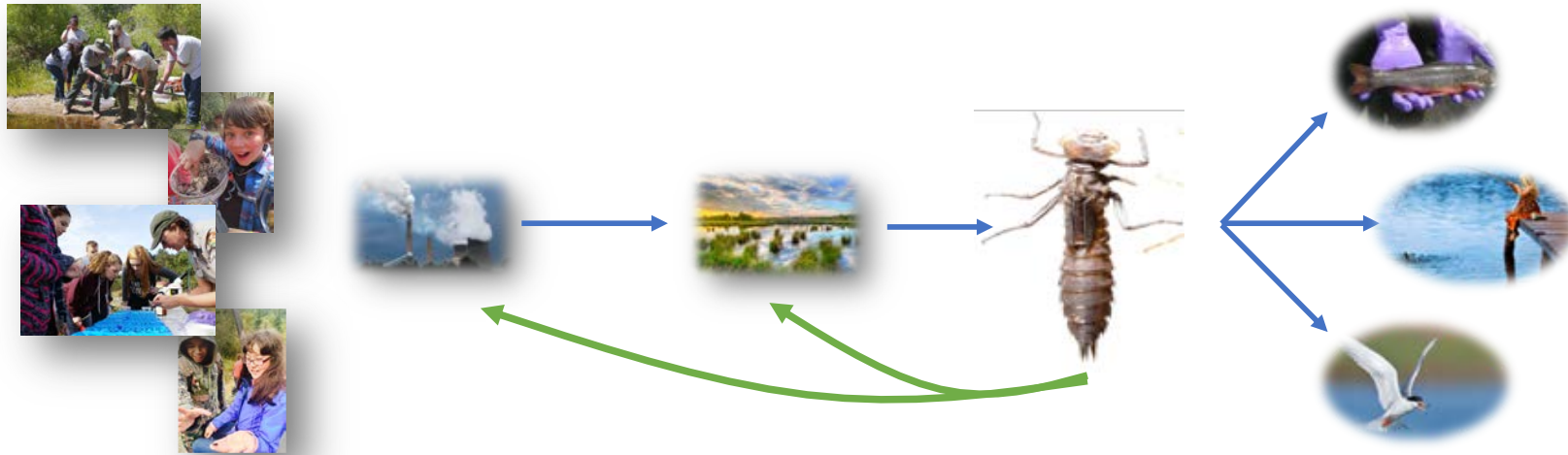




The Dragonfly Mercury Project

A national-scale citizen science program for monitoring mercury risk to ecosystem and human health



Collin Eagles-Smith¹, James Willacker¹, Sarah Nelson², Colleen Flanagan Pritz³, Dave Krabbenhoft¹, Celia Chen⁴, Josh Ackerman¹, Evan Grant¹, David Pilliod¹

¹US Geological Survey, ²Appalachian Mountain Club; ³National Park Service, ⁴Dartmouth University

