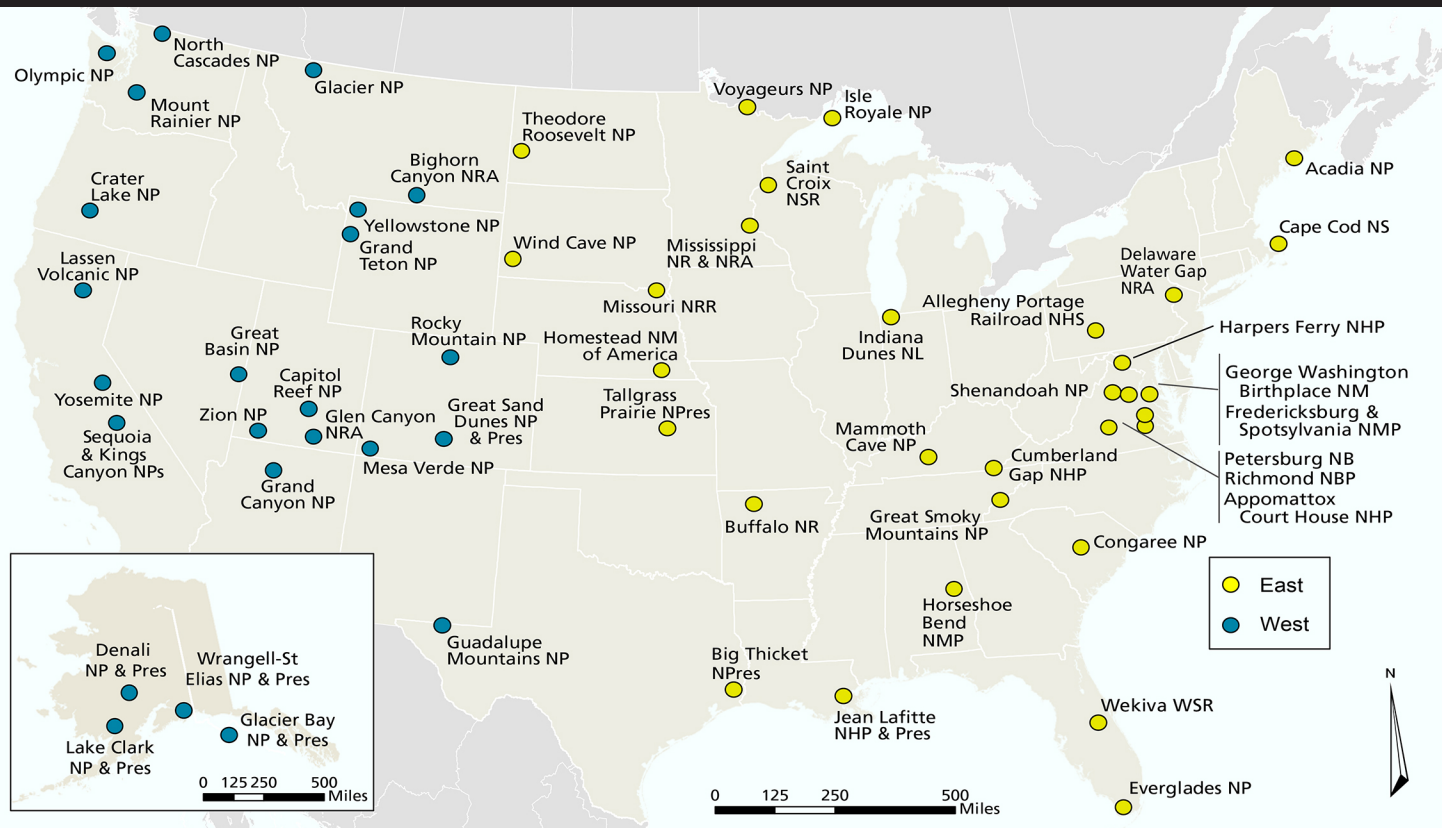


NPS Fish Mercury Study:

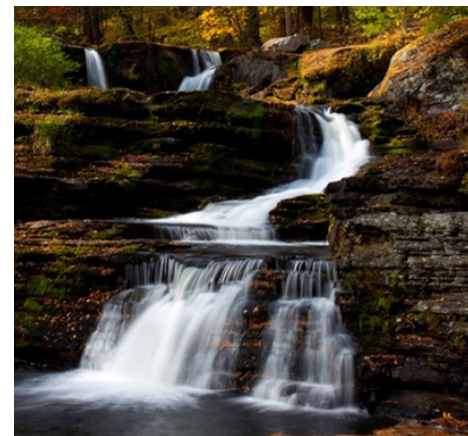
Concentrations and Risk in Fish from U.S. National Parks



Study Overview

Mercury (Hg) emissions to the atmosphere can transport at global scales and subsequently deposit anywhere, including pristine national parks. As Hg accumulates in the ecosystem it can be toxic to natural resources the National Park Service (NPS) is mandated to protect. Possible deleterious effects of Hg include reduced foraging efficiency and reproductive success of wildlife, and the issuance of fish consumption advisories to protect human health. U.S. Geological Survey (USGS) measured Hg concentrations in over 3,900 fish of 51 species from 239 remote lakes and rivers in 55 national parks spanning 32 states. Fish were collected from central and eastern U.S. parks in 2015-2016 and comprise 34 NPS units, while

fish from the western U.S. were collected 2008-2012 from 21 NPS units.



Delaware Water Gap National Recreation Area, NJ/PA

Sampling Criteria

Participating NPS units provided park staff to sample fish. Inclusion also required:

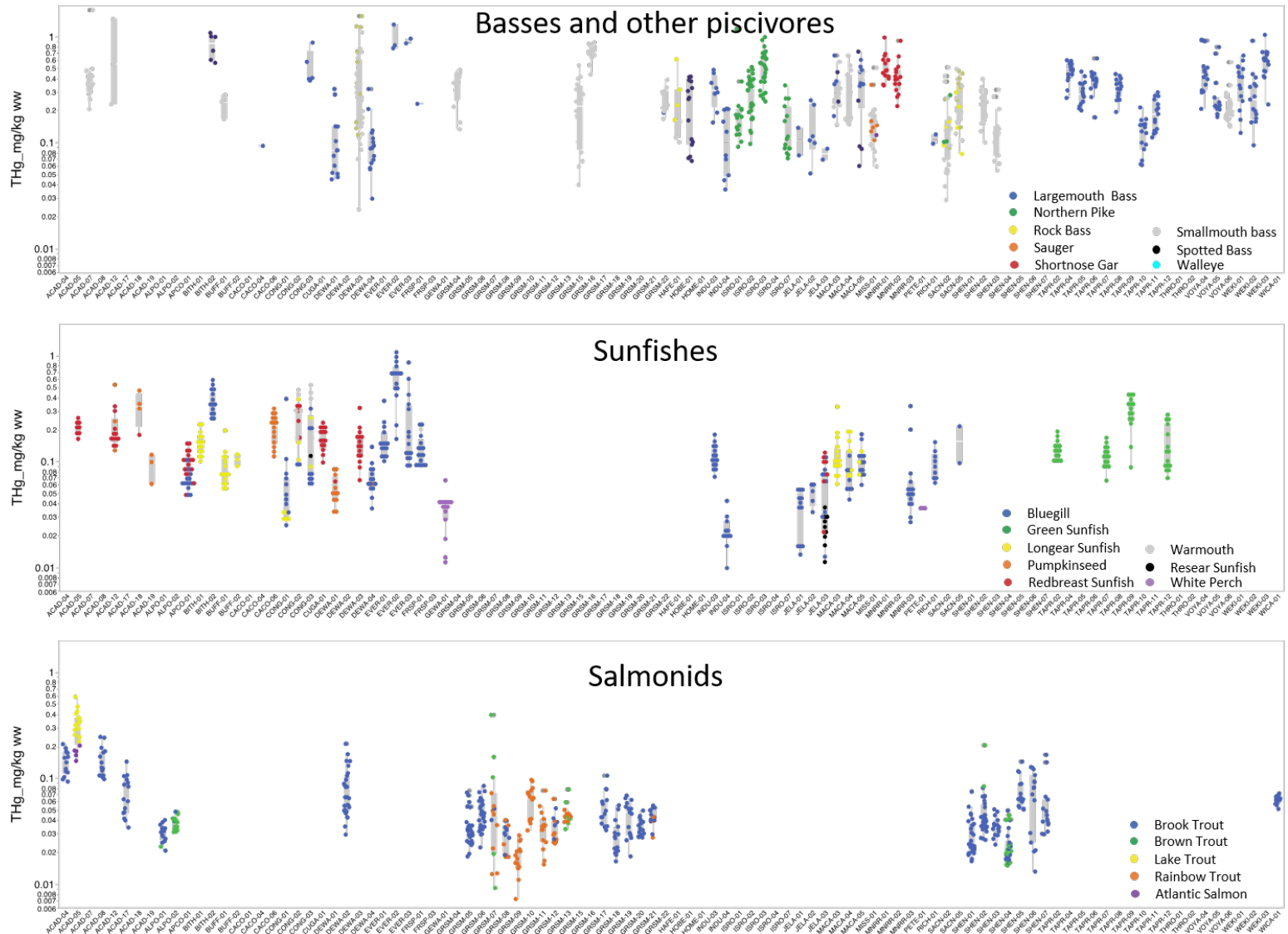
- Long-established fish monitoring records
- Pre-existing or concurrent studies on Hg
- Located in area predicted to experience significant Hg reductions due to emission regulations, landscape particularly susceptible to Hg methylation, and/or sites where little was known.

