

# Dragonfly Larvae as Mercury Biosentinels: From National Parks to National Forests

Kate Buckman<sup>1</sup>, Sarah Nelson<sup>2</sup>, Ralph Perron<sup>3</sup>, Celia Chen<sup>1</sup>

<sup>1</sup>Dept. of Biological Sciences, Dartmouth College, Hanover NH 03755

<sup>2</sup>Appalachian Mountain Club, Gorham NH 03581

<sup>3</sup>USDA Forest Service, Campton NH 03223

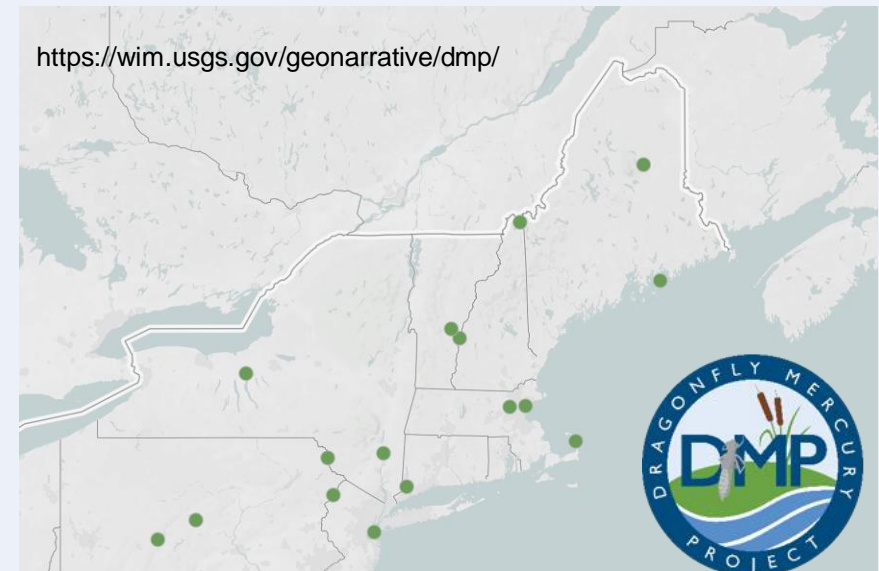
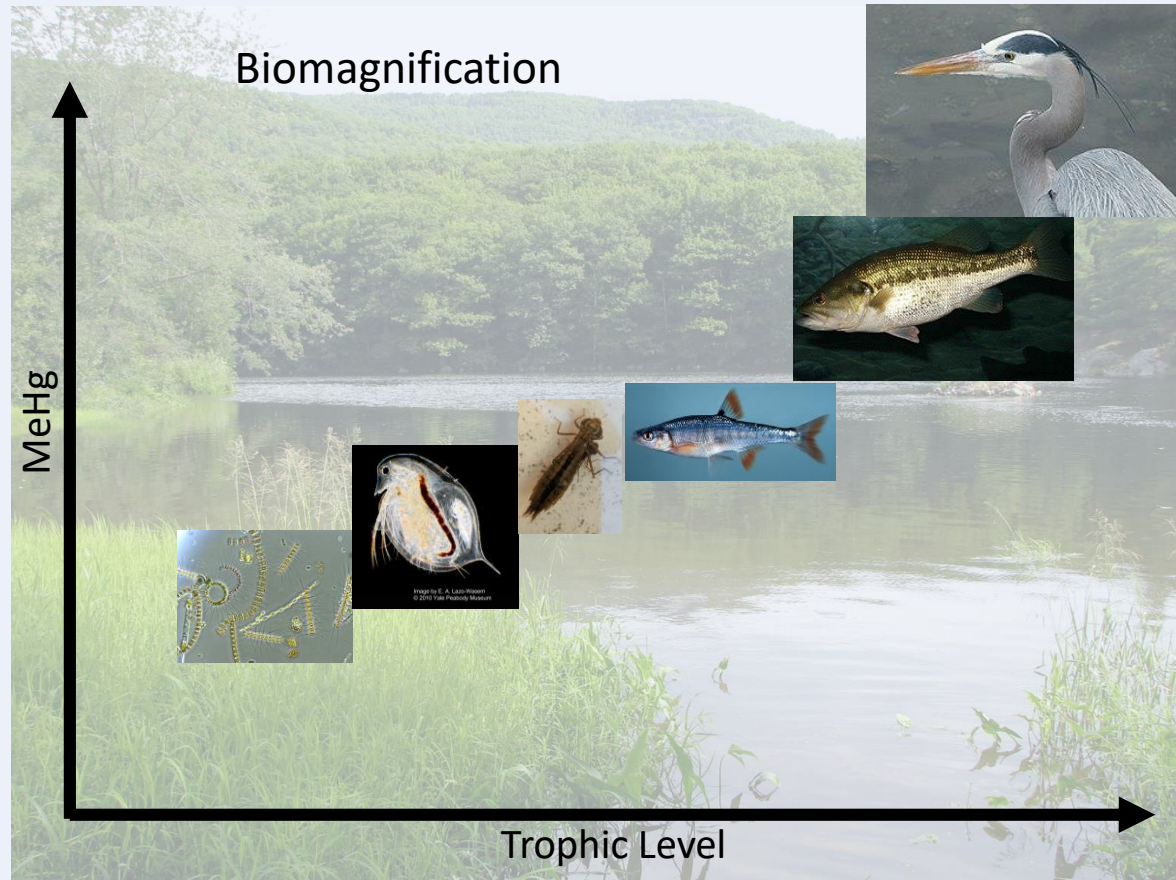


