Technical Report No. 18-05

Anadromous Fish Presence Surveys in Upper West Cook Inlet, 2016–2017

by

Josh M. Brekken

Survey Site on Coal Creek Tributary

April 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 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

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by

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Alaska Department of Fish and Game

April 2018

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EXECUTIVE SUMMARY

In summer 2016 and 2017, the Alaska Department of Fish and Game (ADF&G), Division of Habitat, sampled for the presence of anadromous fish in watersheds of Upper West Cook Inlet. 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 through ADF&G's statutory authority under Alaska Statute 16.05.871. In addition, information on resident fish species distribution was 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, to a point where it was determined through sampling that anadromous fish were not present, or when logistics determined an endpoint.

In 2016 and 2017, 33 streams were surveyed, and 30 nominations were accepted for inclusion in the AWC. These nominations added a total of 86.4 km of new stream habitat to the AWC. Coho salmon (*Oncorhynchus kisutch*) were the most numerous species captured or observed throughout the survey area. Other adult and juvenile salmonid species captured or observed were Chinook salmon (*O. tshawytscha*), sockeye salmon (*O. nerka*), Dolly Varden (*Salvelinus malma*), and rainbow/steelhead trout (*O. mykiss*). Additional species captured or observed were threespine stickleback (*Gasterosteus aculeatus*), ninespine stickleback (*Pungitius pungitius*), lamprey (*Lampetra* spp.), 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.

Cook Inlet is the most populated and fastest growing region in Alaska. It is also an area of increased interest in resource extraction projects, especially Upper West Cook Inlet. Several exploration and mining leases exist in the area, creating the potential for future development that could have effects on aquatic habitats and salmon populations. Documenting anadromous and resident fish habitat and distribution in Upper West Cook Inlet is one step in minimizing the effects that future exploration or development may pose to such habitats.

In the spring of 2016, a 2-year grant was secured through the Alaska Sustainable Salmon Fund to sample streams in Upper West Cook Inlet 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 2016a). 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 2017–2018).

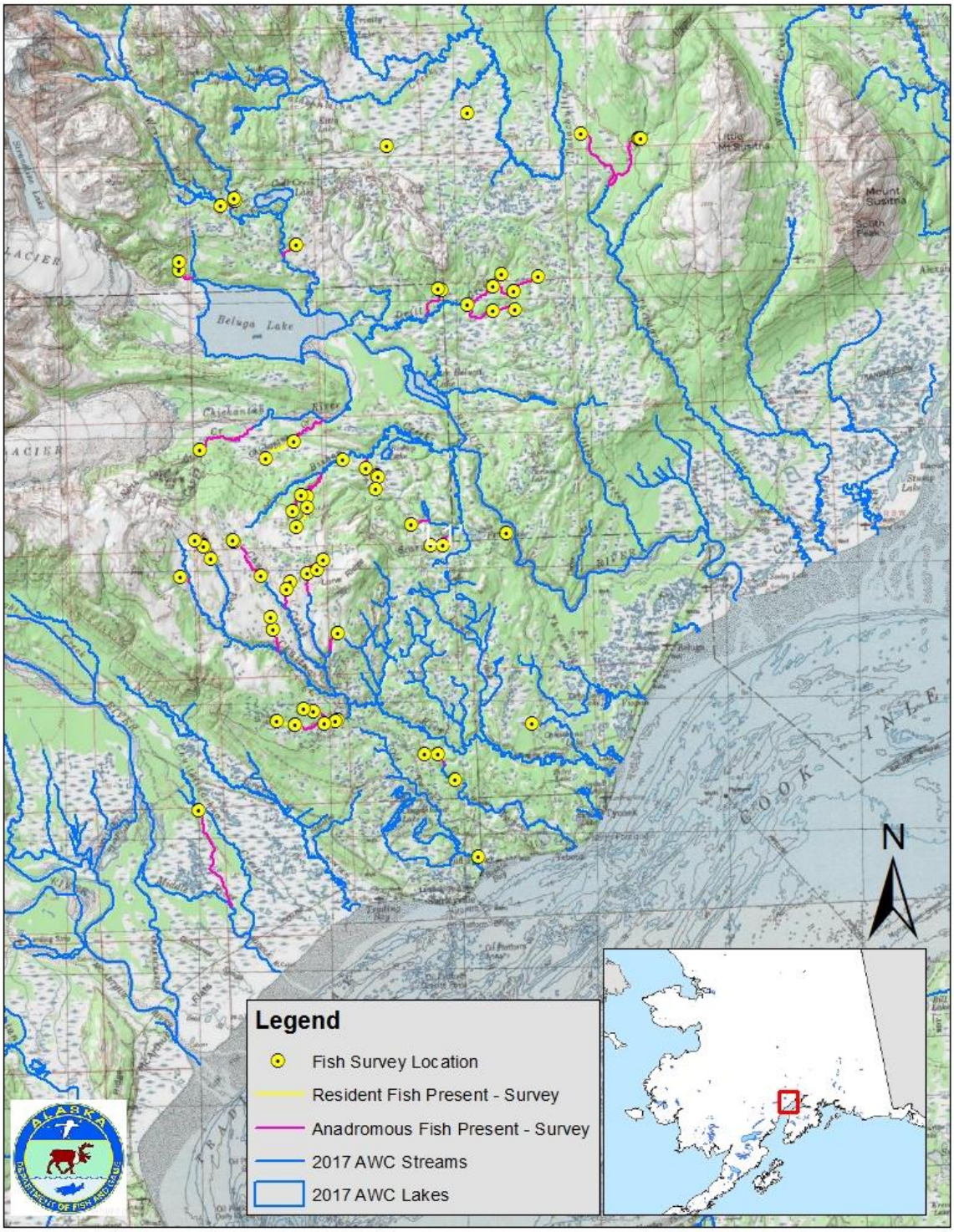

Figure 1.–Upper West Cook Inlet anadromous fish presence survey area, 2016-2017.

