

Mercury in Pike on the Lower Yukon and Kuskokwim Rivers



Angela Matz

U.S. Fish and Wildlife Service

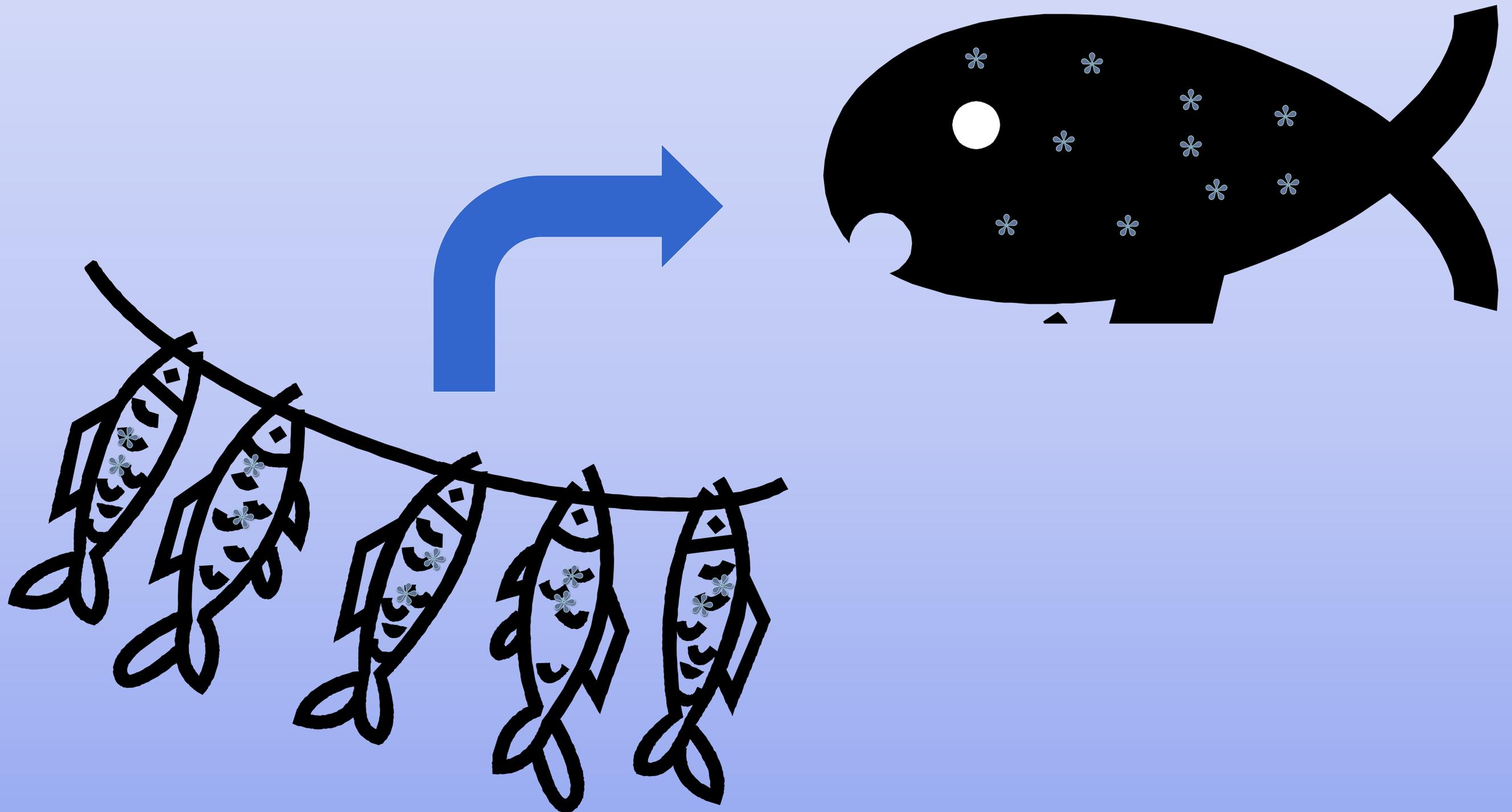
Environmental Contaminants Program

2014 Alaska Forum on the Environment

Mercury Sources

- Mineral deposits
 - Cinnabar (HgS)
 - Elemental Hg
- Mining-associated releases of mercury
- Historic use of mercury as an amalgam in placer gold mining
- Atmospheric transport and deposition
 - From combustion of fossil fuels, medical wastes, volcanoes, forests fires

Biomagnification





Pike Project Background:

Older US Fish and Wildlife data showed high mercury concentrations in large northern pike, a common subsistence food

- But Alaska had no fish advisories

USFWS responsible for subsistence opportunities on National Wildlife Refuges in Alaska

