ACCOUNTING FOR THE INFLUENCE OF LARGE GLACIALLY CARVED LAKES ON UPSTEAM FISH ASSEMBLAGES

Summary of 2010 Field Project

Michael Wiedmer, Ecologist, USGS Forest and Rangeland Ecosystem Science Center, Cascadia Field Station, and College of the Environment, University of Washington mwiedmer@u.washington.edu; (907) 243-7005

SUMMARY OF 2010 FIELD PROJECT

ACCOUNTING FOR THE INFLUENCE OF LARGE GLACIALLY CARVED LAKES ON UPSTEAM FISH ASSEMBLAGES

Principal Investigator: Michael Wiedmer, Ecologist, USGS Forest and Rangeland Ecosystem Science Center, Cascadia Field Station, and College of the Environment, University of Washington mwiedmer@u.washington.edu; (907) 243-7005

Assisting Personnel: Tim Troll, SW Alaska Program Director, The Nature Conservancy and Chair, Southwest Alaska Salmon Habitat Partnership Management Board

Christian Torgersen, Research Landscape Ecologist, USGS Forest and Rangeland Ecosystem Science Center, Cascadia Field Station, and College of the Environment, University of Washington

OBJECTIVES

1. Perform intensive sampling within the Tikchik Lakes and the Upper Mulchatna River area of the Nushagak–Mulchatna drainage to provide data on spatial variation necessary to fit spatial estimation and prediction models.
2. Record characteristics of aquatic and riparian habitats at each sampling location such that sufficient information is documented to provide field-measured covariates to relate to digital spatial data.

PROCEDURES

1. Sampled locations selected to maximize the increase in understanding of landscape controls on fish distribution.
2. For Tikchik Lakes area surveys (Fig. 2) we simultaneously deployed two 3-person teams: a helicopter-supported team sampling the middle and upper reaches of Tikchik Lakes tributaries, and a boat- and floatplane-supported team sampling the 6 large Tikchik lakes and the lower reaches of Tikchik Lakes tributaries.
3. In the Turquoise Lake and Twin Lakes area (Fig. 3), we deployed one 3-person helicopter-supported team.
4. We sampled local fish assemblages with standardized methods developed by Wiedmer (2003) and used to present by ADF&G (Buckwalter et al. 2010).
5. We measured a suite of local water chemistry, channel morphology, and riparian habitat parameters at each sample site. We archived the information in a spatially explicit database developed by Wiedmer and Wallis (Wiedmer 1999), which remains in use today (ADF&G, 2011).

RESULTS

1. Sampled from August 3—20, 2010. 8/3—13 in Tikchik Lakes region, 8/15 in Harris and Old Man creeks, and 8/16-20 in upper Mulchatna region.

Table 1.-Field crew (all volunteered services for field project).

Name	Representing	Study region	Survey Dates
Alex Troll	Volunteer	Tikchik	8/3—7
Chris Konrad	USGS/TNC (hydrology)	Tikchik	8/3—7
Christian Torgersen	USGS/UW (landscape ecology)	Tikchik	8/3—12
Dan Chythlook	Aleknagik Village Council	Tikchik	8/3—15
Dan Young	Lake Clark NP	Upper Mulchatna	8/16—20
Helen Keeling	Lake Clark NP	Upper Mulchatna	8/18—19
John Campbell	Lake Clark NP	Upper Mulchatna	8/16,17,20
Michael Wiedmer	USGS/UW	All	8/3—20
Sarah Wingert	UA Bristol Bay Campus	Tikchik	8/3—11

Name	Representing	Study region	Survey Dates
Todd A Radenbaugh	UA Bristol Bay Campus	Tikchik	8/8—12
Tim Troll	SWASHP/TNC	Tikchik	8/3
Van Kane	UW	Tikchik	8/9—11
Bill Snider	Coastal Helicopters	All	8/3—20

2. Tikchik Lakes survey based at Tikchik Narrows Lodge.
3. Upper Mulchatna survey based at Lake Clark NPS HQ, Port Alsworth.
4. Access permits from DNR-State Parks and NPS.
5. Collected waterbody information at 217 locations.
6. Fish observations at 136 locations.
    a. 4 lake gill net sets (Nuyakuk, Chikuminuk, Upnuk, and Nishlik).
    b. 1 aerial observation (Allen R. spawning sockeye salmon range extension).
    c. 131 stream backpack electrofishing sample reaches.
        i. 88 in Tikchik Lakes
        ii. 4 in Harris Creek/Old Man Creek
        iii. 39 in Upper Mulchatna
7. Barrier (actual or potential) observations at 81 locations.
    a. 45 beaver dams.
    b. 1 landslide.
    c. 20 no surface flow.
    d. 15 high gradients/waterfalls.

Table 2.-Fish collected or observed.

Common Name	Scientific Name	N	Fork length (mm)		Sites observed
			Min.	Max.	
slimy sculpin	*Cottus cognatus*	988	11	101	74
Dolly Varden	*Salvelinus malma*	468	21	365	64
no fish collected or observed		-			23
sockeye salmon	*Oncorhynchus nerka*	101	22	520	15
coho salmon	*Oncorhynchus kisutch*	185	33	116	15

Common Name	Scientific Name	N	Fork length (mm)		Sites observed
Arctic grayling	*Thymallus arcticus*	23	119	430	10
round whitefish	*Prosopium cylindraceum*	27	79	460	8
Chinook salmon	*Oncorhynchus tshawytscha*	53	58	75	8
lake trout	*Salvelinus namaycush*	24	360	910	5
ninespine stickleback	*Pungitius pungitius*	9	30	51	5
Arctic char	*Salvelinus alpinus*	23	185	600	4
coastrange sculpin	*Cottus aleuticus*	7	31	71	3
burbot	*Lota lota*	3	122	242	2
threespine stickleback	*Gasterosteus aculeatus*	1	50	50	1
Arctic-Alaskan brook lamprey paired species	*Lampetra camtschatica/Lampetra alaskense*	1	110	110	1
sculpin-unspecified	*Cottidae*	25	24	87	1
humpback whitefish	*Coregonus pidschian*	3	390	450	1
Total	Species N = 15	1953			

BUDGET AND SCHEDULE

Field data collection completed on schedule and under budget.

PRODUCTS

1. Linked records (including 2330 spatially explicit images) will be posted on the Alaska Freshwater Fish Inventory website (ADF&G, 2011).
2. 21 nominations submitted to the AWC (e.g., Johnson and Blanche 2010); including 100s of kilometers of previously undocumented Chinook and coho rearing habitat.
3. Extensive new data on habitats and fish assemblages in streams tributary to large glacially-formed lakes for use in models estimating relations between landscape variables and local fish assemblages and for predicting fish assemblages in unsampled locations.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 2011. Alaska Freshwater Fish Inventory http://www.sf.adfg.state.ak.us/SARR/Surveys/index.cfm. Alaska Department of Fish and Game, Division of Sport Fish.