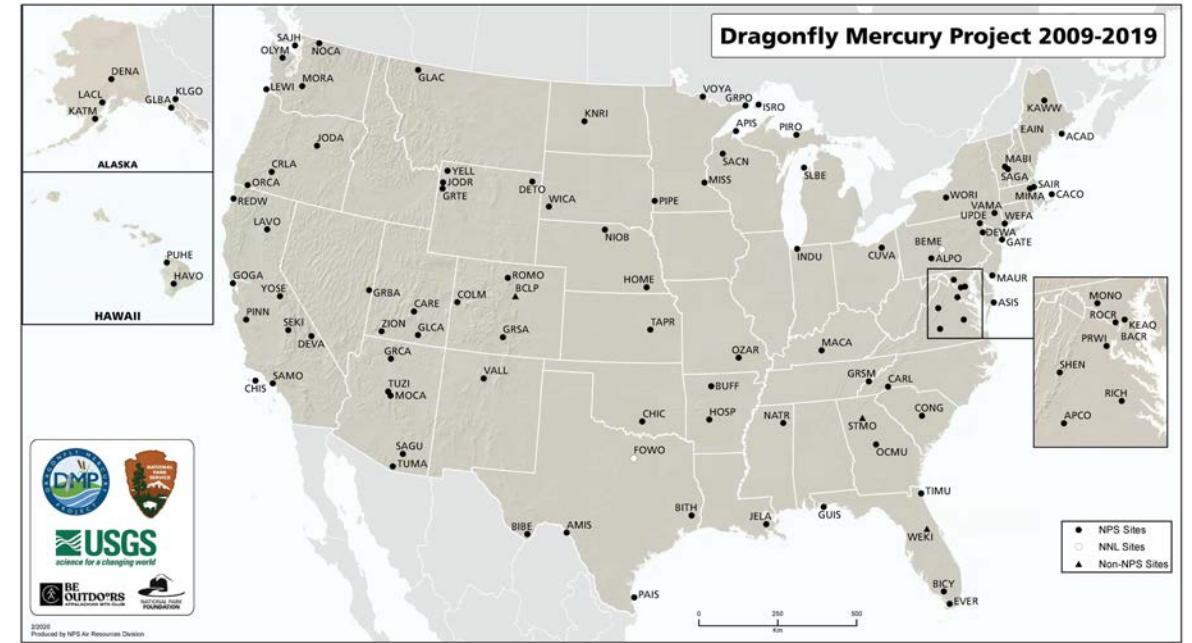
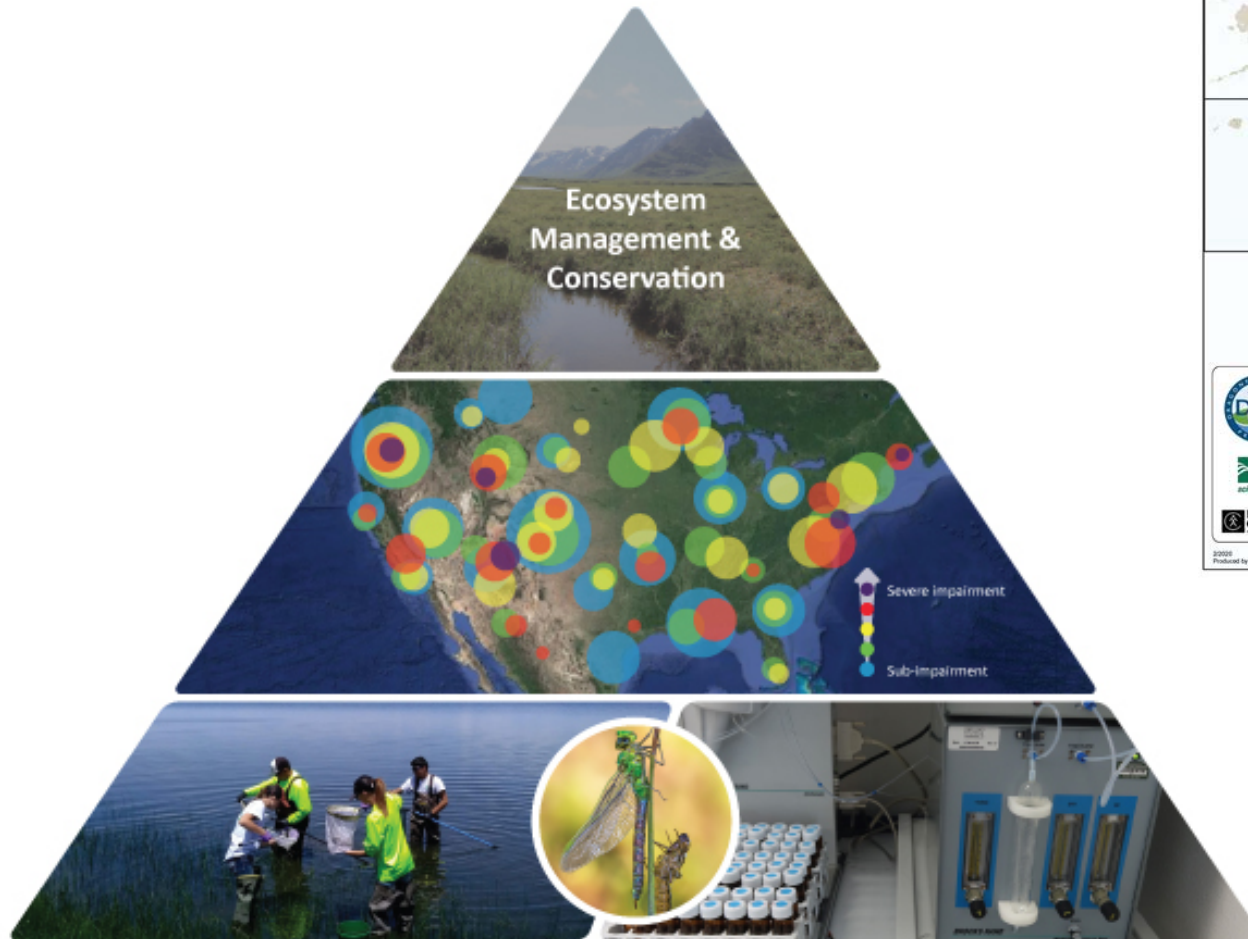
Society for Toxicology and Chemistry, SciCon2

Nov 15-19. 2020



The Dragonfly Mercury Project

-A citizen science program for monitoring mercury in the environment-

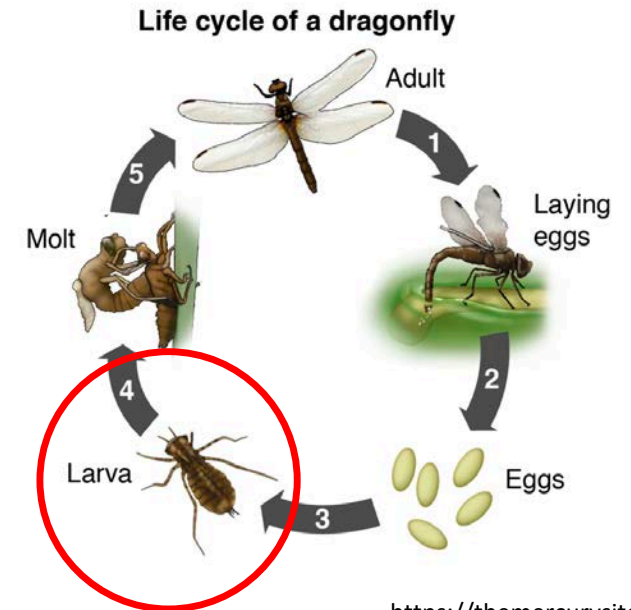


The Dragonfly Mercury Project is a landscape-scale surveillance study that links scientific efforts to understand the drivers and risks of mercury pollution with public engagement to inform management solutions.