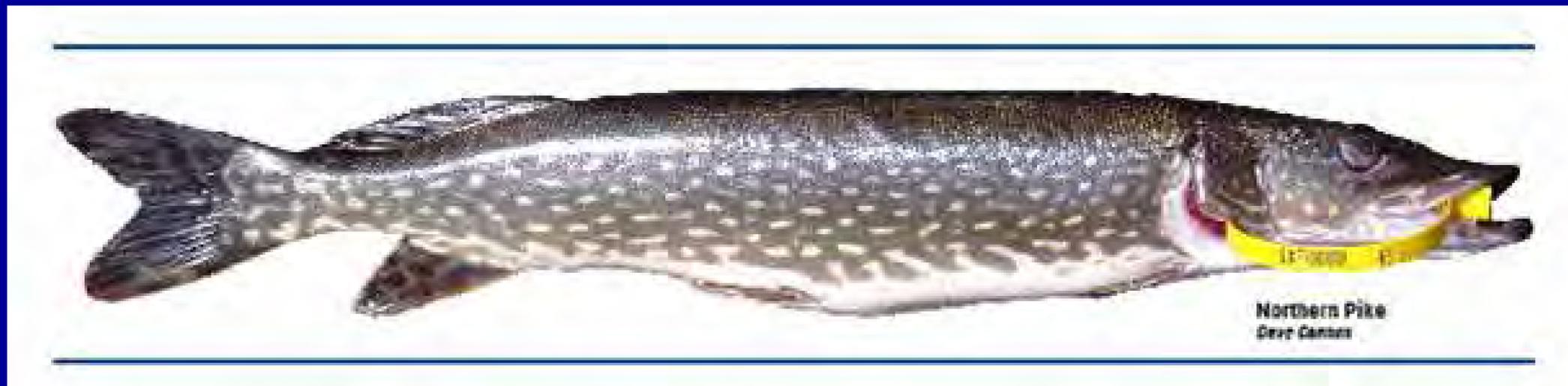
- including hazard communication



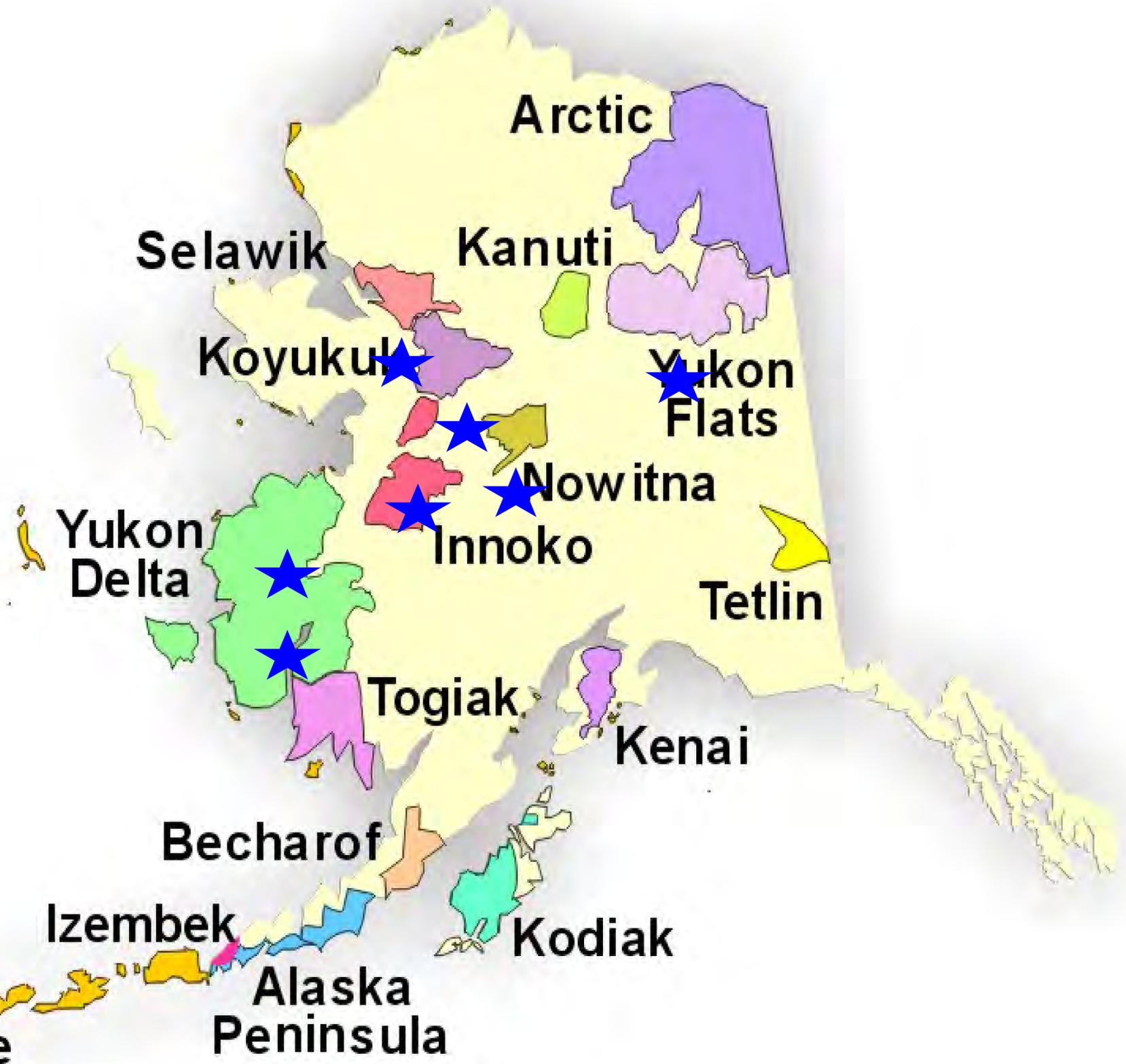
Pike Project Goals:

Determine mercury concentrations in northern pike collected at traditional and well-used subsistence sites

Share the information so people can make informed choices



Pike project sample sites:





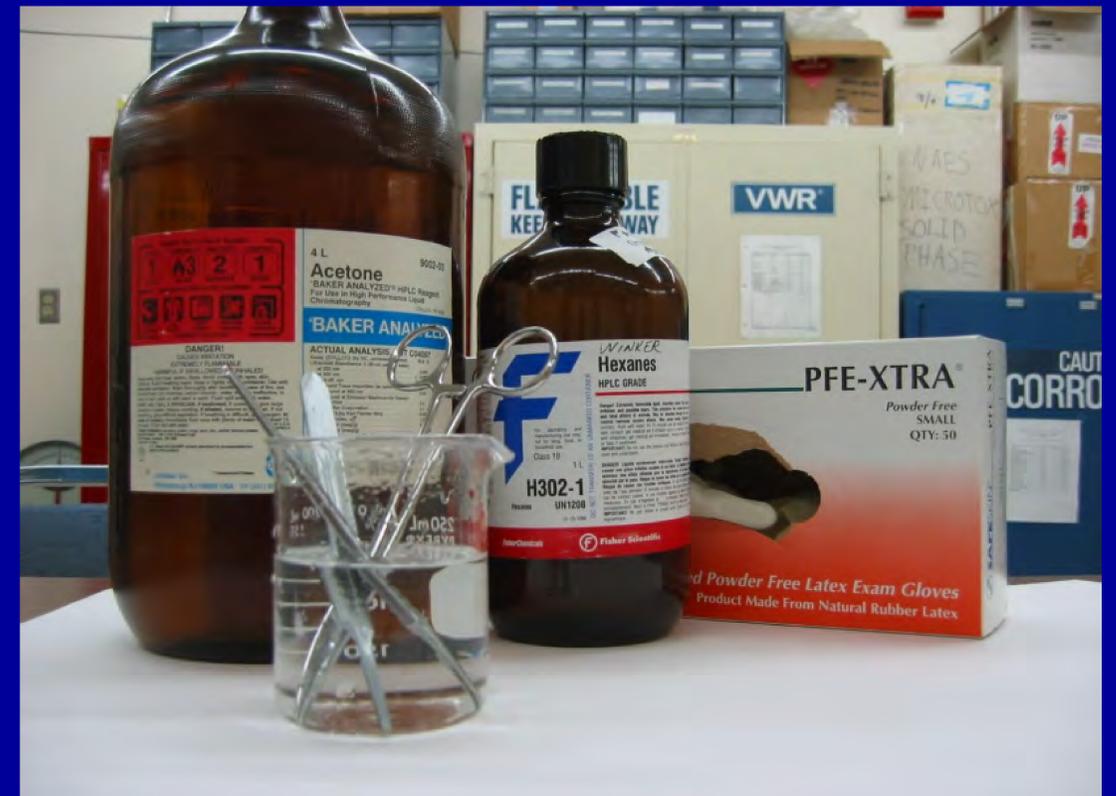
Pike Project Methods:

