Technical Report No. 16-05

Anadromous Fish Presence Surveys in the Municipality of Anchorage, 2014–2015

by

Jacob P. Cunha

Chinook & coho salmon

February 2016

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 Technical Reports by the Division of Habitat. 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. 16-05

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by

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David Rogers
Director
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Alaska Department of Fish and Game

February 2015

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EXECUTIVE SUMMARY

In summer 2014 and 2015, the Alaska Department of Fish and Game (ADF&G), Division of Habitat, sampled for the presence of anadromous fish in watersheds within the Municipality of Anchorage (MOA). The information gathered was used to submit official 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 protect anadromous fish habitat in the MOA through ADF&G's statutory authority under Alaska Statute 16.05.871. In addition, information on resident fish species distribution also is obtained and will be used for permitting activities under Alaska Statute 16.05.841.

Water bodies were sampled using a backpack electrofisher and baited minnow traps. Adult anadromous fish observed were counted and their spawning activity documented for inclusion in the AWC. Streams were sampled until a fish passage barrier was reached or to a point where it was determined through sampling that anadromous fish were not present.

In 2014 and 2015, 15 watersheds were surveyed adding a total of 7.4 km of stream to the AWC. Six streams were updated to better define the species and life cycles supported, and 1 stream was updated to more accurately map its location in the AWC.

All 5 species of Pacific salmon (coho *(Oncorhynchus kisutch)*, Chinook *(O. tshawytscha)*, chum *(O. keta)*, pink *(O. gorbuscha)*, and sockeye *(O. nerka))* were identified within the Municipality during the survey. Other fish identified include rainbow trout *(O. mykiss)*, Dolly Varden *(Salvelinus malma)*, threespine stickleback *(Gasterosteus aculeatus)*, ninespine stickleback *(Pungitius pungitius)*, Alaska blackfish *(Dallia pectoralis)*, and sculpin *(Cottus spp.)*.

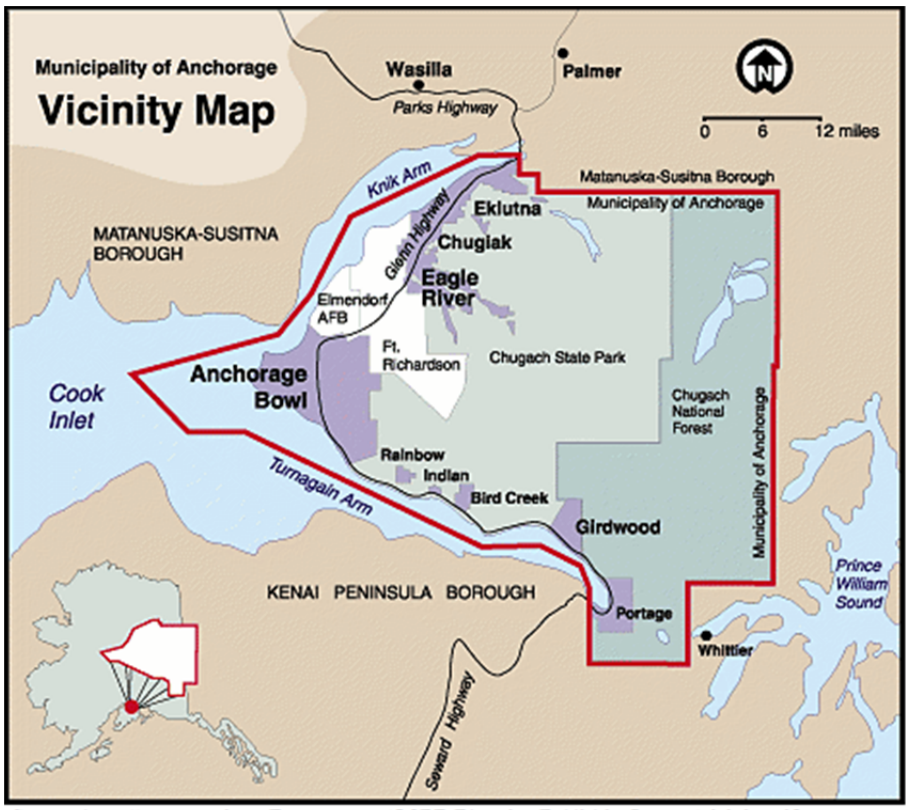
INTRODUCTION

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.

The Municipality of Anchorage (MOA) is located at the head of Cook Inlet and includes the communities of Anchorage, Eagle River, Chugiak, and Girdwood. The MOA also contains the majority of the Chugach State Park and a portion of the Chugach National Forest (Figure 1). In 2014, the United States Census Bureau estimated the human population within the MOA to be 301,010, about 41% of Alaskans, making it the largest and most densely populated region of Alaska.

The urban setting of the MOA often has effects on water quality and fish habitat in local streams. Pollution from stormwater runoff and industrial wastes, barriers to fish passage, increased temperatures and modified flow regimes of surface waters from impervious surfaces, removal of riparian vegetation, and shoreline development have the potential to reduce or eliminate anadromous fish from waterbodies (Regetz 2003). Documenting fish habitat within the MOA is the first step in minimizing the effects an urban community may pose on fish habitat.

