Technical Report No. 18-03

Fish Presence Surveys on Leisnoi Inc. Lands, Kodiak Island, 2017

by

William D. Frost

Unnamed Tributary American River, Kodiak Island

February 2018

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.

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. 18-03

FISH PRESENCE SURVEYS ON LEISNOI INC. LANDS, KODIAK ISLAND, 2017

by

William D. Frost
Alaska Department of Fish and Game, Division of Habitat, Anchorage

Alaska Department of Fish and Game
Division of Habitat
333 Raspberry Road, Anchorage, Alaska, 99518-1565

February 2018

Funding through the Alaska Sustainable Salmon Fund

The Alaska Department of Fish and Game, Division of Habitat, publishes technical reports that are intended for fishery and other technical professionals. These reports available through the Alaska State Library and online at: http://www.adfg.alaska.gov/index.cfm?adfg=habitat_publications.main.

William D. Frost,
Alaska Department of Fish and Game, Division of Habitat,
333 Raspberry Road, Anchorage Alaska 99518 USA

This document should be cited as:
Frost, W. D. 2018. Fish presence surveys on Leisnoi Inc. lands, Kodiak Island, 2017. Alaska Department of Fish and Game, Division of Habitat, Technical Report No. 18-03, Anchorage.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Appendix **Page**

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, Colton Lipka, Lucas Stumpf, and Darin Ruhl, as well as Hans Rinke, DNR, Division of Forestry.

We thank Leisnoi Incorporated for their in-kind financial and logistical support for the 2017 sampling effort. We specifically acknowledge the field assistance provided by Gary Watson, Mat Van Daele, and Phil Ferris.

Finally, I would like to thank Megan Marie for her guidance during the writing of this document.

EXECUTIVE SUMMARY

In 2017, the Alaska Department of Fish and Game (ADF&G), Division of Habitat, sampled for the presence of anadromous fish on Kodiak Island on land owned by Leisnoi Incorporated. 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 is also 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 2017 season, 14 watersheds were sampled on Kodiak Island. Fish presence sampling resulted in 58 nominations to the AWC. As a result of the sampling effort, 33.3 km of new anadromous fish habitat was nominated for inclusion in the AWC. The nominations include six 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. Other adult and juvenile salmonid species captured or observed were pink salmon (*O. gorbuscha)* and chum salmon *(O. keta).* 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 effort between the ADF&G and Leisnoi Inc. 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 2016, a 1-year grant was secured through the Alaska Sustainable Salmon Fund (AKSSF) for ADF&G to sample streams and lakes on Kodiak Island and document the presence of anadromous fish in advance of future development on Leisnoi, Incorporated (Leisnoi) lands. Kodiak Island is located about 390 km southwest of Anchorage, Alaska (Figure 1). The information gathered will be 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 2016). 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 2014–2015). A water body that supports anadromous fish but is not listed in the AWC is not afforded protection under AS 16.05.871.

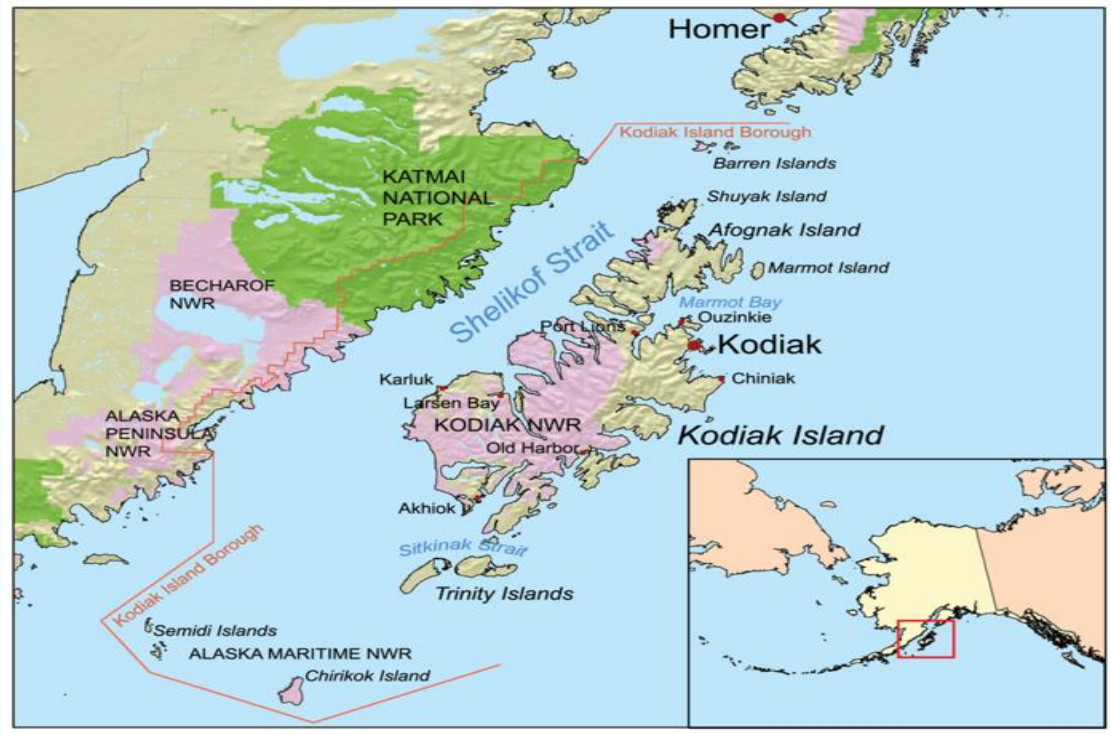


Figure 1.–Afognak and Kodiak Islands.

ADF&G initiated this project to document anadromous fish presence prior to future land development on Kodiak Island. ADF&G coordinated with Leisnoi to prioritize areas to be sampled and arranged 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. Most streams sampled on Kodiak Island in 2017 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 and one Leisnoi employee. Sampling was conducted using a Smith-Root LR-25 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 was 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 a failure to capture fish at a given sampling location.

Table 1.–Anadromous Fish Blockage (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 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 at12% gradient ≥100 at16% gradient ≥50 at 20% gradient ≥25 at 24% gradient				≥100 at 9% gradient

A hand-held Garmin GPS unit was used to record the 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 2016).

RESULTS

In 2017, monthly sampling events occurred on Kodiak Island from May through September with an additional effort in November. A total of 69 reaches were sampled within 14 watersheds with a total length of 40.7 km (Table 2; Appendix A1 through A18). The total length of streams documented as containing anadromous fish and nominated to the AWC was 33.3 km (Table 2). The pre-project AWC status of the surveyed streams and AWC nominations resulting from 2017 sampling are graphically shown in Appendix A.

Table 2.–Kodiak Island watersheds sampled in 2017.

Watershed name	AWC number	# Reaches sampled	Total length sampled (meters)	Total new AWC length (meters)
Myrtle Creek	259-24-10050	3	2,850	2,400
Unnamed Stream	259-24-10048	3	1,120	970
Unnamed Stream		3	1,510	0
Kalsin Creek	259-24-10030	24	11,580	10,535
Olds River	259-24-10020	16	8,630	7,280
Unnamed Stream		1	200	0
Unnamed Stream		1	165	0
Unnamed Stream		1	505	0
American River	259-23-10010	9	9,780	9,780
Salt Creek	259-23-10030	3	1,863	1,863
Unnamed Stream (Woody Island)		1	335	0
Monashka Creek	259-10-10015	1	740	490
Unnamed Stream		1	523	0
Unnamed Stream		2	932	0
Total		69	40,733	33,318

During the 2017 sampling effort, four 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 Island corrected in 2017.

Streams corrected in 2017
259-24-10050
259-24-10030
259-24-10020
259-23-10010

In 2017, there were 58 nominations submitted to the AWC. All of the nominations were accepted for inclusion into the 2018 AWC update, except for eight that are currently being reviewed for the 2019 AWC revision. Juvenile coho salmon (*O. kisutch*) and Dolly Varden were the most common salmonid species captured or observed. Other adult and juvenile salmonid species captured or observed were pink salmon (*O. gorbuscha*) and chum salmon (*O. keta*). 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.–2017 Kodiak Island fork length measurements, by month and species.

	Length range (mm)	
Month	Coho Salmon	Dolly Varden
May	55–90 (n = 28)	55–120 (n = 46)
June	40–90 (n = 104)	40–120 (n = 84)
July	17–100 (n = 23)	(n = 0)
August	45–95 (n = 14)	45–100 (n = 27)
September	45-90 (n = 18)	50–130 (n = 29)
November	60–70 (n =4)	65–75 (n =5)

In 2017, six 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 Island.

Kodiak stream no.	Species added	Life stage added
259-24-10050	Coho	Rearing
259-24-10030	Coho	Rearing
259-24-10020	Coho	Rearing
259-23-10010	Coho	Rearing
259-23-10010-2005	Coho/Dolly Varden	Rearing
259-23-10030	Coho	Rearing

DISCUSSION

Sampling conducted in 2017 on Kodiak Island identified new anadromous water bodies, extended existing anadromous waters, 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 2017 nomination deadline have been accepted, approved, and scheduled for inclusion in the 2018 AWC revision. Eight nominations submitted after the 2018 deadline will be reviewed by the ADF&G and, if accepted, included in the 2019 AWC revision. This sampling year resulted in the addition of 33.3 km of new anadromous fish habitat 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. Thus, this project resulted in additional protection for more water bodies than just the 33.3 km being added to the AWC.

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 Leisnoi and ADF&G. Leisnoi support of this project has been invaluable to identifying and prioritizing waters to sample, which has resulted in aquatic habitat protections required by ADF&G statutes and KIB zoning requirements.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 2016. Anadromous Waters Catalog: Nominations. http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=noms.home

ADF&G (Alaska Department of Fish and Game). 2015. Anadromous Waters Catalog: Overview. http://www.adfg.alaska.gov/sf/SARR/AWC/ (Accessed 1 June 2017).