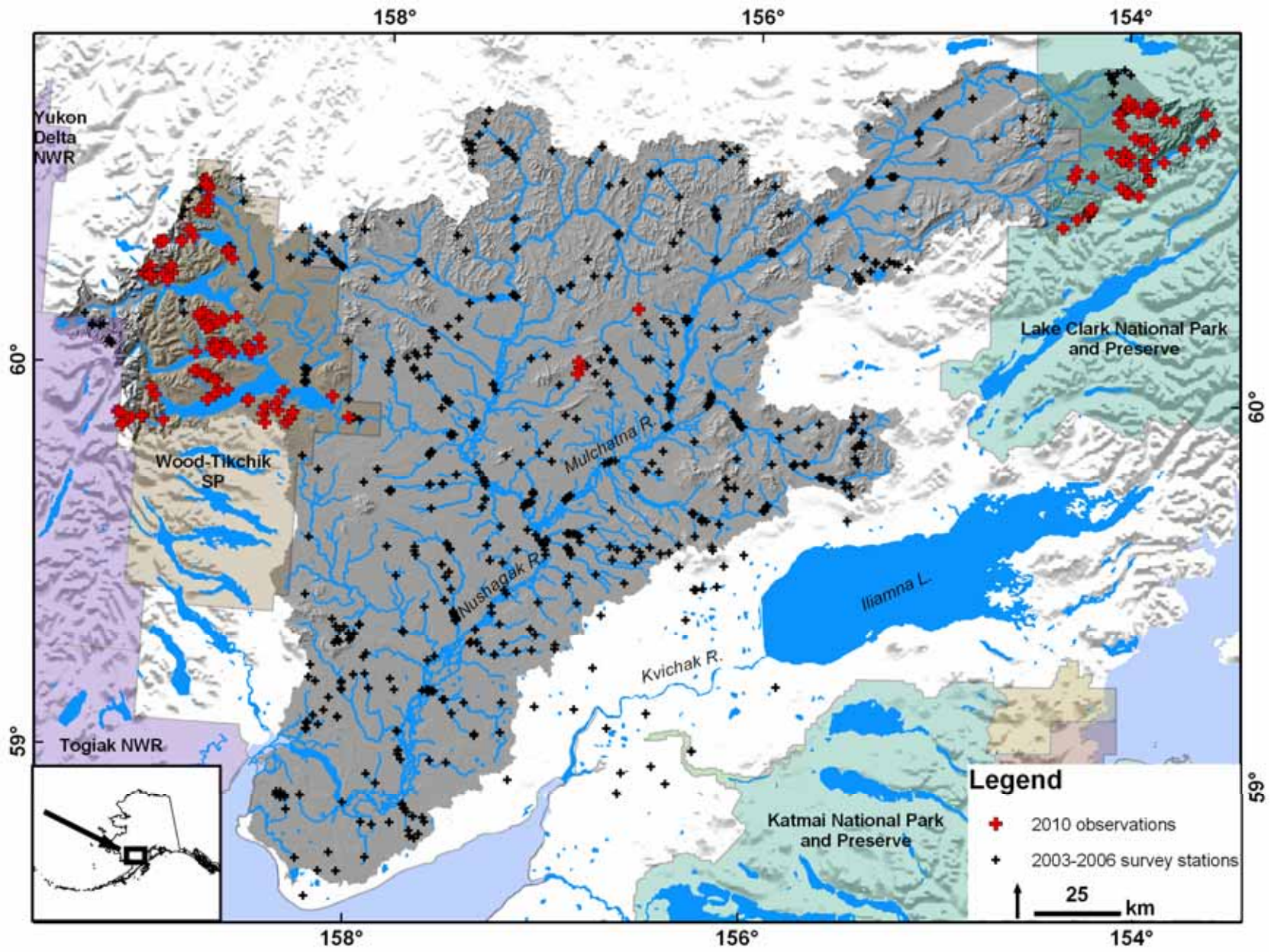
Buckwalter, J. D., J. M. Kirsch, and D. J. Reed. 2010. Fish inventory and anadromous cataloging in the lower Yukon River drainage, 2008. Alaska Department of Fish and Game, Fishery Data Series No. 10-76, Anchorage.

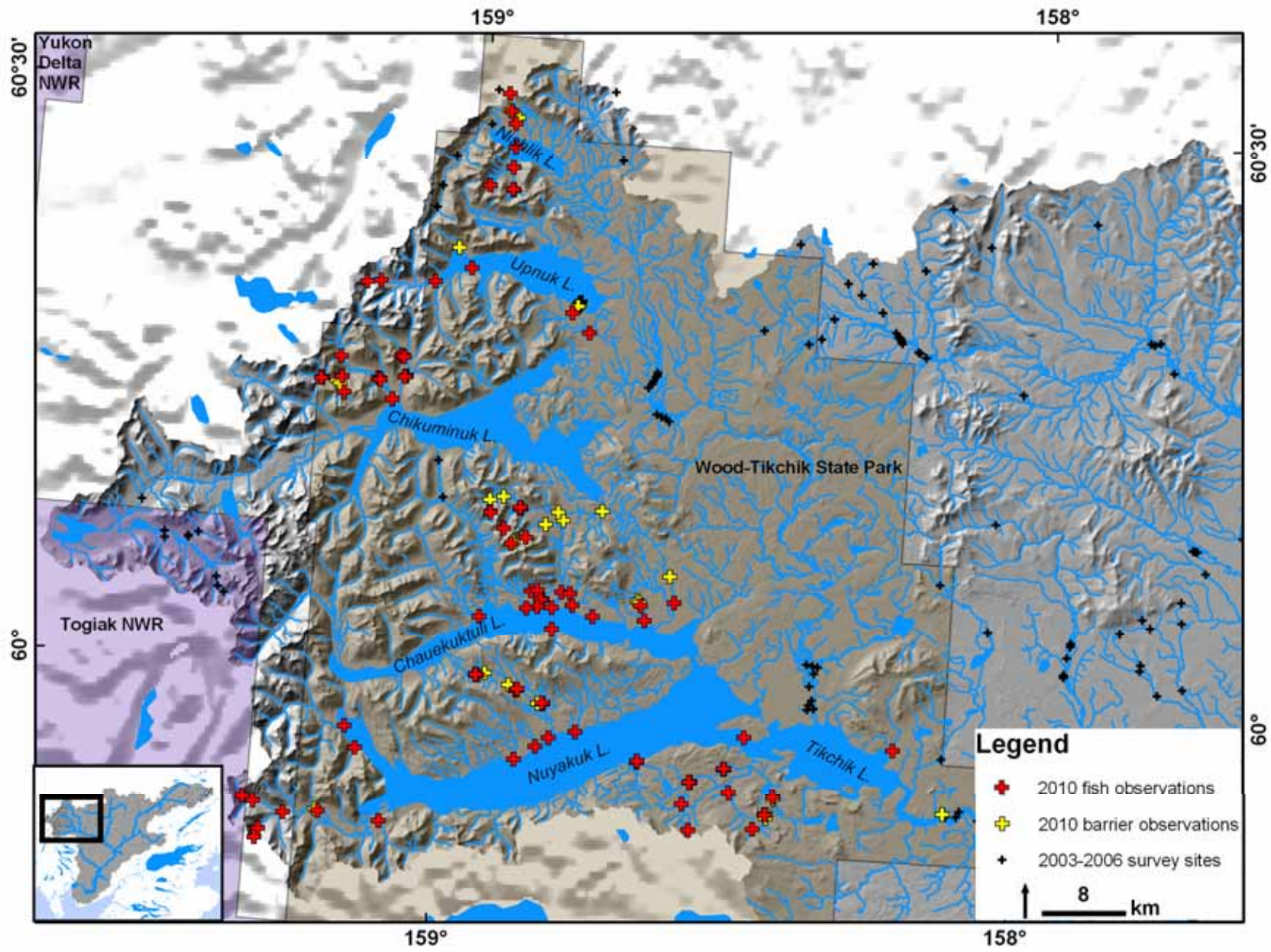
Johnson, J., and P. Blanche. 2010. Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Southwestern Region, Effective June 1, 2010, Special Publication No. 10-08. Alaska Department of Fish and Game, Anchorage, AK.