Dragonfly larvae as biological mercury indicators

- High site fidelity
- Common and widespread
 - Most freshwater habitats
 - 6 continents
- Can inform fishless waters
- Link in food web
 - Voracious predator
 - Common fish prey
 - Vector to terrestrial habitats
- High %MeHg
- Large body size
- Easily sampled



<https://themercurysite.com/>



Dragonfly Mercury Project: Goals

- Increase the understanding of mercury (Hg) contamination across the US using dragonfly larvae as biosentinels
- Engage citizen scientists in the collection of dragonfly larvae, and enhance science literacy
- Inform resource management decisions

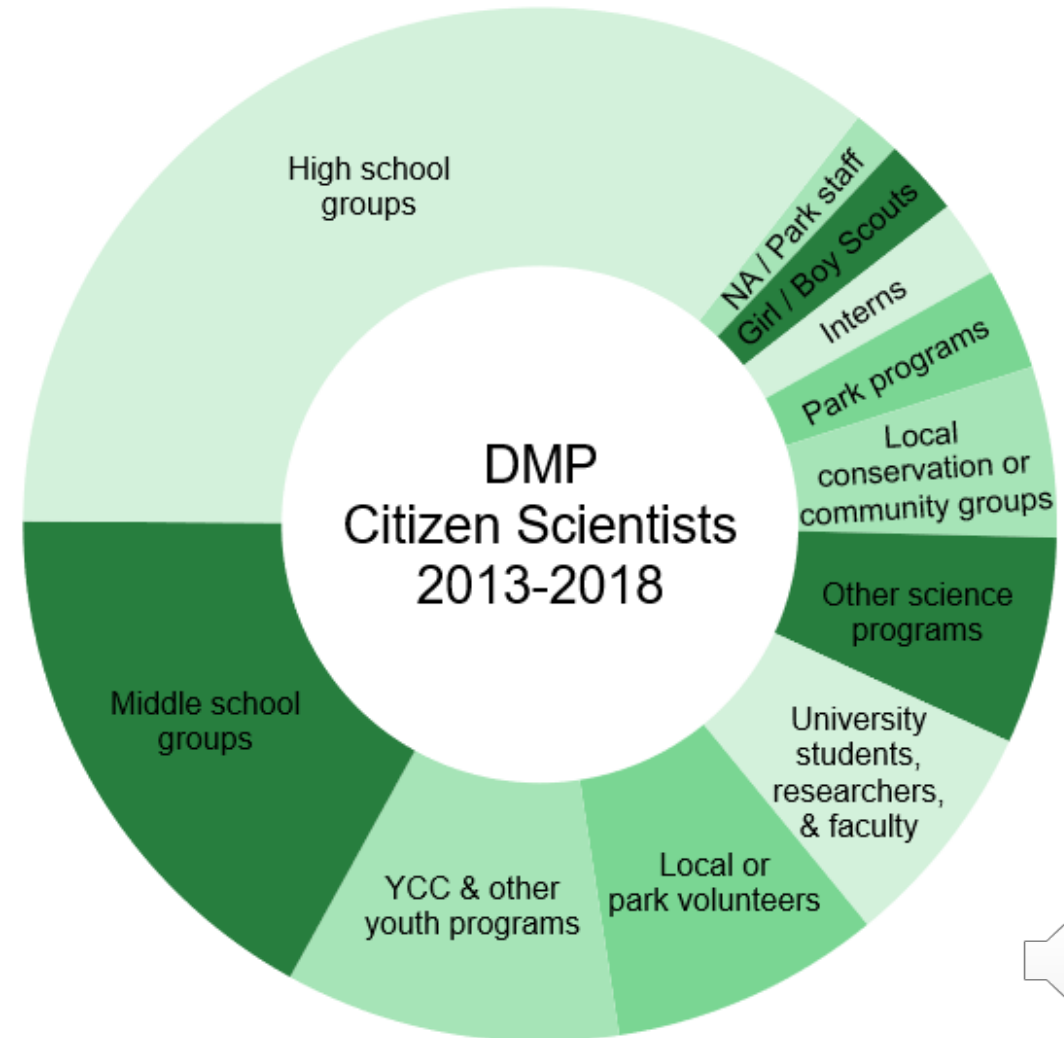


Program Design



Public Participants contribute to the Project's Success

Nearly *two-thirds* of the DMP citizen scientists are *youth*!