Alaska Fish and Game Laws and Regulations Annotated. 2014–2015. Fish and Game. Title 16, Chapter 05, Article 8, Section 871. Protection of fish and game.

Alaska Forest Resources & Practices Regulations. March 2017. Division of Forestry, Department of Natural Resources. Table A: Anadromous Fish Blockage. Page 20.

Bloom, A. M. 1976. Evaluation of minnow traps for estimating populations of juvenile coho salmon and Dolly Varden. The Progressive Fish-Culturist 38:99–101.

Burgner, R. L. 1991. Life history of sockeye salmon (*Oncorhynchus nerka*). Pages 1–117 [*In*] C. Groot and L. Margolis, editors. Pacific salmon life histories. University of British Columbia Press, Vancouver.

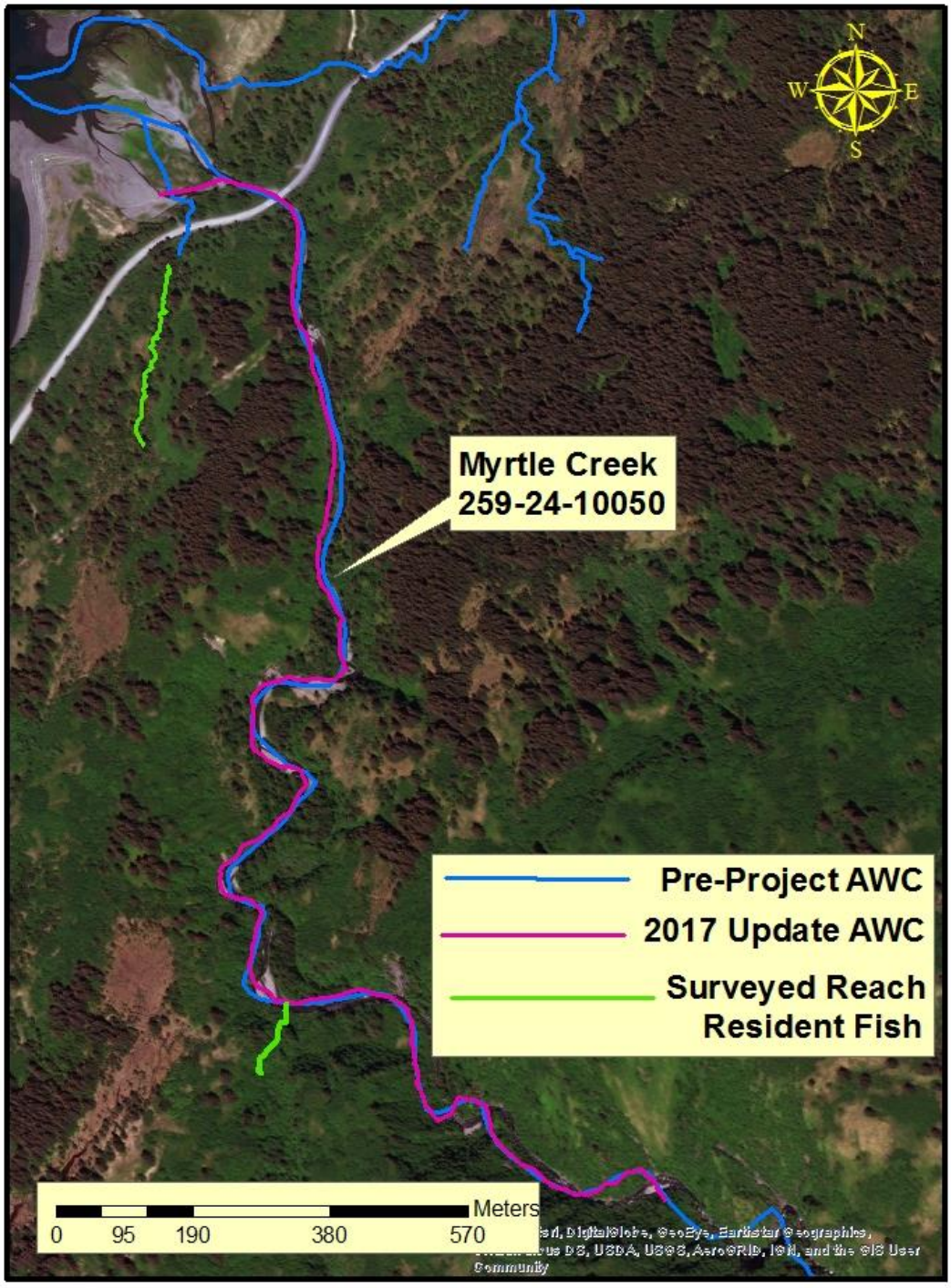
NMFS (National Marine Fisheries Service). 2000. Guidelines for electrofishing waters containing salmonids listed under the Endangered Species Act, June 2000.

Strahler, A. N. 1957. Quantitative analysis of watershed geomorphology. Transactions, American Geophysical Union 38: 913–920.

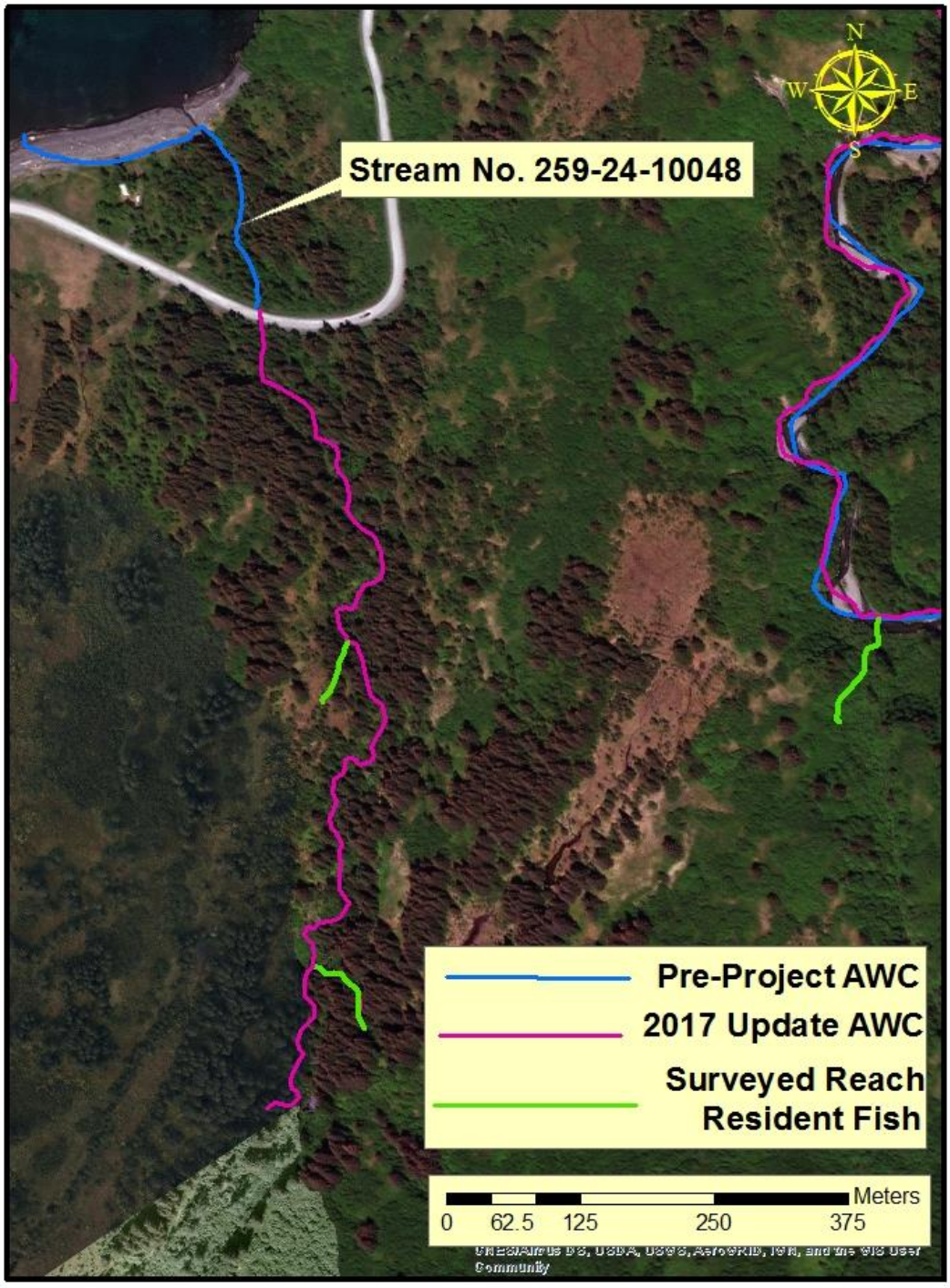
Strahler, A., R. M. Rice, J. S. Rothacher, and W. F. Megahan. 1971. Erosional consequences of timber harvesting: an appraisal. National Symposium on Watersheds in Transition.

Taylor, E. B. 1988. Water temperature and velocity as determinants of microhabitats of juvenile chinook and coho salmon in a laboratory stream channel. Transactions of the American Fisheries Society 117:22–28.

