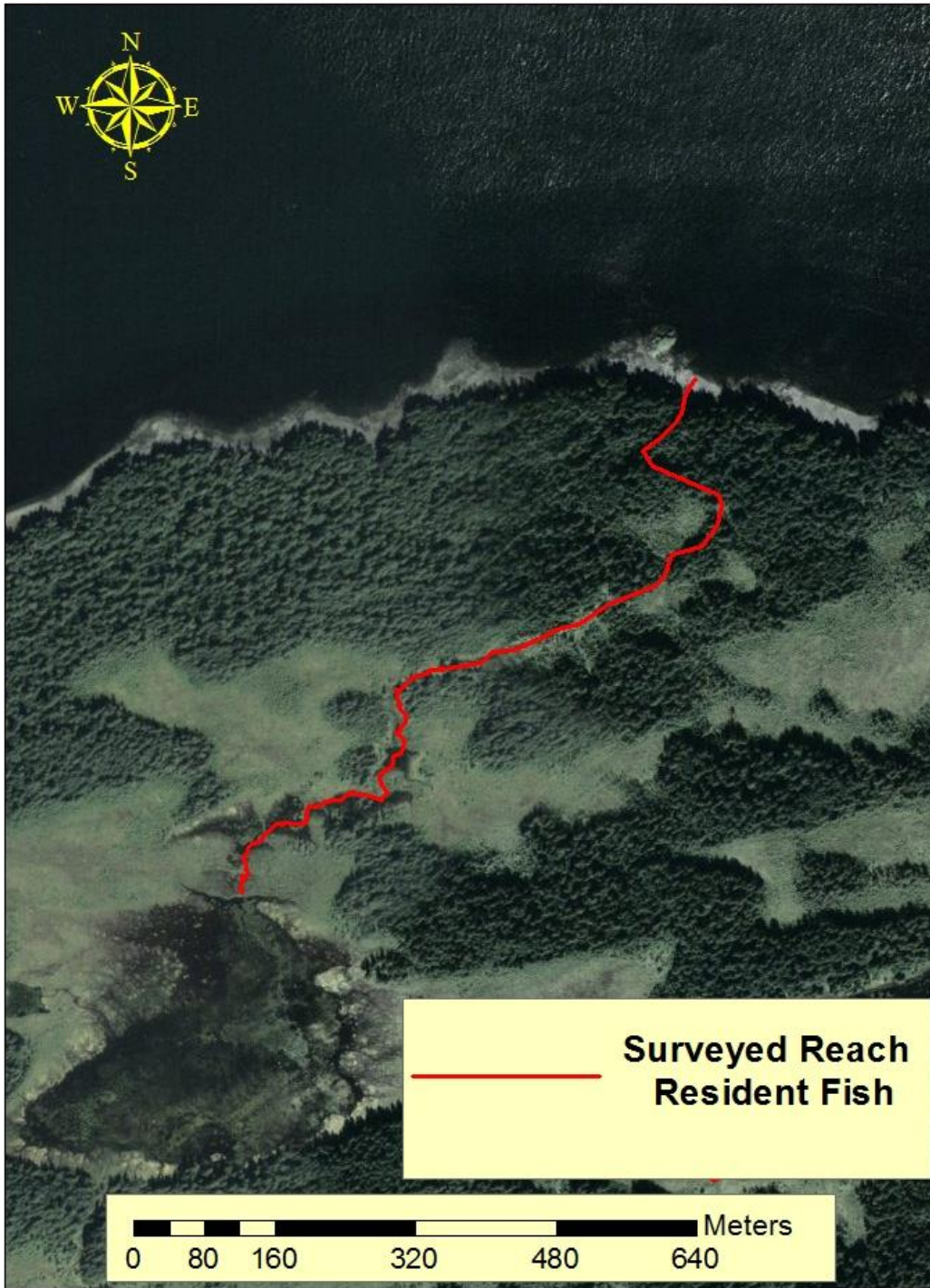
Appendix A 4.– Status of surveyed reach unnamed stream Fox Bay, Kodiak Archipelago.