METHODS

Water bodies were sampled by a team of two biologists, one from ADF&G and one from Tyonek Tribal Conservation District (TTCD). Sampling was conducted using a Smith-Root LR-24 backpack electrofisher and baited minnow traps. Output voltages were typically 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 began surveys upstream of documented anadromy and sampled the best quality habitat observed until it was determined that anadromous fish were not present or when logistical factors limited access. Some surveys were likely ended below the uppermost extent of anadromous fish distribution because of logistical challenges such as limited landing zones for helicopter access or weather concerns. Additionally, the upper distribution of anadromy in streams can be variable due to multiple factors (e.g., water levels, beaver dams). Survey streams were visited one time for sampling.

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 four hours. This method is considered most effective to test for the presence of juvenile 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 and are unlikely to be captured in minnow traps. Chum and pink salmon do not spend long rearing in freshwater. 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 during these surveys.

Captured juvenile salmon, rainbow trout, and Dolly Varden were identified to species and measured to the nearest mm in fork length (FL). Stickleback, lamprey, and sculpin species were noted as present and counted, but not always measured. All fish were released into a slack-water area at the point of capture. Adult salmonids observed were counted and spawning activity was noted.

A chartered Robinson 44 helicopter was the primary means used to access fish sampling locations, but a 4-wheeler was used one day to survey streams on the Tyonek Road System. The sampling team used professional judgement based on available habitat, stream gradient, and sample results balanced with logistical constraints to determine the upper extent of the water body sampled. Available landing zones, fuel/range limitations, and weather were logistical factors that constrained the sampling extent to some degree.

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, and addition of species or life stages. Nominations were completed according to the ADF&G submission guidelines and requirements (ADF&G 2016b).

RESULTS

In 2016 and 2017, 33 different streams were sampled in multiple watersheds in Upper West Cook Inlet over 5½ days of survey effort. Multiple reaches were sampled in some streams while other streams contained just one sample reach or point, depending on available habitat and sampling results. As a result of these survey efforts, 30 streams received nominations to extend their length in the AWC, adding an additional 86.4 km of stream length to the AWC (Table 1). Anadromous fish species were captured at 88% of the sites surveyed with only resident fish species captured in about 15 km of stream length surveyed.

In 2016 and 2017, 30 nominations were accepted for inclusion to the AWC: 17 in 2016 and 13 in 2017. Coho salmon were the most numerous species captured or observed throughout the survey area. Other adult and juvenile salmonid species captured or observed were Chinook salmon, sockeye salmon, Dolly Varden (*Salvelinus malma*), and rainbow/steelhead trout (*O. mykiss*). Additional species captured or observed were threespine stickleback (*Gasterosteus aculeatus*), ninespine stickleback (*Pungitius pungitius*), lamprey (*Lampetra* spp.), and sculpin (*Cottus* spp). A summary of all captures is presented in Appendix A and maps of AWC additions are provided in Appendix B.

Table 1.– Anadromous fish presence survey results from Upper West Cook Inlet, 2016 and 2017.

Site	Stream name	AWC number (or connected to)	Species and life stage	Total new AWC length (m)
16-273	Tyonek Creek	247-20-10040	COr	928
16-279	Chuitna River tributary	247-20-10010-2049 (south fork)	COr	2,580
16-283	Chuitna River tributary	247-20-10010-2049 (north fork)	COr	3,074
16-285	Chuit Creek tributary	247-20-10010-2052-3060-4012	COr	1,690
16-288	Chuit Creek tributary	247-20-10010-2052-3060	COr	4,047
16-289	Chuit Creek tributary	247-20-10010-2052	COr	2,222
16-291	Beluga River tributary	247-30-10090	COr	398
16-293	Scarp Creek tributary	247-30-10090-2105-3015	COr	1,241
16-295	Bishop Creek tributary	247-30-10090-2105	COr	1,700
16-298	Bishop Creek tributary	247-30-10090-2105	COrp	4,354
16-299	Chichantna Creek	247-30-10090-2151	COr	3,865
16-301	Capps Creek	247-30-10090-2151	COr	5,618
16-303	Beluga River tributary	247-30-10090-2180	Ks	2,102
16-305	Coal Creek tributary	247-30-10090-2150	COr	1,565
16-308	Coal Creek tributary	247-30-10090-2150	COr	862
16-313	Bishop Creek tributary	247-30-10090-2105	COr, Ss	3,132
16-314	Scarp Creek tributary	247-30-10090-2105-3015-4012-5010	COr	1,319
17-9	Chuitna River tributary	247-20-10010	COr	2,685
17-11	Chuitna River tributary	247-20-10010	COr	793
17-14	Wolverine Fork – Chuitna River	247-20-10010-2088	COr	2,042
17-17	Chuit Creek	247-20-10010-2052	COr	3,740
17-18	Middle River tributary	247-10-10070	COr	8,582
17-21	Drill Creek	247-30-10090-2120	COr	4,052
17-25	Drill Creek tributary	247-30-10090-2120	COr	4,515
17-27	Drill Creek tributary	247-30-10090-2120	COr	4,922
17-29	Drill Creek tributary	247-30-10090-2120	COr	2,880
17-34	Theodore River	247-30-10080	COr	5,433
17-35	Theodore River tributary	247-30-10080	COr	5,571
17-37	Old Tyonek Creek tributary	247-20-10050-2010	COr	264
17-41	Chuitna River tributary	247-20-10010-2006	COr	192
	Total		COrp, Ks, Ss	86,368

CO = coho salmon, K = Chinook salmon, S = sockeye salmon, r = rearing, p = present, s = spawning

DISCUSSION

During 2016 and 2017, we conducted surveys in multiple watersheds in Upper West Cook Inlet. The surveys identified new anadromous fish habitat in 30 different streams and added species or life stages to four streams. Nominations submitted were accepted and will be included in the 2018 AWC revision. Few fish migration barriers were encountered during these surveys. Beaver dam complexes and extended steep gradients appear to be the most common factors affecting fish distribution in the survey area, but often these features were only partial or likely temporal barriers.