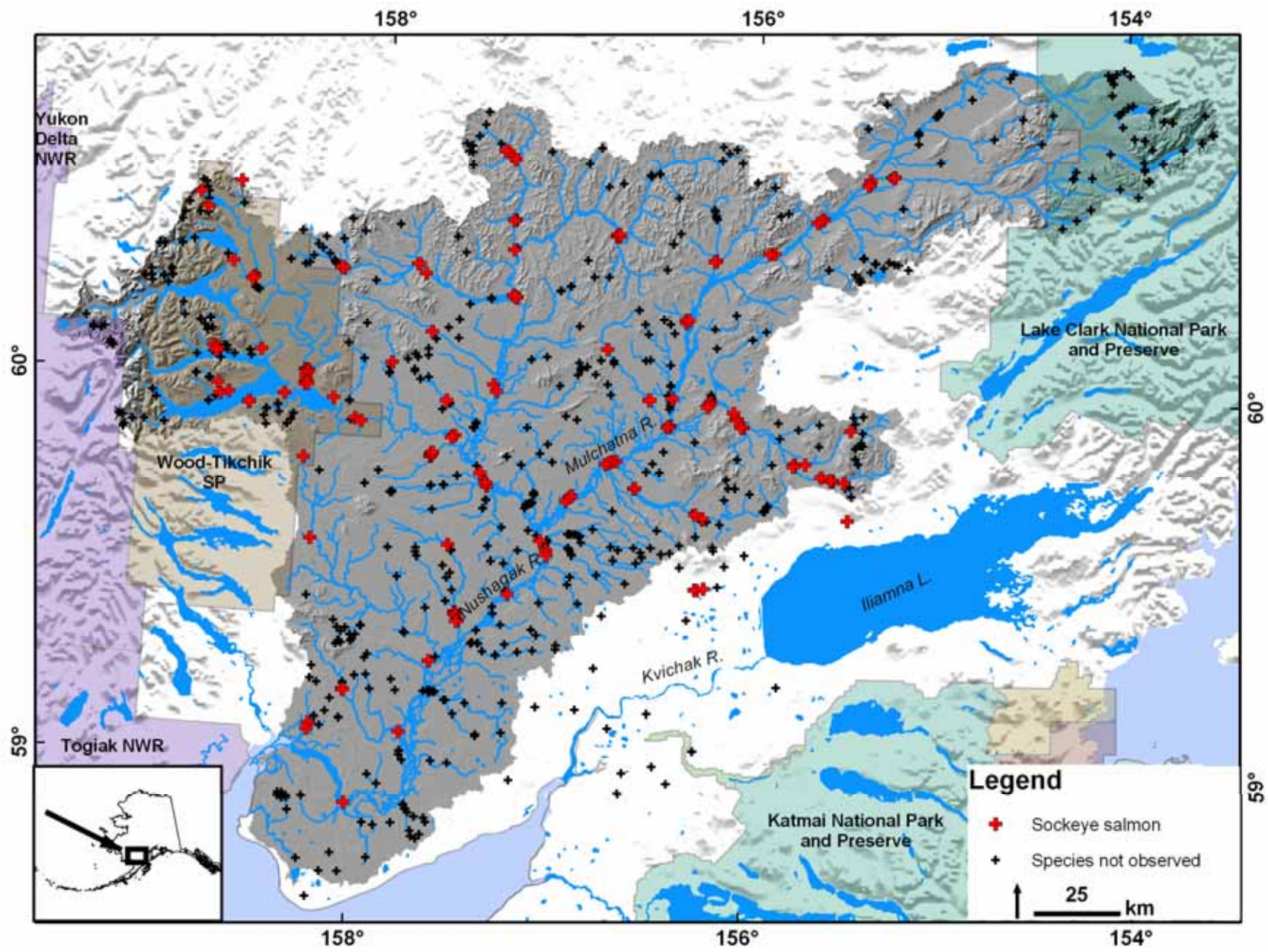
Wiedmer, M. 1999. Carbon Mountain Tract 1998 fish habitat survey, Technical Report No. 99-4. Alaska Department of Fish and Game, Habitat and Restoration Division, Anchorage.

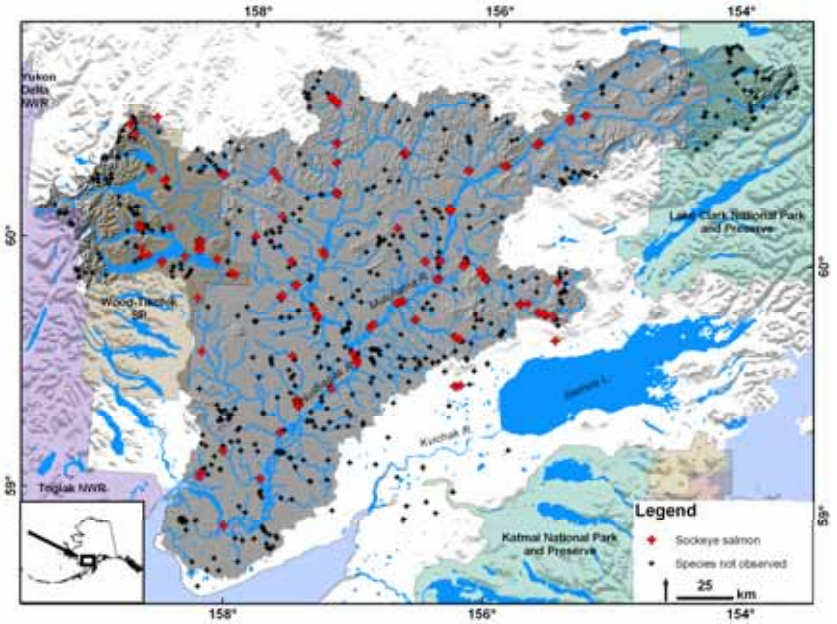
Wiedmer, M. 2003. Synoptic inventory of anadromous fish distribution in Southcentral Alaska freshwaters: FY 2004 Operational Plan. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage.