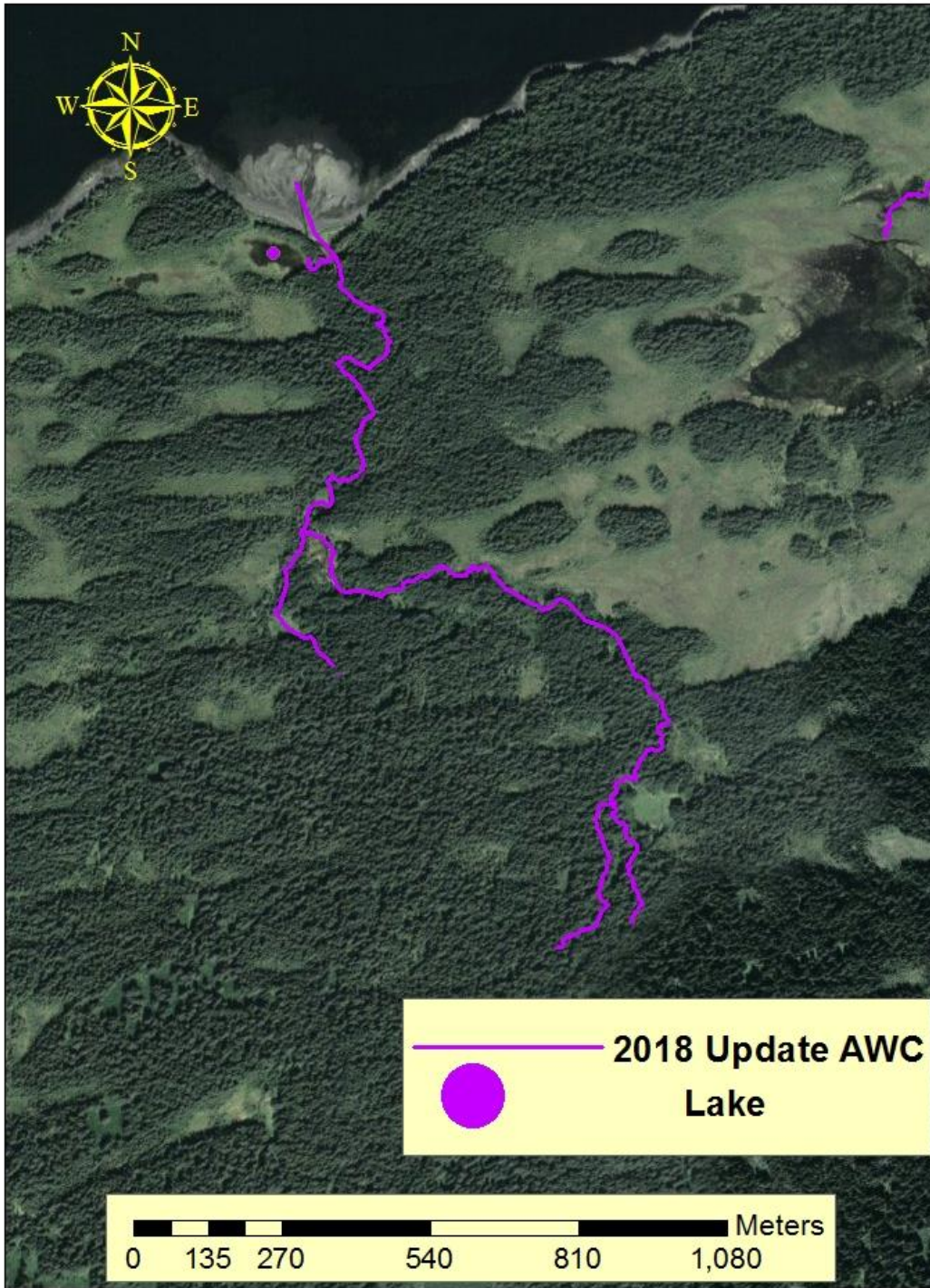
Appendix A 5.— Status of surveyed reach unnamed streams Fox Bay, Kodiak Archipelago.



Appendix A 6.— Status of surveyed reach unnamed streams Afognak Strait, Kodiak Archipelago.