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, to provide proper protection of fish and game. This project resulted in the addition of 86.4 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. 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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NMFS (National Marine Fisheries Service). 2000. Guidelines for electrofishing waters containing salmonids listed under the Endangered Species Act, June 2000.

APPENDIX A: FISH CAPTURES AND SURVEY LOCATIONS

Site	Latitude (N)	Longitude (W)	Fish Captures	Fork Length (mm)	Notes
16-273-1	61.09313	151.34142	sculpin sp.	50	Tyonek Creek drainage
			sculpin sp.	48	
			coho salmon	48	
16-273-2	61.11111	151.3634	sculpin sp.	38	Tyonek Creek drainage
			sculpin sp.	25	Lots of beaver activity along stream
			sculpin sp.	22	
			sculpin sp.	51	
			sculpin sp.	42	
			sculpin sp.	22	
			sculpin sp.	29	
			sculpin sp.	42	
			sculpin sp.	45	
			sculpin sp.	60	
			sculpin sp.	52	
			sculpin sp.	59	
			sculpin sp.	60	
			sculpin sp.	72	
			slimy sculpin	75	
			slimy sculpin	95	
16-273-3	61.1111	151.3834	sculpin sp.	34	Tyonek Creek drainage
			sculpin sp.	12	
			sculpin sp.	32	
			sculpin sp.	41	
			sculpin sp.	22	
			sculpin sp.	24	
			sculpin sp.	18	
			sculpin sp.	16	
			sculpin sp.	36	
			sculpin sp.	24	
			sculpin sp.	30	
16-279-1	61.13687	151.50273	coho salmon	35	Southern tributary of Chuitna River
			coho salmon	52	Beaver activity high
			coho salmon	65	
			coho salmon	36	

Site	Latitude (N)	Longitude (W)	Fish Captures	Fork Length (mm)	Notes
16-279-2	61.13591	151.50557	coho salmon	75	
16-279-3	61.1347	151.52034	coho salmon	37	
			coho salmon	82	
			coho salmon	35	
16-279-4	61.13403	151.56186	coho salmon	88	
			coho salmon	72	Multiple beaver dam complexes
			coho salmon	65	Dams exceed 6 feet in height
16-279-5	61.13424	151.56213	coho salmon	94	
16-279-6	61.13749	151.58699	sculpin sp.	42	
			sculpin sp.	18	
			sculpin sp.	22	
			sculpin sp.	38	
			sculpin sp.	42	
			sculpin sp.	40	
			sculpin sp.	36	
			sculpin sp.	34	
			sculpin sp.	28	
16-283-1	61.14261	151.53549	coho salmon	85	22 sculpin sp. captured, not measured
			coho salmon	96	Lots of beaver activity throughout
16-283-2	61.14499	151.54979	coho salmon	84	system
16-285-1	61.19433	151.49794	coho salmon	62	
			Dolly Varden	125	Northern tributary of Chuitna River
			Dolly Varden	225	Headwaters on Lone Ridge
			Dolly Varden	70	
			Dolly Varden	81	
			Dolly Varden	64	
			Dolly Varden	62	
16-285-2	61.1951	151.49722	coho salmon	84	
			Dolly Varden	110	
			Dolly Varden	72	
			Dolly Varden	61	
			Dolly Varden	63	
			Dolly Varden	58	
			Dolly Varden	96	

Site	Latitude (N)	Longitude (W)	Fish Captures	Fork Length (mm)	Notes
16-288-1	61.23579	151.53719	coho salmon	32	
			coho salmon	37	
16-288-2	61.23817	151.52252	coho salmon	85	
16-288-3	61.24453	151.51331	coho salmon	88	Large beaver pond at headwaters
16-289-1	61.23051	151.56119	coho salmon	87	Large beaver pond at headwaters
			coho salmon	92	
16-289-2	61.2257	151.56651	coho salmon	39	
			coho salmon	105	
16-291-1	61.2574	151.25502	coho salmon	38	Beluga River tributary
			coho salmon	45	Drains Felt Lake
16-293-1	61.2510	151.3460	coho salmon	32	Scarp Creek tributary
			coho salmon	44	Problems with e-fisher at this site
16.293-2	61.25132	151.36198	sculpin sp.	-	>30 sculpin captured, not measured
16-295-1	61.28727	151.53287	coho salmon	49	Bishop Creek tributary
16-295-2	61.27973	151.53436	coho salmon	42	Stream confined to steep valley
			coho salmon	38	
			coho salmon	37	
			coho salmon	44	
			coho salmon	72	
			Dolly Varden	127	
			Dolly Varden	35	
			Dolly Varden	68	
			rainbow trout	75	
			sculpin sp.	22	
16-295-3	61.26663	151.55016	Dolly Varden	210	
			Dolly Varden	195	
16-298-1	61.28836	151.54073	coho salmon	38	Bishop Creek tributary
			coho salmon	37	Stream confined to steep valley
			coho salmon	42	
			coho salmon	51	
			coho salmon	44	
			rainbow trout	41	
			rainbow trout	34	
			rainbow trout	32	