APPENDIX A:
STATUS OF SURVEYED REACHES

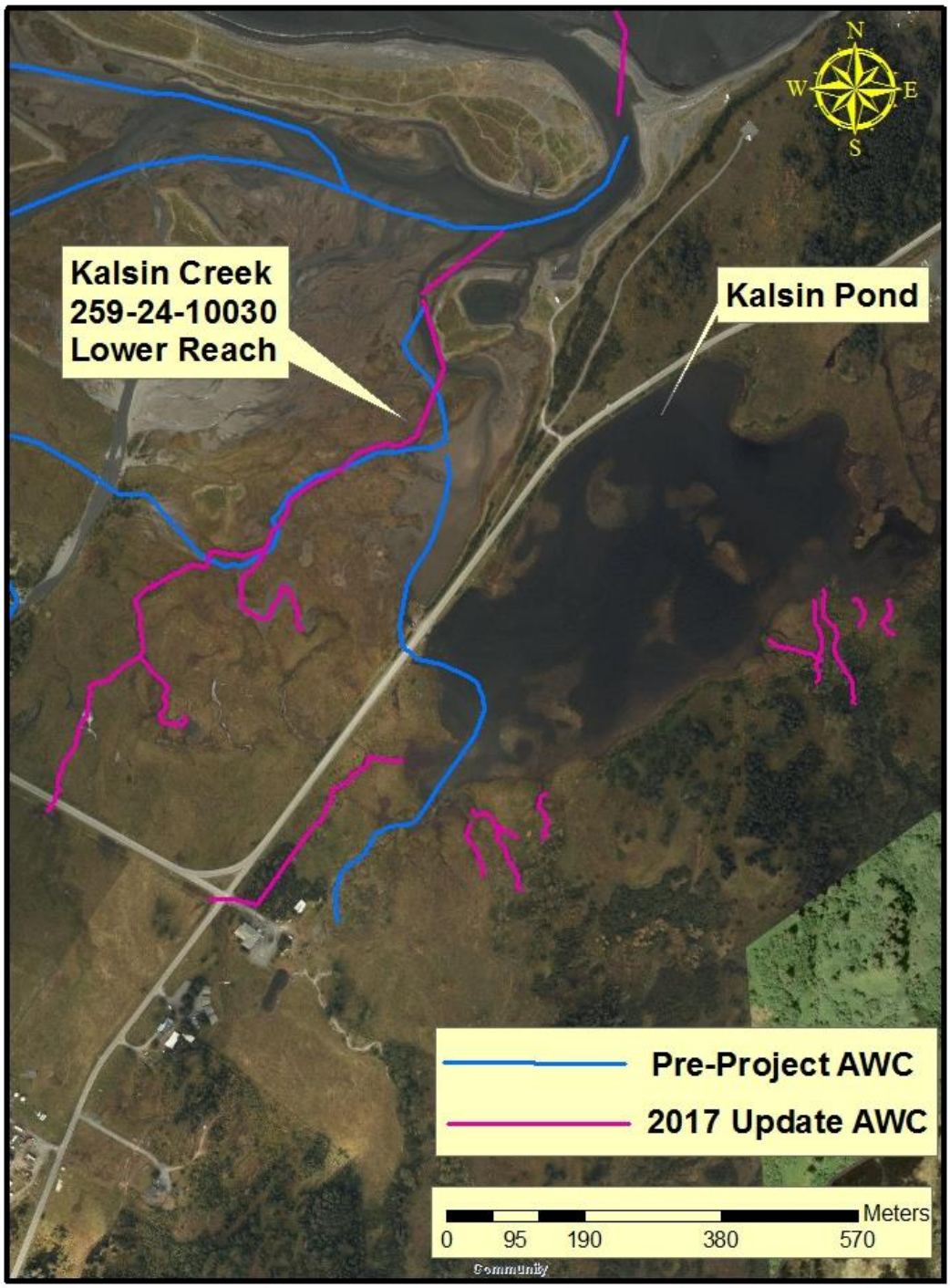


Appendix A 1.–Status of surveyed reaches within Myrtle Creek, Kodiak Island.

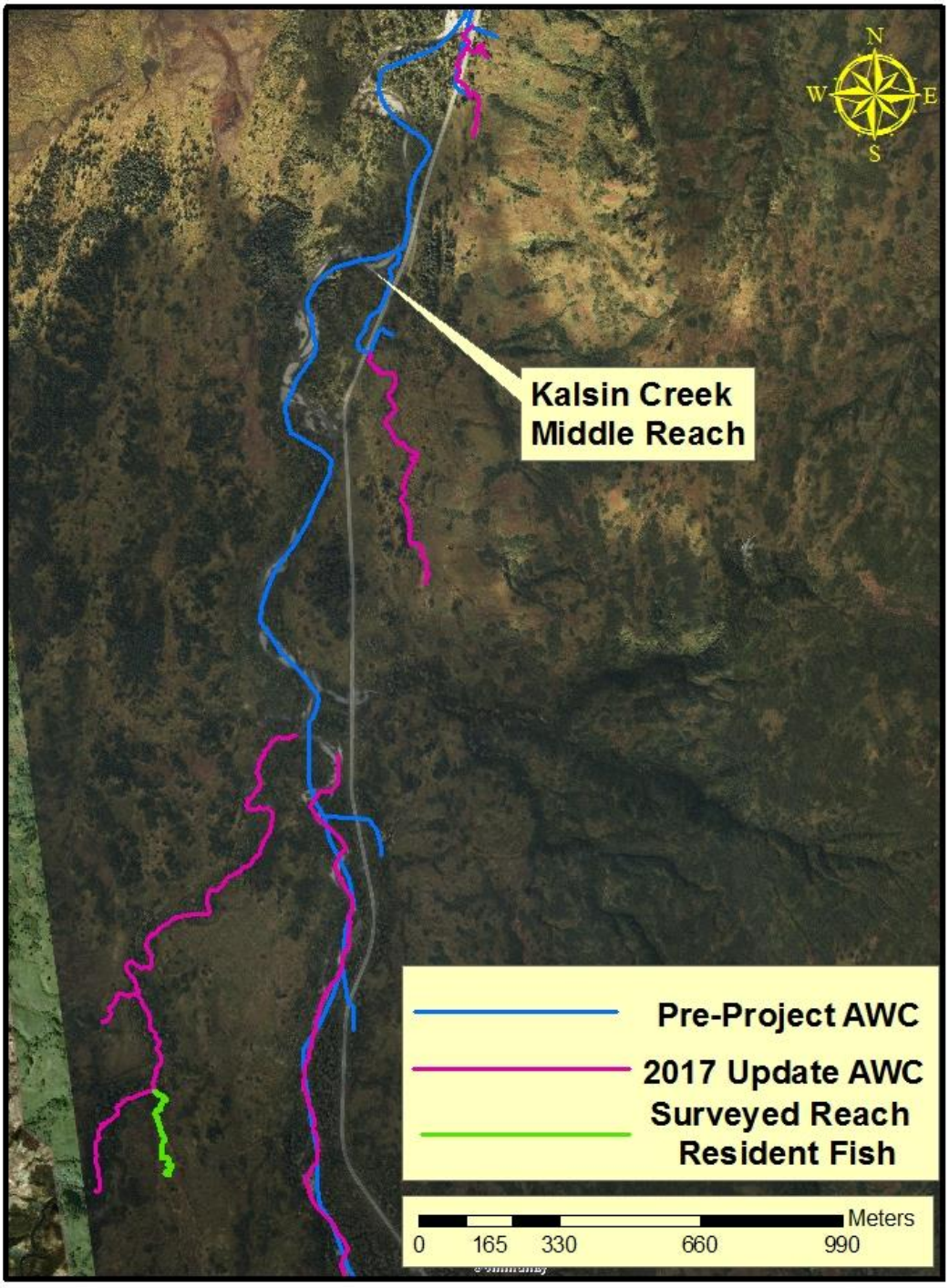


Appendix A 2.–Status of surveyed reaches within Stream No. 259-24-10048, Kodiak Island.

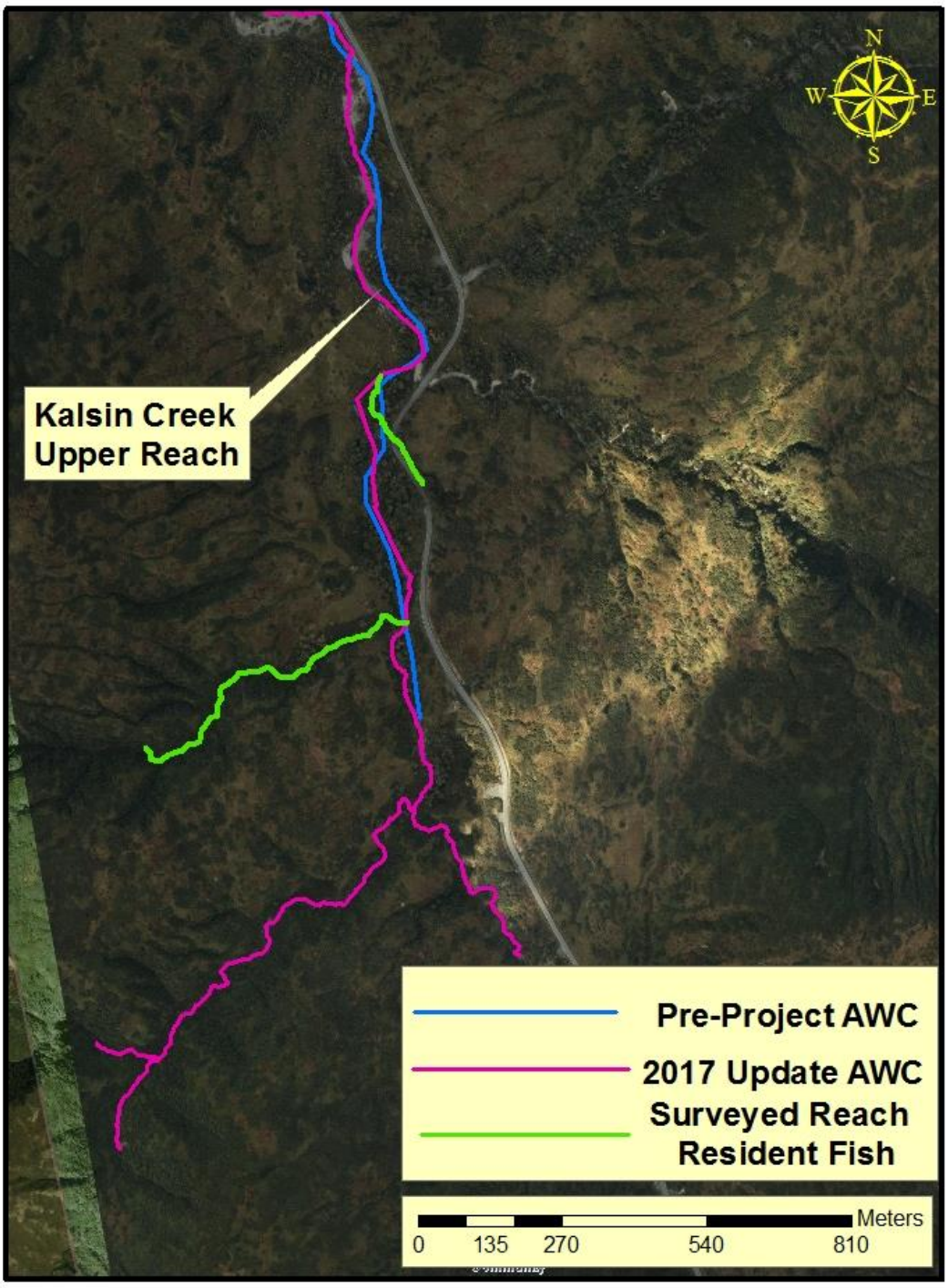
Appendix A 3.–Status of surveyed reaches within unnamed stream, Kalsin Bay, Kodiak Island.