Mercury and methyl-mercury (~1/3 of samples) in skinless filet of northern pike

440 northern pike from 32 samples sites on five National Wildlife Refuges in 2005-2007, at time of year people normally catch them

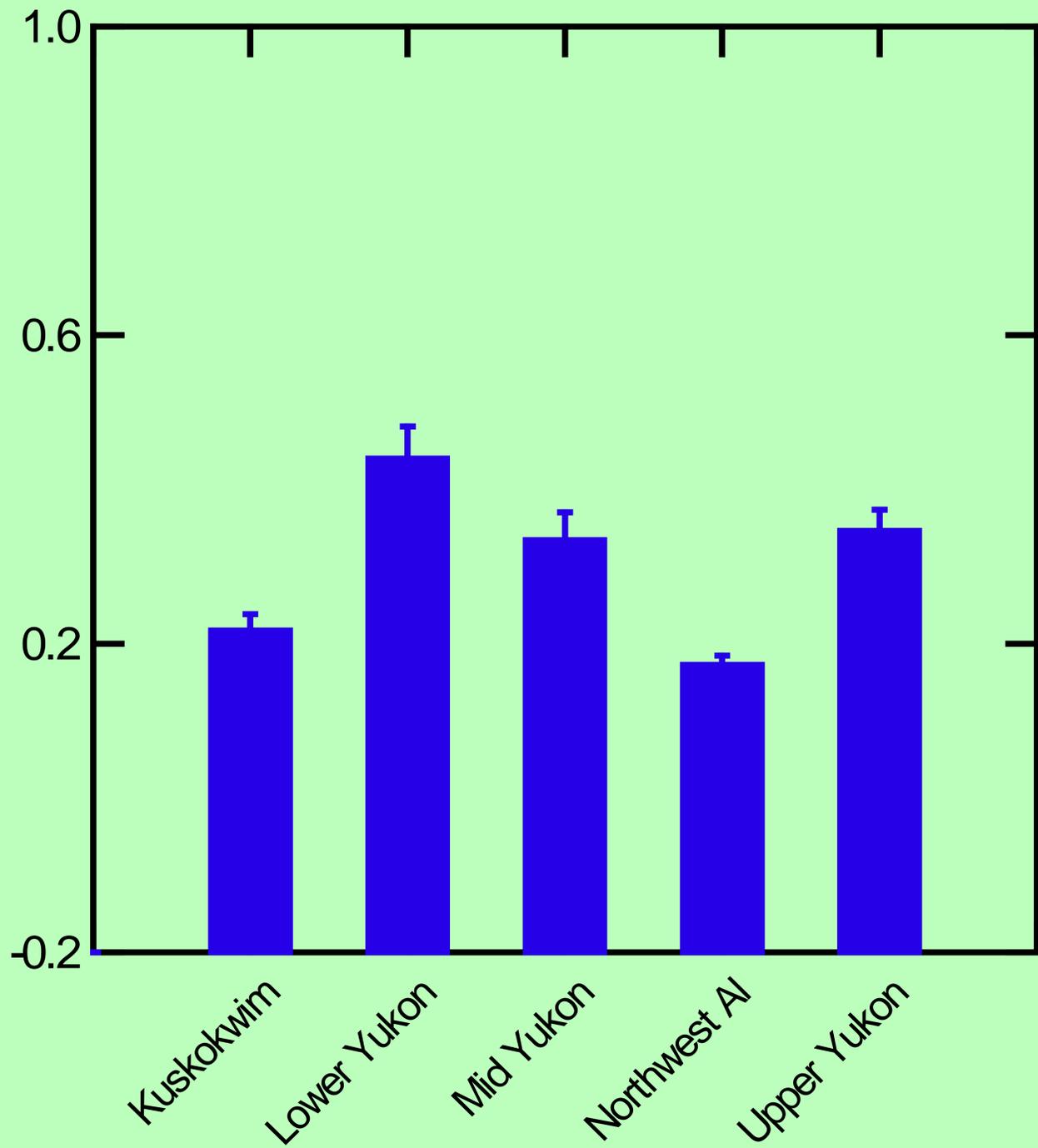
Division of Public Health Study on mercury in hair and fish consumption from villages where pike were sampled

At the lab...