Site	Latitude (N)	Longitude (W)	Fish Captures	Fork Length (mm)	Notes
			rainbow trout	34	
			rainbow trout	36	
16-298-2	61.27814	151.55387	coho salmon	46	
			coho salmon	43	
16-299-1	61.32438	151.5485	coho salmon	50	Chichantna Creek
			coho salmon	62	Numerous large beaver dams could
			sculpin sp.	28	be limiting upstream extent
			sculpin sp.	41	Meandering stream with low gradient
16-299-2	61.31382	151.58986	sculpin sp.	21	Multiple sculpin captured but only
			sculpin sp.	44	two measured
16-301-1	61.32105	151.68153	coho salmon	48	Capps Creek
			coho salmon	52	Difficult to locate landing zones; extent of anadromy likely further upstream
			sculpin sp.	18	Multiple sculpin captured but only
			sculpin sp.	29	two measured
16-303-1	61.44196	151.70187	Chinook salmon	-	Visual observation, no capture
16-303-2	61.44766	151.70219	Chinook salmon	-	7 adult Chinook salmon spawning 1 adult Chinook salmon holding on redd
16-305-1	61.456	151.53477	coho salmon	51	Coal Creek tributary
			coho salmon	51	
16-305-2	61.45614	151.53461	coho salmon	106	Multiple failed beaver dams (blown
			coho salmon	89	out) in process of being rebuilt
16-308-1	61.48721	151.62019	coho salmon	61	High beaver density
			coho salmon	75	
			sculpin sp.	21	
16-308-2	61.48751	151.61978	coho salmon	42	
16-308-3	61.48851	151.62053	coho salmon	42	
16-313-1	61.30437	151.44836	coho salmon	49	Bishop Creek tributary
			coho salmon	42	
			coho salmon	39	
			sockeye salmon		2 adults, one redd observed
16-313-2	61.29928	151.43326	rainbow trout	86	Multiple beaver dam complexes
16-313-3	61.29893	151.43288	coho salmon	49	
			coho salmon	56	

Site	Latitude (N)	Longitude (W)	Fish Captures	Fork Length (mm)	Notes
16-313-4	61.29039	151.43631	rainbow trout	190	
			coho salmon	41	
16-314-1	61.26579	151.38878	coho salmon	102	Scarp Creek tributary
			coho salmon	72	Large beaver dam complexes downstream
17-9-1	61.19877	151.58717	coho salmon	69	Chuitna River tributary
17-9-2	61.19883	151.58713	coho salmon	50	
			Dolly Varden	110	
17-9-3	61.20692	151.59137	coho salmon	52	
			coho salmon	55	
17-11-1	61.23625	151.71527	coho salmon	61	Chuitna River tributary
			coho salmon	64	
			Dolly Varden	61	
17-14-1	61.25676	151.68121	coho salmon	60	Wolverine Fork – Chuitna River
17-14-2	61.25639	151.68156	coho salmon	54	
			coho salmon	62	
17-14-3	61.26027	151.69334	coho salmon	112	
17-17-1	61.25848	151.63898	coho salmon	68	Chuit Creek
17-17-2	61.2586	151.63884	coho salmon	60	Multiple Dolly Varden and sculpin sp.
17-17-3	61.25919	151.63997	coho salmon	62	captured but not measured
17-18-1	61.07961	151.70156	coho salmon	60	Middle River tributary
			coho salmon	68	Captured flow from Chuitkilnachna Creek
17-21-1	61.42328	151.26057	coho salmon	64	Drill Creek
17-21-2	61.43103	151.24784	coho salmon	57	
17-25-1	61.412	151.298	coho salmon	73	Drill Creek tributary
17-25-2	61.4193	151.23093	coho salmon	45	
17-25-3	61.4285	151.1963	coho salmon	48	
17-27-1	61.4066	151.26199	coho salmon	94	Drill Creek tributary
17-27-2	61.40668	151.23128	coho salmon	88	
17-29-1	61.4223	151.33313	coho salmon	37	Drill Creek tributary
			coho salmon	69	
17-29-2	61.42336	151.33848	coho salmon	45	
17-30-1	61.52028	151.40161	sculpin sp.	-	Talachulitna River tributary

Site	Latitude (N)	Longitude (W)	Fish Captures	Fork Length (mm)	Notes
17-31-1	61.5399	151.28665	lamprey sp.	-	Talachulitna River tributary
			sculpin sp.	-	sculpin and lamprey not measured
17-34-1	61.51787	151.04573	coho salmon	89	Theodore River (E. Fork)
17-34-2	61.51772	151.04419	coho salmon	59	
17-34-3	61.5178	151.04305	coho salmon	84	
17-35-1	61.52328	151.1272	coho salmon	64	Theodore River (W. Fork)
			coho salmon	73	
17-37-1	61.0412	151.3131	coho salmon	32	Old Tyonek Creek tributary
			coho salmon	33	Unauthorized culvert (perched)
			coho salmon	34	blocking fish passage
17-41-1	61.1288	151.2316	coho salmon	85	Chuitna River tributary
			coho salmon	100	Anadromy likely extends much further upstream based on habitat