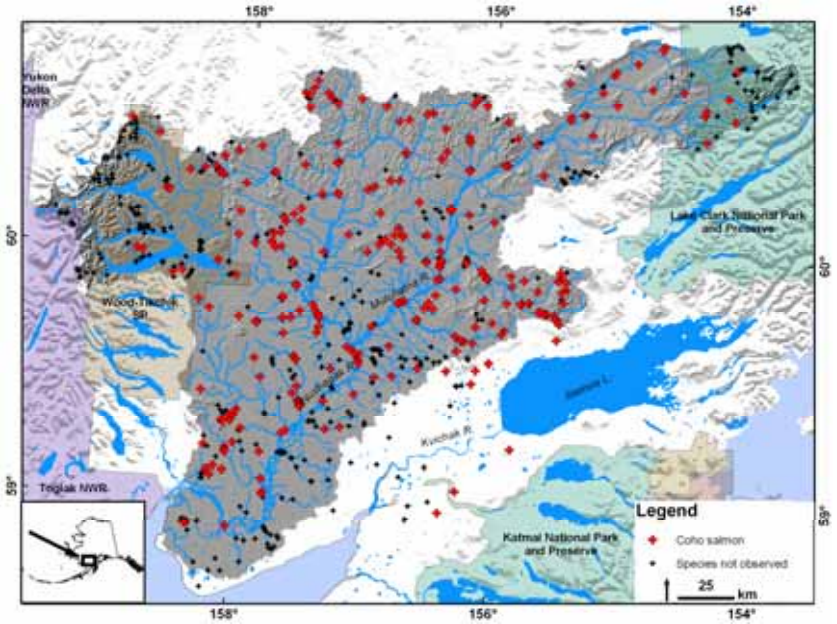
APPENDIX A. STUDY AREA MAPS

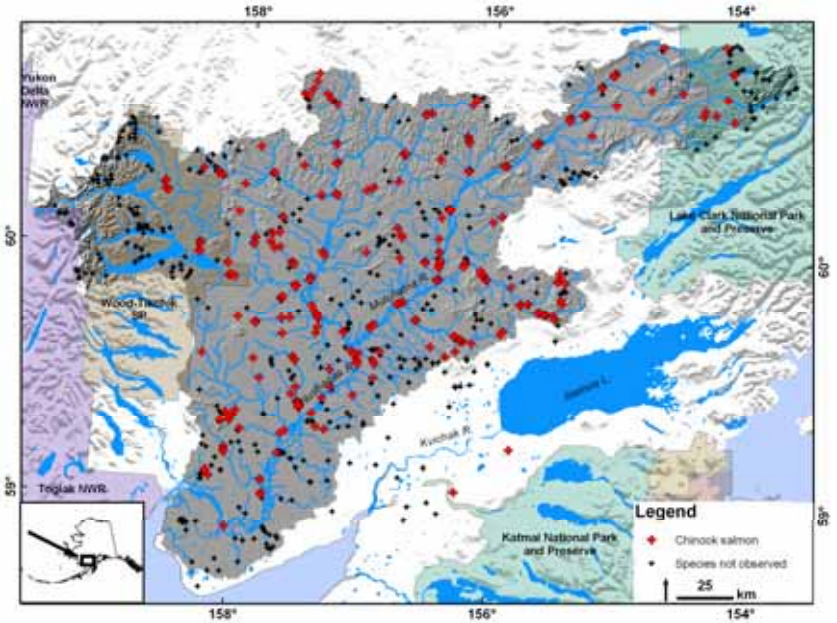

158°
156°
154°
60°
59°
Yukon Delta NWR
Wood-Tikchik SP
Togiak NWR
Lake Clark National Park and Preserve
Katmai National Park and Preserve
Mulchatna R.
Nushagak R.
Kvichak R.
Iliamna L.
Legend
2010 observations
2003-2006 survey stations
25 km

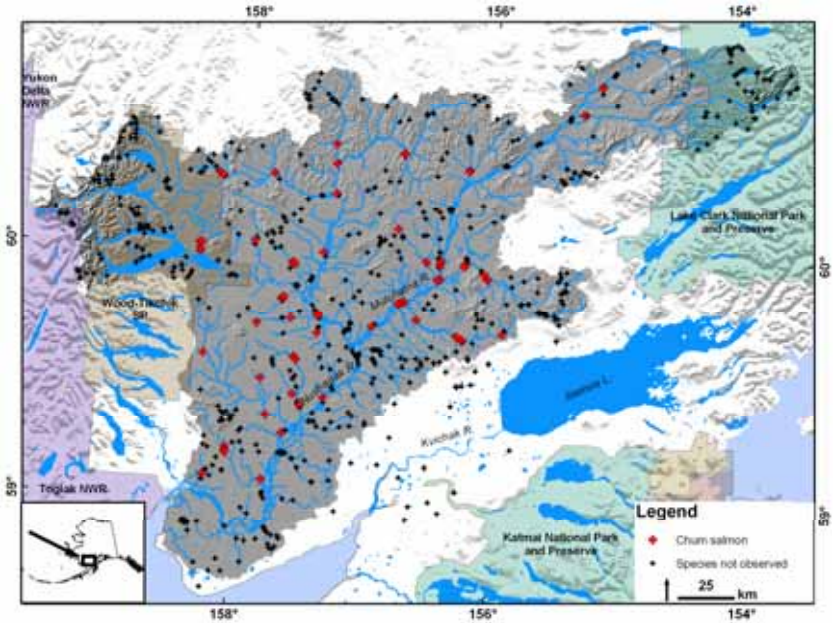

159°
158°
60°30'
60°
Yukon Delta NWR
Upnuk L.
Chikuminuk L.
Wood-Tikchik State Park
Togiak NWR
Chauekuktuli L.
Nuyakuk L.
Tikchik L.
Legend
2010 fish observations
2010 barrier observations
2003-2006 survey sites
8
km

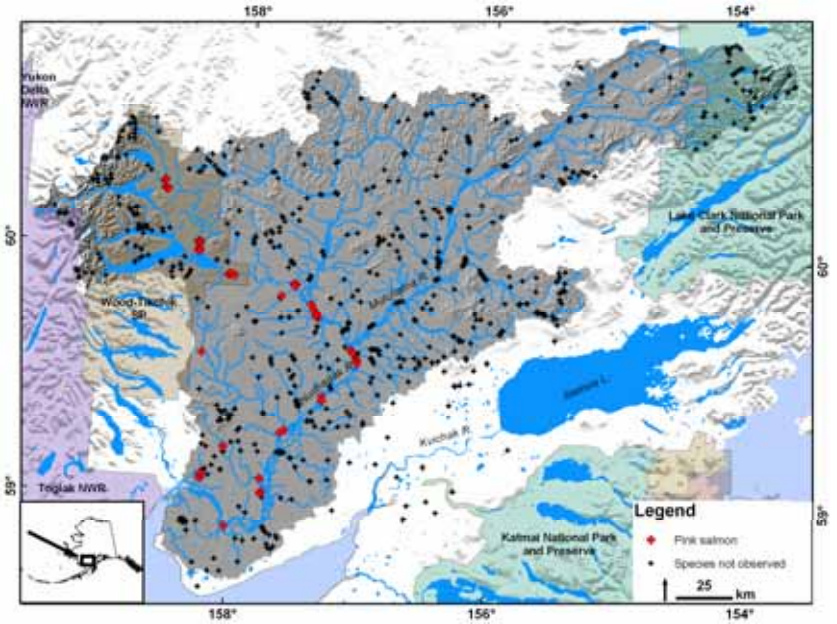

158°
156°
154°
60°
59°
Yukon Delta NWR
Wood-Tikchik SP
Togiak NWR
Lake Clark National Park and Preserve
Katmai National Park and Preserve
Mulchatna R.
Nushagak R.
Kvichak R.
Iliamna L.
Legend
Sockeye salmon
Species not observed
25
km