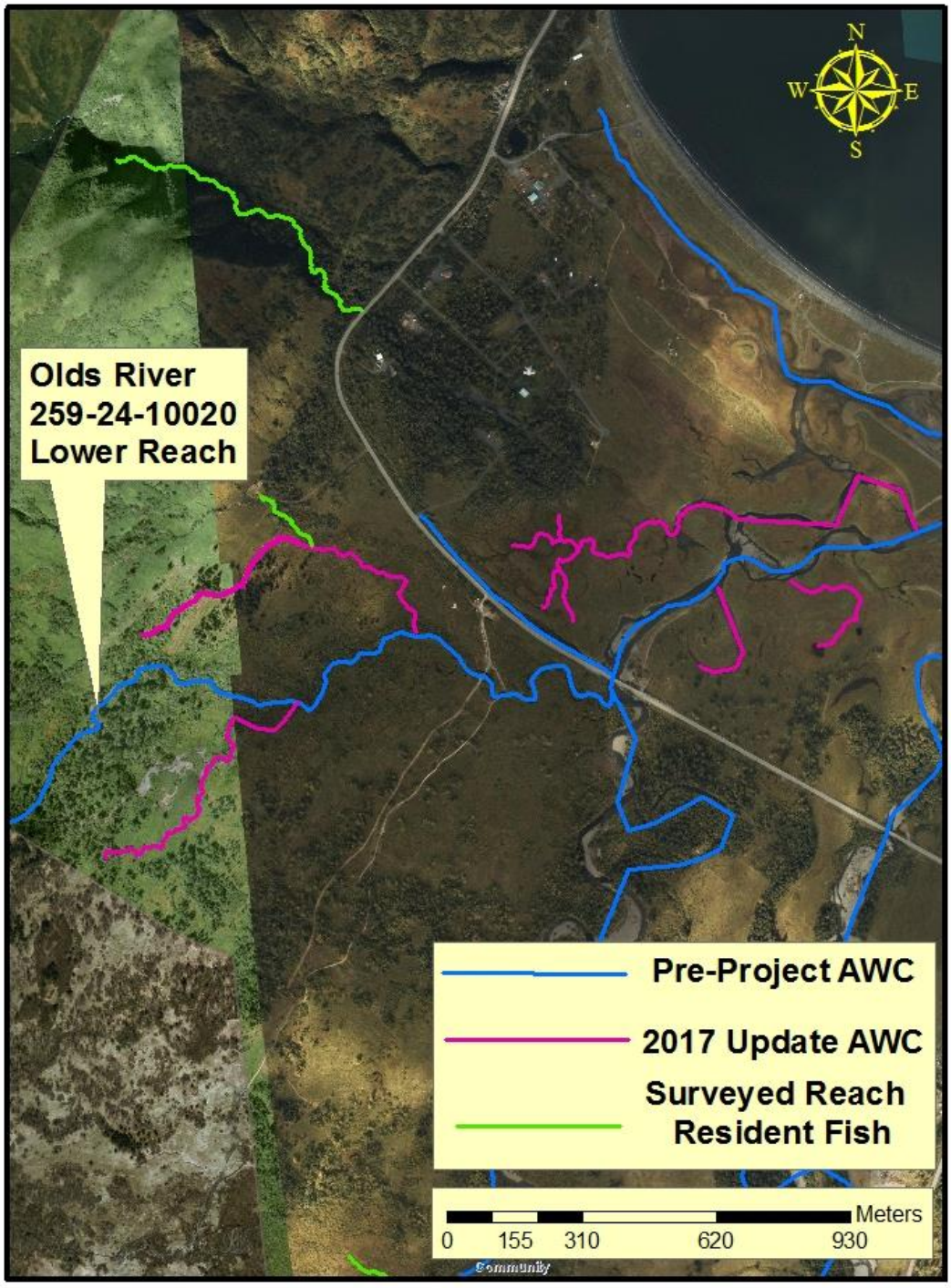
Appendix A 4.–Status of surveyed reach within the lower Kalsin Creek, Kodiak Island.



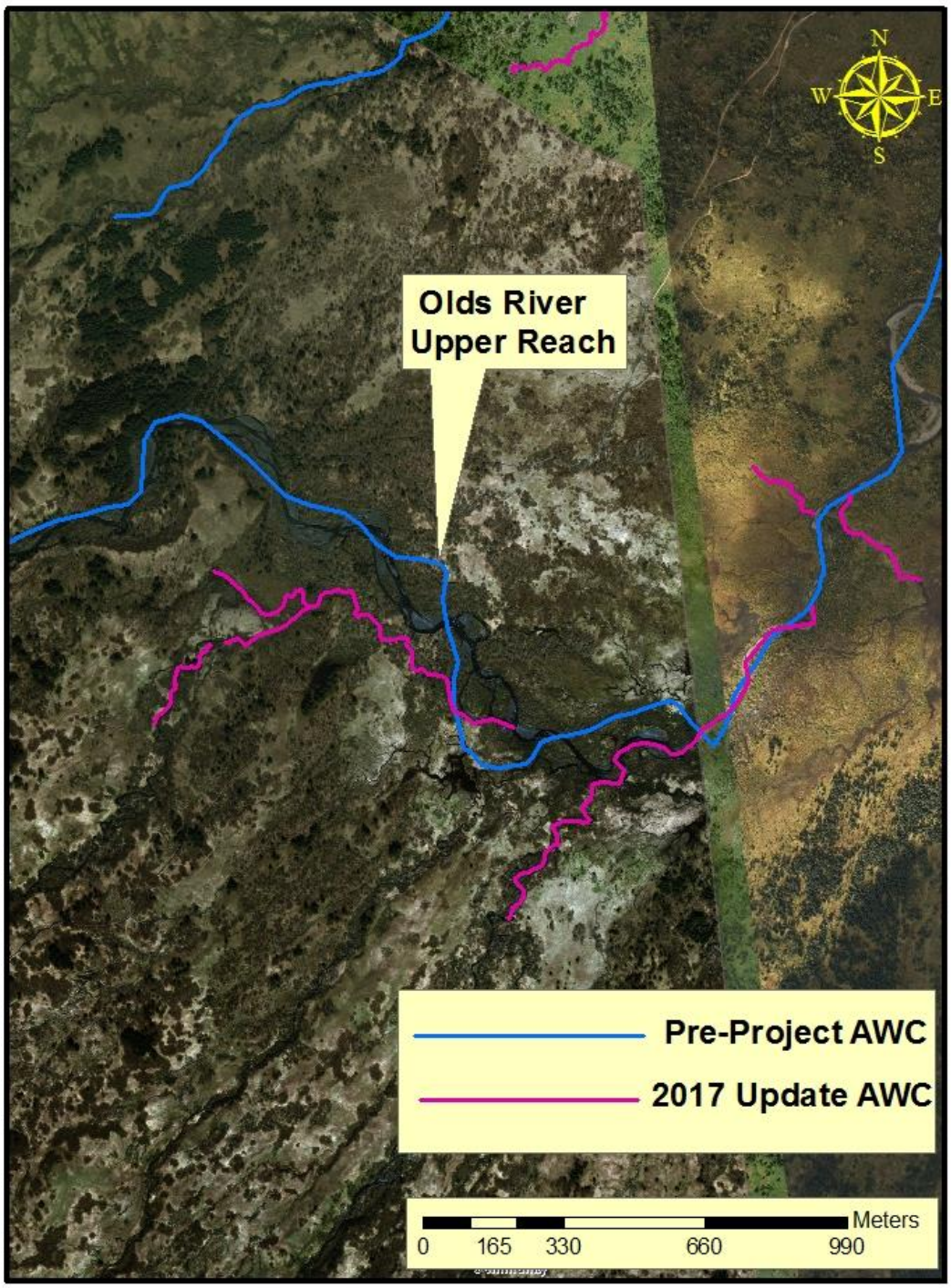
Appendix A 5.–Status of surveyed reaches within the middle Kalsin Creek, Kodiak Island.