In the spring of 2014, a 2-year grant was secured through the Alaska Sustainable Salmon Fund to sample streams within the MOA for the presence of anadromous fish. The information gathered was used to submit official 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 2016b). The catalog is a numerically-ordered list of anadromous water bodies. The Atlas shows cartographically the location, name and number of these specified water bodies, the anadromous fish using these water bodies, and the fish life history phases for which the water bodies are used. A specified water body listed in the AWC is afforded protection under State law at Alaska Statute (AS) 16.05.871 (ADF&G 2014–2015).



Source: http://www.muni.org/Departments/OCPD/Planning/PublishingImages/vicinity.gif

Figure 1.–Municipality of Anchorage.

METHODS

Water bodies were sampled by a team of 2 or 3 ADF&G staff. Sampling was conducted using a Smith-Root LR-24 backpack electrofisher or baited minnow traps. Output voltages were determined using the Quick Setup option on the electofisher unit then adjusting to the minimum level necessary to achieve taxis (forced swimming). The resulting setup produces continuous DC output with minimum injury to fish (NMFS 2000). Fish sampling crews worked moving upstream and sampled the best quality habitat observed until a barrier was reached or until it was determined that anadromous fish were not present.

Ponds and slow moving sections of streams were sampled using Gee G-40 galvanized steel minnow traps baited with betadine-treated salmon eggs. Traps were fished for a minimum of 4 hours and up to 24 hours. This method is considered an adequate test for the presence of coho (*Oncorhynchus kisutch*) and Chinook salmon (*O. tshawytscha*; Magnus et al. 2006). Chum (*O. keta*), pink (*O. gorbuscha*), and sockeye salmon (*O. nerka*) have different life cycles than coho and Chinook salmon. Chum and pink salmon do not spend long rearing in fresh water. Juvenile sockeye salmon are planktivores and are less likely to be attracted to baited minnow traps (Burgner 1991). Chum, pink, or sockeye salmon were not captured in minnow traps.

Captured juvenile salmon, rainbow trout, and Dolly Varden were identified to species and counted. Because of time constraints, a select number were measured to the nearest mm in fork length (FL). Stickleback and sculpin 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 noted.

We used existing FRPA criteria (Table 1; FRPA 2013) 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 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 the coordinates of all collected data as individual waypoints. Number and length of fish captured, along with the corresponding waypoint from the GPS were recorded in a field notebook. 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 location. Nominations were completed according to the ADF&G submission guidelines and requirements (ADF&G 2016a).

RESULTS

In 2014 and 2015, 15 watersheds were sampled within the MOA from May through October (Appendix A1–A11). A total of 35.0 km of streams were surveyed within the 15 watersheds. As a result of these sampling efforts, 5 watersheds received nominations to extend their length in the AWC, adding an additional 7.4 km of stream length to the AWC (Table 2).

Table 2.–Anchorage Municipality streams sampled in 2014 and 2015.

Stream name	AWC number	Total length sampled (meters)	Total new AWC length (meters)
Campbell Creek	247-60-10340	3,317	1,132
Chester Creek	247-50-10050	2,166	433
Crow Creek		242	
Explorer Creek	247-60-10210-2015	1,440	1,440
Fish Creek	247-50-10046	3,528	
Indian Creek	247-60-10290	1,313	
Meadow Creek	247-50-10110-2053	666	
Penguin Creek	247-60-10280-2008	1,775	1,775
Rabbit Creek	247-60-10320	5,453	
Twentymile River	247-60-10230	1,931	
Virgin Creek	247-60-10248	1,089	
Unnamed (Edmonds Lake Outlet)		2,691	
Unnamed (Mirror Lake Outlet)		2,696	
Unnamed (Glenn Highway)		2,783	
Unnamed (Turnagain Arm)	247-60-10232	3,954	2,598
Total		35,044	7,378

Five watersheds known to support anadromous species were found to support additional species or life stages (Table 3). This information was used to update an additional 10.6 km of stream length in the AWC. The North Fork Little Campbell Creek was corrected to accurately display its course in the AWC. No new watersheds were added to the AWC.

Table 3.-Additional species and life stages submitted to the AWC.

Stream name	Stream No.	Species added	Life stage added
Penguin Creek	247-60-10280-2008	Coho salmon	Rearing
Penguin Creek	247-60-10280-2008	Chinook salmon	Rearing
Indian Creek	247-60-10290	Coho salmon	Rearing
Unnamed Tributary of North Fork Little Campbell Creek	247-60-10340-2018-3005-4011	Chinook salmon	Rearing
Middle Fork Chester Creek	247-50-10050-2301	Coho salmon	Rearing
South Fork Chester Creek	247-50-10050-2302	Coho salmon	Spawning
South Fork Chester Creek	247-50-10050-2302	Sockeye salmon	Spawning
Meadow Creek	247-50-10110-2053	Chum salmon	Spawning
Meadow Creek	247-50-10110-2053	Coho salmon	Rearing
Meadow Creek	247-50-10110-2053	Chinook salmon	Rearing

