

Mercury in Lake Trout from Southwest Alaska Parks



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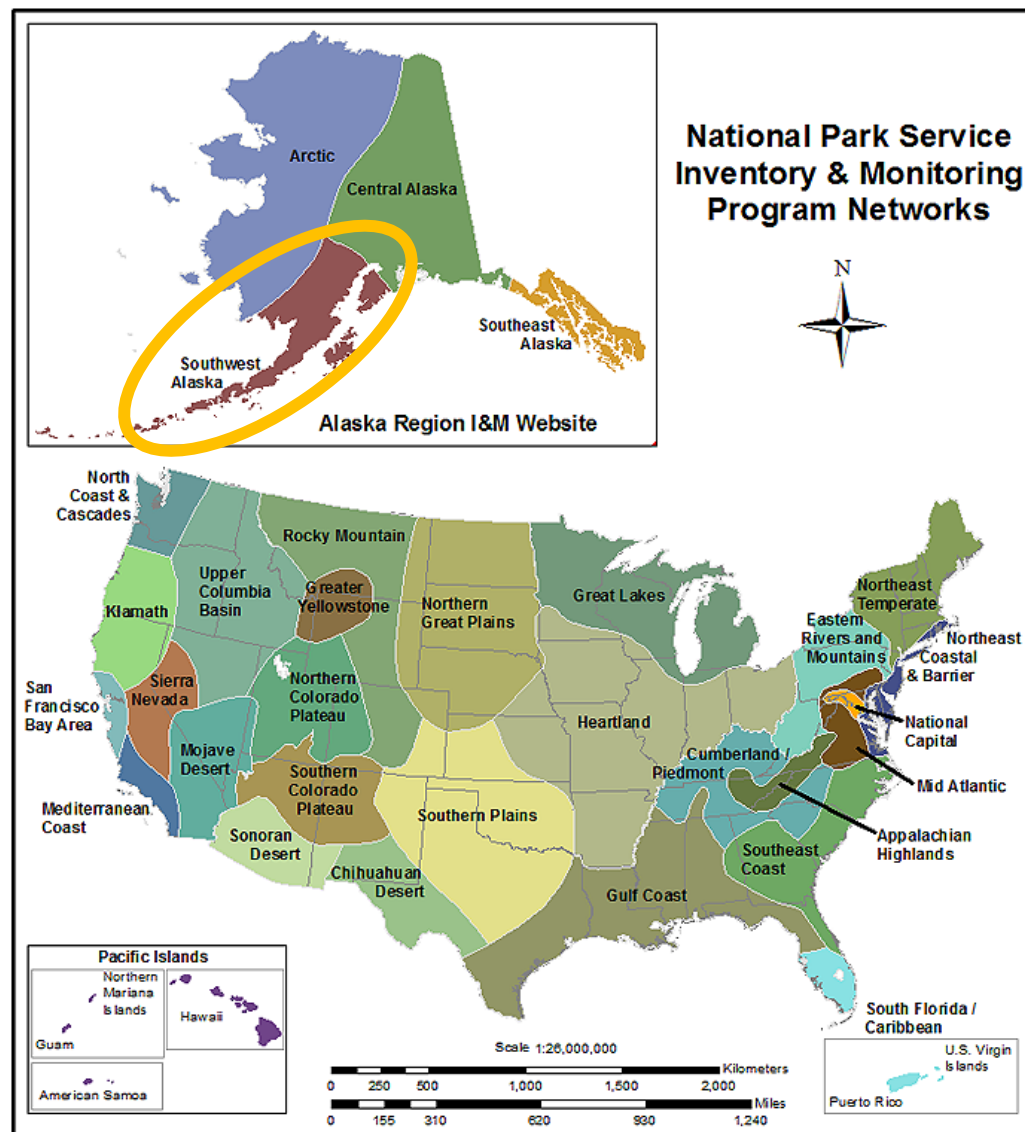


Inventory and Monitoring Division

Division created in
1998

Parks divided into
32 “networks”