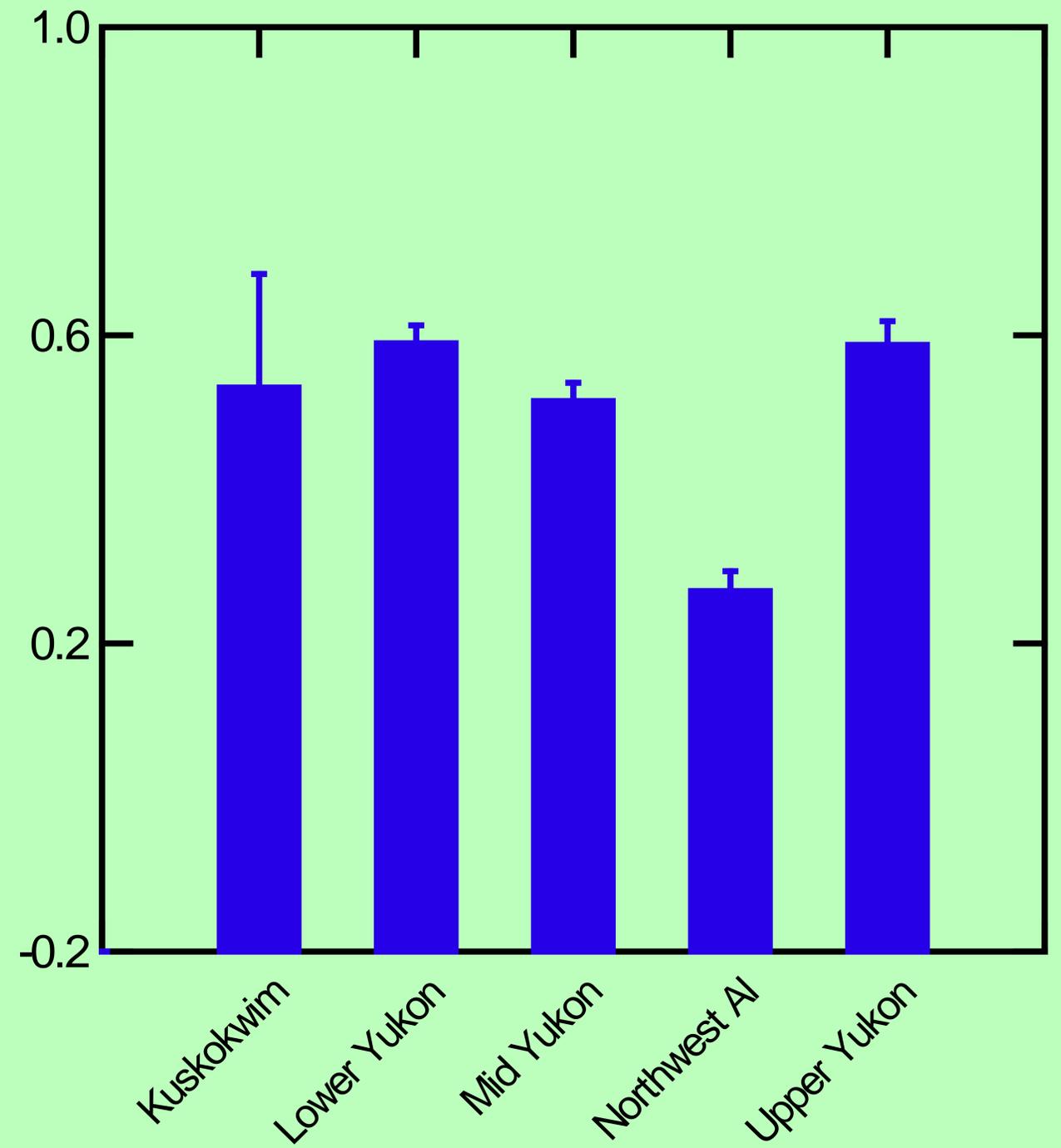


In the field...

< 2ft



> = 2ft



Mean (\pm SE) MeHg (ppm ww; calculated with MeHg:Hg = 0.96) in small and large northern pike from watersheds in Alaska, 2005-2007.

People also get mercury from their diet.



- Data on fish mercury concentrations, and consumption advisories from elsewhere, warranted development of Alaskan guidelines
- Alaska Fish Consumption Guidelines developed with a statewide working group in 2007.



Communication and Outreach

- Village visits, pre-, during, & post-sampling
- Presentations to village or tribal councils
- Public meetings like AFE
- School presentations at all grade levels
- Posters



Mercury in Northern Pike from the Yukon Delta National Wildlife Refuge

U.S. Fish and Wildlife Service and Alaska Dept. of Health and Social Services – Division of Public Health



Why are we concerned about mercury?

Mercury is a neurotoxin - at high levels it can damage the developing brains of babies (including babies in the womb) and children. Mercury levels in most Alaska fish are low, so any health effects would be very subtle. Still, health officials recommend a margin of safety to protect our children's health.

Should I worry about eating fish?

Overall, mercury levels in Alaska fish are low, so the **only** people who need to think about limiting the amount of fish they eat are **women who are or can become pregnant, nursing mothers, and children age 12 years and under**. Women and children can still get the benefits of eating fish by choosing to eat fish that are low in mercury, like salmon.

Men, elders, and teenage boys may eat unlimited amounts of most Alaska fish, including pike.

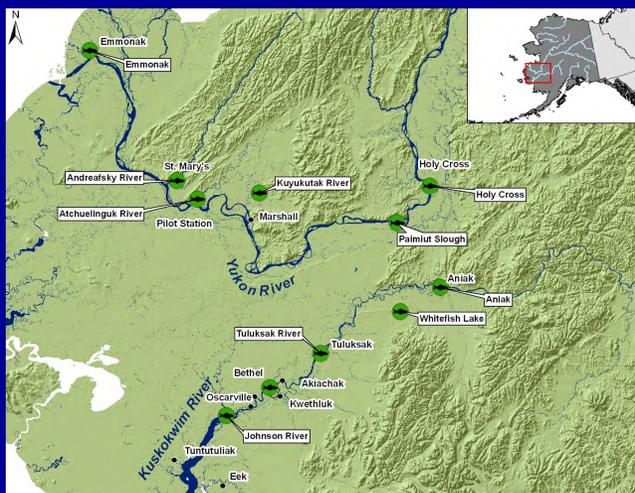
The State of Alaska has developed guidelines for women and children on how much of each fish they can safely eat, based on the amount of mercury in a variety of fish species. These guidelines:

- Reflect guidelines developed by other states and national agencies.
- Incorporate studies of dietary mercury effects on children.
- Include a large safety factor, so do not have to be viewed as strict dietary limits.