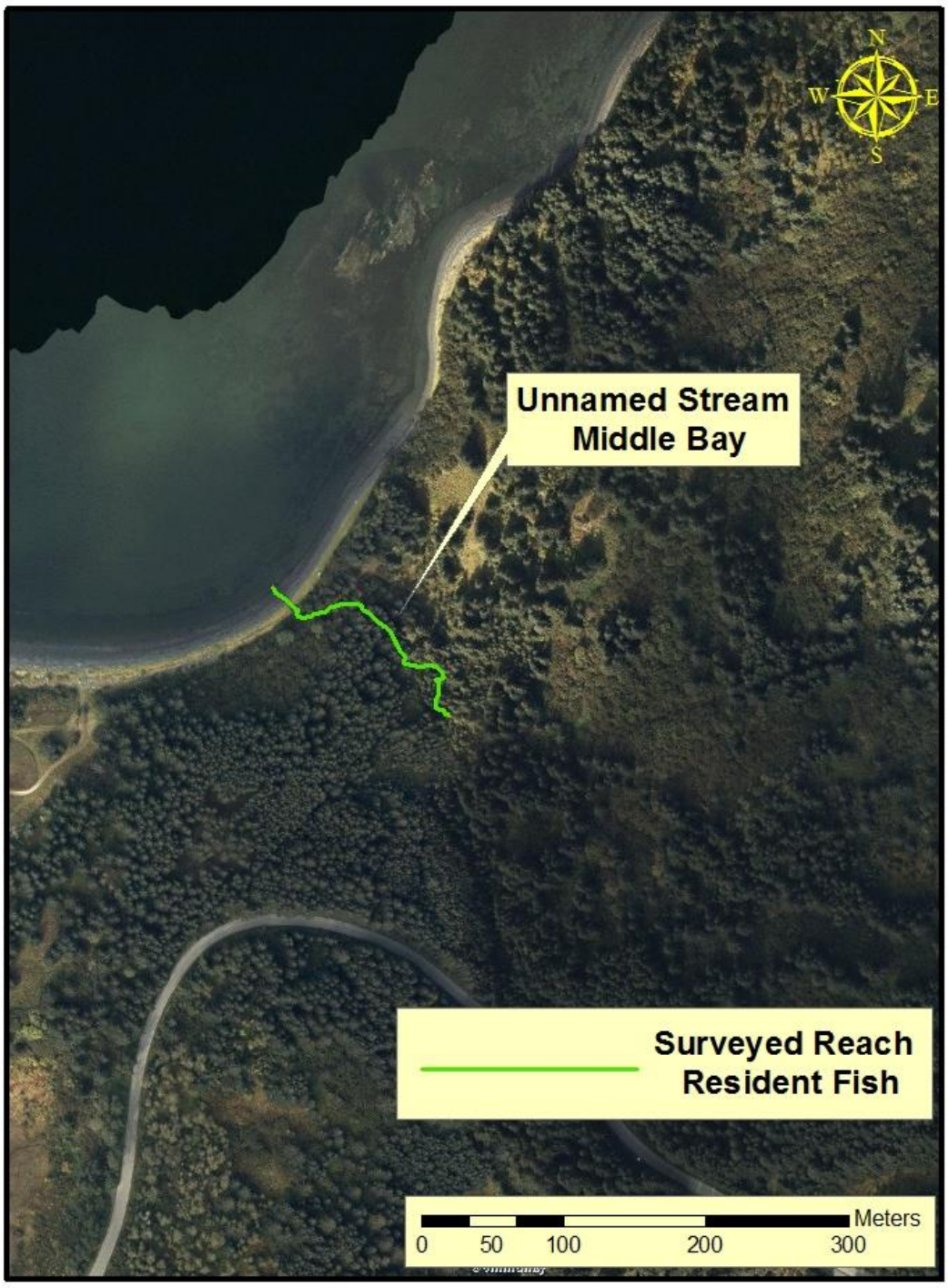
Appendix A 6.–Status of surveyed reaches within the upper Kalsin Creek, Kodiak Island.



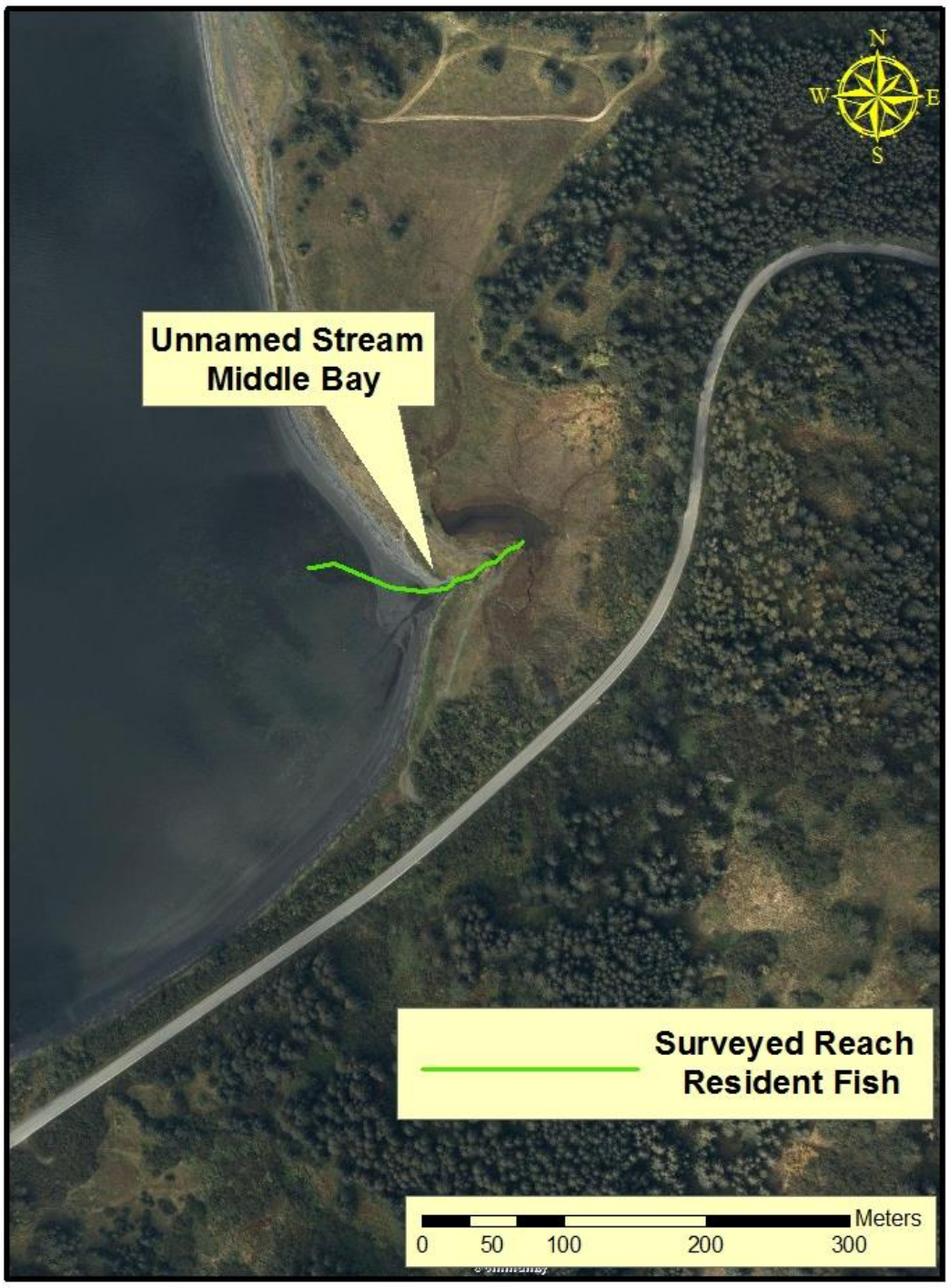
Appendix A 7.–Status of surveyed reaches within the lower Olds River, Middle Bay, Kodiak Island.



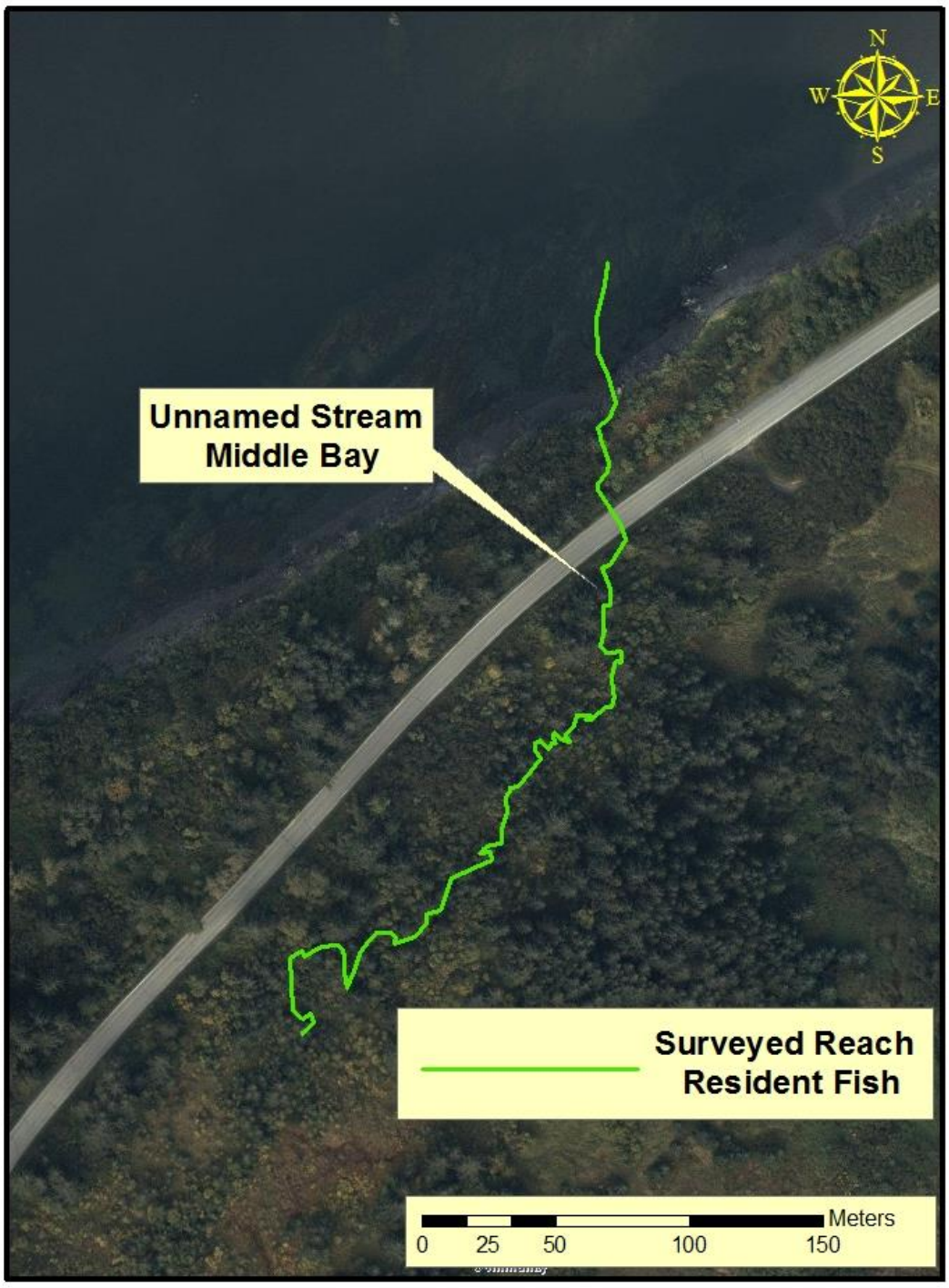
Appendix A 8.–Status of surveyed reaches within the upper Olds River, Kodiak Island.