COMMUNITY ENGAGEMENT: GIRL SCOUTS

GLEN CANYON NRA – AZ



National Park Service

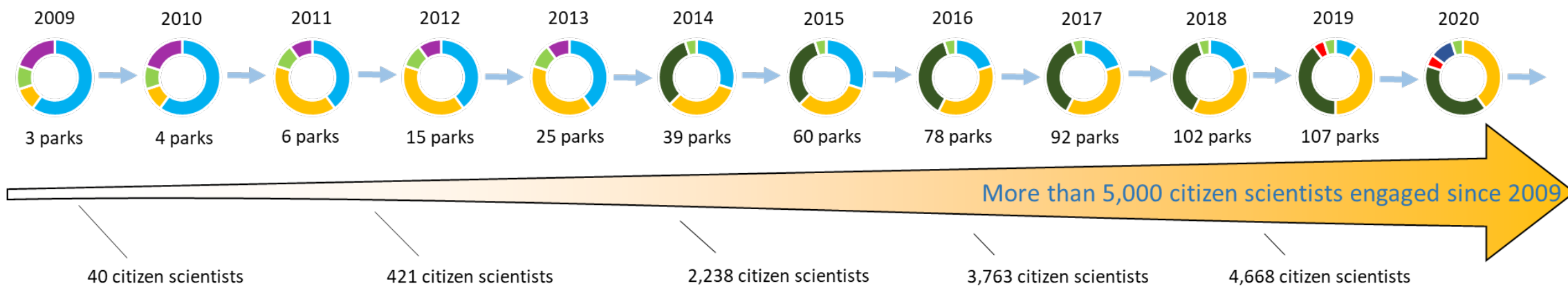


National Park Service

COMMUNITY ENGAGEMENT: URBAN GROUNDWORKS

SHENANDOAH NP – VA





■ UMaine
 ■ NPS
 ■ USGS
 ■ NPF
 ■ AMC
 ■ Dartmouth
 ■ Schoodic



Developmental Timeline

Demonstrates growth in citizen engagement and partnership institutions over time.



DMP Process and Information Flow Pathways

Each step communicates directly with all the others to produce robust data products for science applications, resource management, and community education.



A National-Scale Assessment of Mercury Bioaccumulation in United States National Parks Using Dragonfly Larvae As Biosentinels through a Citizen-Science Framework

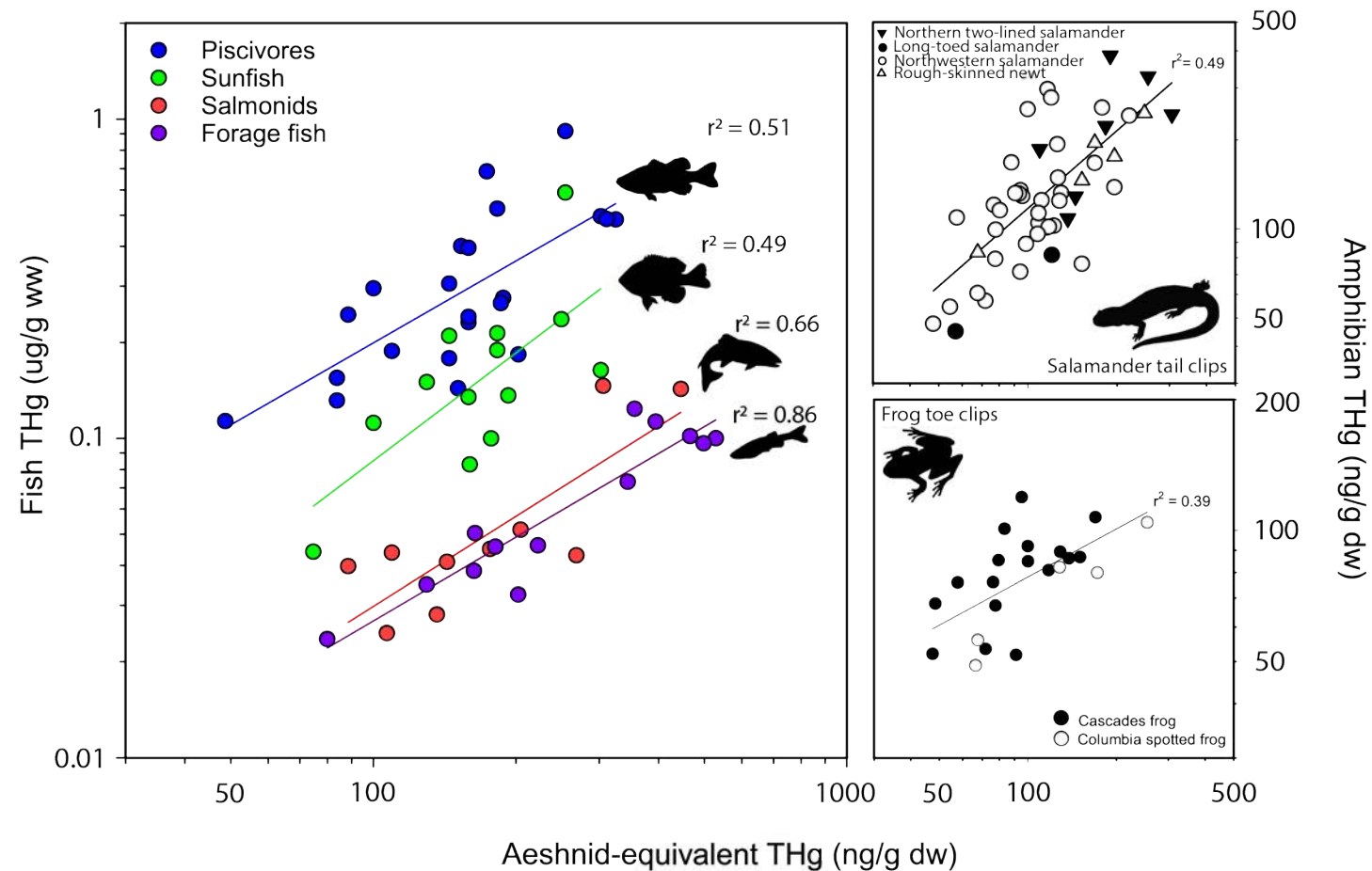
Collin A. Eagles-Smith,^{*} James J. Willacker, Sarah J. Nelson, Colleen M. Flanagan Pritz, David P. Krabbenhoft, Celia Y. Chen, Joshua T. Ackerman, Evan H. Campbell Grant, and David S. Pilliod