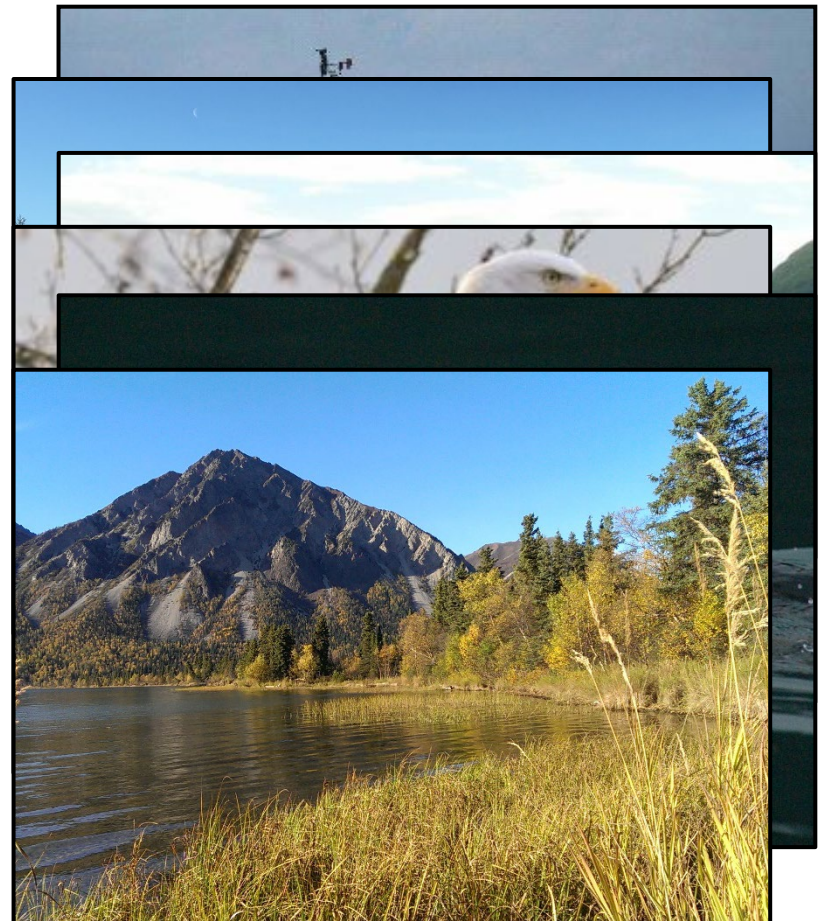
4 networks
in Alaska



SWAN Objective

Monitor a suite of indicators (“vital signs”) in 6 project areas and communicate with managers and the public

- Weather & climate
- Air quality
- Terrestrial vegetation
- Wildlife
- Nearshore marine systems
- **Freshwater systems**



SWAN Freshwater Vital Signs

SWAN monitors 4 freshwater “vital signs”