BE OUTDOORS  
APPALACHIAN MTN CLUB



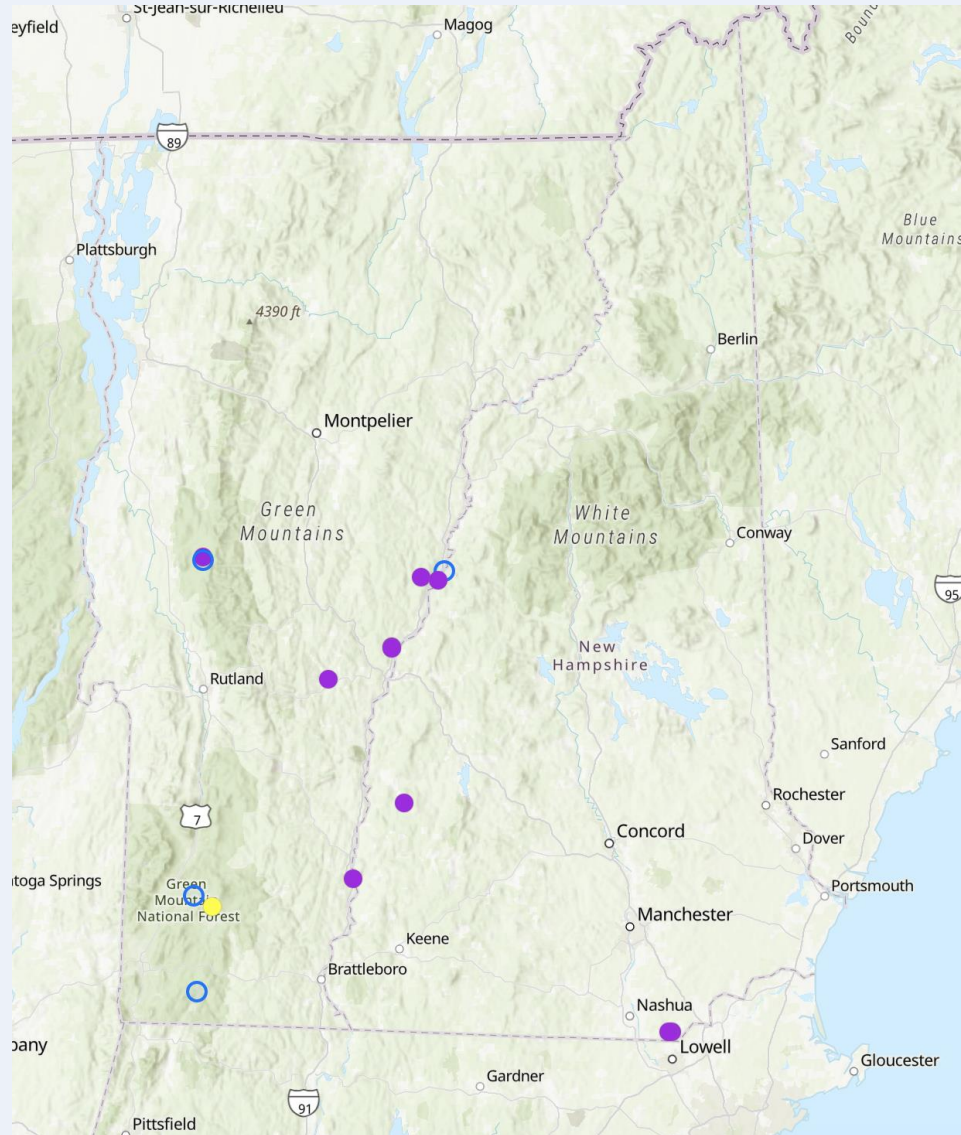
# Background

- forested landscapes in New England known to be susceptible to mercury deposition and can enhance methylation and bioaccumulation
- implications for ecosystem and human health



- over 100 parks in national DMP
- variation by ecoregion, family, & waterbody type
- we felt we could add important data points to NNE, complementing our existing data set of 700+ samples in NH and VT

# Site Selection



# Collection

- utilize similar methods to the national DMP
- collect additional water quality and site description data
- collections occur late summer through fall
- lead collector adds data to Aneccdata.org

A screenshot of the Aneccdata.org website showing the "Add observation" form for the "Dartmouth Dragonfly Mercury Project". The form includes fields for "Sample Location ID", "Site name", "Collection Year", "Collection Date", "Collection time", "Collection Location (Town, State)", "School", "Water body type", "General Surrounding Land Use", "Substrate", "Nearby known source of Hg pollution?", "Dominant vegetation", and "Average water depth". There are also dropdown menus for "Water temperature", "pH", "Nitrate", and "Ammonia". The form is partially filled out with "4CS9XW" for the location ID and "Morning" for the collection time.