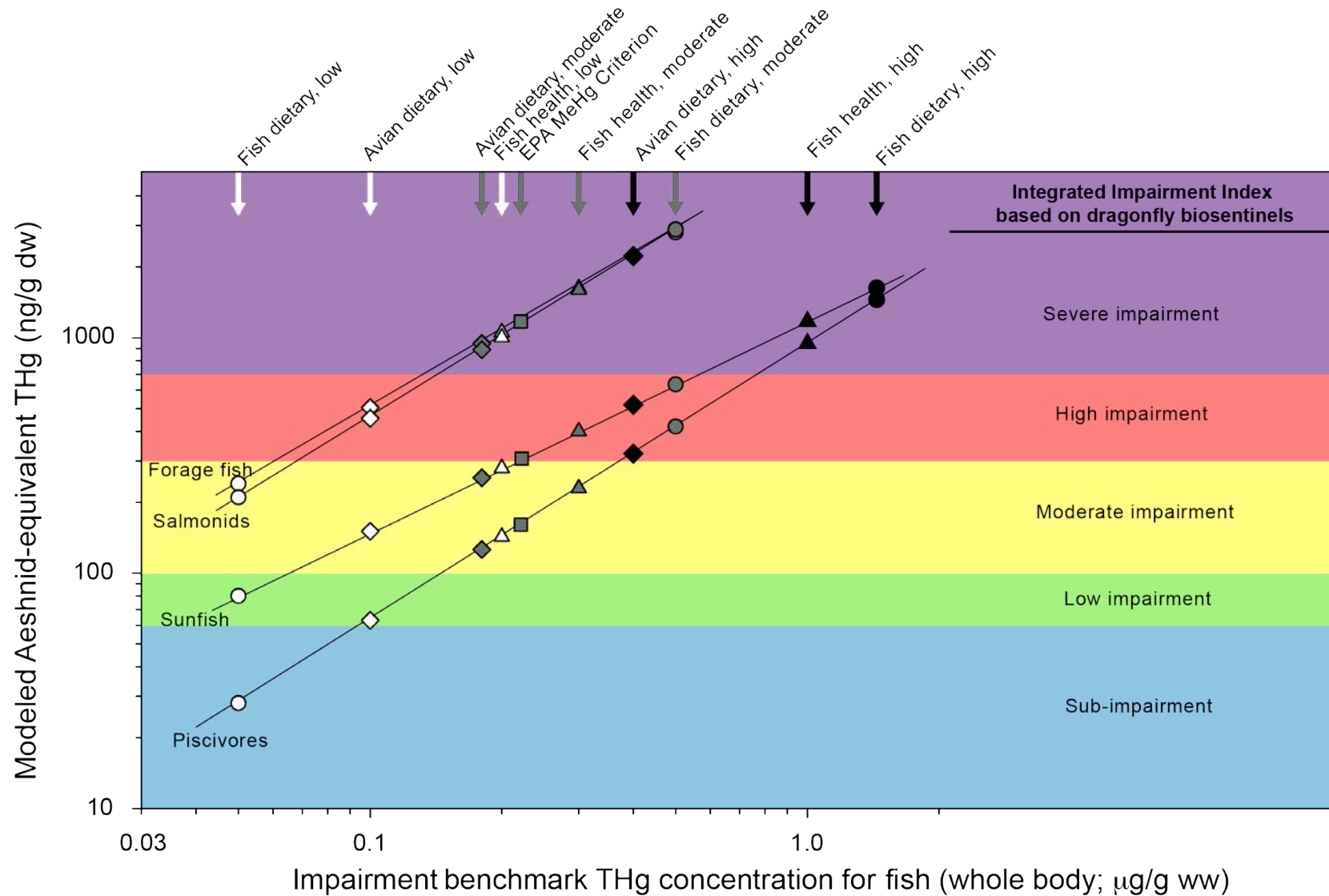
National Park Service



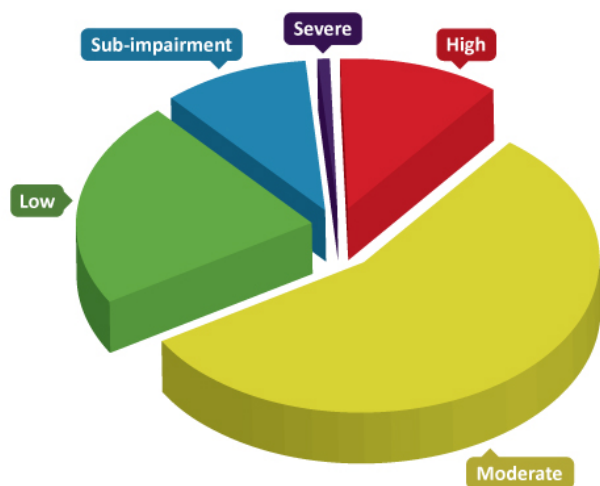
Dragonfly Hg correlated with fish and amphibian Hg