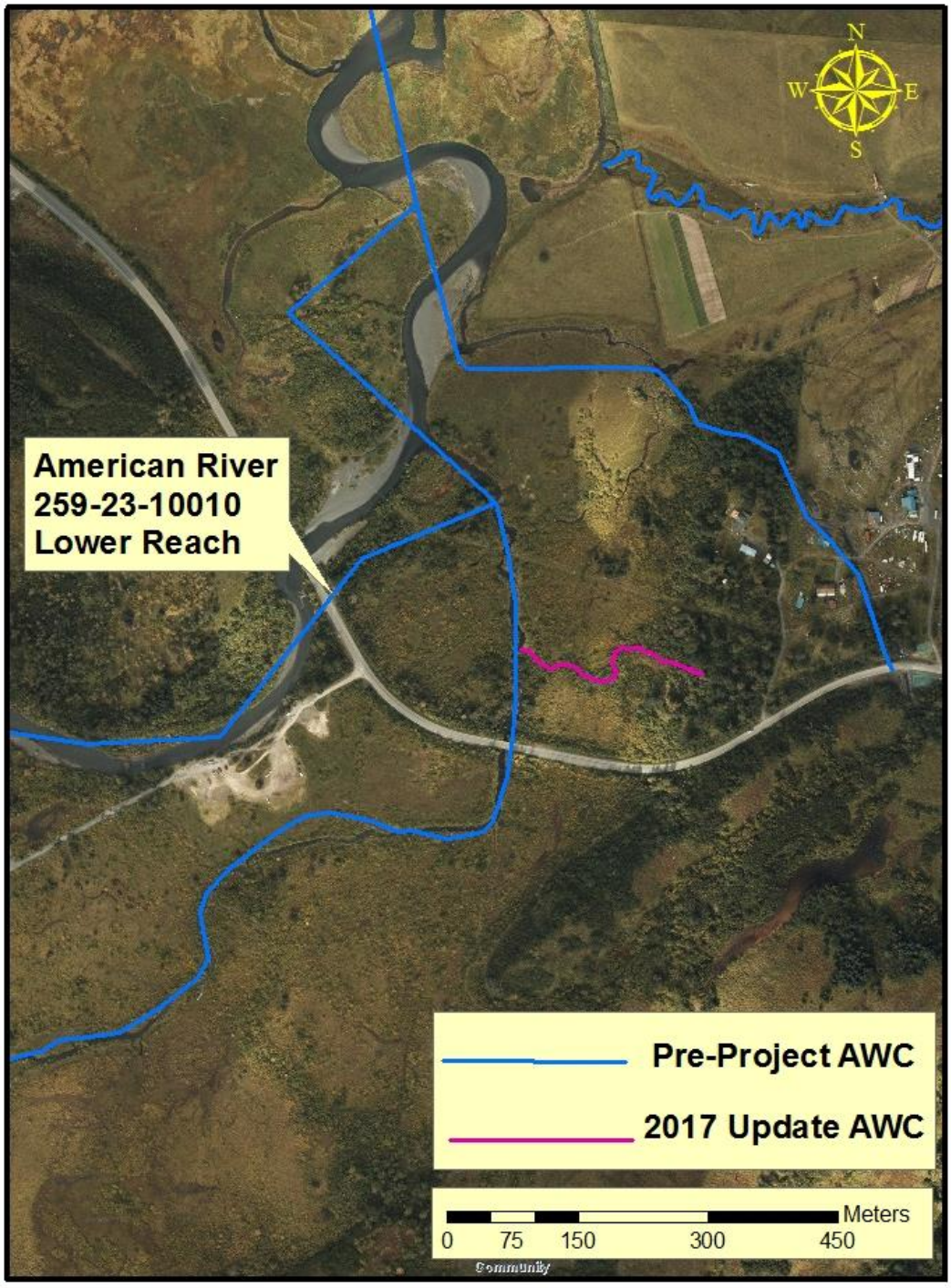
Appendix A 9.–Status of surveyed reach within unnamed stream, Middle Bay, Kodiak Island.



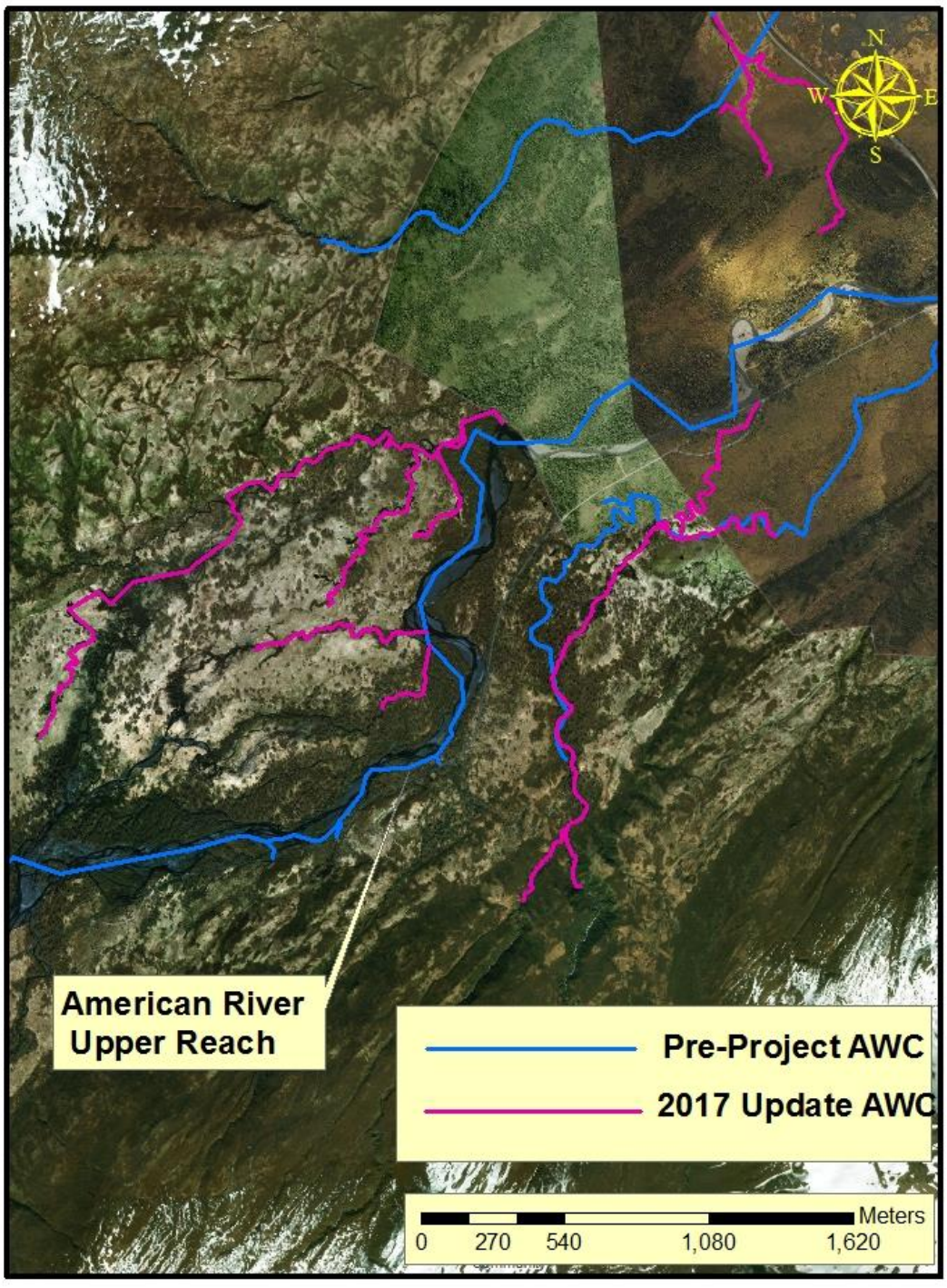
Appendix A 10.–Status of surveyed reach within unnamed stream, Middle Bay, Kodiak Island.