# Identification

Field Cards  
For Identifying  
Dragonfly  
Nymphs  
To  
Family

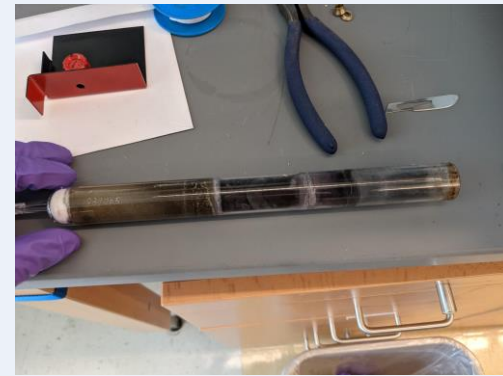
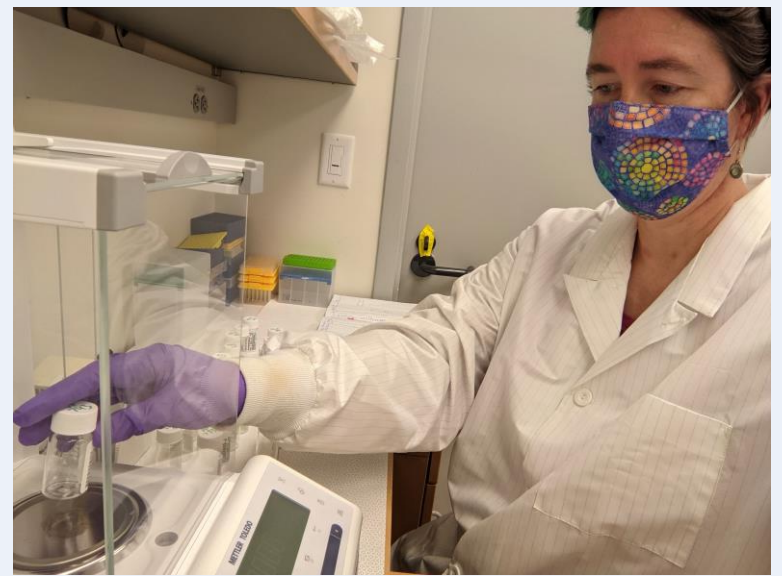
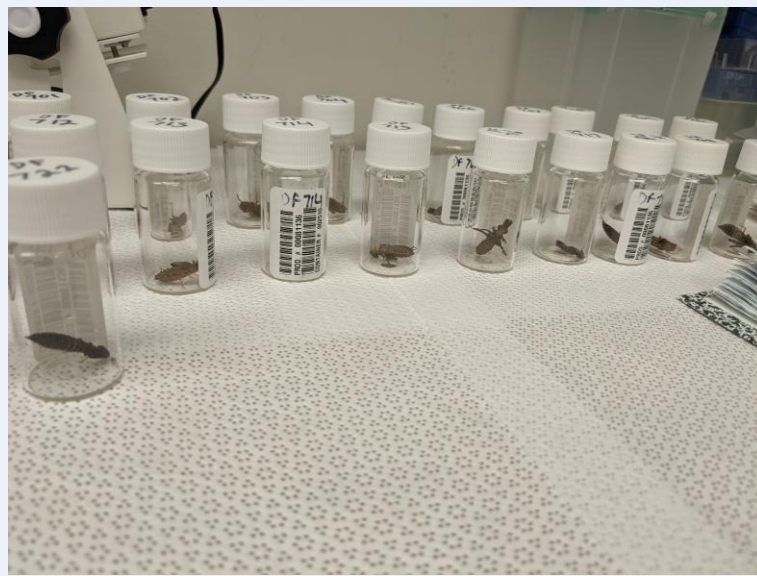
1865 THE UNIVERSITY OF MAINE  
USGS science for a changing world  
NATIONAL PARK SERVICE  
SCHOODIC INSTITUTE AT ACADIA NATIONAL PARK

For use with Mercury in Dragonfly Nymphs from National Parks Citizen Science  
Dragonfly Nymphs Collection  
© 2014 Schoodic Institute at Acadia National Park



UMaine et al., 2020  
available at:  
<https://irma.nps.gov/DataStore/Reference/Profile/2265706>