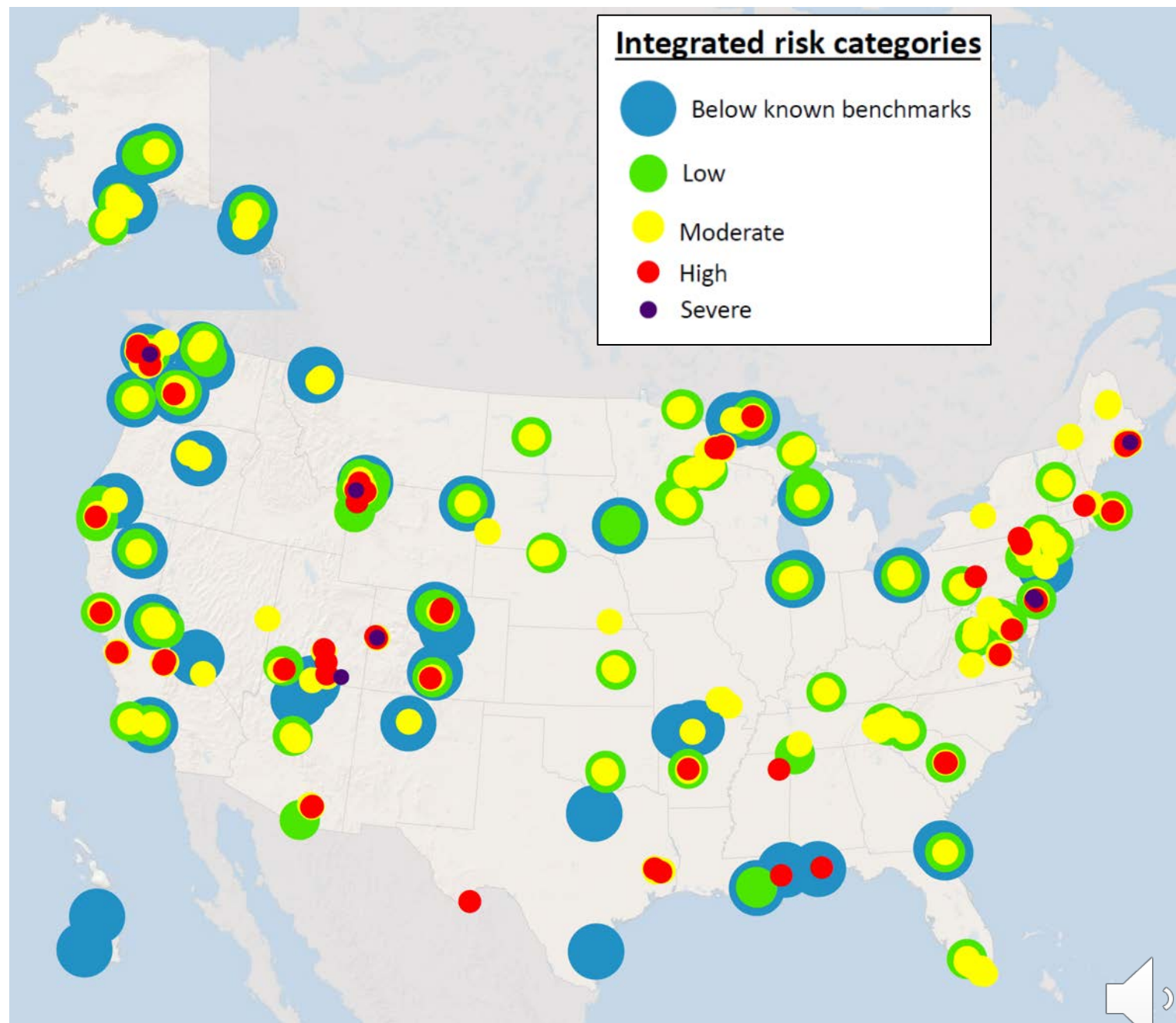
Integrated Impairment Index



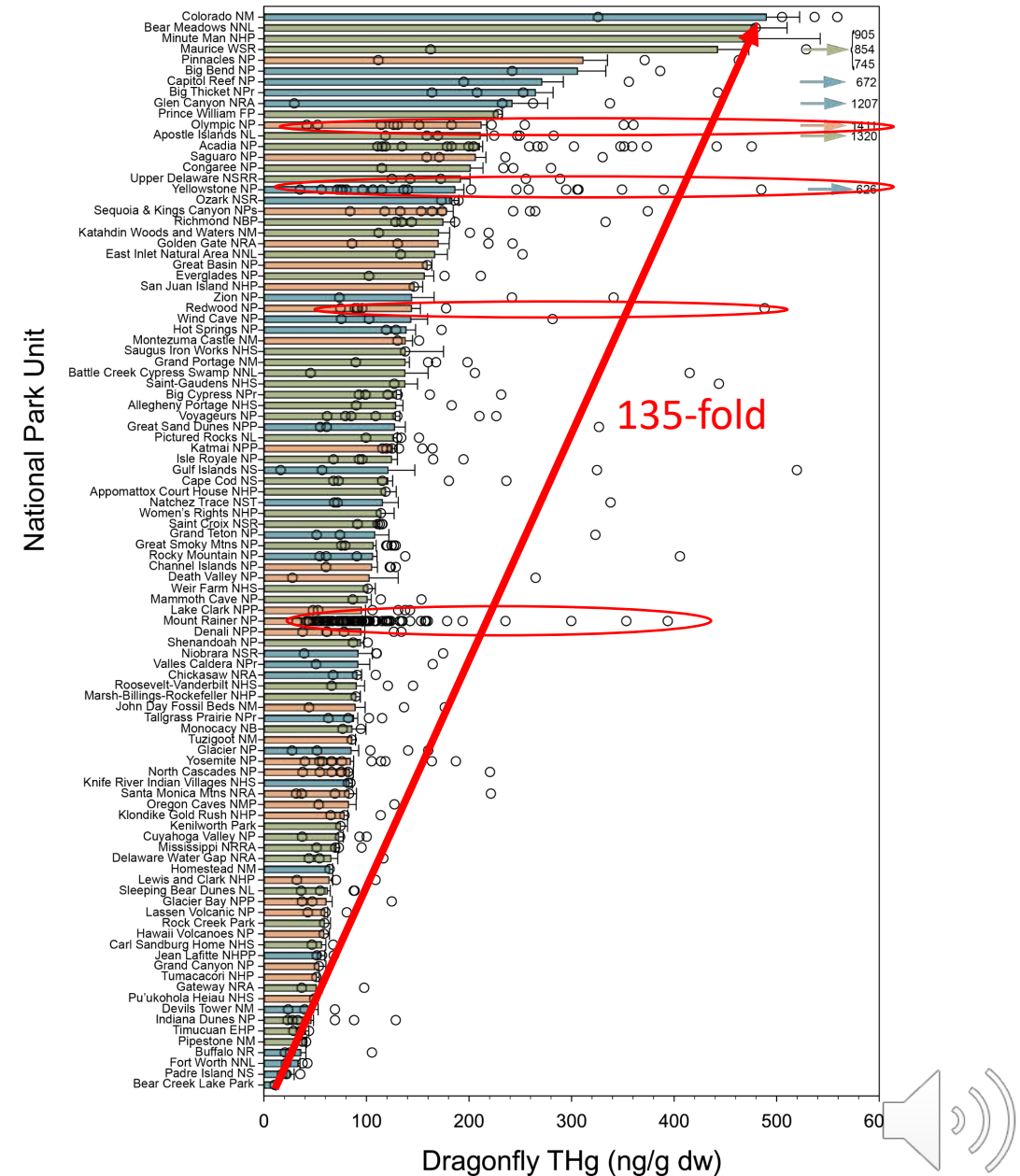
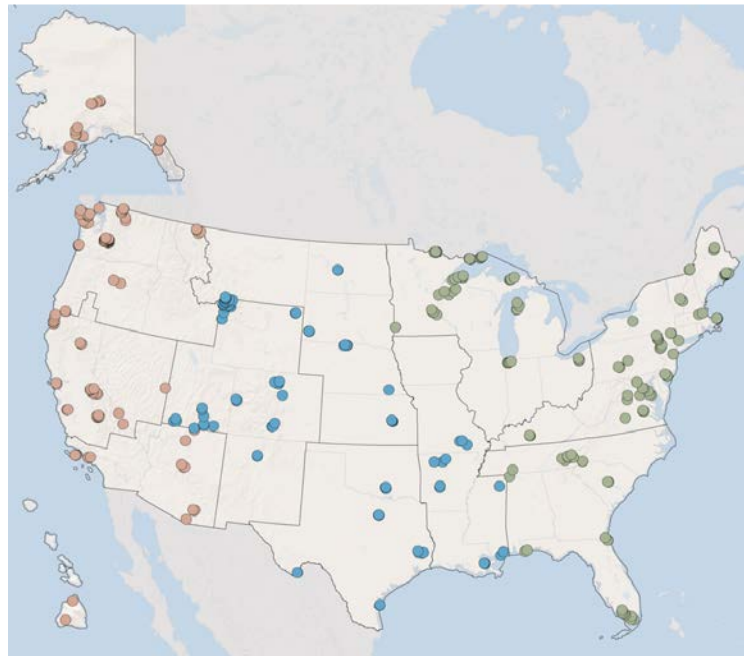
SITE-SPECIFIC INTEGRATED HG RISK ESTIMATES