In 2014 and 2015, 12 nominations were submitted to the AWC: 2 in 2014 and 10 in 2015. All of the nominations were accepted for inclusion into the AWC, except for 1 that will be reviewed for the 2017 AWC revision. All 5 species of Pacific salmon were captured or observed during surveys in 2014 and 2015. Coho salmon were the most numerous salmon species captured or observed and had the largest range within the MOA. Other adult and juvenile salmonid species captured or observed were Dolly Varden (*Salvelinus malma*) and rainbow/steelhead trout (*O. mykiss*). Additional species captured or observed were threespine stickleback (*Gasterosteus*

aculeatus), ninespine stickleback (*Pungitius pungitius*), Alaska blackfish (*Dallia pectoralis*), and sculpin (*Cottus* spp).

DISCUSSION

During 2014 and 2015 we surveyed 15 watersheds within the MOA. The surveys identified new anadromous water bodies in 5 watersheds, added species or life stages to 5 watersheds, and corrected 1 existing anadromous stream location. Nominations submitted in 2014 were included in the 2015 AWC revision. Nominations submitted in 2015 prior to September 30 were accepted and are expected to be included in the 2016 AWC revision. The nomination submitted after September 30, 2015, meets the criteria for inclusion in the AWC and is expected to be accepted and included in the 2017 AWC revision.

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. This project resulted in the addition of 7.4 km of new anadromous fish habitat to the AWC. Data collected from this project are also used to add information to the AWC, detailing species of salmon and life stages that each watershed supports. The addition of species and life stages to the AWC aids biologist when reviewing proposed development projects and allows them to authorize projects in ways that minimize disturbances to all species of anadromous fish known to use a specified waterbody.

Many streams within the MOA are affected by urban development. Once in the AWC, the ADF&G, Division of Habitat, has the authority to regulate development that affects these streams, and minimize negative impacts to fish and habitat both during and after a project.

