


Flying the Frontier: Perspectives from the Great Alaska Freshwater Fish Inventory

C. Nate Cathcart  | Western Native Fishes Committee, Western Division of the American Fisheries Society, 2410 E 16th Avenue, Anchorage, AK 99508. E-mail: cncathca@gmail.com

“Roads? Where we’re going, we don’t need roads.”
-Dr. Emmett Lathrop Brown,
inventor of the Flux Capacitor.

In early 2018, I landed with the Alaska Department of Fish & Game and their Alaska Freshwater Fish Inventory program, a taskforce dedicated to documenting the occurrence and distribution of fishes—with a focus on anadromous species such as Pacific Salmon *Oncorhynchus* spp.—throughout the state’s abundant waters far from the few roads and towns (Alaska Department of Fish & Game 2018). This program guides Alaska state law (AS 16.05.871) by listing qualifying waters in the *Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes*, or the Anadromous Waters Catalog (AWC; Johnson and Blossom 2018). Besides the mission, the work is glamorous; using helicopters to access wilderness streams of Alaska’s frontier.

My first rodeo with the Freshwater Fish Inventory program took me to the Arctic Circle where the upper Koyukuk and Kobuk river basins flow rich with Jack London-esque legends of the Brooks Range and the sustained legacies of Inupiaq and Athabascan people (Figure 1). This area is important because it has sustained first nations for centuries and now provides a corridor for a proposed 340-km Ambler Road project that would connect the Dalton Highway with mines north of Kobuk village (Figure 2). The 1980 Alaska National Interest Lands Conservation Act made this potential road possible because it established a right-of-way through Gates of the Arctic National Park and Preserve for economic development. Before industrial extraction and modifications loomed, Bob Marshall (The Wilderness Act’s sparkplug who also helped found The Wilderness Society) popularized the upper Koyukuk River from his travels in the decade preceding his death in 1939 (Marshall 1980). The Kobuk River has no human symbol that I know of and is instead renowned for the world’s most mega