Why study mercury in pike?

There is more of the toxic form of mercury – methylmercury – in fish that eat other fish and in older fish, like large pike. In this study, we measured mercury in pike muscle, from pike caught at traditional and well-used subsistence fishing sites. We are sharing this information with you because you live in an area where people eat a lot of pike.

With the help of subsistence fishermen, we collected 163 pike from 11 sites in the Yukon Delta National Wildlife Refuge in 2005 (on the Kuskokwim River) and 2006 (on the Lower Yukon River).



Sample sites in the Kuskokwim River area (2005) and the Lower Yukon River area (2006).

How much pike from the Yukon Delta area should women and children eat?

| Methylmercury concentration in fish (mg/kg) | Meals per month | Fresh pike | Dried pike |
|---|-----------------|-----------------------------------|-----------------------------------|
| 0 - 0.15 | Unlimited | | |
| >0.15 - 0.32 | up to 16 | Kuskokwim < 2 ft | |
| >0.32 - 0.40 | up to 12 | | |
| >0.40 - 0.64 | up to 8 | Kuskokwim > 2 ft, All Lower Yukon | |
| >0.64 - 1.2 | up to 4 | | Kuskokwim < 2 ft |
| >1.2 - 1.4 | up to 3 | | |
| >1.4 - 2.0 | up to 2 | | |
| >2.0 - 3.4 | up to 1 | | Kuskokwim > 2 ft, All Lower Yukon |

The most recent (2007) guidelines, *Fish Consumption Advice for Alaskans: A Risk Management Strategy to Optimize Public Health*, is available at: http://www.epi.hss.state.ak.us/bulletins/docs/rr2007_04.pdf.

For pike in the Yukon Delta National Wildlife Refuge, the recommendations for women and children are:

Kuskokwim River area pike *shorter than 2 feet* may be eaten in up to **16 meals per month if fresh**, and up to 4 meals per month if dried.

Kuskokwim River area pike *longer than 2 feet* may be eaten in up to **8 meals per month if fresh**, and **in up to 1 meal per month if dried**.

All Lower Yukon River area pike may be eaten in up to **8 meals per month if fresh**, and **in up to 1 meal per month if dried**.

A "meal" is one six-ounce portion of fish, dried or fresh.

Notes: Small pike (< 2 feet long) often have less mercury than large pike (> 2 feet long). Also, dried pike has a higher mercury concentration than fresh pike (the mercury is "diluted" with the water in the fresh pike), so the guidance allows fewer meals of dried pike than fresh pike.

Where does mercury in Alaska come from?

- **Anthropogenic (human-caused) sources** such as global air pollution from burning fuels and garbage, and mining runoff
- **Natural sources** such as forest fires, volcanoes, and local bedrock weathering into streams

Mercury gets into wetlands where it is transformed by bacteria into methylmercury. From there, it accumulates in fish and animals.

For more information on mercury in pike contact Angela Matz (angela_matz@fws.gov, 907-456-0442), U.S. Fish and Wildlife Service, 101-12th Ave., Room 110, Fairbanks, AK 99701.

Measuring Mercury in Humans

Although mercury concentrations in fish can give us an idea of possible mercury exposure, Alaska has a program that tests for actual mercury levels in humans. **If you are a woman of child-bearing age, you can get your hair tested and find out your own mercury levels – for free!**

The Alaska Division of Public Health will analyze a small hair sample from any Alaskan woman of child-bearing age for mercury. Hair collection is done by a health care provider, and results are sent to the woman and her health care provider within two months. If you are one of the very few women in Alaska who has a high hair mercury level, the Alaska Division of Public Health and your health care provider will work with you to help reduce your mercury exposure.



A simple hair test can tell you how much mercury you may have in your body. For more information on hair mercury monitoring, or to arrange for testing, contact the Environmental Public Health Program at the Alaska Division of Public Health, 3601 C Street, Suite 540, Anchorage, AK 99503, 907-269-8000, <http://www.epi.hss.state.ak.us/eh/default/stm>

When Deciding What to Eat, Remember...

Subsistence foods, including almost all fish, are better for you and less expensive than store-bought foods. Also, the subsistence way of life helps keep Alaska Native cultures healthy and traditional ways alive.