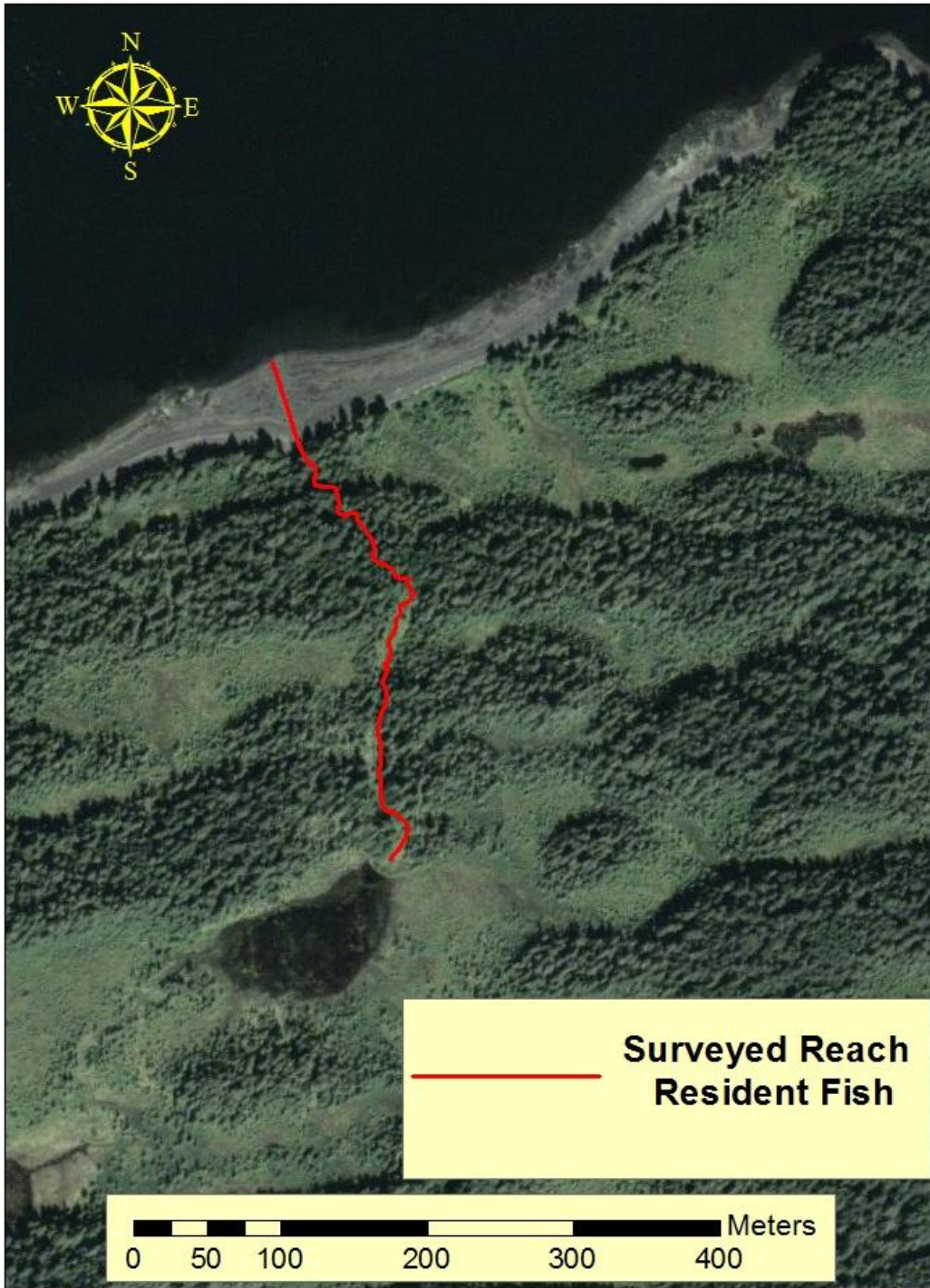


Appendix A 7.— Status of surveyed reach unnamed stream Afognak Strait, Kodiak Archipelago.