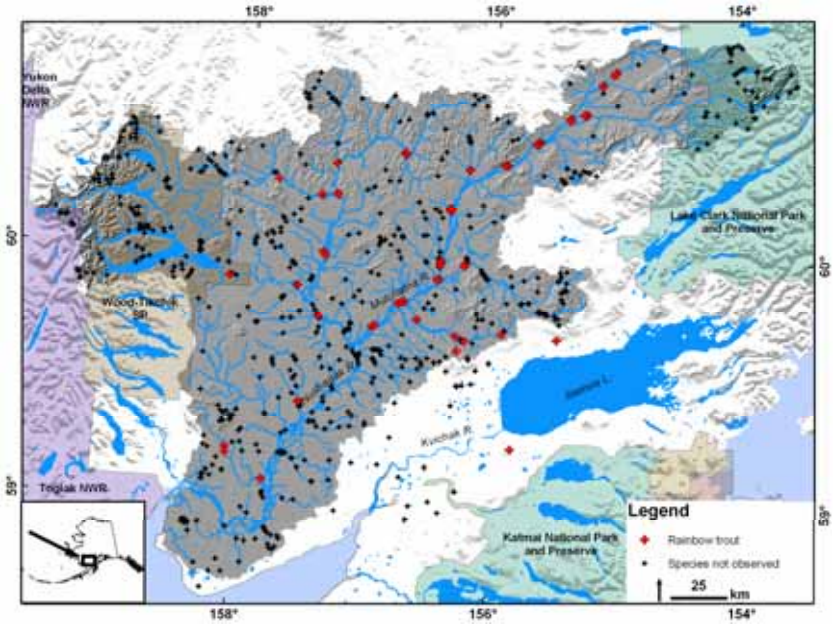

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Katmai National Park and Preserve
Legend
Sockeye salmon
Species not observed
25 km

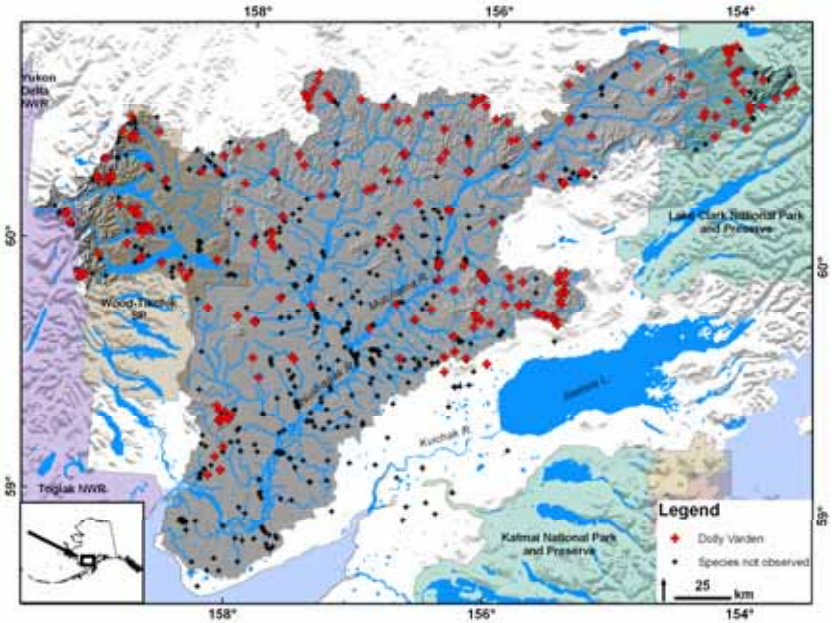

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Katmai National Park and Preserve
Legend
Coho salmon
Species not observed
25 km

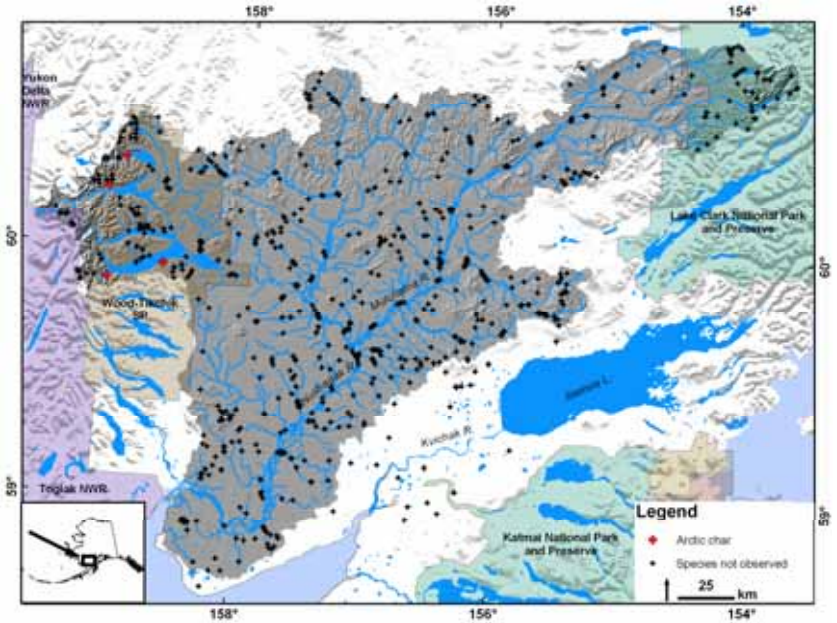

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Katmai National Park and Preserve
Legend
Chinook salmon
Species not observed
25 km

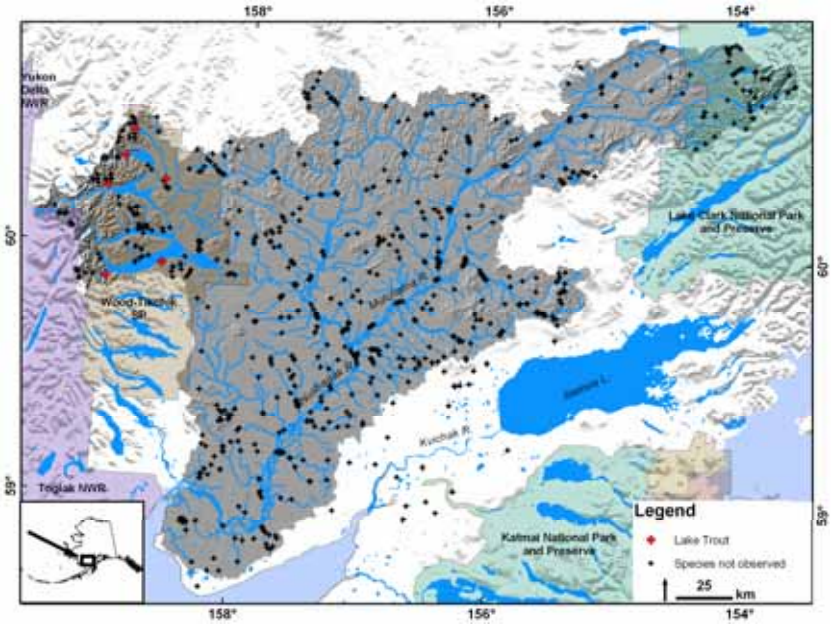

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Katmai National Park and Preserve
Legend
Chum salmon
Species not observed
25 km