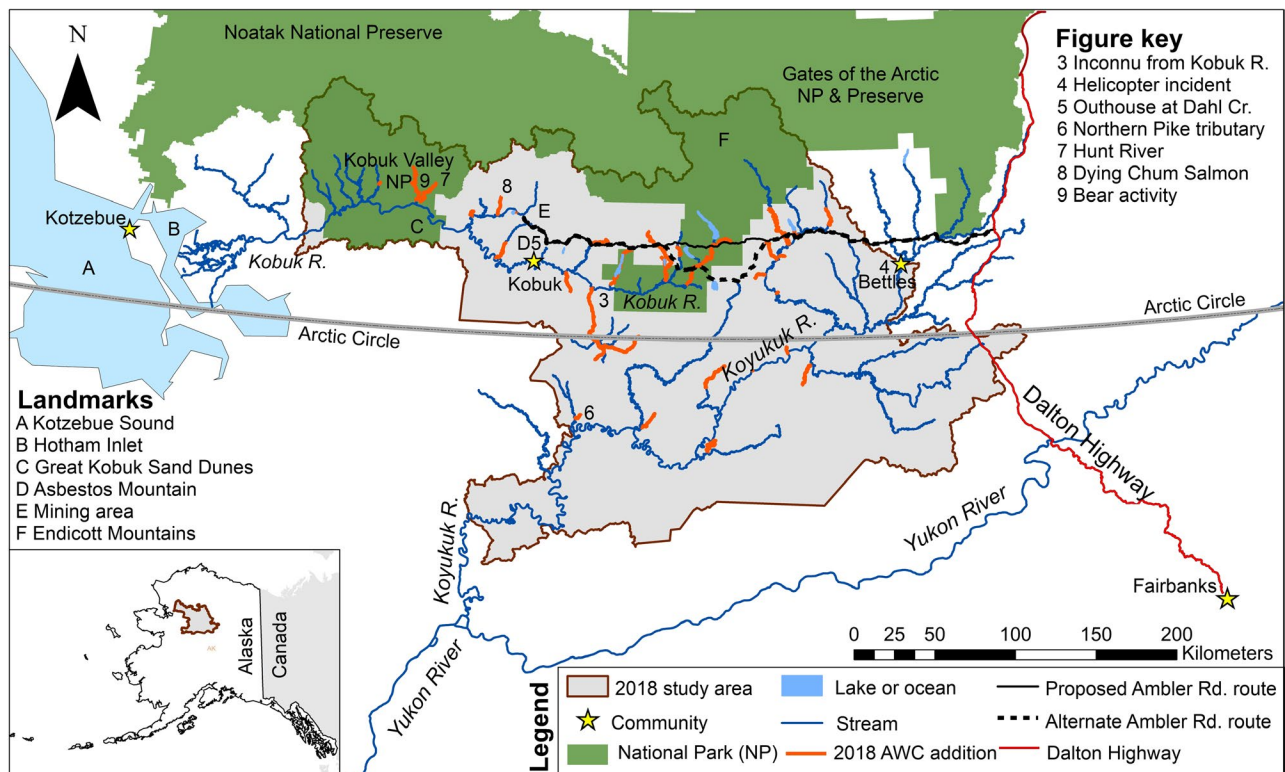


Figure 1. Study area for 2018 Alaska Freshwater Fish Inventory with landmarks and figure key to relate to pictures. AWC = Anadromous Waters Catalog

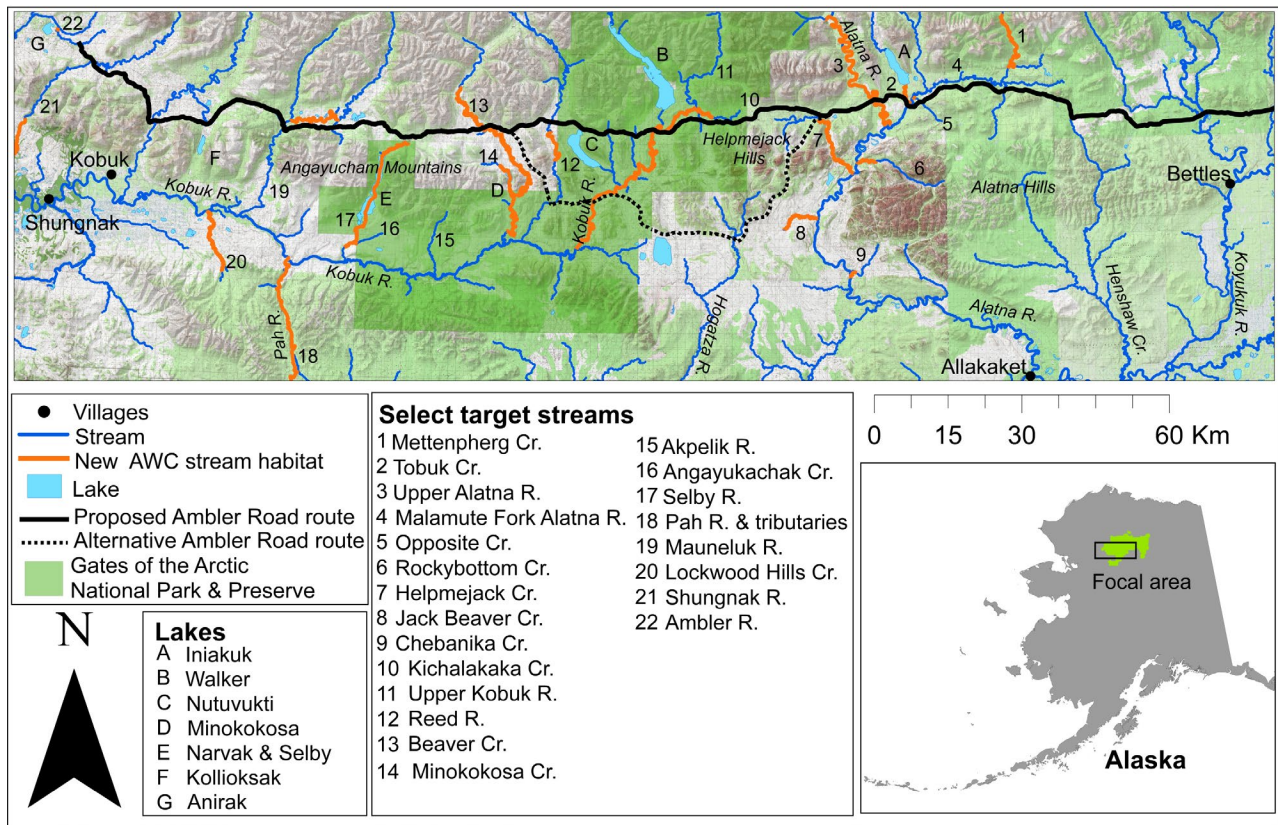


Figure 2. Study area for 2018 Alaska Freshwater Fish Inventory within proposed Ambler Road corridor and select target streams. AWC = Anadromous Waters Catalog

whitefish, the Inconnu *Stenodus leucichthys* (Figure 3), AKA the Sheefish, Tarpon of the north, or bush bass (Alt 1987).