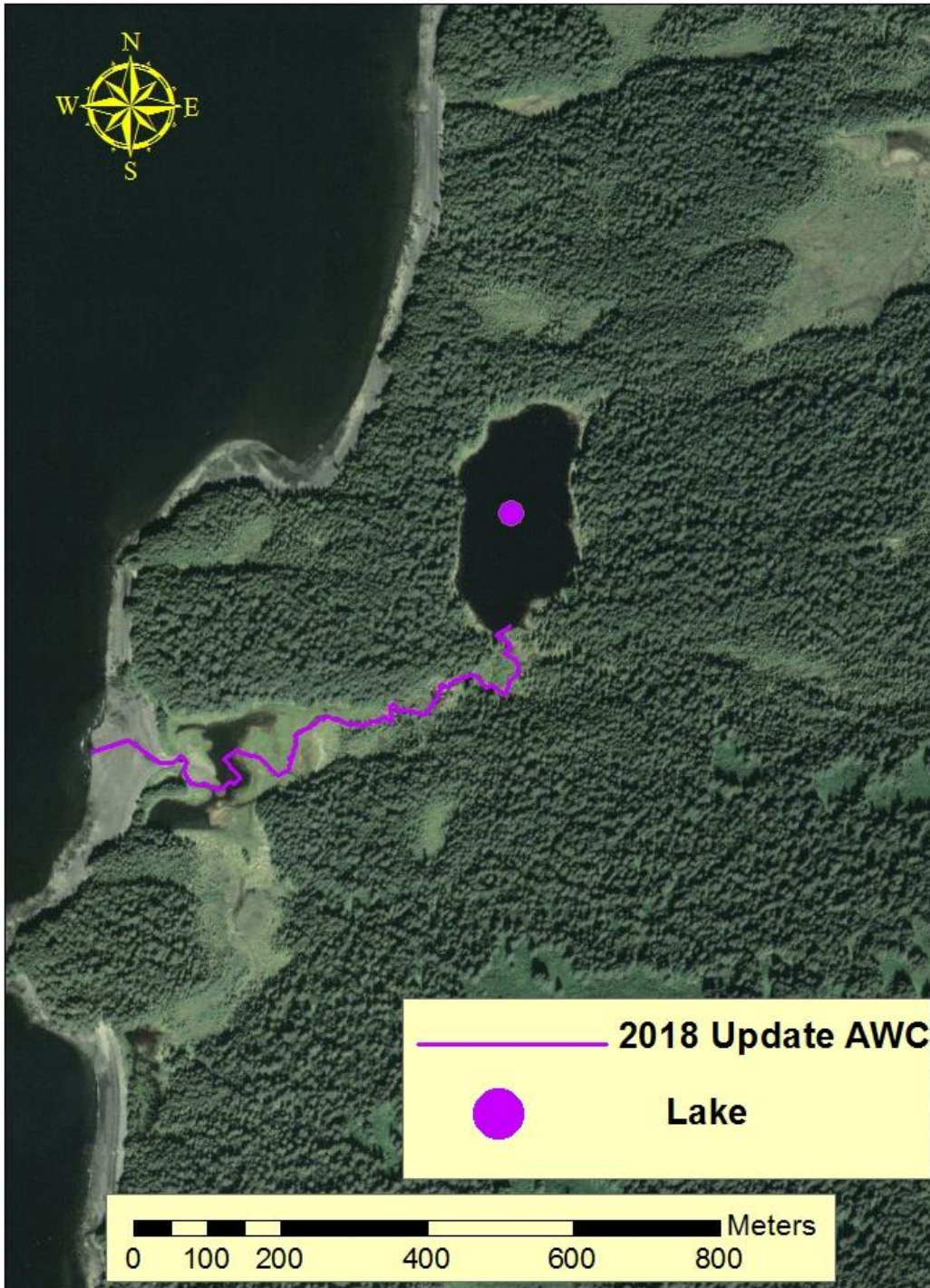


Appendix A 8.— Status of surveyed reach unnamed streams Afognak Strait, Kodiak Archipelago.