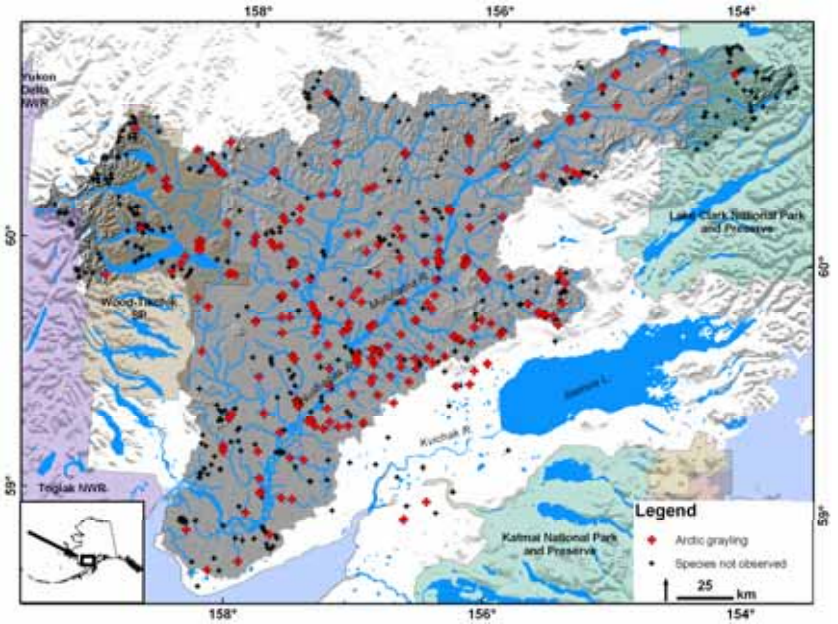

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Pink salmon
Species not observed
25 km

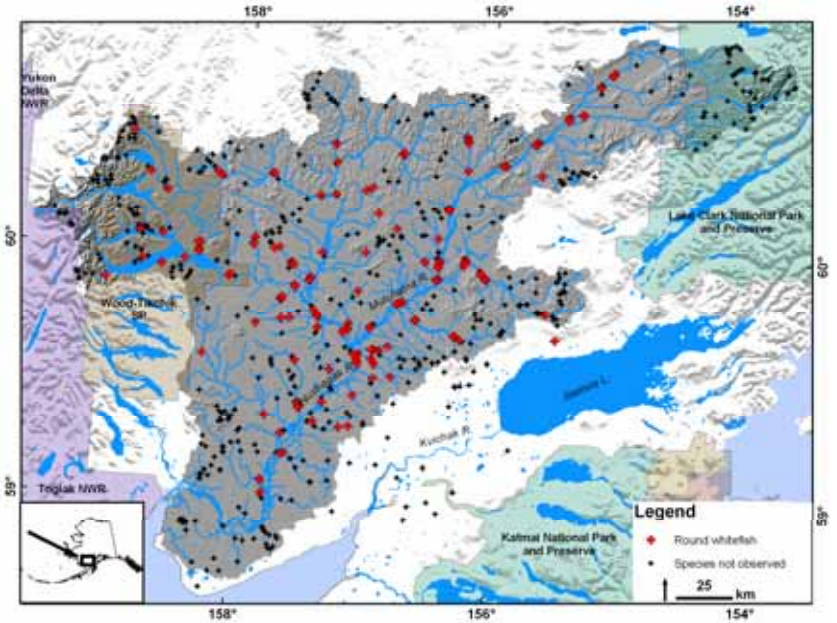

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Rainbow trout
Species not observed
25 km

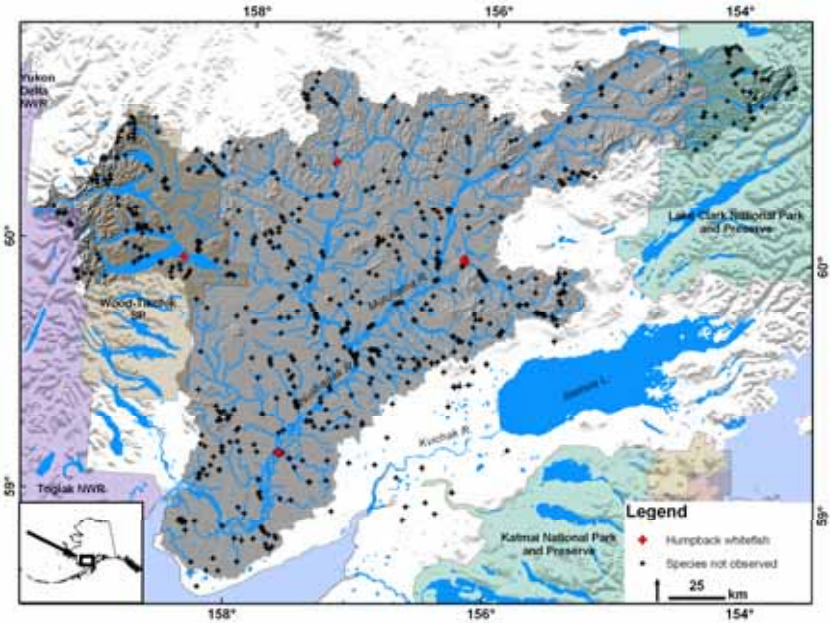

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Dolly Varden
Species not observed
25 km

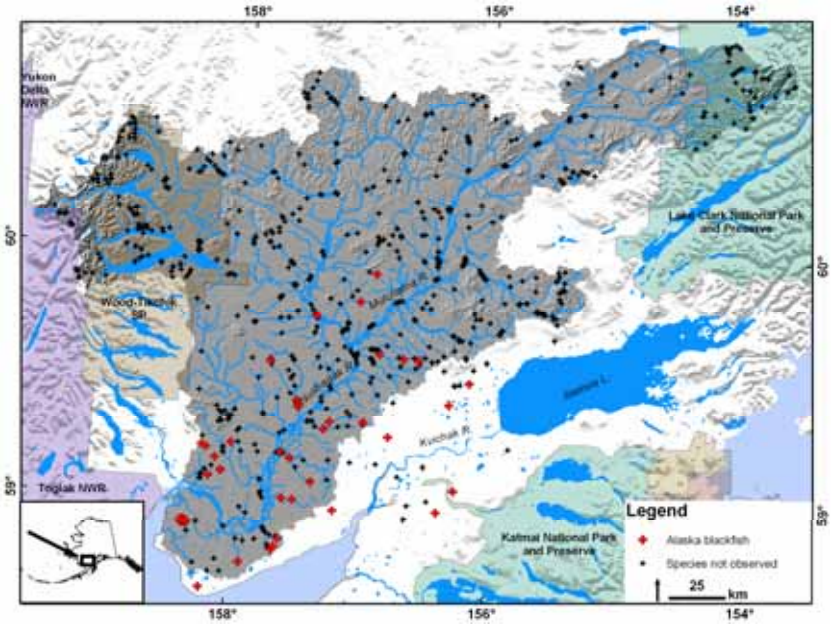

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Arctic char
Species not observed
25 km