During our first half of sampling from late July until early August, 2018, we lived on the ancient floodplain of the Koyukuk River in the village of Bettles, west of the Dalton Highway and home to 20 or so adults. Bettles is a hub for villagers, hunters, and Gates of the Arctic National Park adventurers. My supervisor, the raft electrofishing crew leader familiar with this program since its inception in 2002, and I (backpack electrofishing crew leader) each led a team of three people, including a helicopter pilot. The raft crew sampled one long reach of a larger river per day, while the backpack team chased fish at 4–12 wadeable sites a day. It took me a few days to learn how to best select sampling sites that would be great candidates for inclusion to the AWC. For example, some preselected sites were easily wadeable but because they were far upstream from a mainstem river, were potentially less accessible to anadromous fishes due to intense beaver activity. Yet if we landed too far downstream, we may be in areas more accessible to anadromous fishes but our methods would be less effective in larger waters. Therefore, we often recalibrated our preselected sites based on aerial observations to maximize anadromous fish observation potential.

By the time my crew was humming along, our Robinson R44 helicopter wasn't. On our fifth field day, about 5 minutes after take-off from Bettles, at an altitude from 150–300 m, we heard a loud hollow "POW!" and felt a massive lurch in the chopper. The pilot was calm and said, "That was a major engine failure." I imagined his rigid body at the controls stabilized the craft from the death spirals of doomed Hollywood helicopters. A lot of thoughts go through your head when

you are autorotating to earth. I first thought it was serene and the definition of surreal to be falling toward such a beautiful landscape on a bluebird day. My second thought had more gravity as I looked below and wondered where we would land: spruce forest or bog? And the last thought asked myself if I should be taking pictures. We splashed down hard into a bog with the tail and other parts falling off (Figure 4). Blueberries never tasted sweeter. The next day we were back in the saddle adding Chinook Salmon *Oncorhynchus tshawytscha* rearing and spawning habitats to the AWC and, once we got a new helicopter, we only gained momentum. So it goes.

Leaving Bettles, we flew west along the ancient Kobuk portage, a low valley used by native people to move between the Koyukuk and Kobuk river drainages. Until mid-August, our new home sat north of Kobuk village in a National Park Service cabin at the base of Asbestos Mountain, surrounded by blueberries and furnished with an airy outhouse and outdoor shower (Figure 5). Now our work coincided with the annual upstream migration of Inconnu. Inupiaq lore explains the frequent late-summer storms through a trade between an Inconnu and the semipalmated plover *Charadrius semipalmatus* that gave a beautiful band (or beaded necklace) to the shorebird in exchange for windy, stormy skies that hide Inconnu from fishing activity (Georgette and Loon 1990). However, relatively clear, sunny, and dry skies blessed us throughout our stay. This weather especially aided aerial surveys. For example, while surveying the bowl-shaped Pah River drainage (site of the world record Inconnu catch), we had sampled no salmon from eight deep, dark, tannic tributaries. When the stars aligned late in the day, we spied Chum Salmon *O. keta* spawning in a section of sunlit

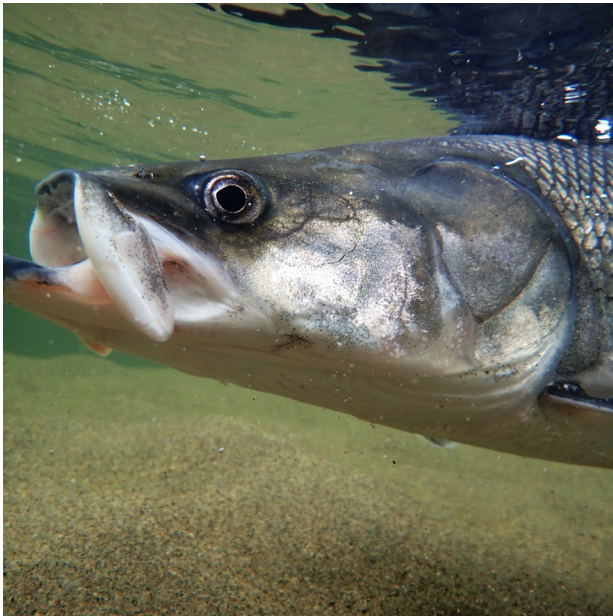


Figure 3. A Kobuk River Inconnu from the mouth of the Pah River.