- Water quantity
- Water quality
- Sockeye salmon
- Resident lake fish

lake level, discharge



adult abundance, age



temperature, clarity

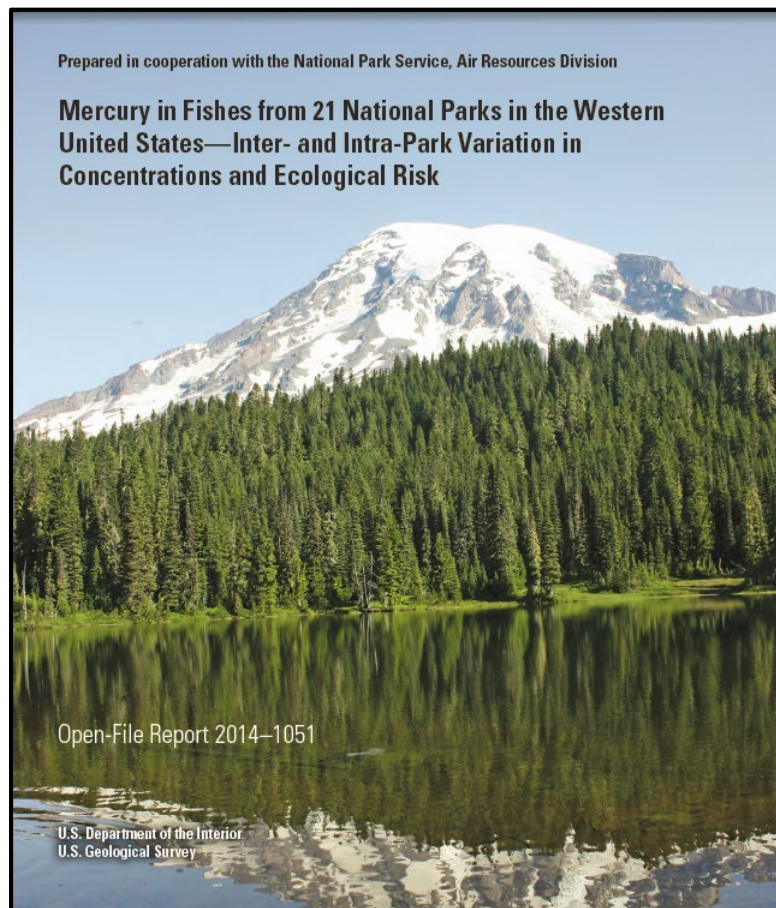


mercury concentration





Impetus



Mercury levels in lake trout from Lake Clark NP were among the highest, of the 21 parks included.