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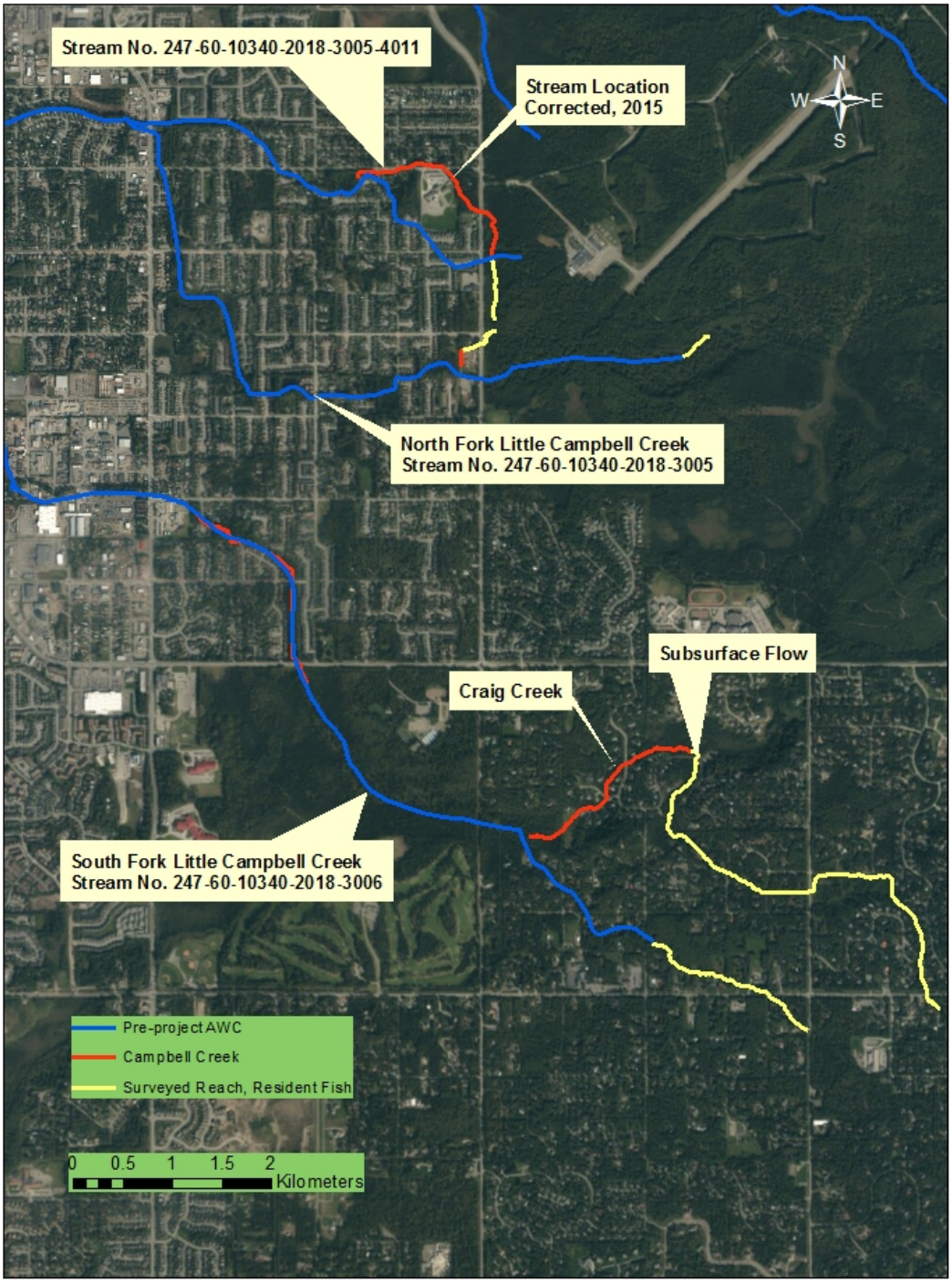
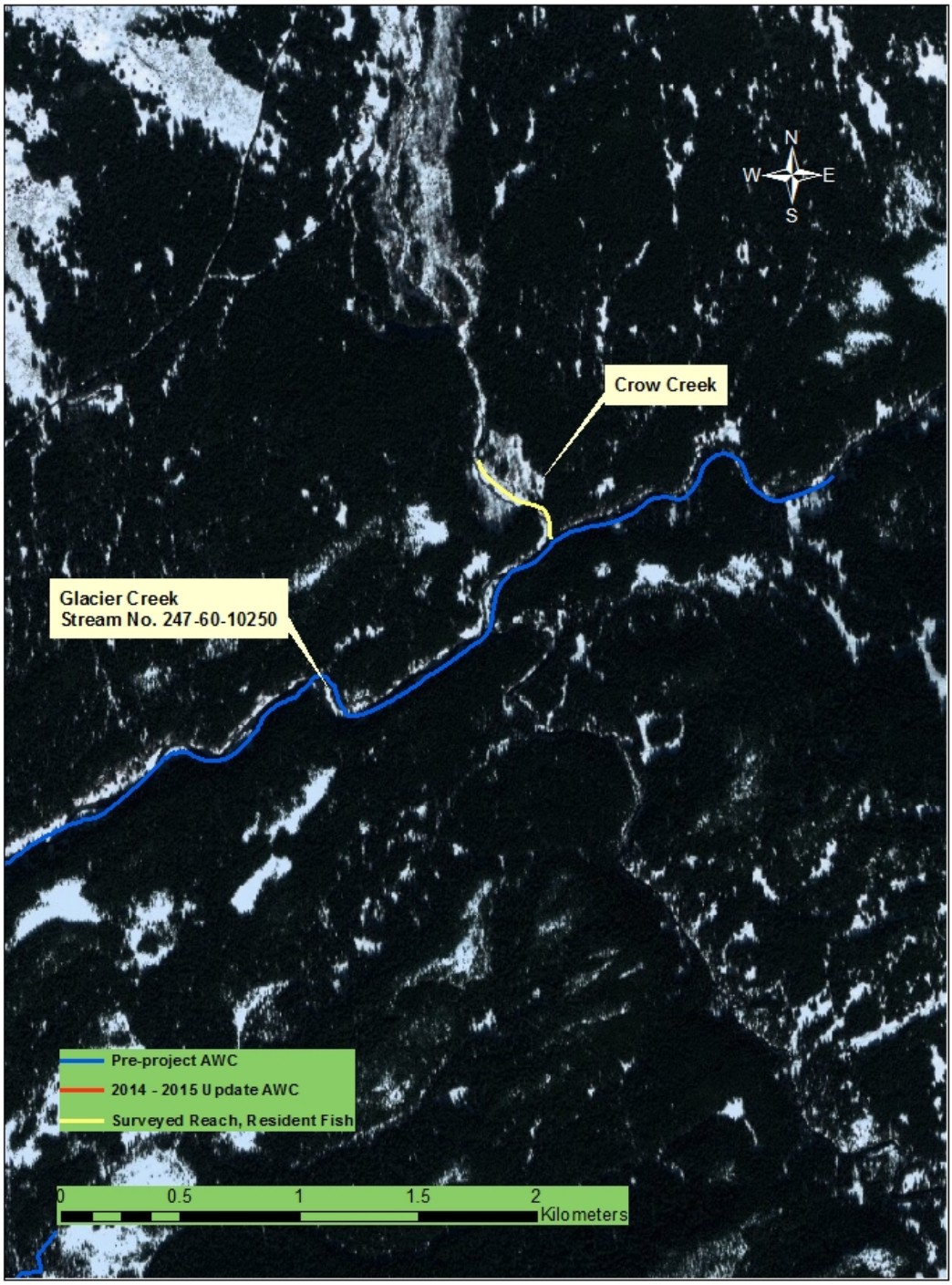
APPENDIX A: STATUS OF SURVEYED WATERSHEDS