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APPENDIX B: MAPS AND STATUS OF SURVEYED WATERBODIES

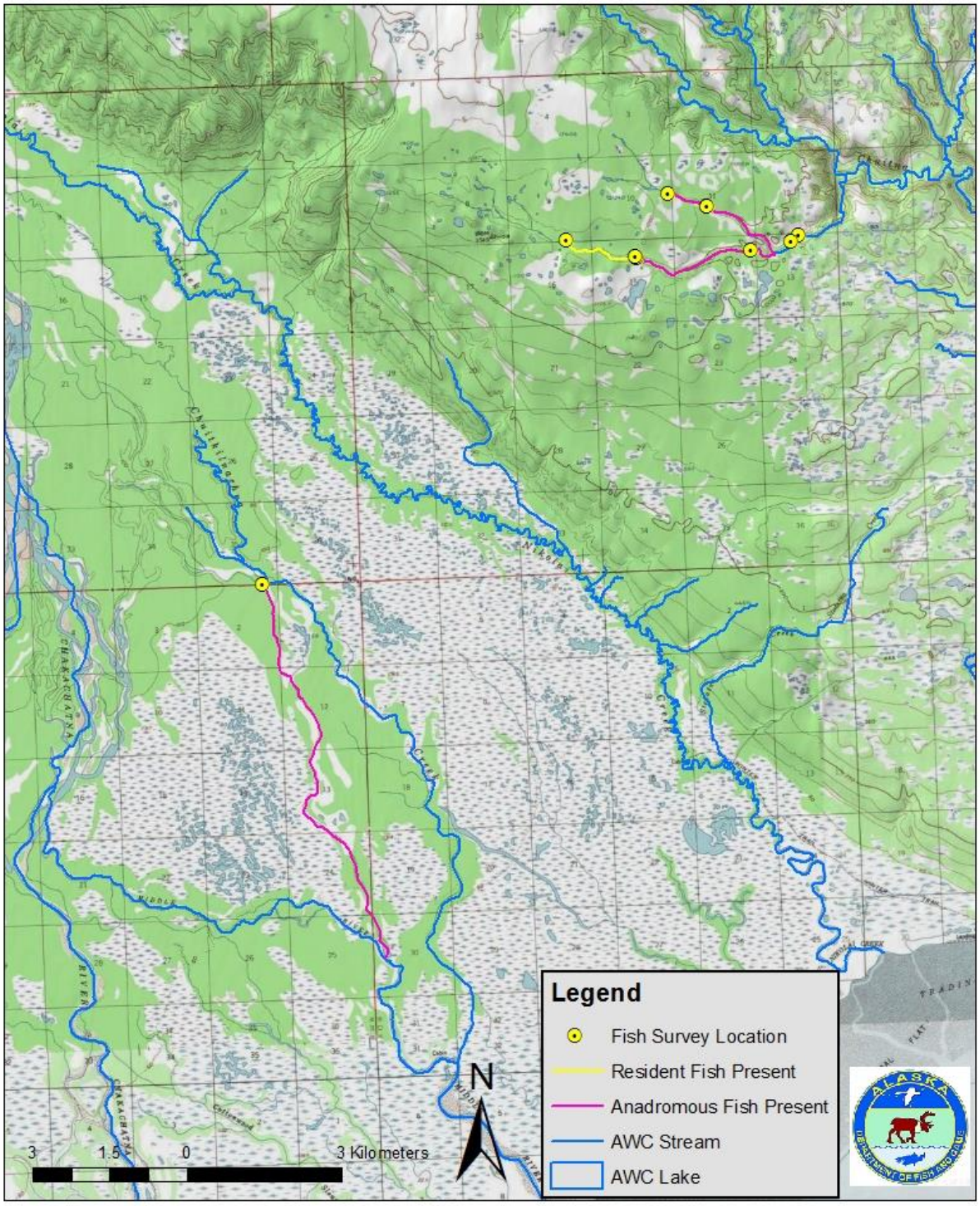


Figure B1.–Status of surveyed reaches within the Chuitkilnachna Creek (Middle River) and Chuitna River watersheds.