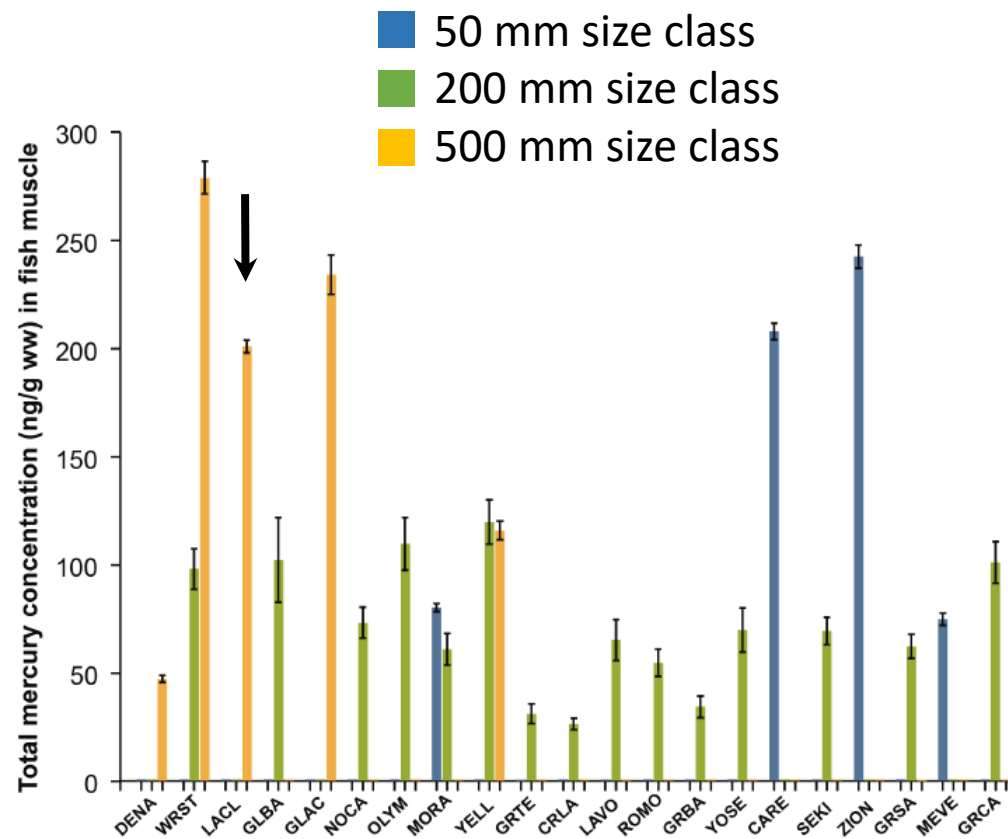


Figure 4

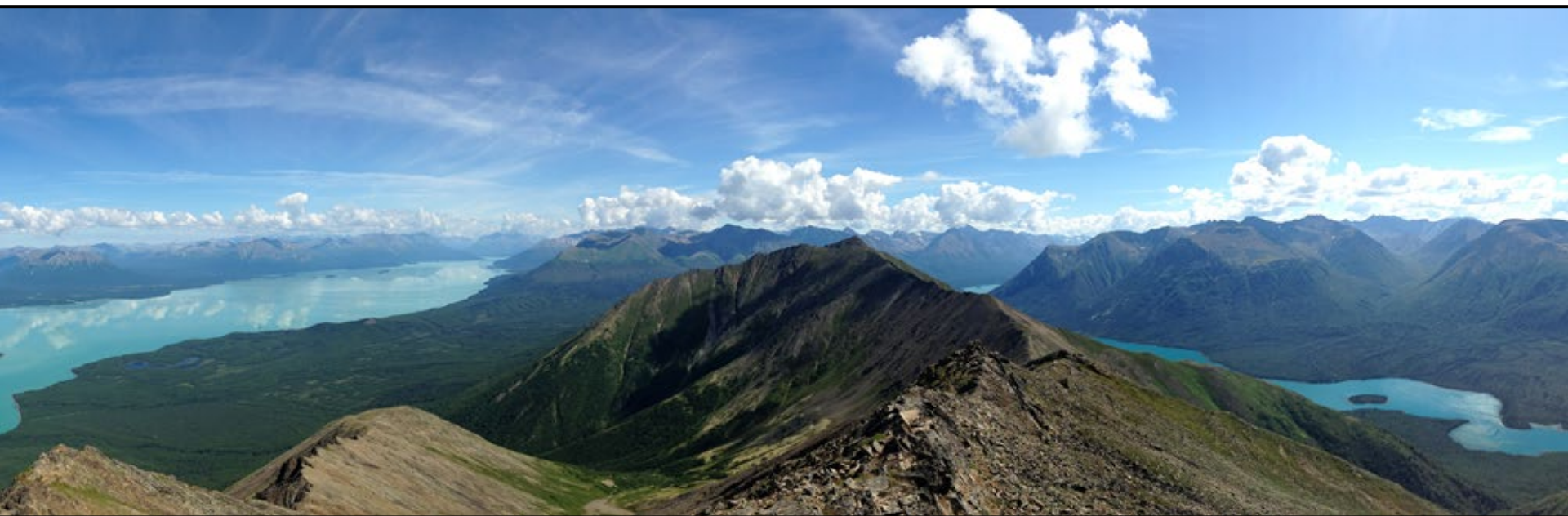




Questions

Why do some fish from SWAN parks have such elevated mercury levels?

What accounts for differences in fish mercury levels among lakes?





Potential Drivers

Factors driving fish Hg levels can be grouped into four categories:

Loading • Methylation • Bioaccumulation • Biomagnification

Overseas emissions



Melting glaciers



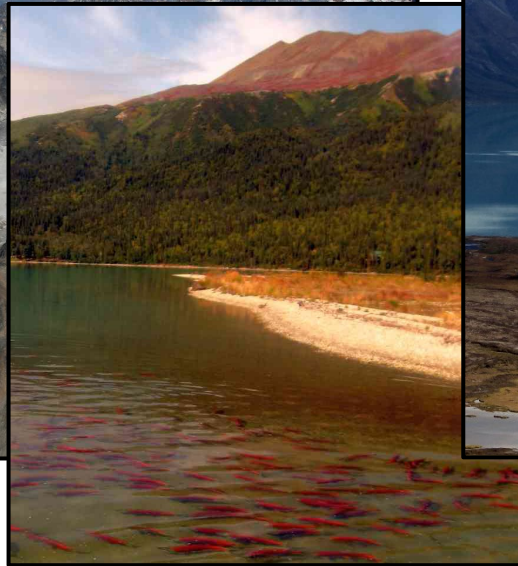
Methylating wetlands



Underlying geology



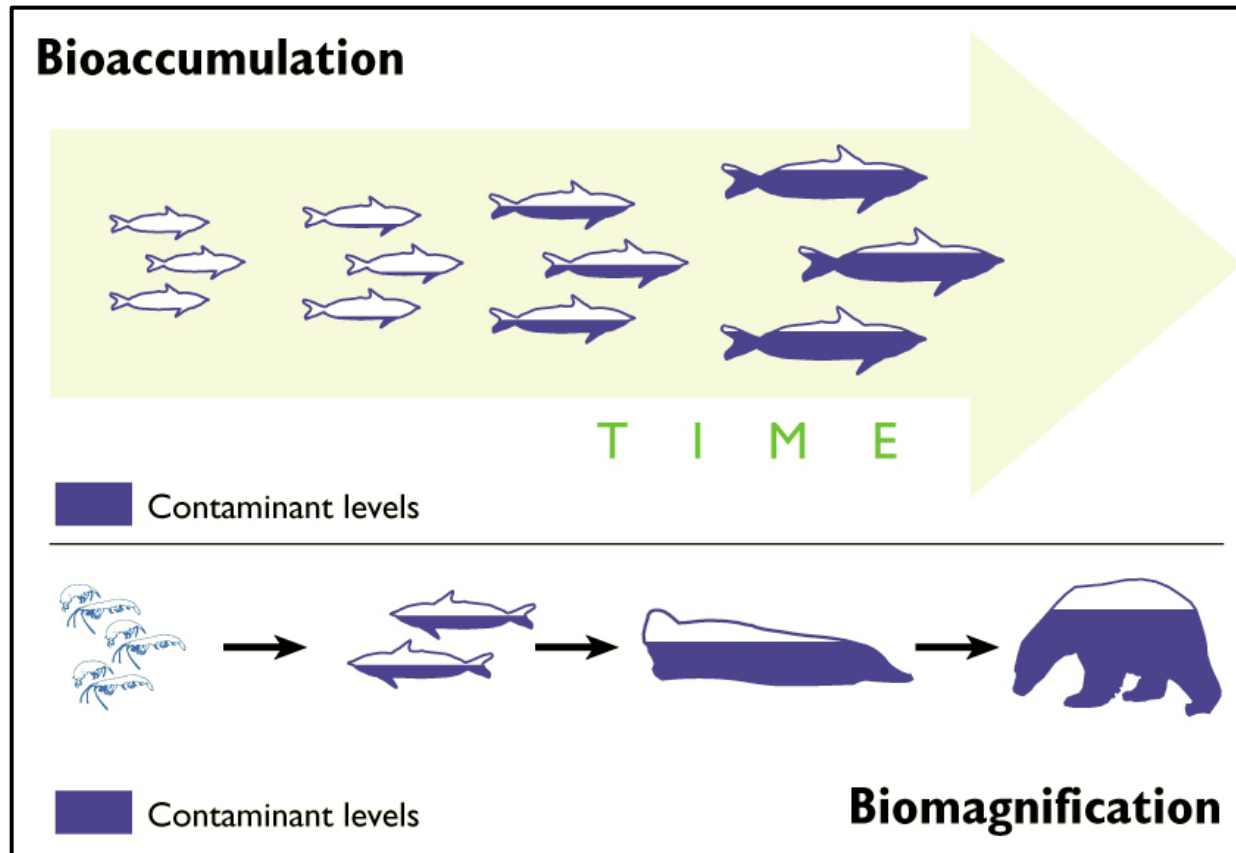
Migrating salmon



Water quality

Potential Drivers

Most mercury in fish tissue is methylmercury
Methylmercury bioaccumulates and biomagnifies