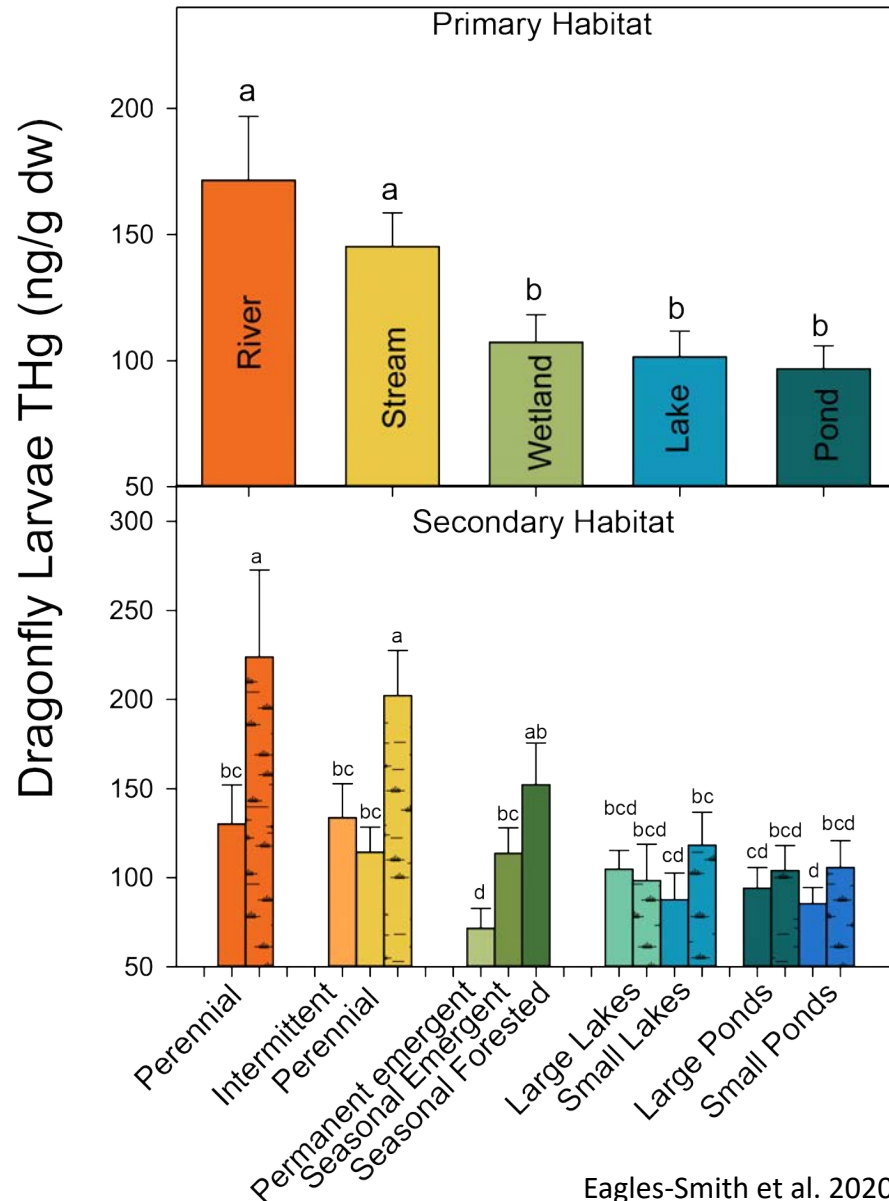
Percentage of sample sites with dragonfly mercury concentrations that correspond with defined risk categories of ecosystem health.