# Analysis

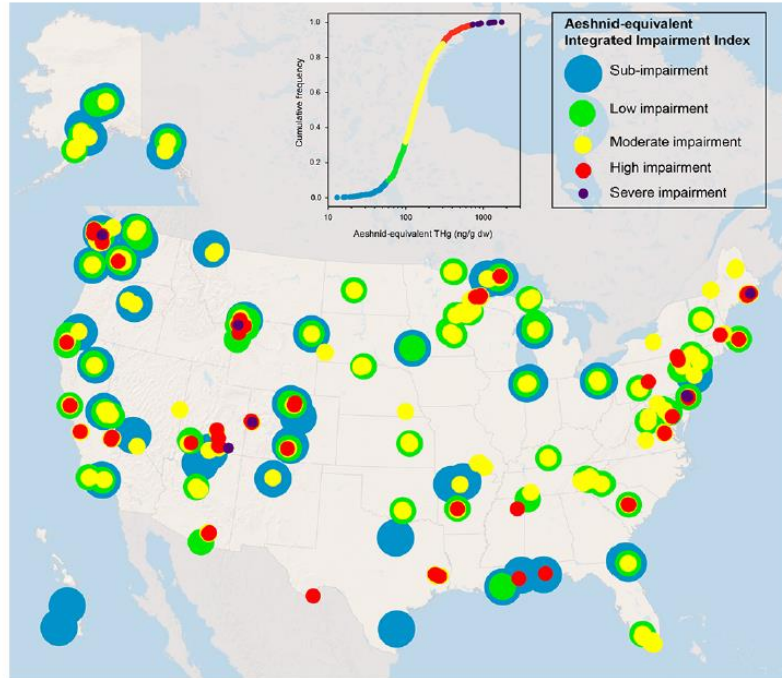


analyzed for total Hg by Direct Mercury Analyzer

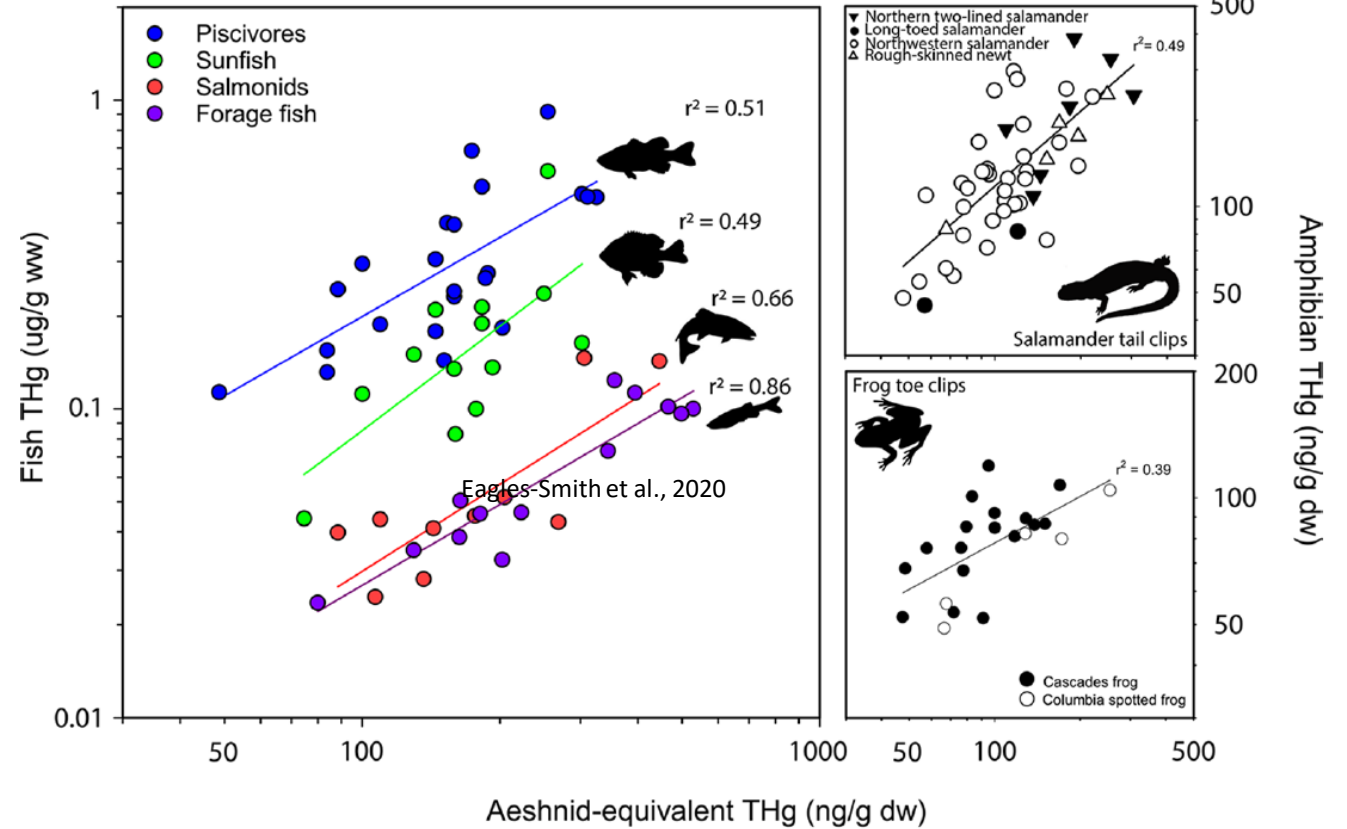
2021 samples are still a work in progress!

130 larvae from 10 sites collected in Sept and Oct

# Data



**Figure 6.** Integrated impairment indices for all 457 sites sampled between 2009 and 2018. Integrated impairment indices are derived from Aeshnid-equivalent geometric mean THg concentrations for each site–year and their corresponding association with Hg exposure in fish and other wildlife. The inset for the cumulative frequency distribution illustrates the proportion of sites and years that fall into each of the five categories. Note that the map geography was altered to include Alaska and Hawaii within the map frame.