Figure 4. The consequence of an engine failure.

stream that would add nearly 150 km to the AWC. Another day, we flew from Kobuk over the divide back to the Koyukuk River drainage and followed a clear river full of Chum Salmon spawning in a land with no trees. Our destination was a lake-borne, slow, broad, weedy tributary where we witnessed massive Northern Pike *Esox lucius* ready for ambush and roaming packs of Inconnu (Figure 6). The helicopter flew low while we counted fish and the disturbed water from the rotor wash triggered a school of small indeterminate whitefish to swim downstream. In an explosive rush from cover, a 1-m long Northern Pike stopped a whitefish crossways in its toothsome jaws.

Beyond fish, each day we essentially performed aerial transects for terrestrial animals. The moments impressed: a



Figure 5. The outhouse at Dahl Creek, north of Kobuk village, looking toward Asbestos Mountain.



Figure 6. A slow-moving, weedy tributary of the upper Koyukuk River teeming with Inconnu and Northern Pike.

swimming bull moose *Alces alces* plowing water with its antlers in a small pond; four rotund grizzly bears *Ursus arctos horribilis* laying on their bellies while gobbling blueberries together on the tundra; a half-dozen Dall sheep *Ovis dalli* perched on the Endicott Mountains; and a lone wolf *Canis lupus* loping across the tundra of the sunny Kobuk River valley. It's hard to explain how much awe can fit into such a small helicopter.

Our aquatic safari culminated west of Kobuk village near Kobuk Valley National Park, where pine-lined, gravel-bottomed streams teemed with spawning Chum Salmon (Figure 7). On the ground, the major role of salmon in this Arctic riverscape



Figure 7. Aerial view of the Hunt River drainage near Kobuk Valley National Park.



Figure 9. Bear feces along the Hunt River near the confluence of Akiak Creek.



Figure 8. A dying Chum Salmon in Cross Creek, tributary to the Ambler River.

showed itself by their deaths that give essential nutrients to their natal watershed (Figure 8) and apex predators such as brown bears *U. arctos*—which give “salmon runs” a whole new meaning (Figure 9). In our last few days, every flight home occurred within eyesight of the Great Kobuk Sand Dunes to the south, a remarkable geological juxtaposition among tundra and pine, as well as a reminder that although the work is glamorous, we don’t get to visit *all* of the amazing places.

Not long after the last helicopter ride and the gear dried, the data were entered and analyzed. Overall, we sampled 14 species, or less than 25% of Alaskan freshwater fishes

Table 1. Fish species collected by river basin (Koyukuk or Kobuk rivers) during the 2018 field season. Collection method code is as follows: (A) angling, (E) electrofishing, (T) minnow trap, and (V) visual survey from helicopter. * indicate species could be anadromous, however, Dolly Varden and Inconnu have resident and anadromous forms depending on river basin.

Species	Koyukuk	Kobuk
Longnose Sucker	E	E
Alaska Blackfish		E, T
Northern Pike	E, A, T, V	E
Round Whitefish	E	E
Humpback Whitefish*		E, A
Inconnu*	V	A
Chum Salmon*	E, V	E, A, V
Chinook Salmon*	E, V	
Pink Salmon*		A, E, V
Burbot	E	
Arctic Grayling	E, T	E, A
Slimy Sculpin	E, T	E
Dolly Varden*	E	E, A
Lake Trout		A

(Table 1). We added over 700 km to the AWC, not including new kilometers per species. This involved additions or extensions of 41 streams. In the proposed Ambler Road corridor, we added or extended 12 streams in the AWC (Table 2; Figure 2). Even with these additions, our work only scratched the surface. Future efforts will need to be performed on the abundant streams we could not reach during our abbreviated field season, such as those closer to the coast. Additionally, sampling efforts may need to be temporally expanded on streams we visited because our timing may not have been in synch with all migratory species such as Chinook or Coho

Table 2. Anadromous fish species encountered in target waterbodies within and adjacent to the proposed Ambler Road corridor. * indicates stream was extended in or added to the Anadromous Waters Catalog and would be crossed by or immediately adjacent to the proposed road. Species code is as follows: Chinook Salmon (OT); Chum Salmon (OK); Dolly Varden (DV); Humpback Whitefish (HWF); Inconnu (INC). Life stage code is as follows: spawning (SP); juvenile rearing (JR); adult present (AD); indeterminate between juvenile or adult (JV/AD). Map key indicates location in Figure 2.