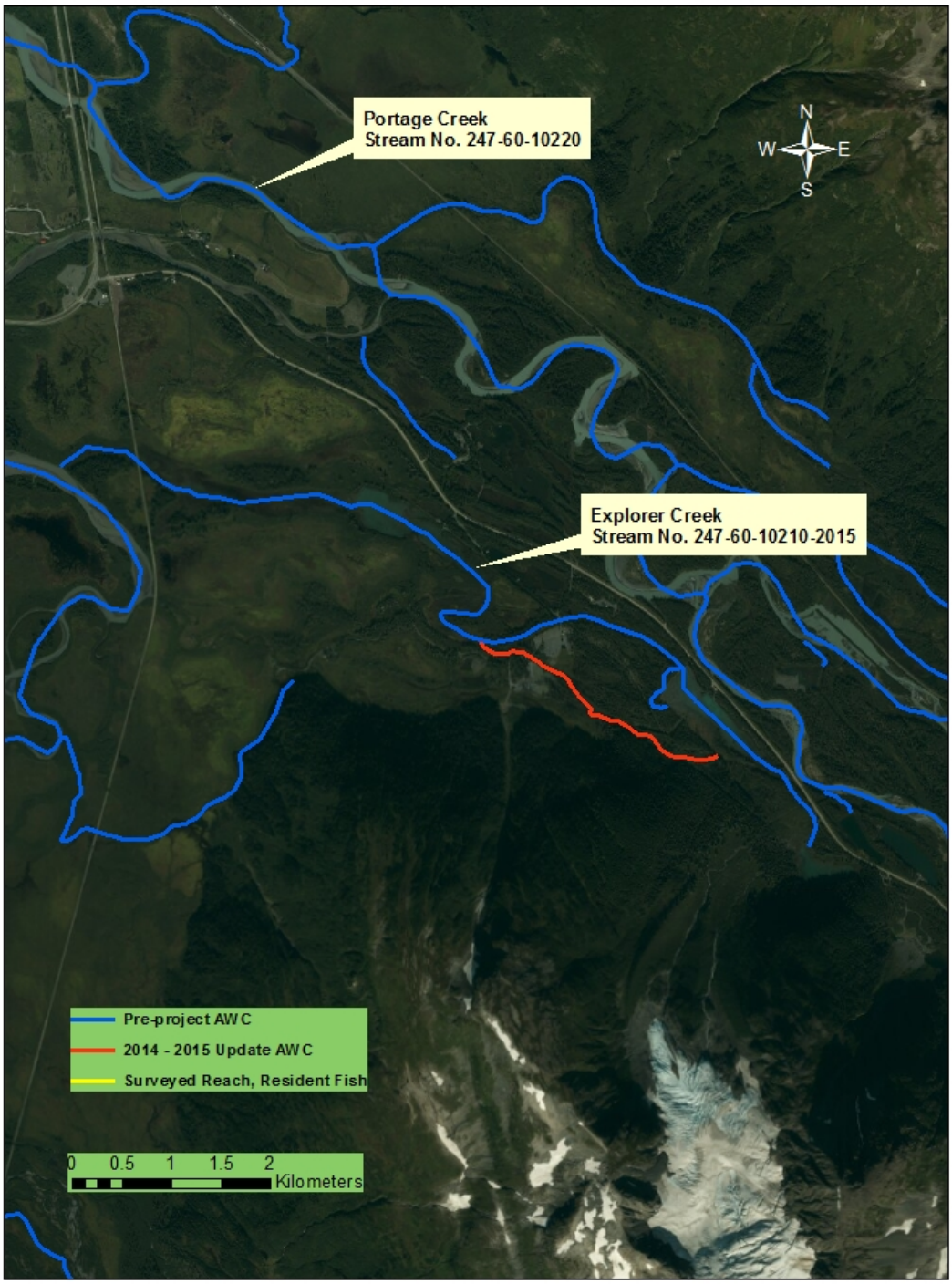


Appendix A1.–Status of surveyed reaches with the Campbell Creek watershed.

Appendix A2.–Status of surveyed reaches within the Chester Creek watershed.