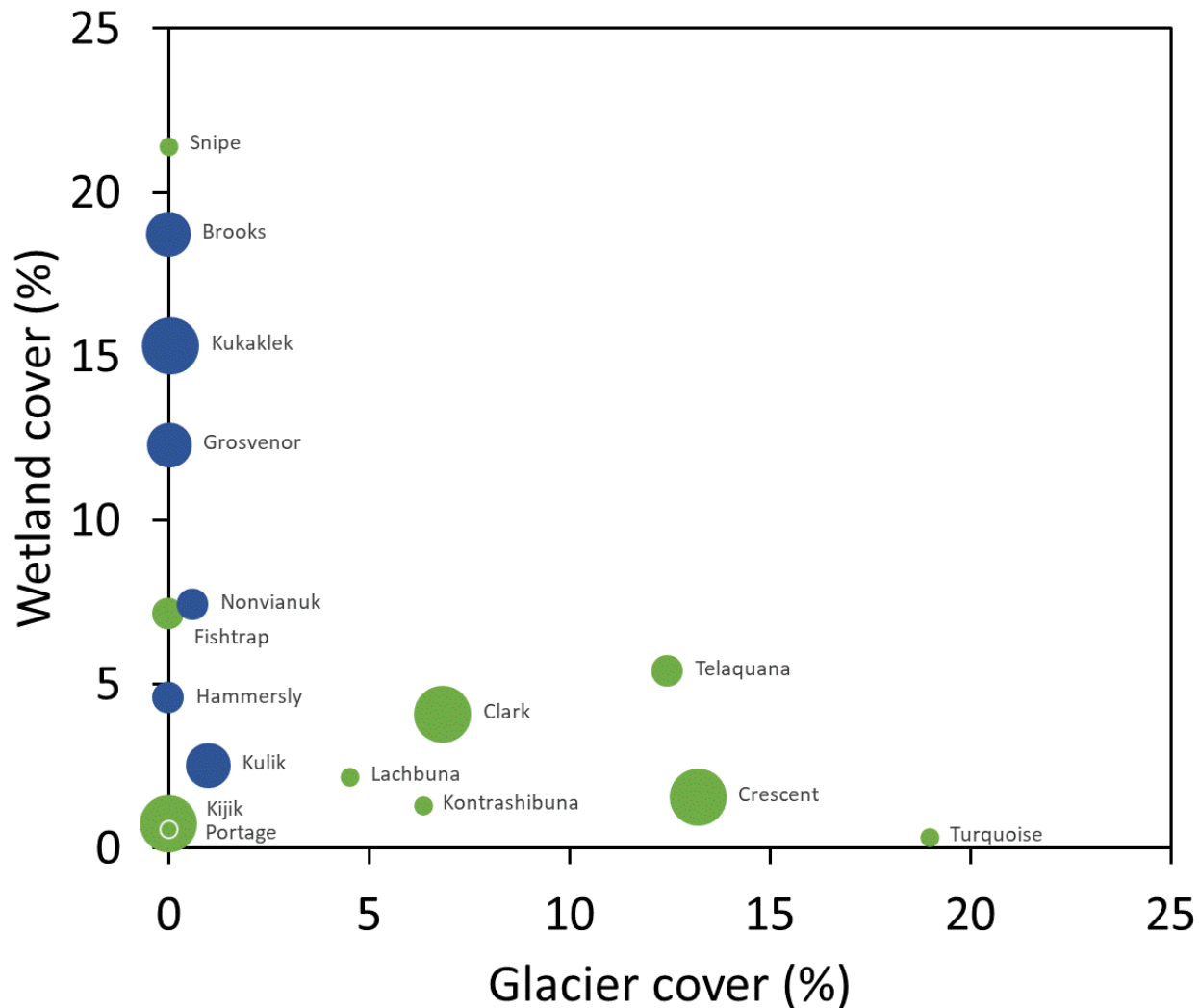
From <http://mercurypolicy.scripts.mit.edu/blog/?p=499>

Older fish at the top of the food chain have higher concentrations of mercury



Study Design

16 lakes spanning a range of wetland, glacier, and salmon influence



- Telaquana
- Turquoise
- Snipe
- Portage
- Lachbuna
- Fishtrap
- Crescent
- Kijik
- Kontrashibuna
- Clark
- Kukaklek
- Nonvianuk
- Kulik
- Hammersly
- Grosvenor
- Brooks

Sample Collection and Analysis

Collected from each of 16 lakes:

- 10+ lake trout
- 3 sockeye salmon (if present)
- Water samples
- Plankton samples
- Sediment samples