Basin	Waterbody	Anadromous species (stage)	Map key
Koyukuk	Mettenpherger Creek*	OK (SP)	1
	Tobuk Creek*	OT (SP)	2
	Upper Alatna River*	OK (SP)	3
	Malamute Fork Alatna River*	OK (SP)	4
	Opposite Creek*	OT (JR)	5
	Rockybottom Creek	OK (SP)	6
	Helpmejack Creek*	OK (SP), OT (SP)	7
	Jack Beaver Creek	OK (SP)	8
	Chebanika Creek	OK (SP)	9
Kobuk	Kichalakaka Creek	DV (JR)	10
	Upper Kobuk River*	OK (SP)	11
	Walker Lake*	HW (JV/AD)	B
	Reed River*	OK (SP)	12
	Beaver Creek*	OK (SP)	13
	Minokokosa Creek*	DV (JR)	14
	Akepelik Creek	DV (AD); OK (SP)	15
	Angayukachak Creek	DV (JR)	16
	Selby River*	DV (JR); OK (SP)	17
	Pah River & tributaries	SF (SP); HW (JV/AD); OK (SP); DV (JR)	18
	Mauneluk River*	OK (SP)	19
	Lockwood Hills Creek	DV (JR)	20
	Shungnak River*	OK (SP)	21
Ambler River*	OK (SP)	22	

Salmon *O. kisutch* that may have respectively migrated before or after our efforts.

Kurt Vonnegut once wrote, “If this isn’t nice, I don’t know what is.” When I consider the frontiers waiting for us to explore, I could not agree more—although they may not be as literal as Alaska’s frontier. As fisheries professionals, I hope we can look beyond the sterile text of a statute or publication and recognize the romance of establishing our understanding of fish communities, one stream (or one helicopter ride) at a time.

ACKNOWLEDGMENTS

This program and its results would not be so impressive without Joe Giefer, J. Johnson and Gillian O’Doherty leading the charge. Mat Sorum (National Park Service), helicopter pilots (Luke Fledderman and Eryk de la Montana), field personnel (Josh Brekken, Maxwell Newton, Lisa Stuby, and Katelyn Zonneville), and logistical support (Duncan Green, Guy Moyer) made this project happen. Jason Graham and Chester Murphy provided GIS prowess to our navigation and site selection processes. Judy Jespersen and Brooks Range Aviation were instrumental in moving us from Bettles to Dahl Creek. The Bureau of Land Management (April Rabuck and Robin Walthour), U.S. Fish and Wildlife Service (Tina Moran and Bob Rebarchik), and the National Park Service provided permits for this work. The United States Environmental Protection Agency, under assistance agreement 83590301 to the U.S. Endowment for Forestry and

Communities, partly funded this project. The Alaska Sustainable Salmon Fund, a State Wildlife Grant, and State Fish and Game funds also contributed to this project. This article does not reflect the views and policies of any co-worker, collaborator, funder or participating agency, nor do they endorse the use of any commercial products mentioned in this document. Explore for yourself at: <http://www.adfg.alaska.gov/index.cfm?adfg=ffinventory>. There is no conflict of interest declared in this article.

ORCID

C. Nate Cathcart  <https://orcid.org/0000-0002-0689-9382>

REFERENCES

- Alaska Department of Fish and Game. 2018. Alaska Freshwater Fish Inventory. Available: <http://www.adfg.alaska.gov/index.cfm?adfg=ff-inventory.main>
- Alt, K. T. 1987. Review of Sheefish *Stenodus leucichthys* studies in Alaska (No. 3). Alaska Department of Fish and Game, Division of Sport Fish, Dillingham.
- Georgette, S., and H. Loon. 1990. Subsistence and sport fishing of Sheefish on the upper Kobuk River, Alaska. Technical Paper No. 175. Alaska Department of Fish & Game, Division of Subsistence, Kotzebue.
- Johnson, J., and B. Blossom 2018. Catalog of waters important for spawning, rearing, or migration of anadromous fishes - Interior Region, Effective June 1, 2018. Alaska Department of Fish and Game, Special Publication No. 18-03, Anchorage.
- Marshall, R. 1980. Alaska wilderness: exploring the central Brooks Range. University of California Press, Berkeley. 