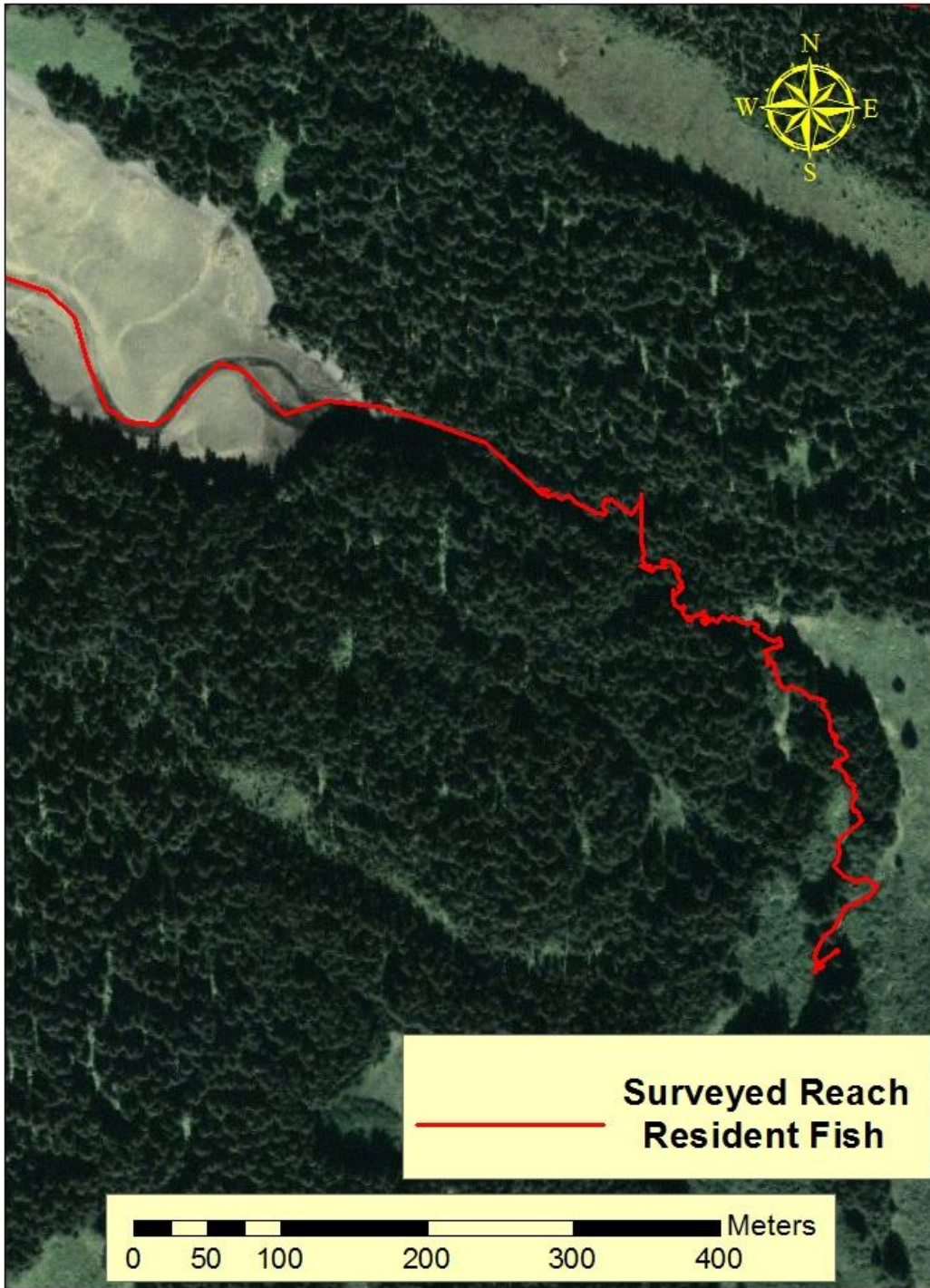




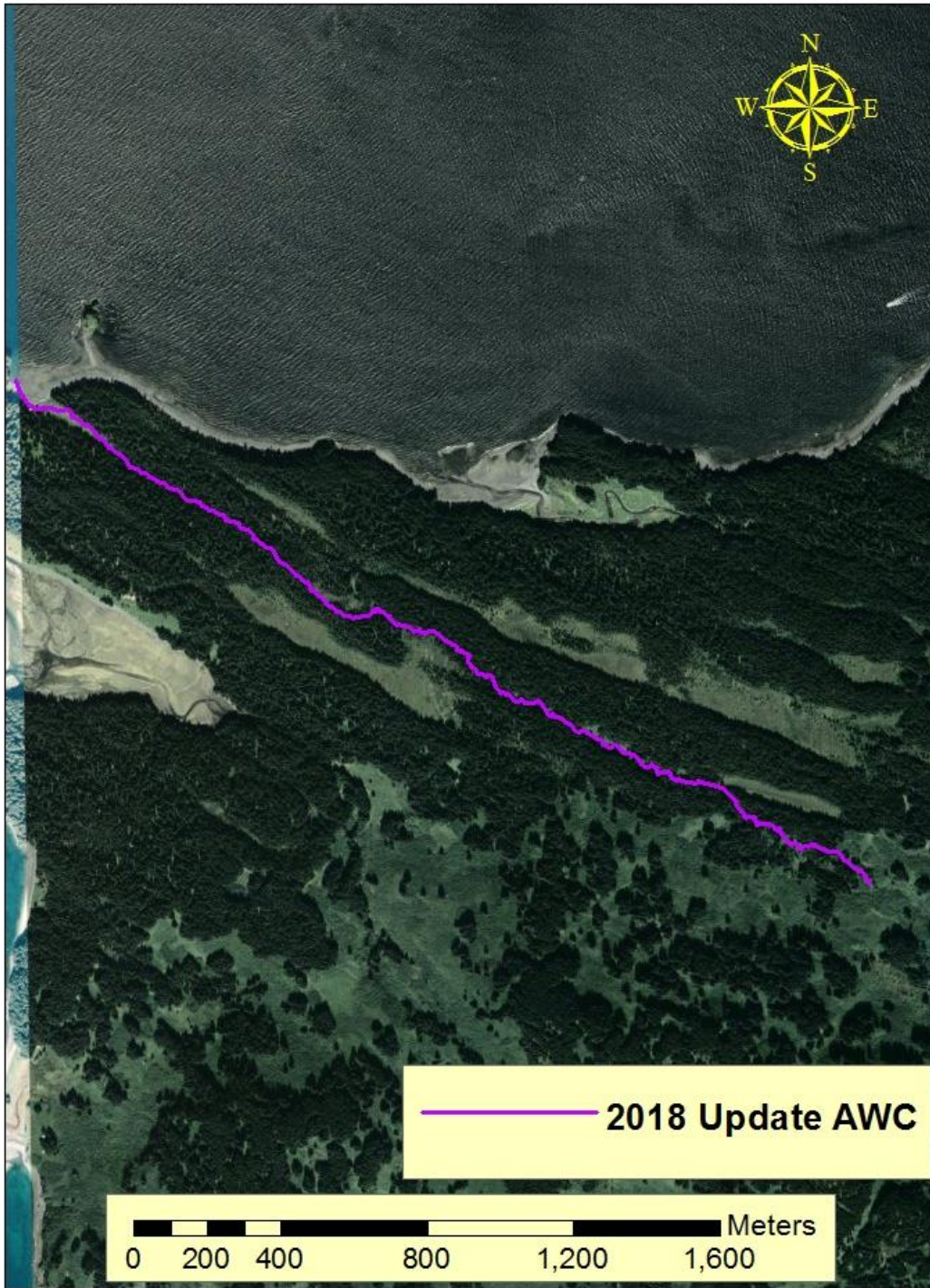
Appendix A 9.— Status of surveyed reach unnamed stream Afognak Strait, Kodiak Archipelago.