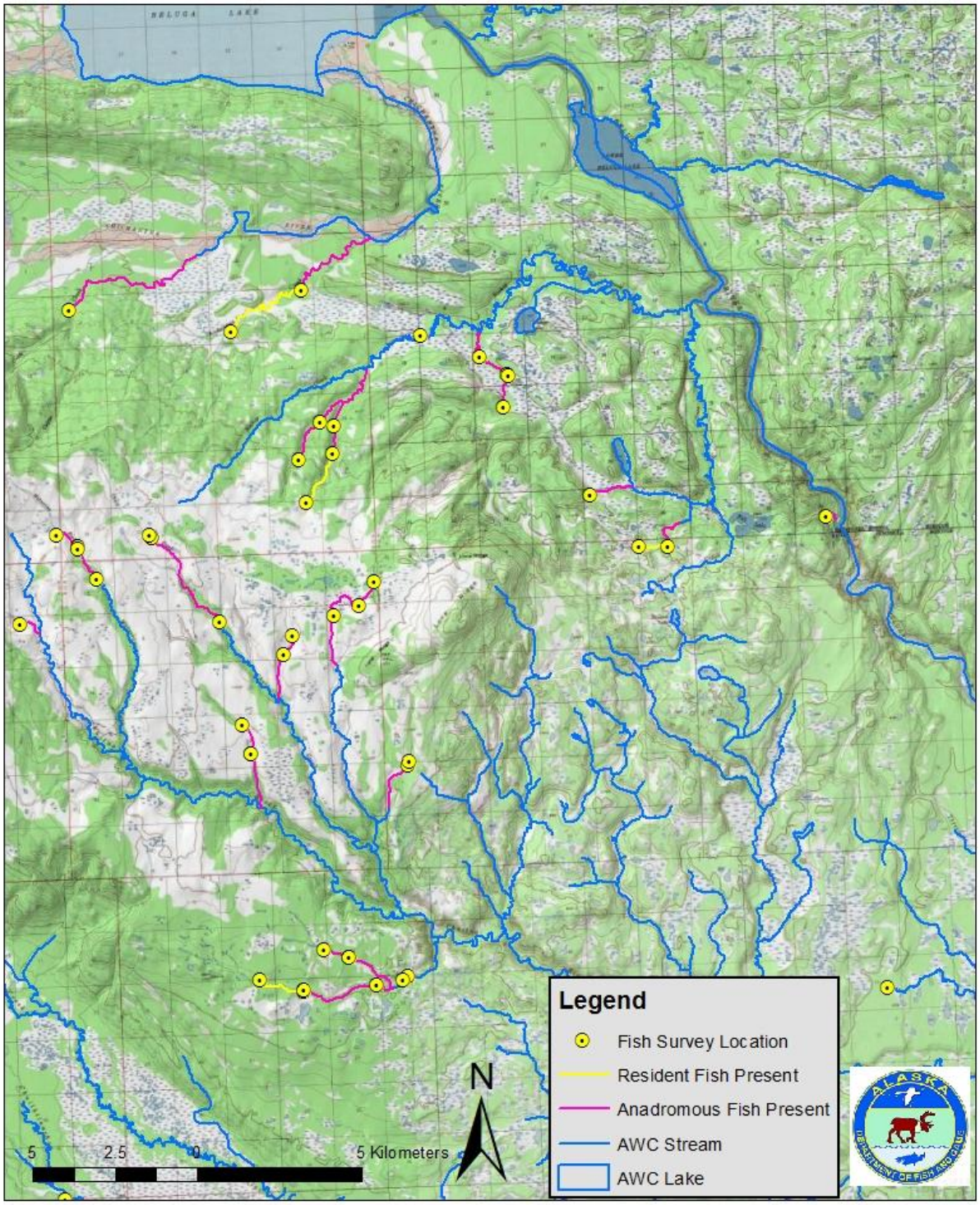


Figure B2.–Status of surveyed reaches within the Chuitna, Chichantna, and Beluga River watersheds.

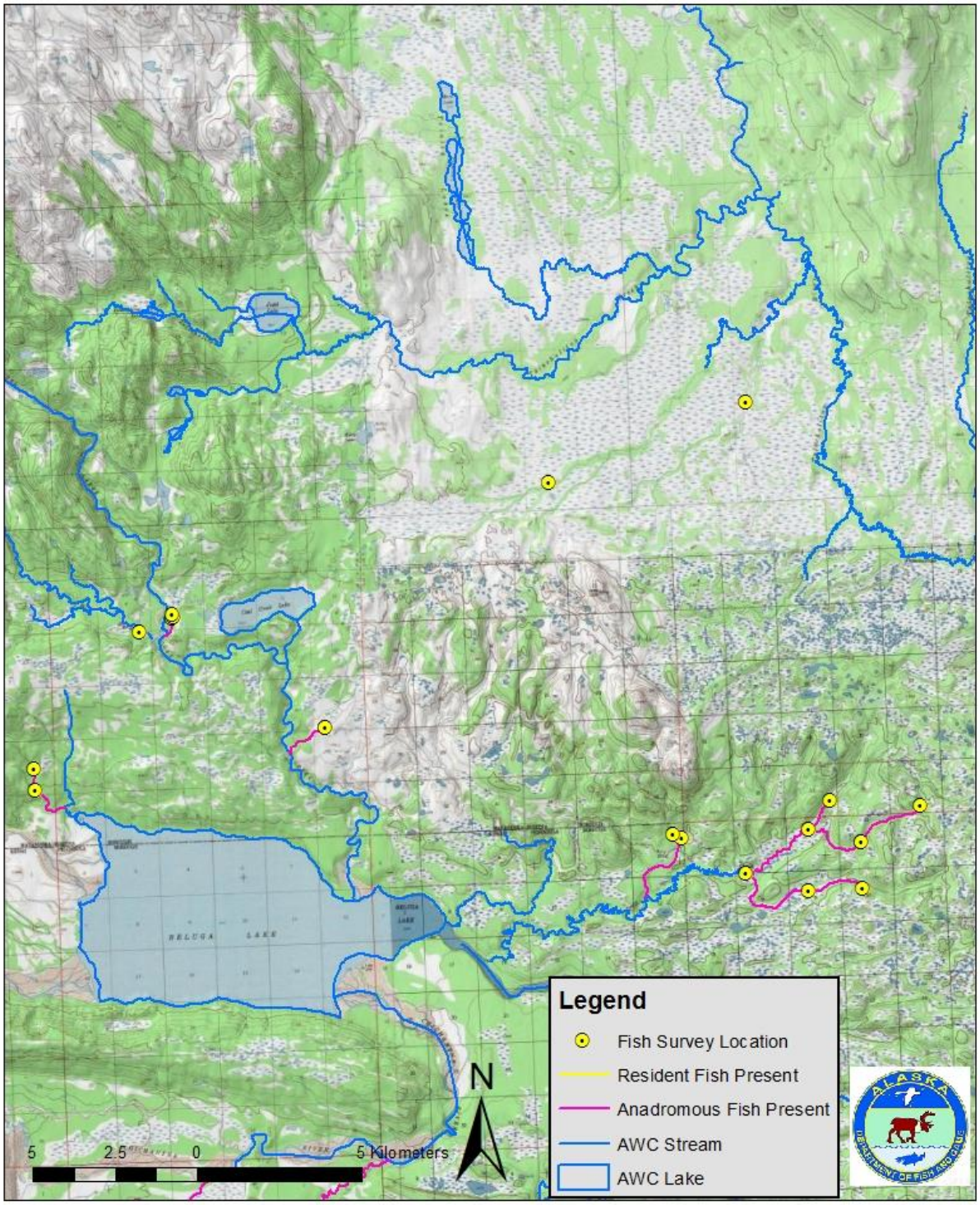


Figure B3.–Status of surveyed reaches within the Drill Creek, Coal Creek, Talachulitna River, and Beluga River watersheds.