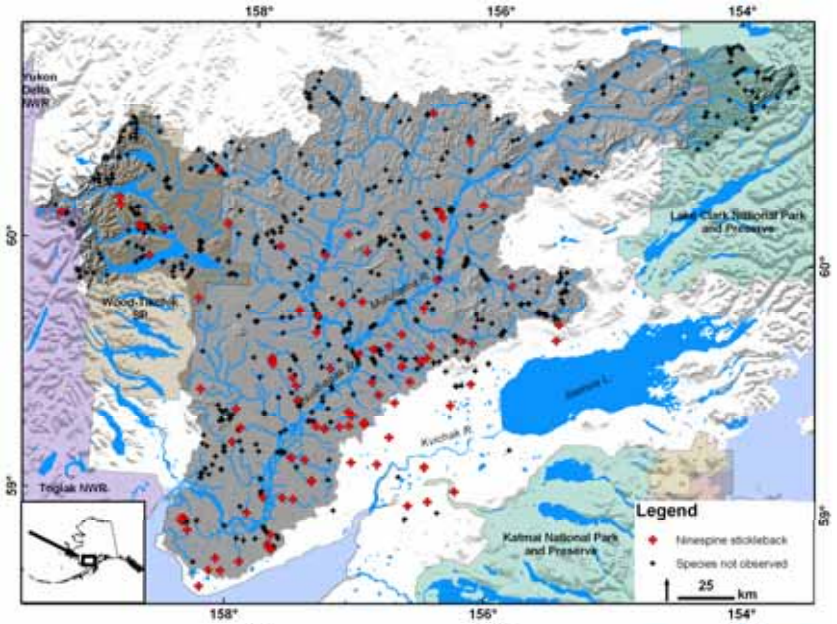

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Lake Trout
Species not observed
25
km

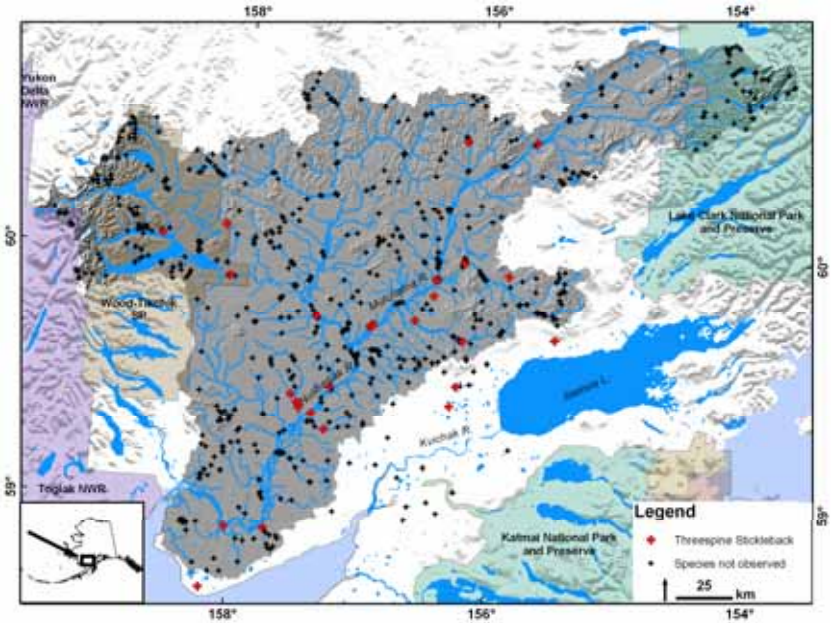

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Arctic grayling
Species not observed
25
km

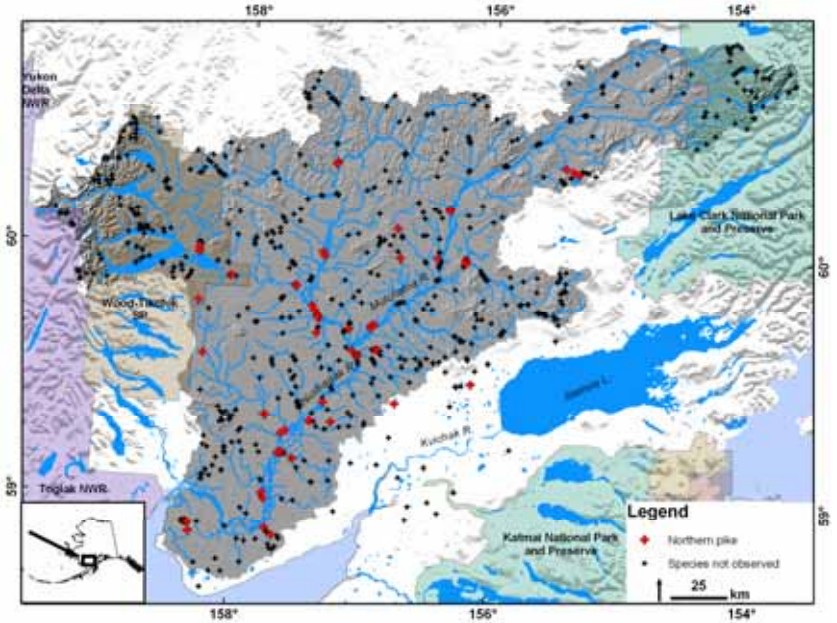

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Round whitefish
Species not observed
25
km

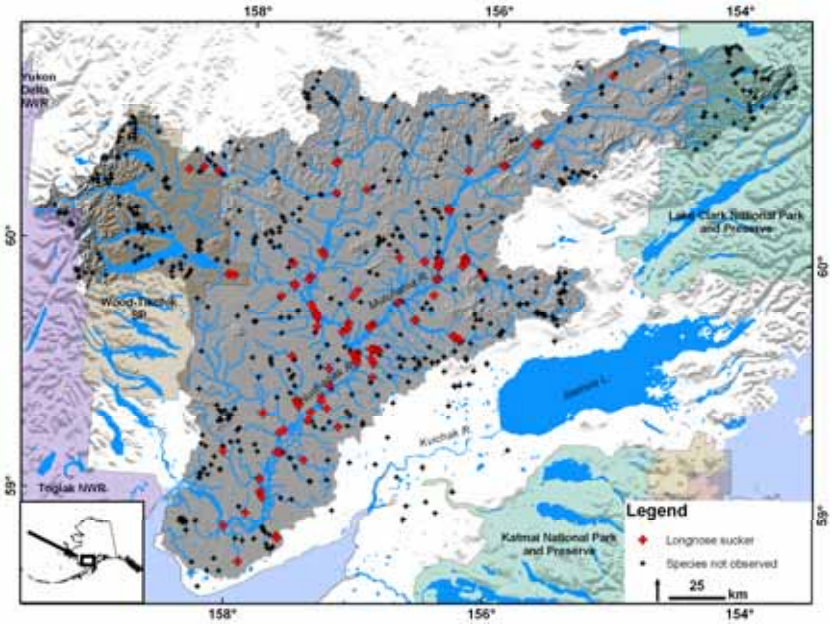

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Humpback whitefish
Species not observed
25
km