Targeted fish species were widely distributed and represent a variety of ecologies, but all fish are generally important for wildlife and human consumption. Groups overlap when possible, but ecological niches constrained the ability to collect identical species. Fish from the central and eastern sites included: basses, sunfishes, catfish, and trout. In the West, salmonids were targeted; mainly brook, lake, rainbow, and cutthroat trout.

Data

Data indicate that across all parks, sites, and species, fish Hg concentrations ranged from less than 0.01 to greater than 2.5 mg/kg ww. This figure displays the distribution of Hg concentrations from a subset of fish species in central and eastern U.S. national parks (Eagles-Smith et al. 2019) ordered alphabetically from left to right

on the x-axis; the figure excludes data from the western U.S. study (Eagles-Smith et al. 2014). The subset of data in the figure below represents raw concentrations and thus may not be comparable across sites or species. Ongoing analyses and interpretation by USGS will address size adjustments and facilitate inter-site comparisons.



Human Health Implications

Neither the USGS nor the NPS regulate environmental health guidelines. The NPS will be coordinating with state officials regarding potential fish consumption advisories, in accordance with 515 DM 5. State fish consumption guidelines consider both the risks associated with Hg exposure and the benefits of fish consumption, such as improved cardiac health

from increased omega-3 fatty acid consumption or potential reduced intake of unhealthy fats due to food substitutions. According to the Centers for Disease Control and Prevention, exposure to high levels of Hg in humans may cause damage to the brain, kidneys, and the developing fetus. Pregnant women and young children are particularly sensitive to the effects of Hg.

Next Steps

The NPS fish Hg concentration data and source attribution analyses using Hg isotopes are being analyzed by USGS researchers and will be published in the peer-reviewed literature later in 2019. The NPS Fish Hg Study is a collaboration with the NPS Air Resources Division, NPS Water

Resources Division, national parks, regions, networks, states, and the USGS Forest and Rangeland Ecosystem Science Center.

For more information:

Jeffrey Olson: jeffrey_olson@nps.gov