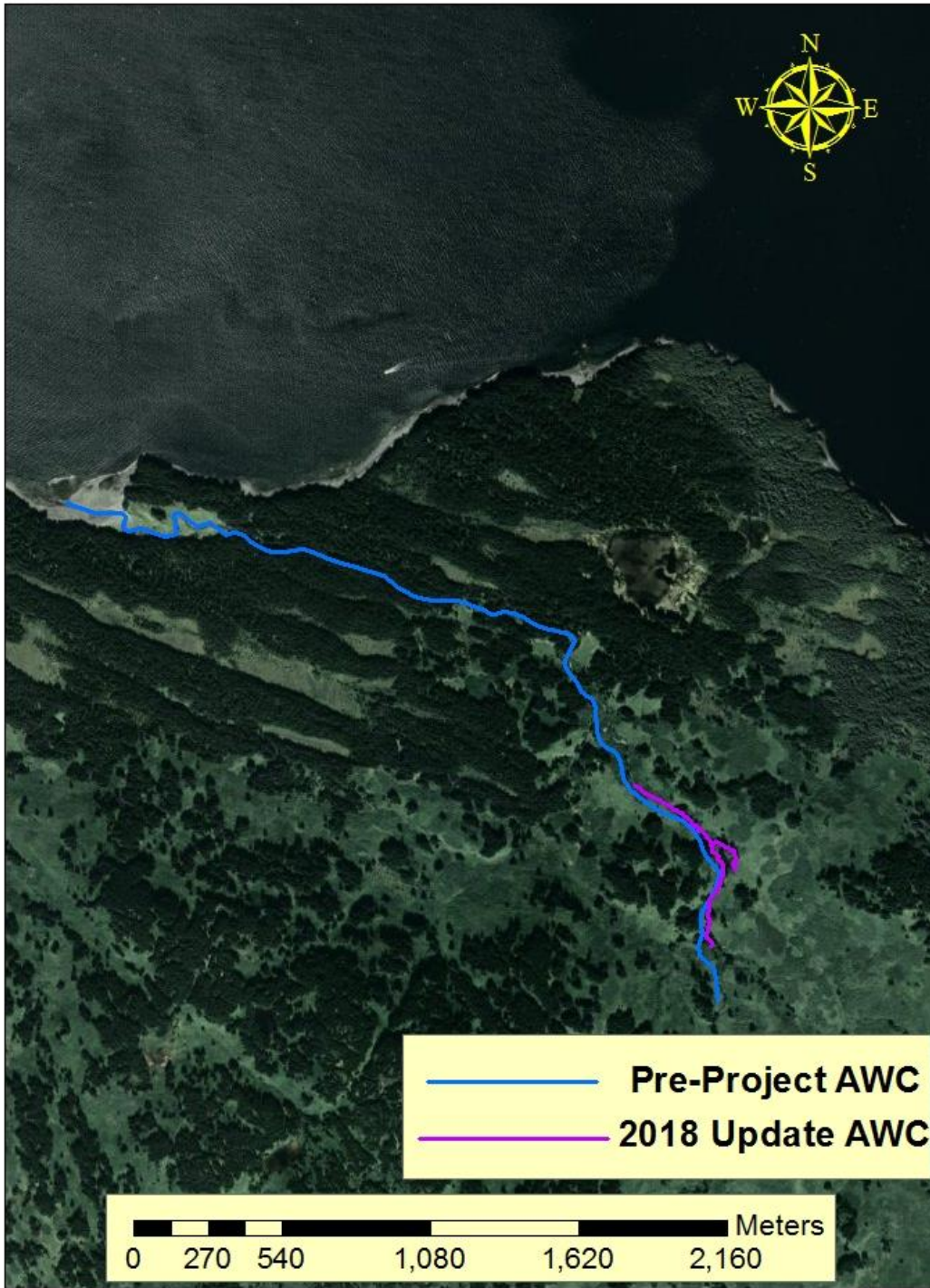
Appendix A 10.— Status of surveyed reach unnamed stream Occident Point, Kodiak Archipelago.