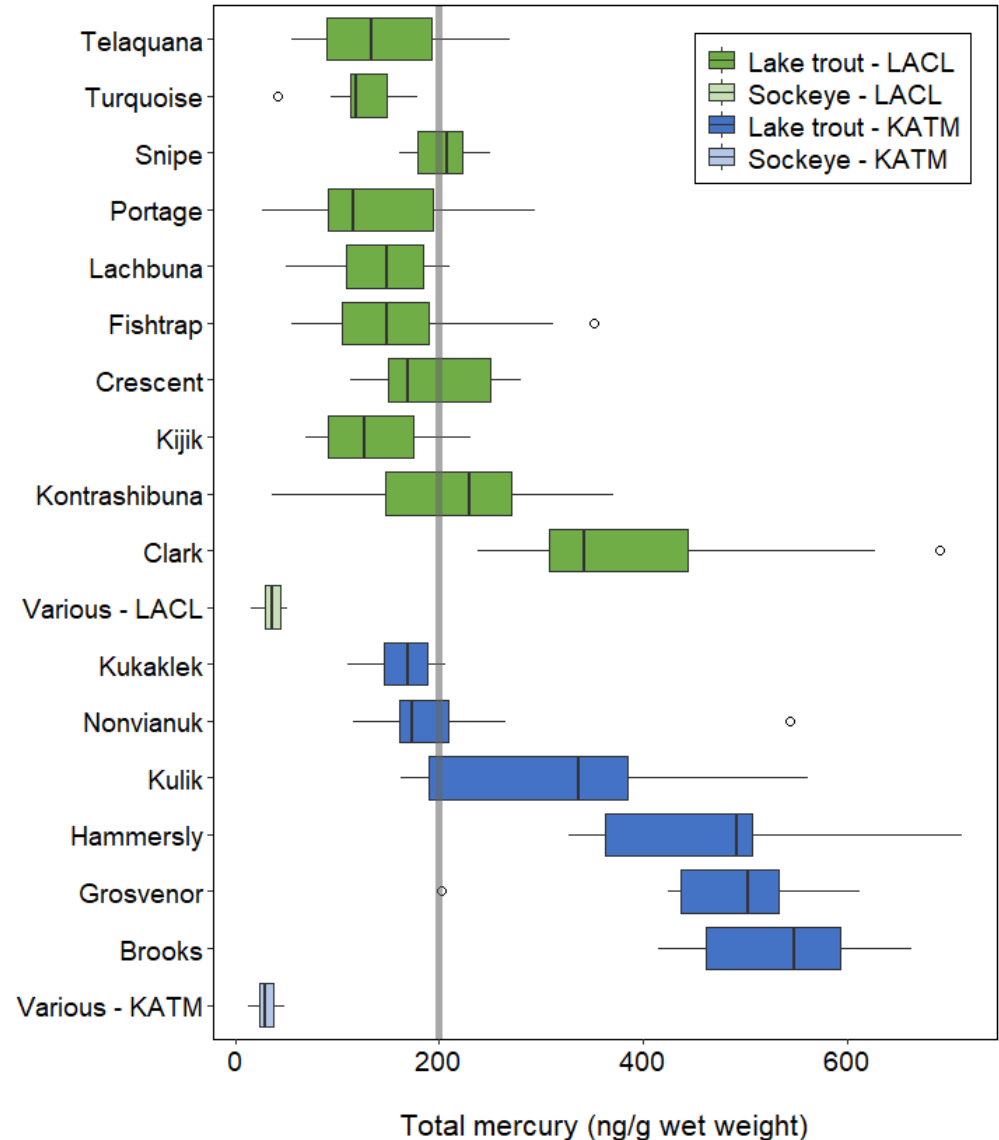
Analyzed in each fish sample:

- Total Hg, N, C
- Isotopes of Hg, N, C
- Otoliths (fish age)

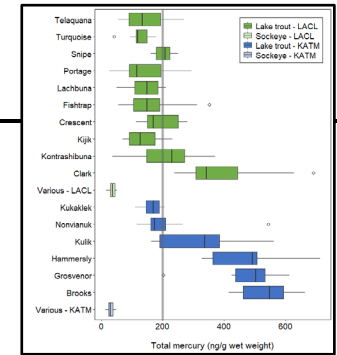


Preliminary Results

- Lake trout have a wide range of total Hg levels, within and among lakes.
- The median value of lake trout total Hg is above the State's consumption threshold in 7 lakes.
- Sockeye salmon total Hg levels are consistently low and have little variability.