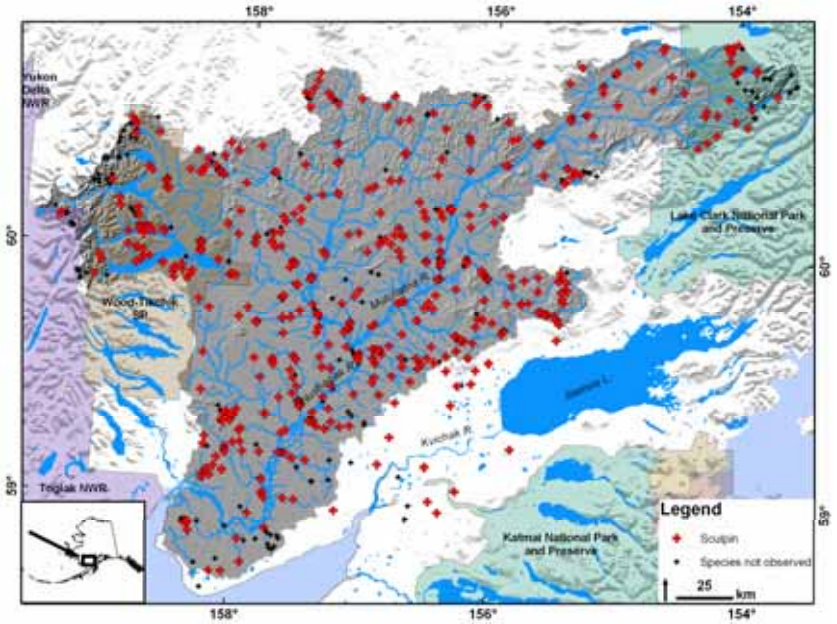

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik State Park
Togiak NWR.
Kuskokwim R.
Nushagak R.
Iliamna L.
Kvichak R.
Katmai National Park and Preserve
Legend
Alaska blackfish
Species not observed
25 km

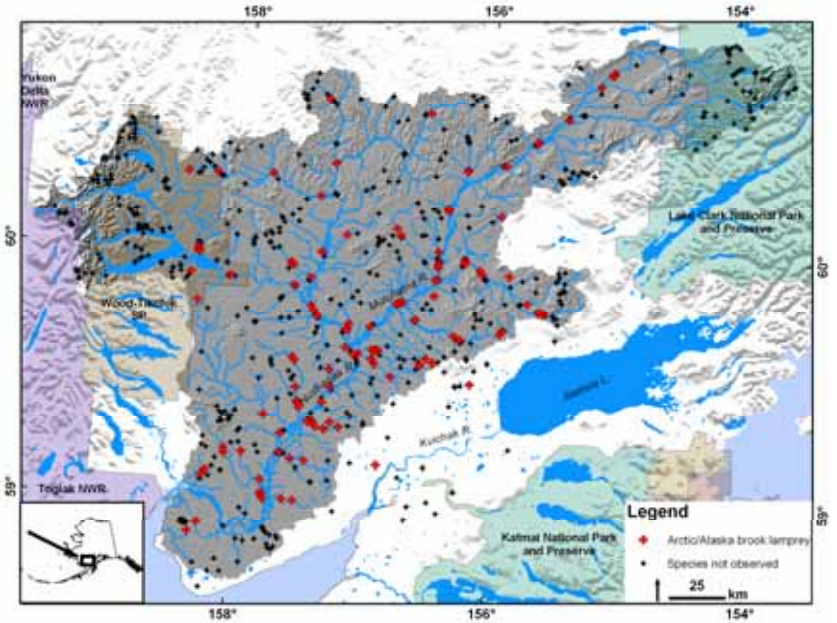

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik State Park
Togiak NWR.
Kuskokwim R.
Nushagak R.
Iliamna L.
Kvichak R.
Katmai National Park and Preserve
Legend
Ninespine stickleback
Species not observed
25 km

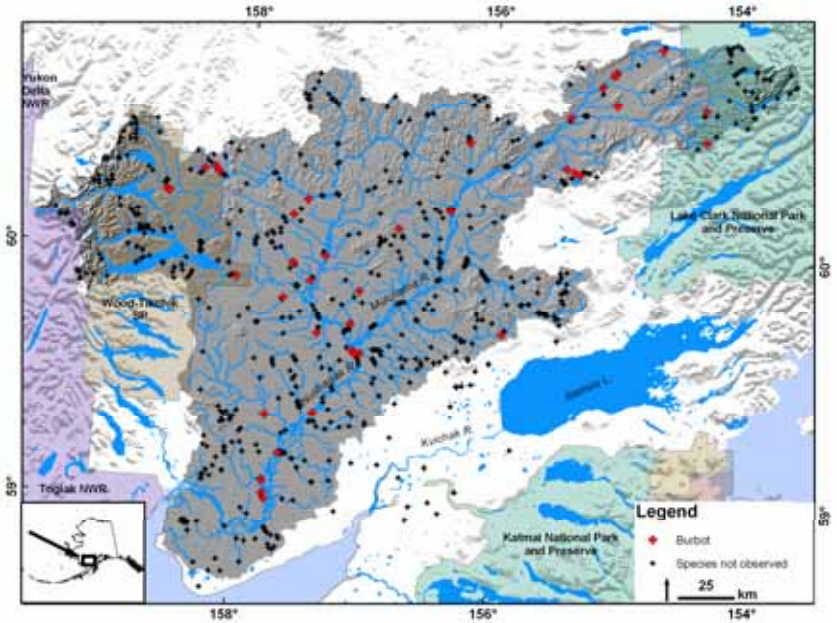

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik State Park
Togiak NWR.
Kuskokwim R.
Nushagak R.
Iliamna L.
Kvichak R.
Katmai National Park and Preserve
Legend
Threespine Stickleback
Species not observed
25 km

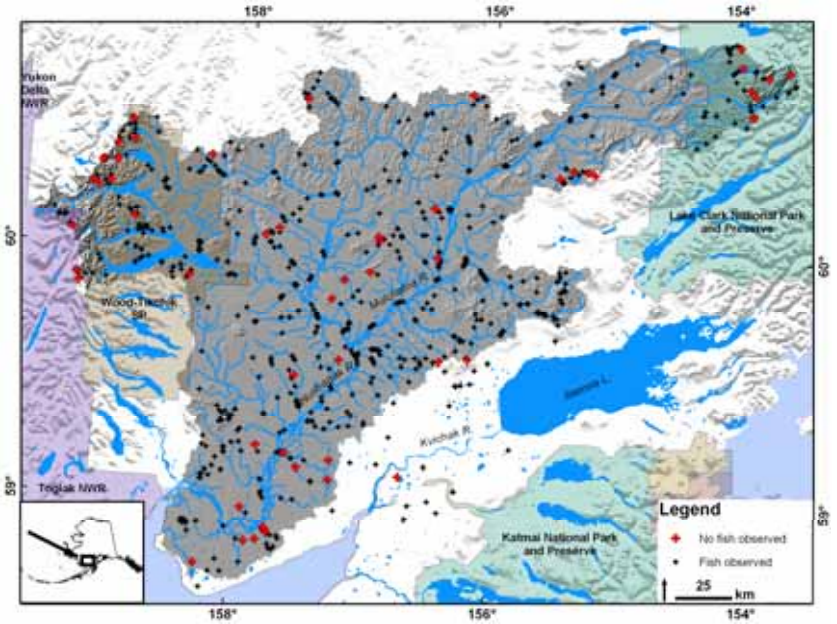

158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik State Park
Togiak NWR.
Kuskokwim R.
Nushagak R.
Iliamna L.
Kvichak R.
Katmai National Park and Preserve
Legend
Northern pike
Species not observed
25 km


158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Longnose sucker
Species not observed
25
km


158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Sculpin
Species not observed
25
km


158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Arctic/Alaska brook lamprey
Species not observed
25
km


158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Iliamna L.
Katmai National Park and Preserve
Legend
Burbot
Species not observed
25
km


158°
156°
154°
60°
59°
Yukon Delta NWR
Lake Clark National Park and Preserve
Wood-Tikchik SP
Togiak NWR
Kvichak R.
Katmai National Park and Preserve
Legend
No fish observed
Fish observed
25 km