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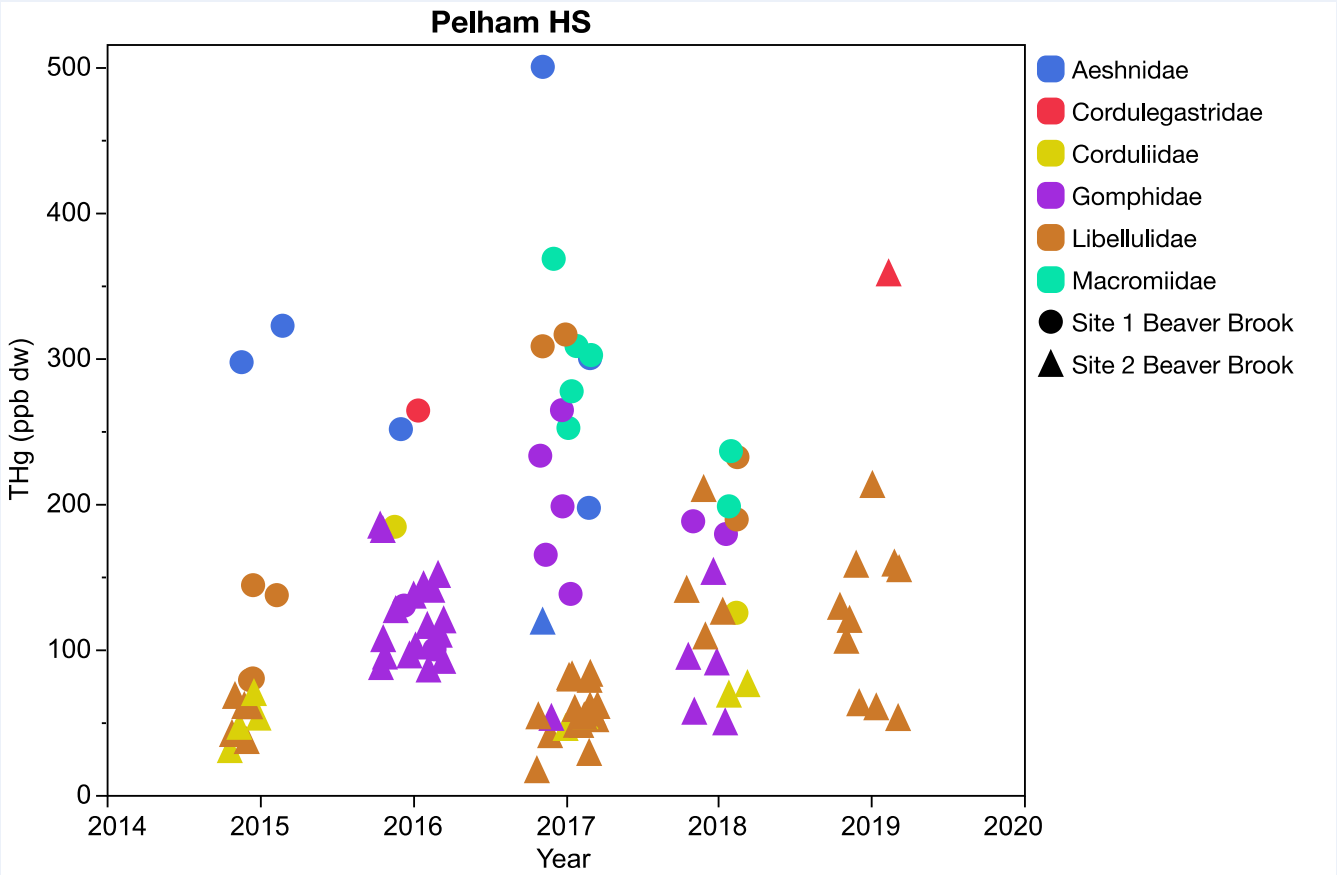
## A National-Scale Assessment of Mercury Bioaccumulation in United States National Parks Using Dragonfly Larvae As Biosentinel through a Citizen-Science Framework