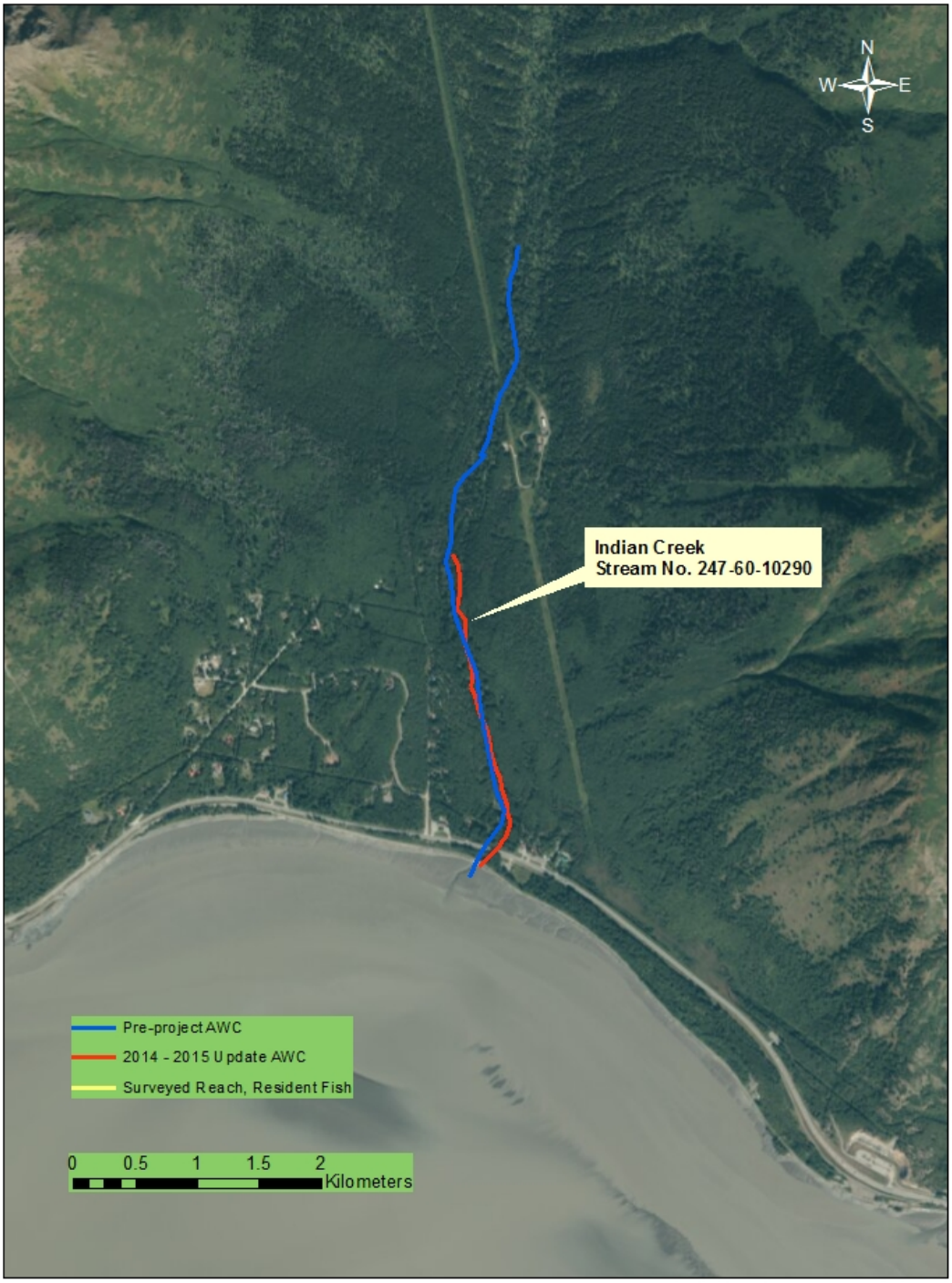


Appendix A3.–Status of Crow Creek survey within the Glacier Creek watershed.



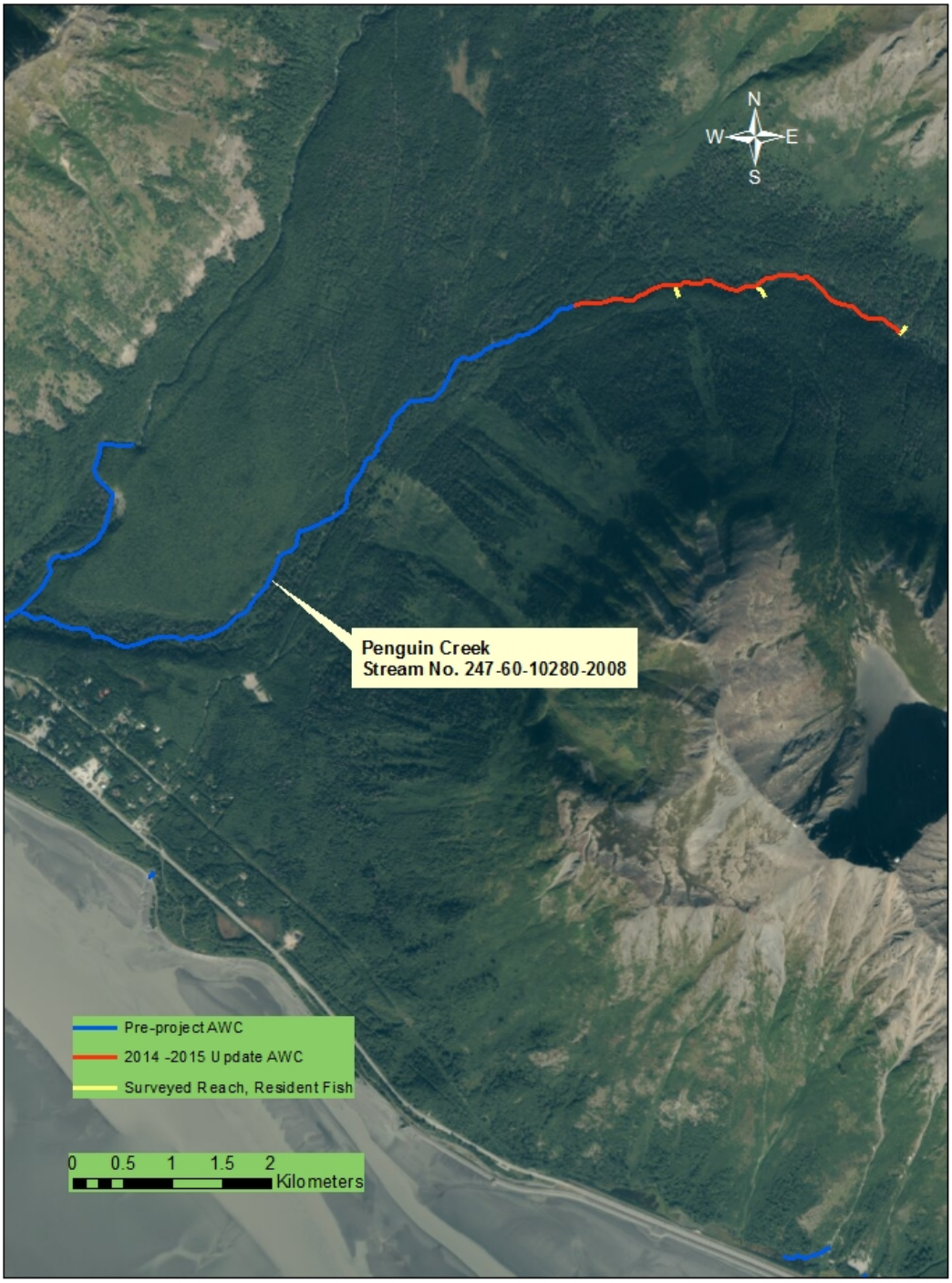
Appendix A4.–Status of Explorer Creek survey within the Portage Creek watershed.