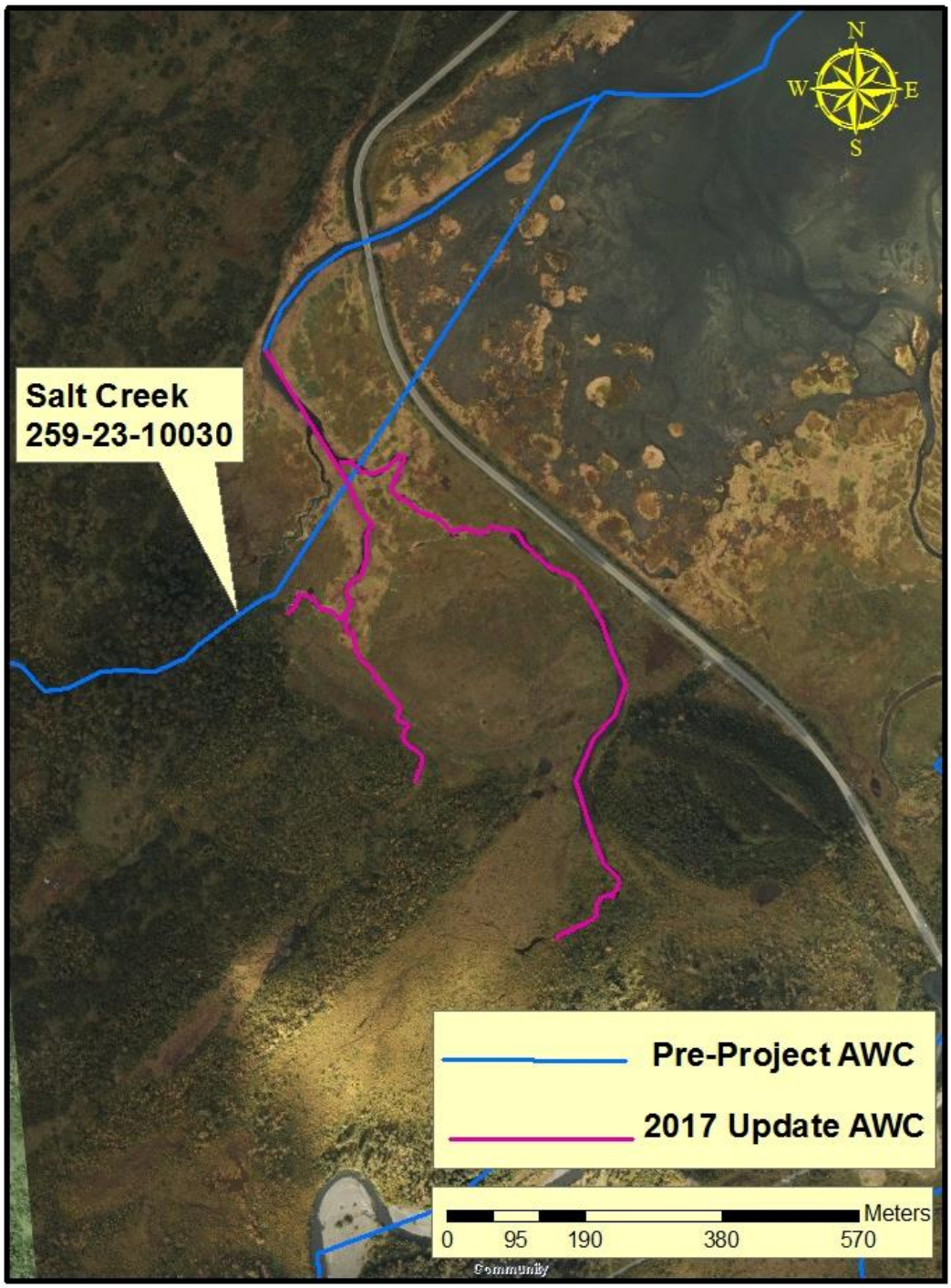
Appendix A 11.–Status of surveyed reach within unnamed stream, Middle Bay, Kodiak Island.



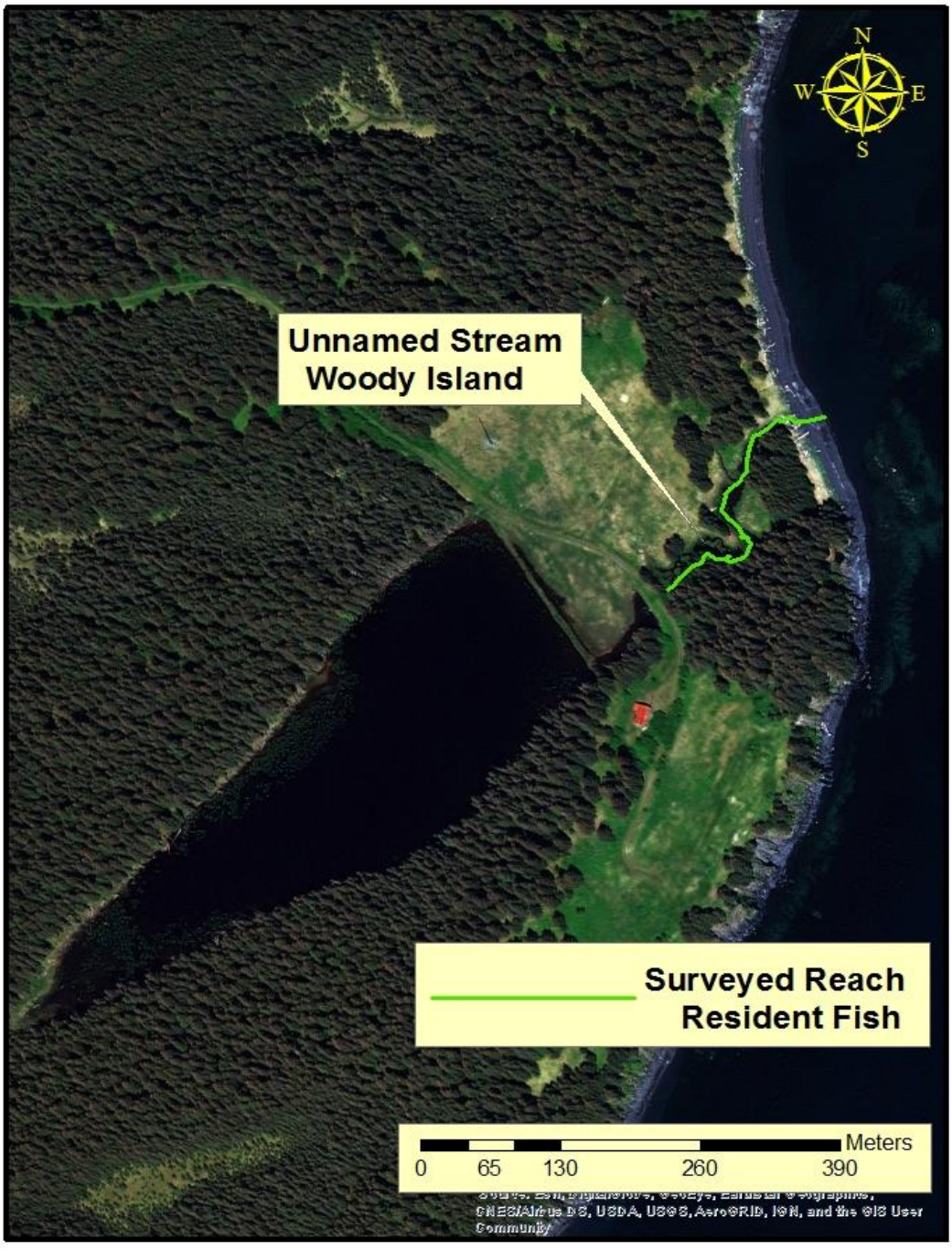
Appendix A 12.–Status of surveyed reach within the lower American River, Kodiak Island.



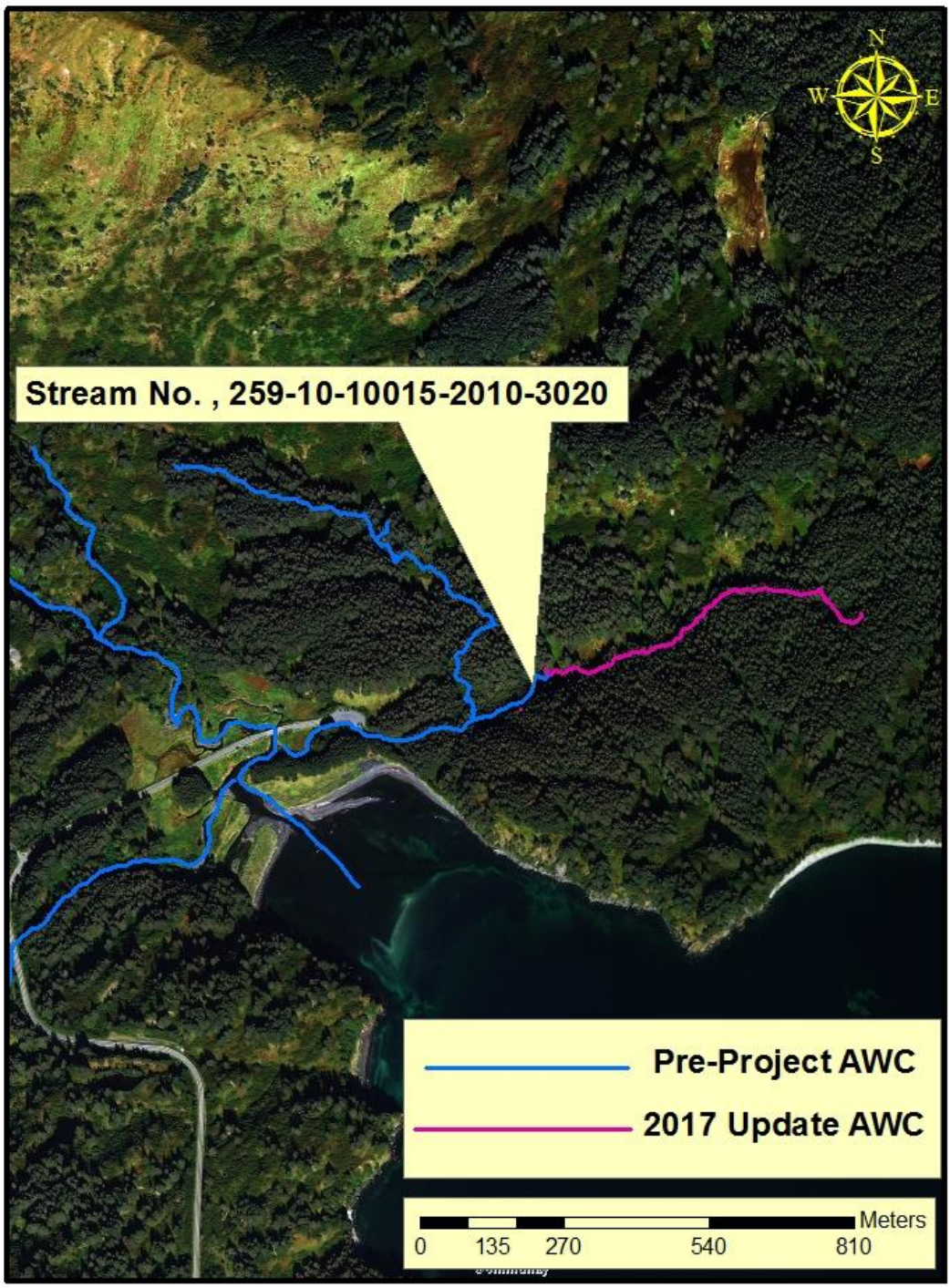
Appendix A 13.–Status of surveyed reaches within the upper American River, Kodiak Island.