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

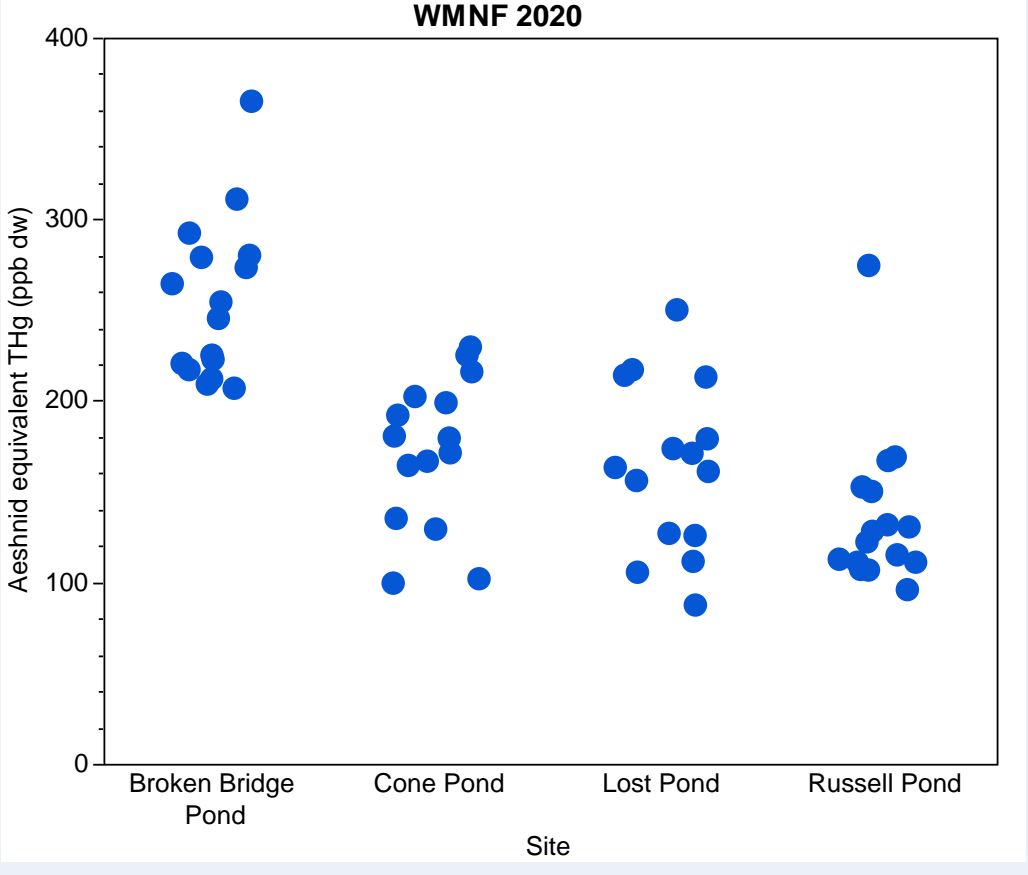
Cite This: <https://dx.doi.org/10.1021/acs.est.0c01255>

Read Online

# Data



temporal and spatial variability



moderate impairment of WMNF 2020 sites

Eagles-Smith et al. Total Mercury Concentrations in Dragonfly Larvae from U.S. National Parks (ver. 7.0, October 2021) <https://www.sciencebase.gov/catalog/item/5b92cffce4b0702d0e80a2d5>



# Thanks to:

2021 collection partners:

Pelham High School, Stevens High School, Bellows Fall Union High School, Rivendell Academy, Dawn Dextraze, Black River Action Team, Nathan Giffard, Barbara Carey, Suzanne Leiter

Thanks also to USDA Forest Service and National Park Service

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## Lend a hand in 2022!

contact [Kate.L.Buckman@dartmouth.edu](mailto:Kate.L.Buckman@dartmouth.edu) if you are interested in helping collect larvae