Preliminary Results



Models

- to understand which drivers explain observed pattern
- include “fish-level” and “lake-level” variables

Fish-level variables that explain mercury concentrations include:

- lake trout age
- lake trout body condition
- lake trout diet specialization

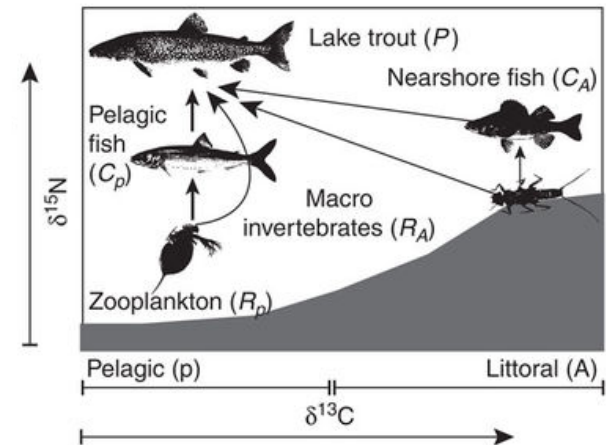
Hg is \uparrow in older fish



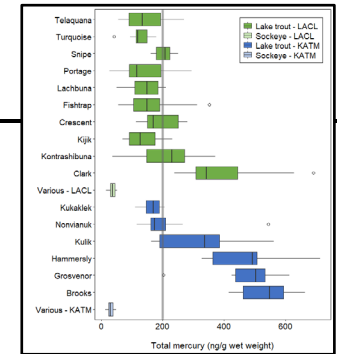
Hg is \uparrow in skinnier fish



Hg is \uparrow in fish feeding offshore



Subsistence



“...women who are or can become pregnant, nursing mothers and children should follow these guidelines to limit their mercury intake. Everyone else can eat as much seafood as they like.”

Eating Fish Safely Guidelines for Alaska Women and Children

Mix and match your fish meals for up to:

12 POINTS PER WEEK

Note: A *meal size* is 6 ounces, uncooked weight (or roughly the size of a deck of cards).

Alaska fish is rich in nutrients and good for you. State health officials recommend that everyone eat fish at least twice per week. However, all fish contain some mercury, a toxic metal that can harm the developing nervous systems of unborn babies and children. Because of this, women who are or can become pregnant, nursing mothers and children should follow these guidelines to limit their mercury intake. Everyone else can eat as much seafood as they like.

PER MEAL
0
Points

Unrestricted amounts

Arctic Cisco	Pacific Ocean Perch
Big Skate	Rainbow Trout
Black Rockfish	Rougheye Rockfish
Broad Whitefish	Sablefish
Dolly Varden	Salmon, Chinook (King)
Dusky Rockfish	Salmon, Chum
Grayling	Salmon, Pink
Halibut <40 pounds	Salmon, Red (Sockeye)
Humpback Whitefish	Salmon, Silver (Coho)
Least Cisco	Sheefish
Lingcod <35 inches	Walleye Pollock
Pacific Cod	

PER MEAL
3
Points

Halibut 40–80 pounds
Lake Trout
Lingcod 35–40 inches

PER MEAL
4
Points

Halibut 80–140 pounds
Lingcod 40–45 inches
Longnose Skate

PER MEAL
6
Points

Yelloweye Rockfish
Halibut 140–220 pounds

PER MEAL
12
Points

Halibut >220 pounds
Lingcod >45 inches
Salmon Shark
Spiny Dogfish

Eat a *variety* of fish and other seafood as part of a balanced diet.



For more information, go to:
www.epi.hss.state.ak.us/
or call (907) 269-8000



<http://dhss.alaska.gov/dph/Epi/eph/Documents/fish/FishConsumptionCalc.pdf>

Questions?

