



Growing the Impact and Value of the Dragonfly Mercury Project



Public participants in the Dragonfly Mercury Project at Saguaro National Park (AZ), Indiana Dunes National Park (IN), and Cuyahoga Valley National Park (OH), left to right.

Overview

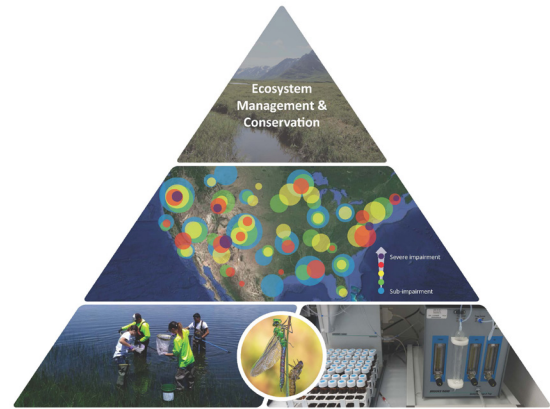
The Dragonfly Mercury Project assesses ecosystem health in U.S. national parks. This unique program is a monitoring, research, and education initiative that engages community volunteers nationwide in sampling an ideal biosentinel, dragonfly larvae, to estimate the risks that mercury contamination pose to resources managed by the National Park Service, and to human health. The existing infrastructure combines public participation, advanced laboratory and computational analyses, and robust data management, positioning this program to provide information and tools for resource managers to better understand and work toward mitigating mercury risks across varied ecosystems.

Engaging the public in science to inform resource management and protect public health

To date, the Dragonfly Mercury Project (DMP) has engaged more than 5,000 citizen scientists to quantify mercury impairment using dragonfly larvae from over 500 waterbodies across greater than 100 U.S. national parks and other federal, state, and local protected areas. The DMP’s multi-tiered approach benefits diverse partners by providing authentic research experiences for youth and other volunteers, delivering information that can be used to quantify mercury risk and inform resource management actions. Further development of this program, building on the successful framework already in place, will expand its utility for park management.

Specifically, developing geospatial models to predict potential risks in unsampled waters requires additional geographic coverage across ecosystems and environmental gradients. The outcome of this expansion would provide direct information on the extent of contamination in participating regions, quantify the most important ecosystem drivers that regulate mercury risk in different ecosystem types, and establish baseline data on mercury to track changes through time. Collectively, these outcomes can be used to communicate potential risks, monitor sensitive populations, and inform management actions that may facilitate risk reduction.

Linking mercury concentrations in dragonfly larvae to health risks for wildlife and humans



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

Mercury is among the most globally pervasive environmental contaminants, harming the health of people and wildlife across the U.S. and abroad. Because it is transported through the air, mercury contamination can impact even remote and protected lands. Dragonfly larvae are the ideal mercury biosentinel because they are ubiquitous across ecosystem types, easy and cost-effective to monitor, and provide high-quality data that reflect mercury exposure in fish and other wildlife. As a result, a major contribution from the DMP to date, is the development of linkages between mercury concentrations in dragonfly larvae to exposure and potential health risks in fish, wildlife, and humans.

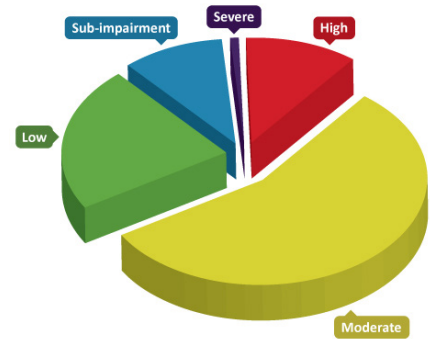
Demonstrated value for risk assessment and public engagement

This study is the most comprehensive assessment of mercury contamination and environmental risk in the nation's protected lands. This foundational work (Eagles-Smith et al. 2020):

- Developed an index that informs wildlife and human health risk to mercury based on dragonfly concentrations.
- Determined that mercury risk differed among habitats, with rivers being higher than lakes, and that the presence of wetlands further increased risk in nearby waterbodies.
- Found evidence that local ecosystem factors confound the direct linkage between atmospheric mercury deposition and patterns of mercury risk to fish and wildlife.
- Engaged citizenry in meaningful research and experiential learning opportunities that provide community learning and important

scientific contributions, and an exceptional cost savings to the public in comparison to more common approaches.

- Found 10 percent of sites were safer (below known impairment benchmarks); whereas, 12 percent of sites posed high or severe risk of impairment to fish, wildlife, and humans.



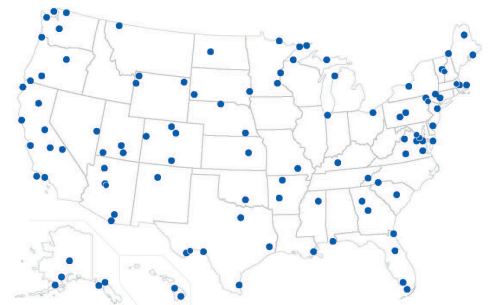
Percentage of sample sites with dragonfly mercury concentrations that correspond with defined risk categories of ecosystem health.

Growing the Dragonfly Mercury Project will increase its ability to address critical needs for managers and the public

The data delivery and interpretation tools developed by the DMP serve resource managers and public health officials in decision making and management actions. However, the utility of these tools is still limited. Opportunities to grow the program for achieving goals central to the missions of resource management and environmental protection agencies, include:

1. Developing risk forecasting models to identify safer water bodies for fishing and those that pose health risks to people and wildlife;
2. Informing management techniques and tools that could reduce mercury risk;
3. Assessing the effectiveness of domestic and international efforts to reduce mercury in the environment;
4. Engaging and enhancing learning of citizen scientists and the public; and
5. Communicating the importance and understanding of mercury issues for a variety of audiences.

Achieving these objectives requires broadening the baseline operations to incorporate new habitats and ecoregions, reach more public audiences, and strengthen partnerships with additional agencies and organizations; and implementing targeted activities associated with each specific goal, e.g., filling spatial data gaps.



Dragonfly Mercury Project sampling locations across 107 national parks and other protected places, 2009-2019.

The DMP is poised to help protect natural resources – and the people who enjoy and depend on them – from mercury exposure. We invite you to help us achieve that goal.

For More Information

Project Webpage:
<http://go.nps.gov/dragonflymercury>

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

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Eagles-Smith, C.A., et al. 2020. Environ. Sci. Technol. 54 (14): 8779–8790. <https://doi.org/10.1021/acs.est.0c01255>

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