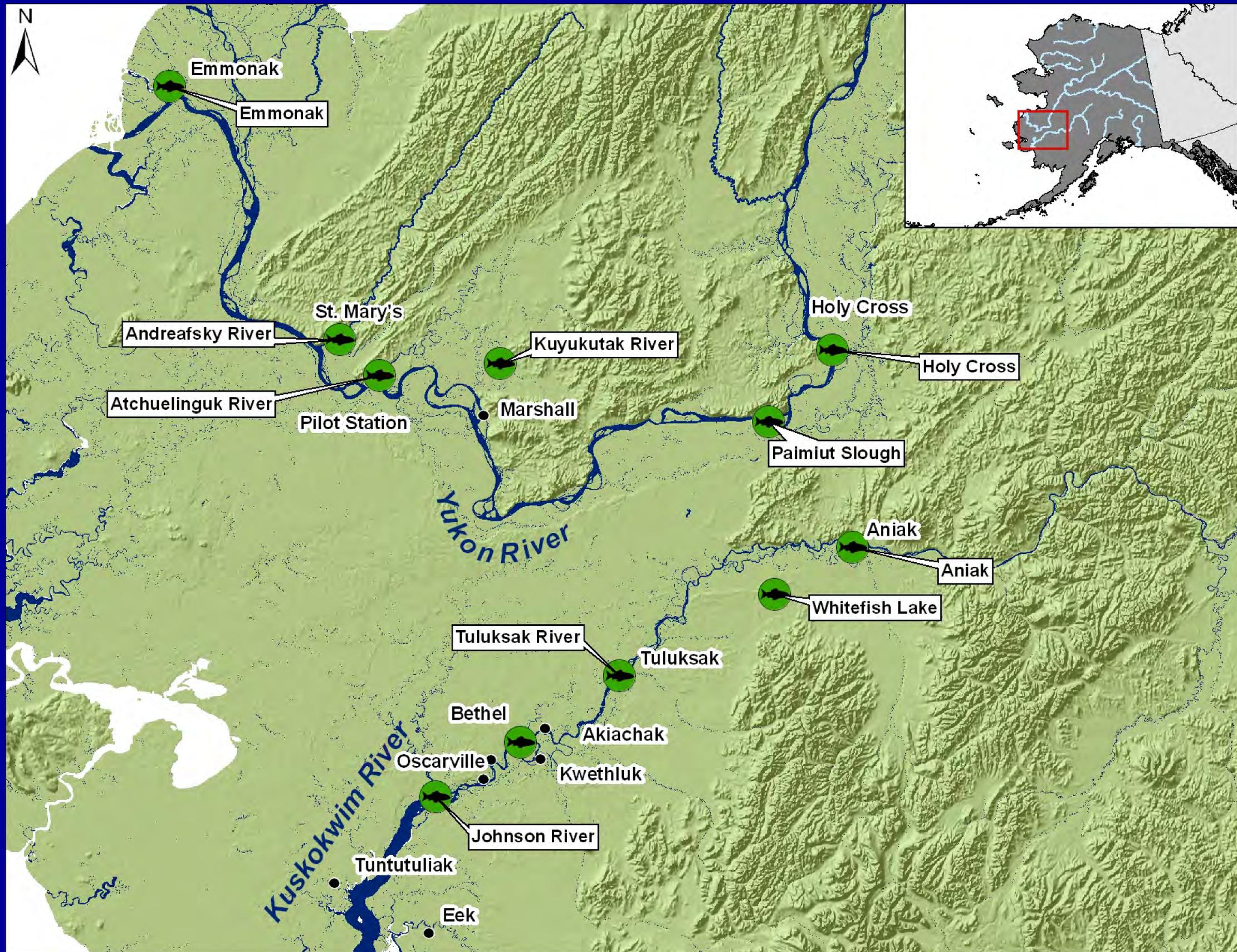
Fish are nutritious, with vitamins A, E, and C, iron, zinc, protein, and very important omega-3 fatty acids. These nutrients help keep your nervous system, your immune system, and your heart healthy, and are important for a healthy pregnancy.

Subsistence foods are low in sugar and saturated fats. Store-bought foods can have unhealthy amounts of sugars and fats, which can contribute to obesity and diabetes, both of which are at epidemic levels in Alaskans, and heart disease. All these diseases are increasing among Alaska Natives.

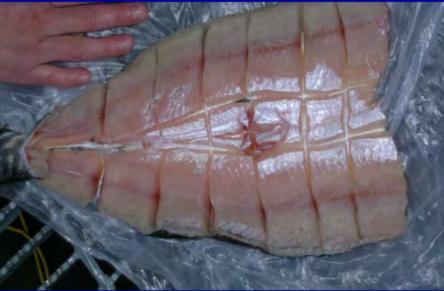
Most subsistence foods are very clean. For example, all five species of Alaska salmon have very low contaminant levels and are safe to eat in unlimited quantities.

For more information on fish consumption guidelines, or the benefits of eating subsistence foods, contact the Environmental Public Health Program, 907-269-8000, Alaska Division of Public Health, 3601 C Street, Suite 540, Anchorage, AK 99503.

Mercury in Northern Pike sample sites, in and near Yukon Delta National Wildlife Refuge



How much pike from the Lower Yukon and Kuskokwim can women and children eat?



Methylmercury concentration in fish (mg/kg) Meals per month

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- Women who are or may become pregnant, and children, can still get the benefits of eating fish
 - Choose **salmon** or other fish that are lower in mercury (we've tested Yukon and Kusko salmon)
- Women in Alaska can also find out what is in their own bodies, by getting a free test of mercury levels in their hair.

Measuring Mercury in Humans

If you are a woman of child-bearing age, you can get your hair tested and find out your own mercury levels – for free!

If you are one of the very few women in Alaska who has a high hair mercury level, the Alaska Division of Public Health and your health care provider will work with you to help reduce your mercury exposure.





Mid – Kuskokwim Fish Data

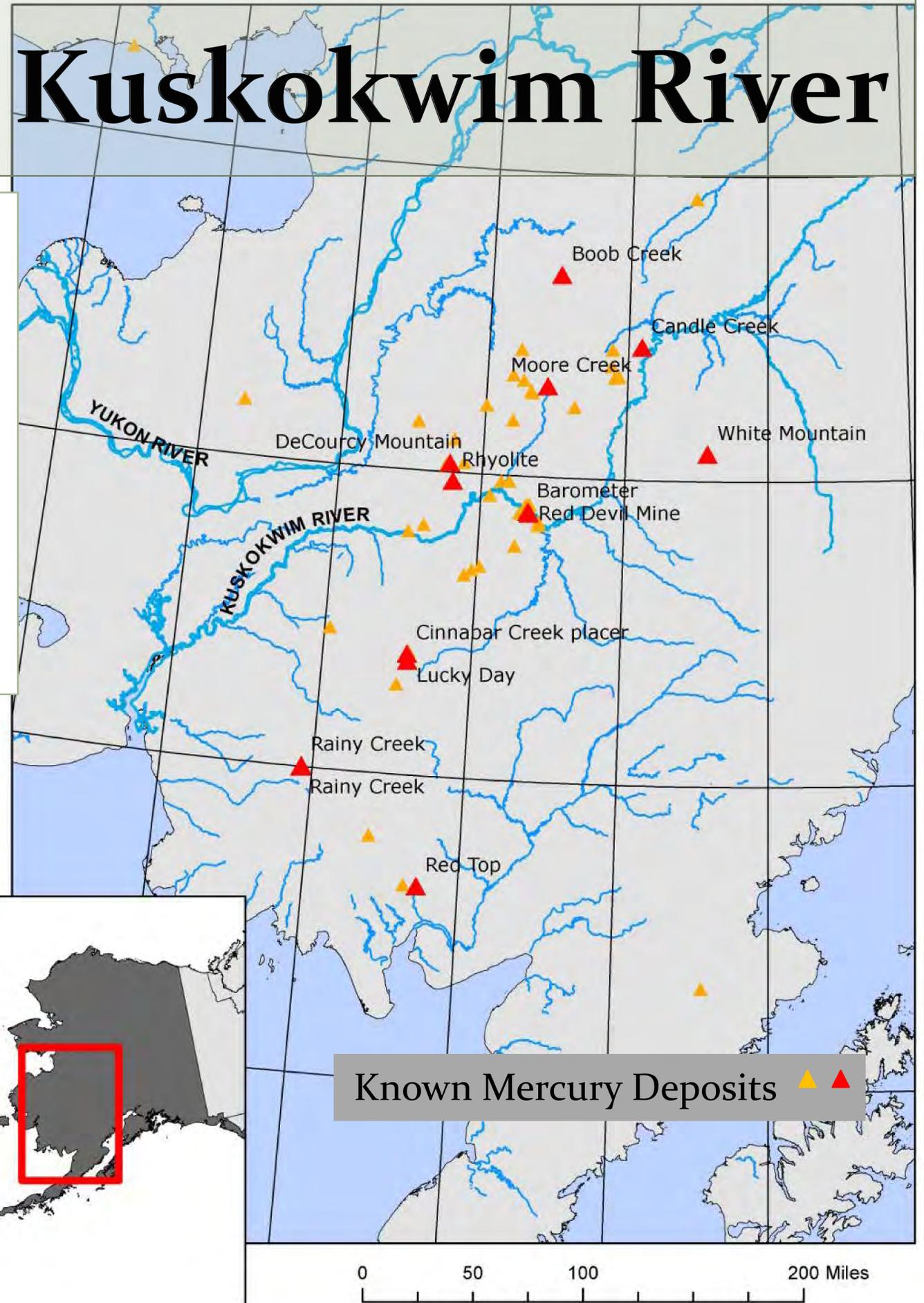
Determine mercury concentrations in northern pike and other species in the mid-Kuskokwim, a region with many mercury mines and deposits