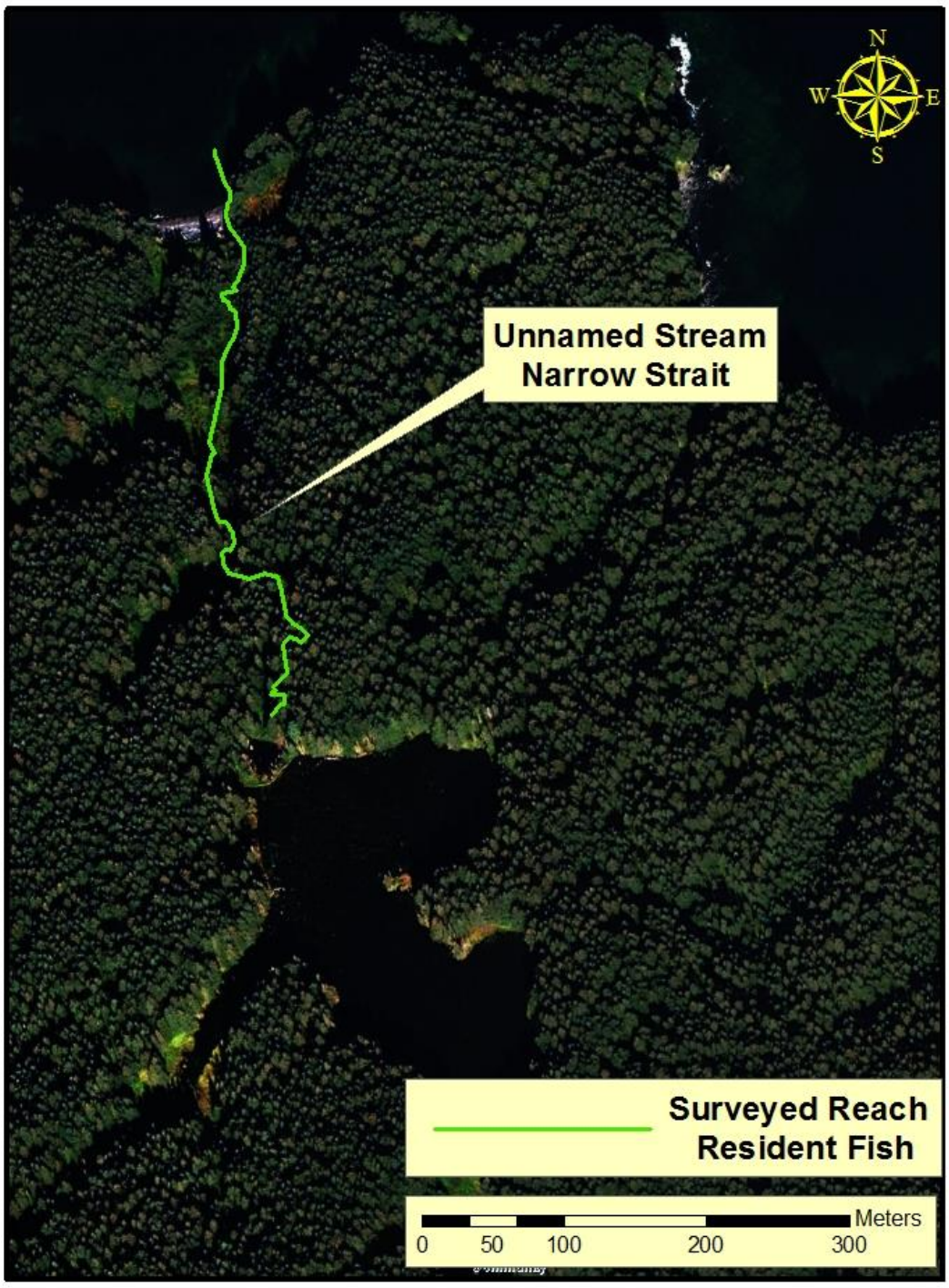
Appendix A 14.–Status of surveyed reaches within Salt Creek, Kodiak Island.



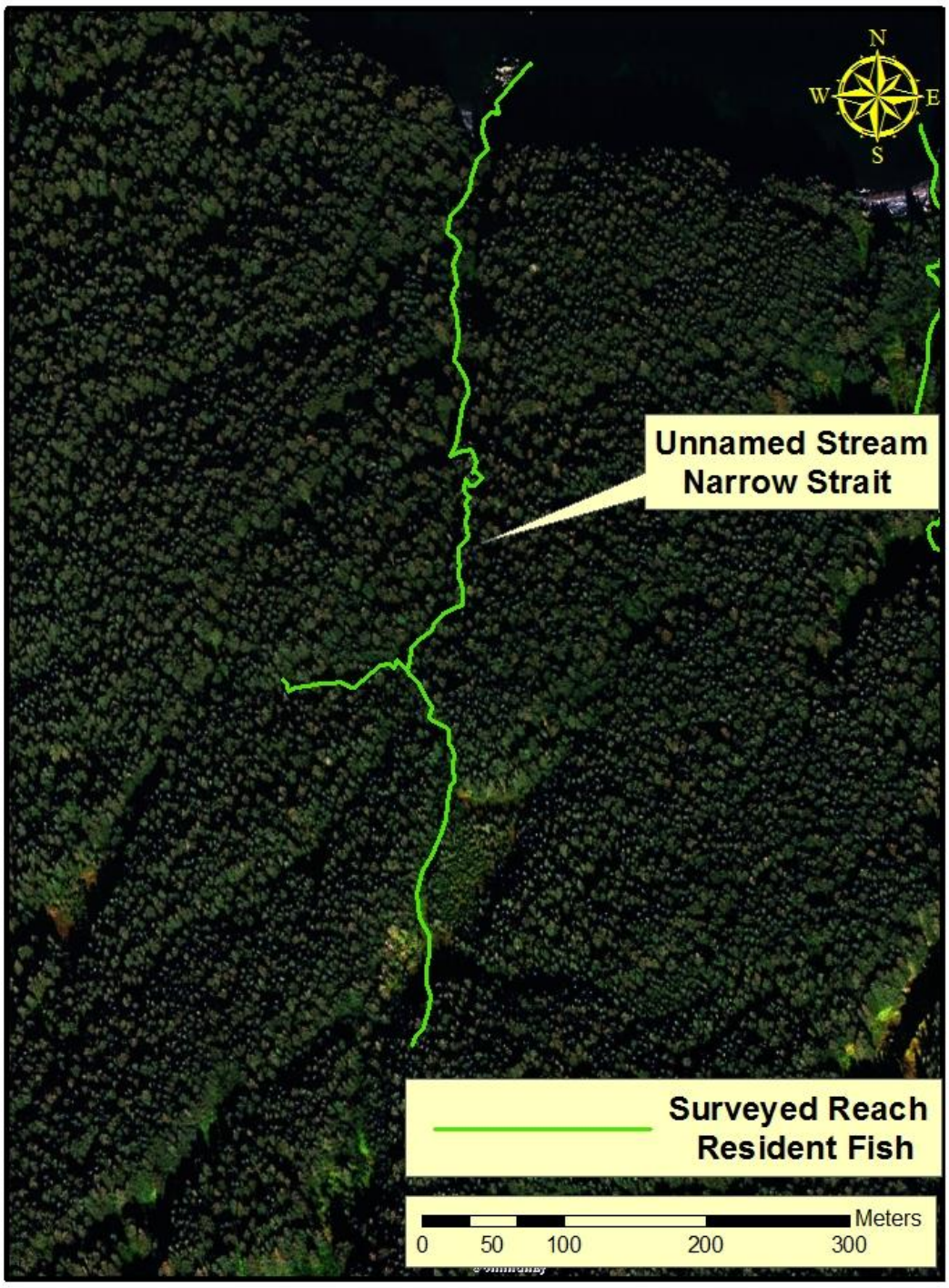
Appendix A 15.–Status of surveyed reaches within unnamed stream, Woody Island.



Appendix A 16.–Status of surveyed reach within Stream No. 259-10-10015-2010-3020 Kodiak Island.



Appendix A 17.–Status of surveyed reach within unnamed stream, Narrow Strait Kodiak Island.



Appendix A 18.–Status of surveyed reaches within unnamed stream, Narrow Strait Kodiak Island.