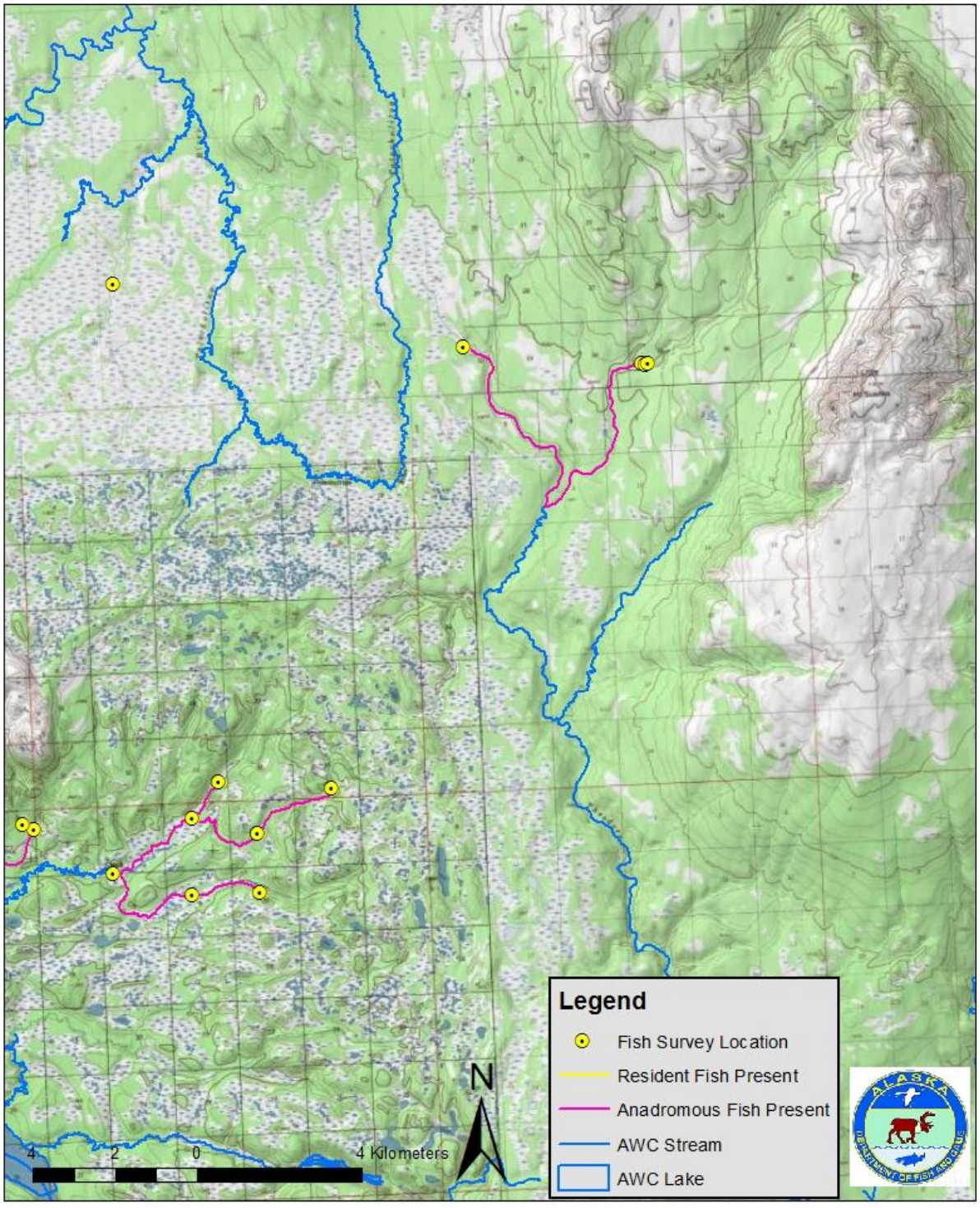


Figure B4.– Status of surveyed reaches within the Theodore River, Drill Creek, and Talachulitna River watersheds.