Share the information so people can make informed choices

Study funded by the Bureau of Land Management (BLM) in conjunction with cleanup of the Red Devil mine site

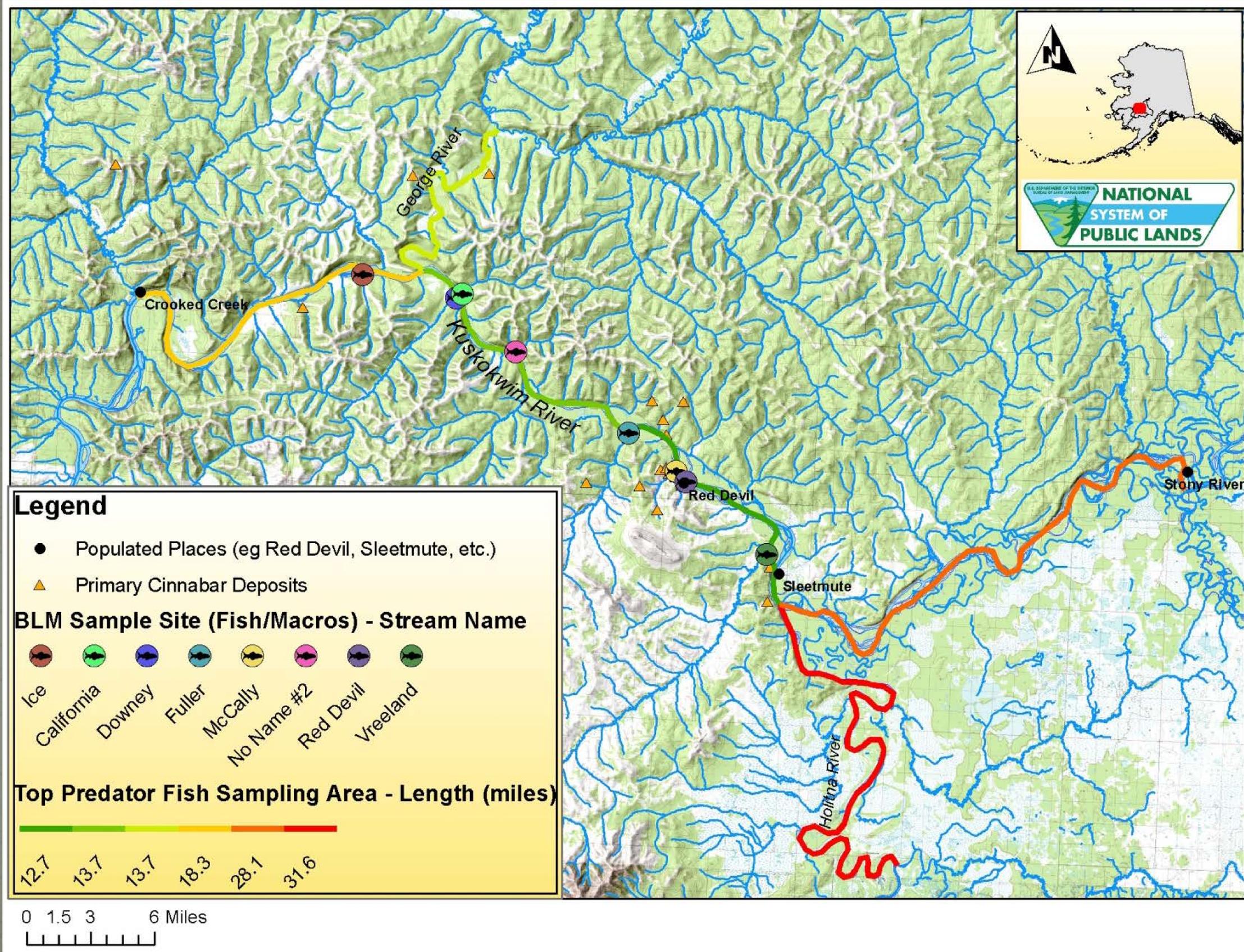
Mercury and the Kuskokwim River

- Approximately 1400 t of mercury have been produced from the region, which is ~99% of all mercury produced from Alaska.
- Red Devil Mine produced nearly 87% of all mercury produced from Alaska.
- Cinnabar is the principle ore mineral containing mercury.