SPATIAL VARIATION EVIDENT BOTH AMONG AND WITHIN PARKS



Mercury variation among habitats



Eagles-Smith et al. 2020; 10.1021/acs.est.0c01255

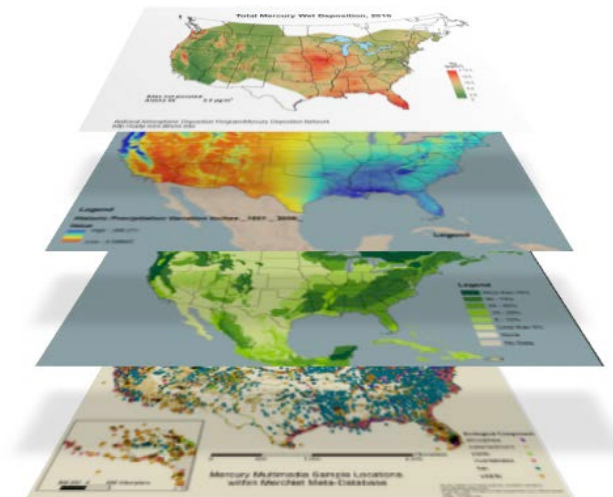
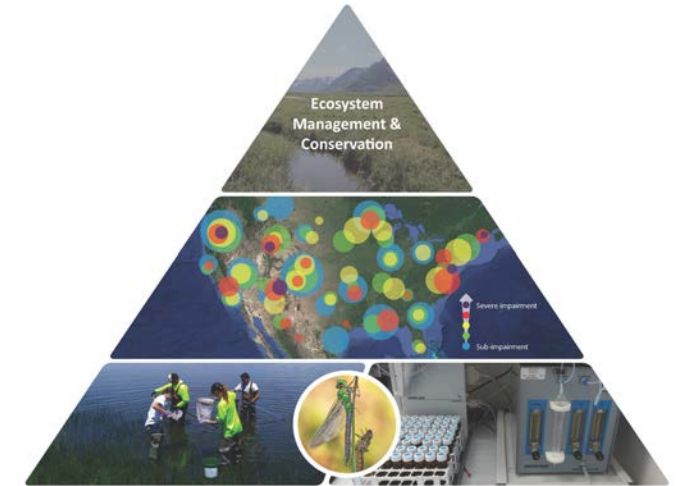
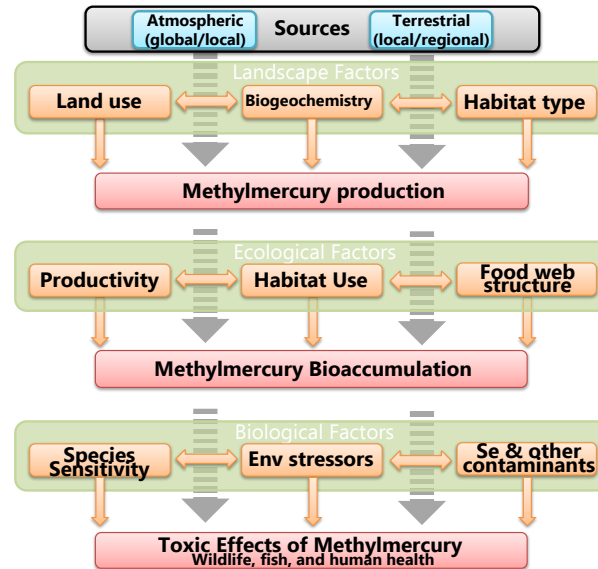


5 CORE ELEMENTS FOR ENGAGEMENT AND RELEVANCE



Predictive models, quantifying drivers, informing management

- Habitat replication across the landscape
 - Site replication within habitats
- Ancillary parameters
 - Existing geospatial layers and new data collection
- Time-series at select locations





Interactive Story Map:
<https://wim.usgs.gov/geonarrative/dmp/>