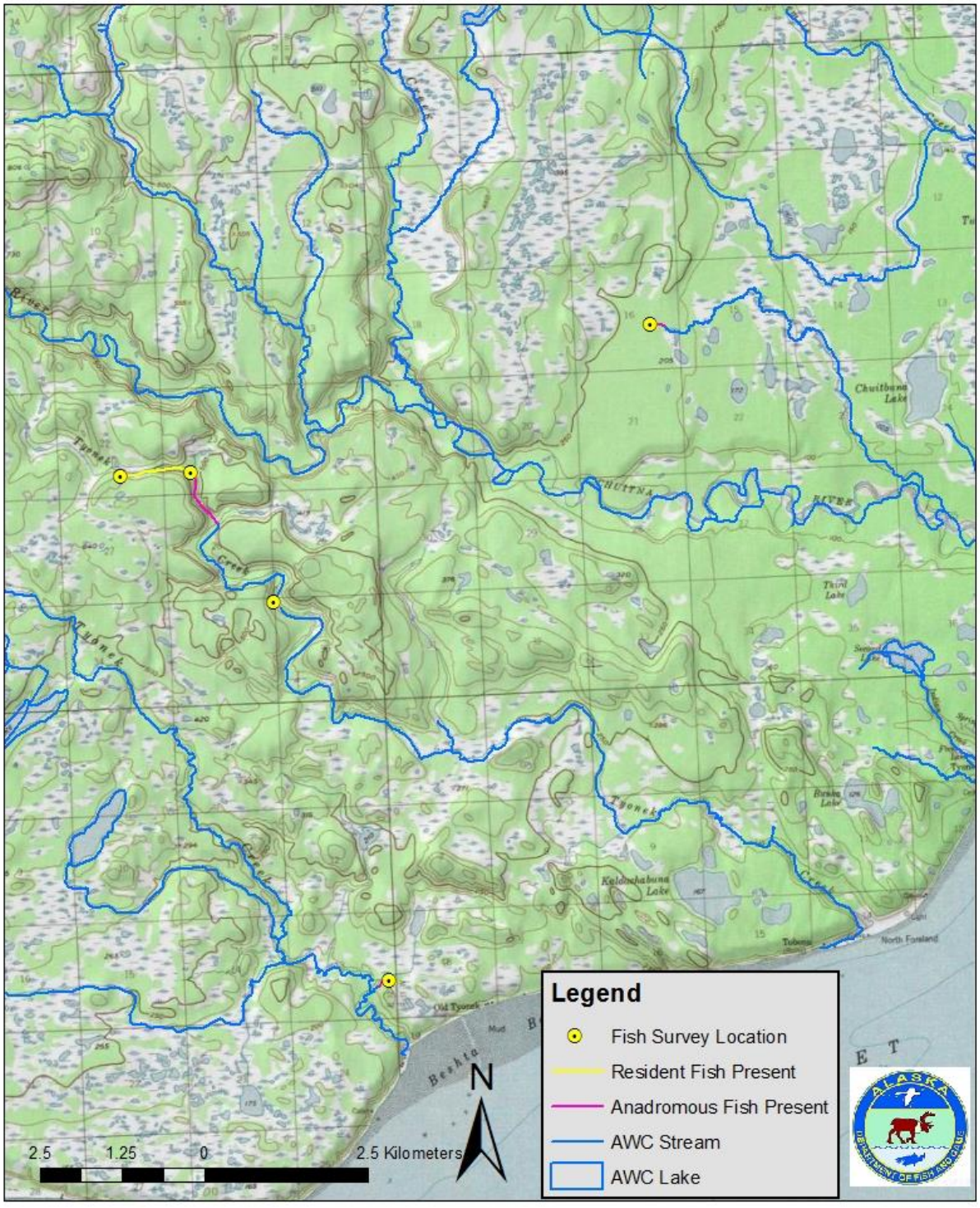


Figure B5.– Status of surveyed reaches within the Tyonek Creek, Old Tyonek Creek, and Chuitna River watersheds.

APPENDIX C: SELECT PHOTOGRAPHS FROM SURVEYED WATERBODIES

Tyonek Creek (247-20-10040) at Site 16-273-2

Juvenile coho salmon captured in Tyonek Creek (247-20-10040) at Site 16-273-2

AWC Stream No. 247-20-10010-2049 at site 16-279-5

AWC Stream No. 247-20-10010-2052-3060-4012 near site 16-285-1

AWC Stream No. 247-20-10010-2052-3060 near site 16-288-2

Headwater area of unnamed tributary of Chuit Creek (AWC Stream No. 247-20-10010-2052) at site 16-289-2

Juvenile coho salmon captured in unnamed tributary of Bishop Creek at site 16-295-2

Unnamed tributary of Bishop Creek at site 16-298-2

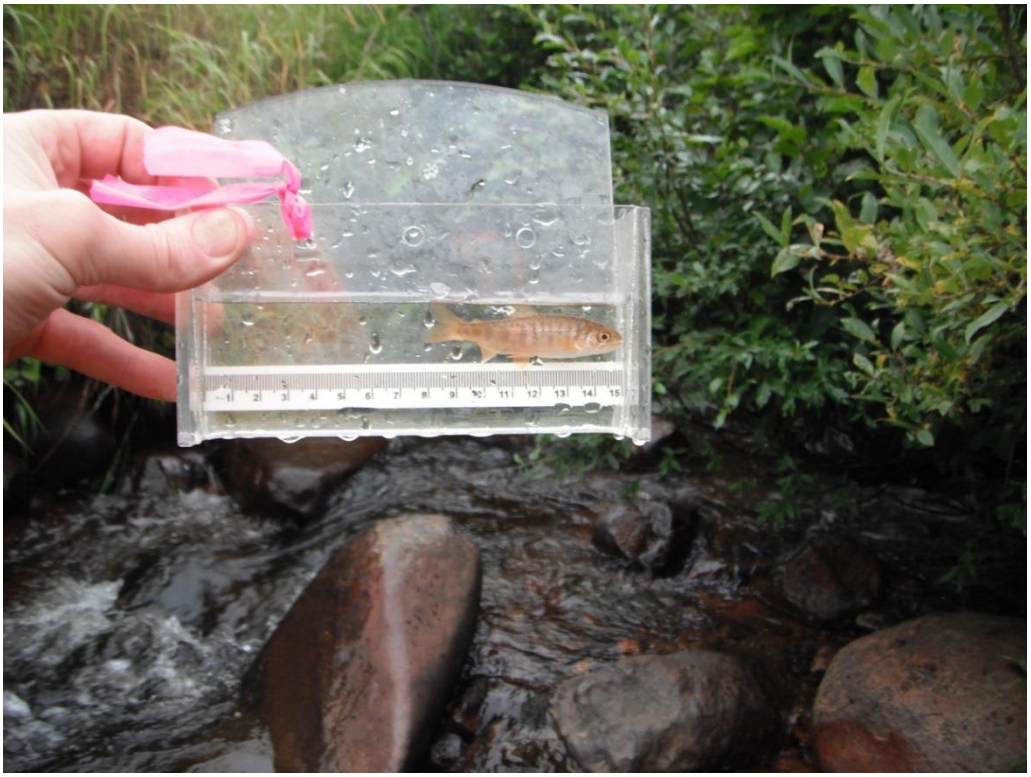
Chichantna Creek near site 16-299-1


Capps Creek at site 16-301-1

Unnamed tributary of Coal Creek at site 16-305-2

Unnamed tributary of Coal Creek at site 16-308-2

Beaver dam located just upstream of site 16-313-3 on tributary of Bishop Creek (similar dams exist downstream)



Juvenile coho salmon from Site 17-9-3.

Unnamed tributary of the Chuitna River at Site 17-11-1.

Juvenile coho salmon from Site 17-14-2.

Upper Wolverine Fork at Site 17-14-3.

Upper Chuit Creek at Site 17-17-3.

Chuitkilnachna Creek at Site 17-18-1.

Drill Creek at Site 17-21-1.

Juvenile coho salmon from Site 17-27-2.

Drill Creek tributary at Site 17-27-2.

Theodore River at Site 17-34-2.

Beaver dam on Theodore River at Site 17-34-3.

Upper Theodore River (west fork) at Site 17-35-1.


Unpermitted culvert downstream from Site 17-37-1.