Cinnabar

Sampling Areas and Locations





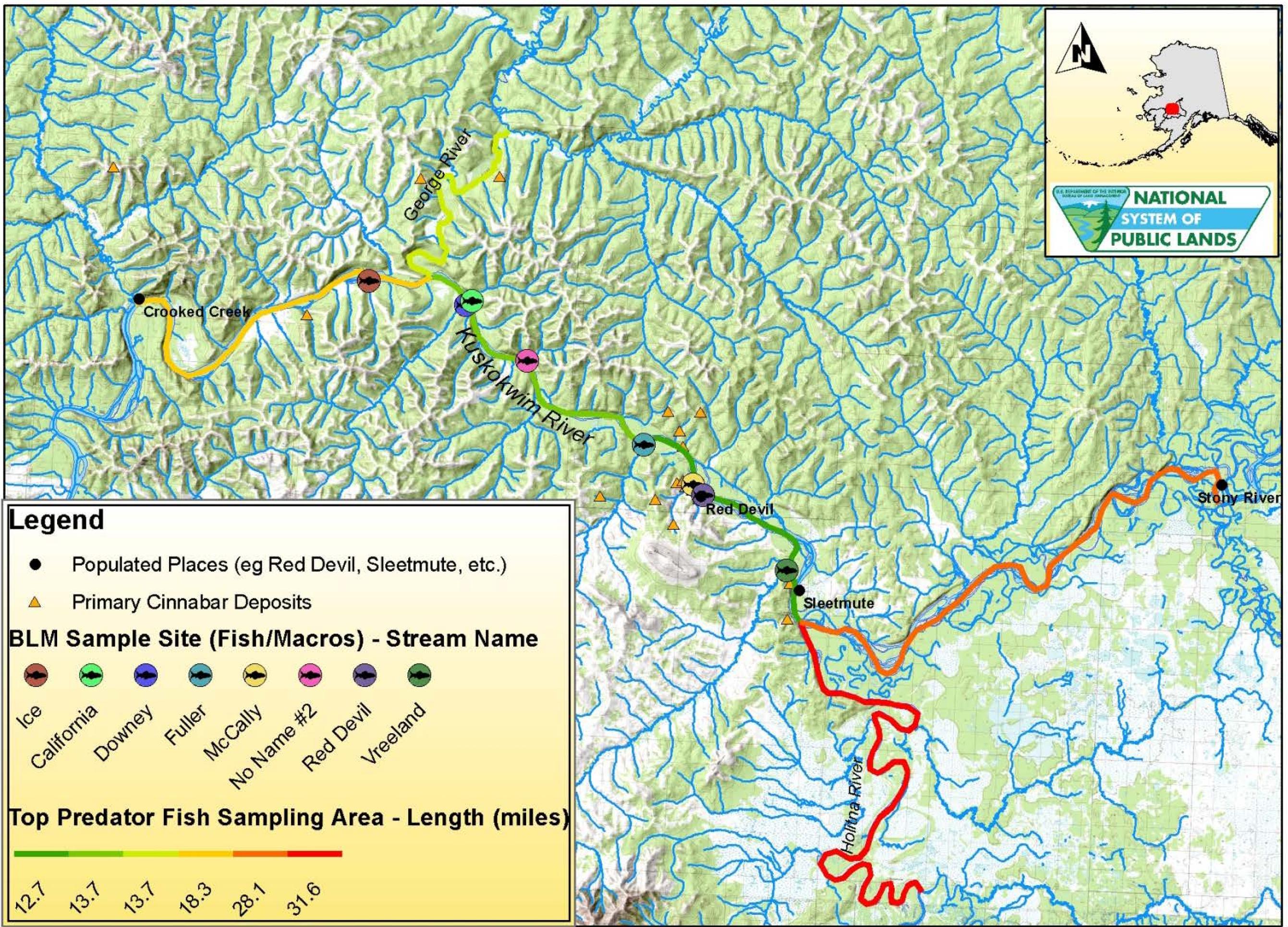
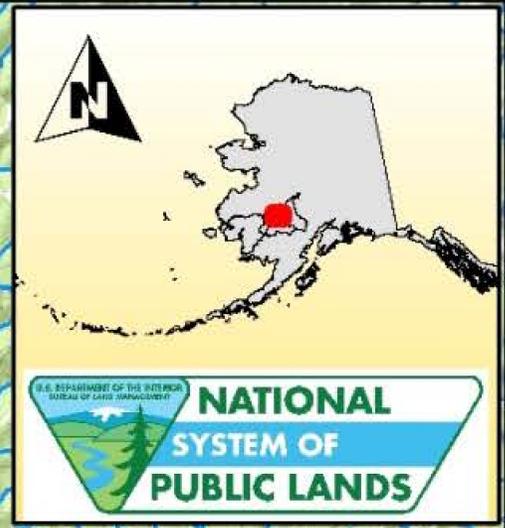
Mid – Kuskokwim Fish Data

Interim Report Available (Search “BLM Red Devil Mine”):

http://www.blm.gov/ak/st/en/fo/ado/hazardous_materials/red_devil_mine.html

Data incorporated into State mercury in fish guidance

Ongoing analysis of how fish movements affect their mercury levels (ADF&G fish telemetry)



Legend

- Populated Places (eg Red Devil, Sleetmute, etc.)
- ▲ Primary Cinnabar Deposits

BLM Sample Site (Fish/Macros) - Stream Name

| | | | | | | | |
|-----|------------|--------|--------|---------|------------|-----------|----------|
| | | | | | | | |
| Ice | California | Downey | Fuller | McCally | No Name #2 | Red Devil | Vreeland |

Top Predator Fish Sampling Area - Length (miles)

| | | | | | |
|------|------|------|------|------|------|
| | | | | | |
| 12.7 | 13.7 | 13.7 | 18.3 | 28.1 | 31.6 |





Angela Matz
Environmental Contaminants Program
U.S. Fish and Wildlife Service
101 12th Ave., Room 110
Fairbanks, AK 99701
907-456-0442
angela_matz@fws.gov