Appendix A5.–Status of surveyed reaches of Fish Creek.



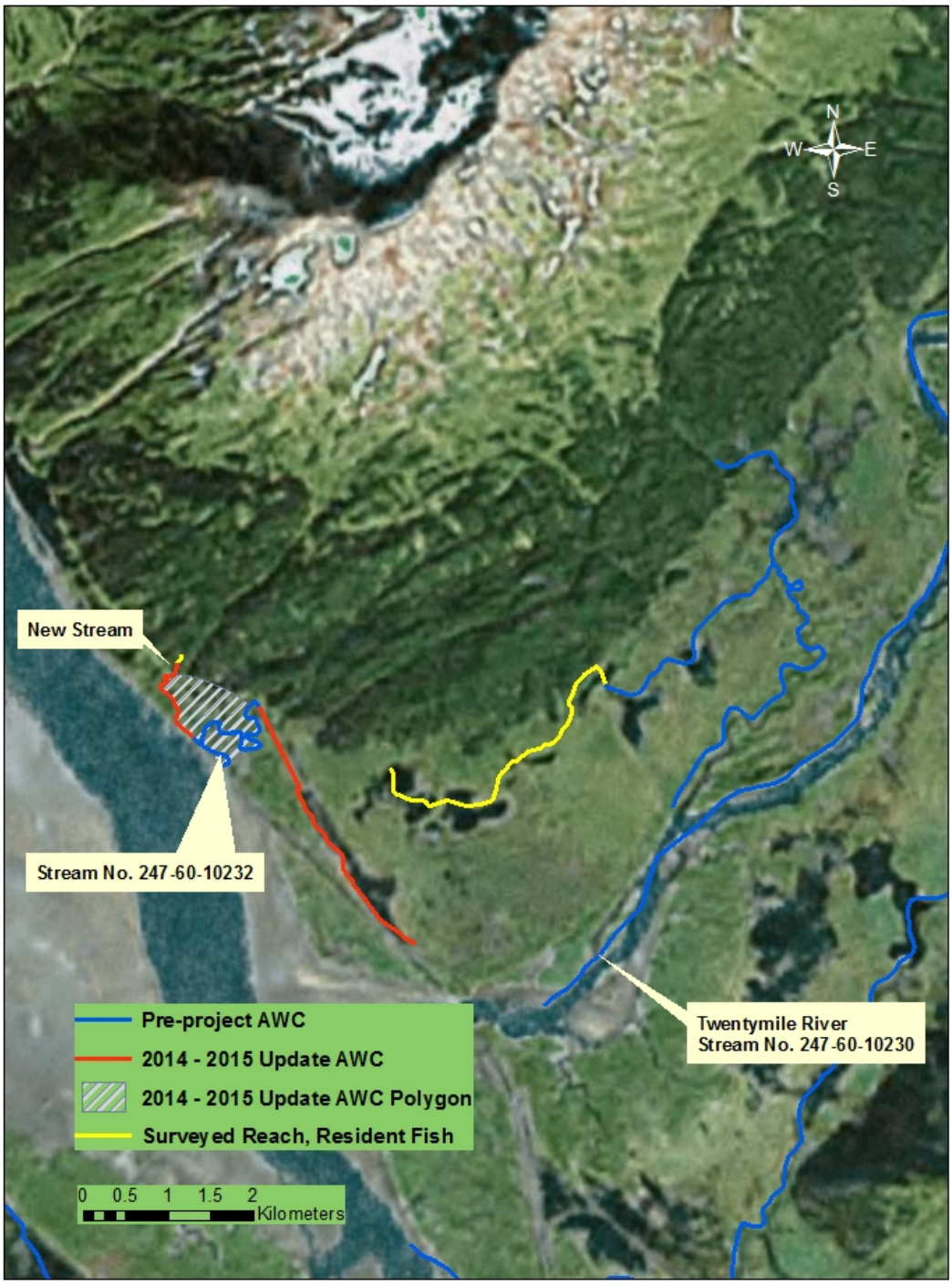
Appendix A6.–Status of surveyed reached of Indian Creek.