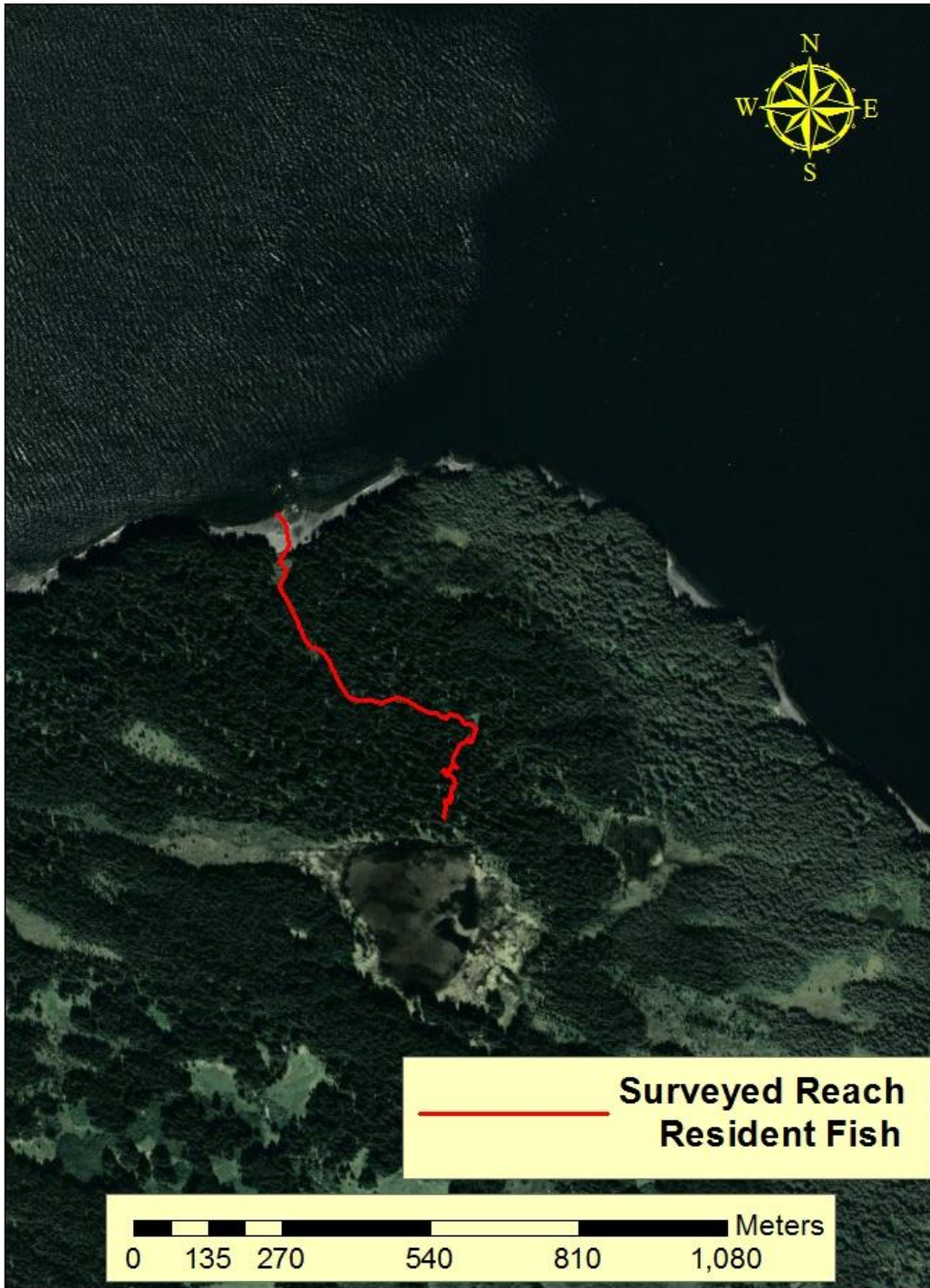
Appendix A 11.— Status of surveyed reach unnamed stream Ostrovka Point, Kodiak Archipelago.



Appendix A 12.— Status of surveyed reach unnamed stream Ostrovka Point, Kodiak Archipelago.



Appendix A 13.— Status of surveyed reaches Stream No. 252-35-10020, Kodiak Archipelago.



Appendix A 14.— Status of surveyed reach unnamed stream Chernof Point, Kodiak Archipelago.



Appendix A 15.— Status of surveyed reach unnamed stream Whale Passage, Kodiak Archipelago.



Appendix A 16.— Status of surveyed reach unnamed stream Whale Passage, Kodiak Archipelago.