Appendix A7.–Status of Meadow Creek surveys within the Eagle River watershed.

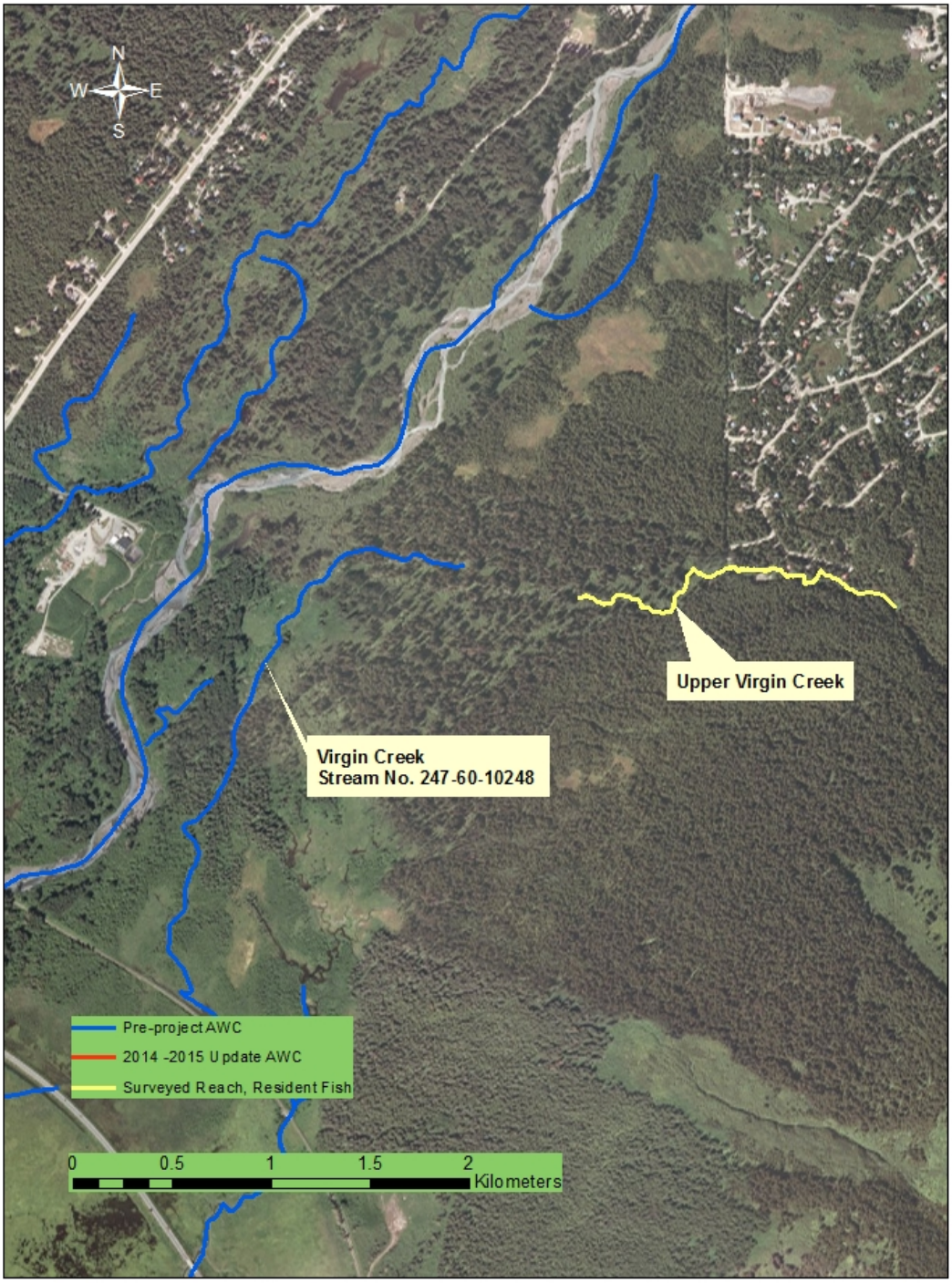


Appendix A8.–Status of Penguin Creek surveys within the Bird Creek watershed.

Appendix A9.–Status of surveyed reaches within the Rabbit Creek watershed.



Appendix A10.–Status of surveyed reaches of Twentymile River and the unnamed stream, Stream No. 247-60-10232 near the head of Turnagain Arm.



Appendix A11.–Status of surveyed reaches within the Virgin Creek watershed.

Appendix A12.–Status of surveyed unnamed streams near the Glenn Highway north of Eagle River.