



# National Atmospheric Deposition Program

Mercury in the Environment and Links to Deposition Science Committee

## National Atmospheric Deposition Program (NADP) Mercury in the Environment and Links to Deposition (MELD) 2025-2026 Annual Report

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## 1.0 Introduction

The Mercury in the Environment and Links to Deposition (MELD) Science Committee aims to improve our understanding of the effect of atmospherically derived mercury sources, pathways, processes, and effects on the environment. The science committee brings together experts from across federal, state, academic, tribal, and non-governmental organizations to discuss on-going mercury research and monitoring efforts. Established in 2019, the MELD science committee was charged to:

- Integrate the expertise affiliated with the Mercury Deposition Network (MDN), Atmospheric Mercury Network (AMNet), Litterfall Mercury Monitoring Network (MLN), and mercury biomonitoring initiatives to identify data and science gaps, coordinate research efforts to fill those gaps, and better utilize the data.
- Support existing and emerging national networks that monitor mercury both in the atmosphere and across the landscape by providing a multi-disciplinary forum to share information on measuring techniques, model development, and uncertainties associated with these approaches.
- Develop and use critical loads as a tool for understanding ecological responses to mercury loads and provide estimates of total mercury deposition.
- Enhance the public recognition of NADP by underscoring the importance of monitoring the atmospheric deposition of mercury on environmental and public health.
- Contribute to efforts evaluating the effectiveness of global mercury reductions (e.g., Minamata Convention on Mercury, Convention on Long-range Transboundary Air Pollution).
- Foster a connection between NADP and other national and international organizations to advance global mercury science and monitoring capacity, increasing external involvement in the NADP science community.

This annual report will summarize MELD accomplishments and activities for the 2025 – 2026 period. During this period the government shutdown between October 1<sup>st</sup> and November 12<sup>th</sup>, resulting in the rescheduling of the Fall meeting to mid-December.

### **The MELD Executive Team for 2025 – 2026**

**Co-Chairs:** Connor Olson (Harvard & CU Boulder), Timothy Sharac (EPA), David Schmeltz (EPA, retired)\*

**Secretary:** *Vacant*

\*David Schmeltz stepped down from the co-chair position following his retirement in the Spring of 2025; Timothy Sharac has assumed his position.

**MELD Advisory Group:** Colleen Flanagan-Pritz (NPS), Collin Eagles-Smith (USGS), Sarah Janssen (USGS)

This report was produced by the MELD executive team and circulated to MELD members prior to acceptance.

## 2.0 Annual Summary of MELD Accomplishments

Major MELD accomplishments for the year include:

1. Successful annual Spring and Fall business meetings. Attendance at the meetings were 60 and 47 participants, respectively. An overview of the Spring minutes can be found on the MELD website; Fall minutes will be available following a vote of approval by the MELD

community.

2. Participation in network optimization efforts. A major focus of the Spring business meeting was to discuss several optimization proposals which affected the MDN, AMNET, and MLN. The MELD community provided feedback on the impact of implementing these proposals.
3. The completion of the first year of sampling for the Passive Mercury Pilot network. The pilot network began sampling on December 31, 2024 and has been approved for an additional year of sampling. Initial passive data provided important insights into the intra- and inter-site variability measured by Tekran-prepared MerPAS samplers and those prepared at the Wisconsin State Lab of Hygiene. These data were particularly important as they informed discussions on altering the year one sampling design of the passive network in order to save on costs and reduce analytical effort.
4. The publication of a Mercury Litterfall Network (MLN) analysis, which included a focus on national trends. The manuscript was published in *Atmospheric Environment* (ca. [Gustin et al. 2025](#)). This was the result of a working group established to synthesize MLN data and helped inform network optimization efforts. Concentrations of methylmercury were found to be both low and unchanging over time, as consequently have ceased being measured.
5. The approval for renewal of the MELD science committee charter.
6. David Gay and Timothy Sharac presented at the 14<sup>th</sup> Annual Asia Pacific Mercury Monitoring Network (APMMN) Partners Meeting in Taiwan, December 9<sup>th</sup> – 12<sup>th</sup>, 2025. David Gay presented, “The Asia Pacific Mercury Monitoring Network (APMMN): Support from North America (NADP)” and Timothy Sharac presented, “The Asia Pacific Mercury Monitoring Network (APMMN): An Update on Progress and Opportunities”. Additional topics of interest to MELD included presentations on the Conference of the Parties (COP) to the Minamata Convention on Mercury, talks from numerous APMMN partners and stakeholders, summaries of mercury concentration measurement results, equipment training, a discussion on APMMN’s network direction, and wrapping up with a field trip. For more information see [the conference website](#) and [the MOENV 2026 report \(page 16\)](#).

### 3.0 General Updates

Timothy Sharac became the junior co-chair of MELD following the retirement of David Schmetlz; Connor Olson was subsequently promoted to the senior co-chair.

Katrina McSween and Timothy Sharac have become co-advocates for the Passive Pilot Network following the retirement of Kristi Morris and David Schmetlz.

Several motions were passed at the 2025 Fall business meeting. These approved motions proposed to:

- Change the current passive network sampler deployment.
- Change from 3 Tekran MerPAS and 1 WSLH-Prepared samplers and 1 Tekran MerPAS and 1 WSLH-Prepared trip blanks to 2 Tekran MerPAS and 2 WSLH-Prepared samplers and 1 WSLH-Prepared trip blank. To be implemented ahead of the March 31, 2026 sample start.
- Approve the spring 2025 MELD minutes.
- Renew the MELD science committee.

### 4.0 MELD Working Group Updates

#### *WG-1: Integrative Hg Review*

The Integrative Hg Review working group aims to compile and synthesize mercury monitoring programs from across federal and state agencies to produce an integrated monitoring dataset.

The goals of this review are to:

- *Share current information on research and monitoring in the U.S. related to the chemical and biological endpoints of Hg contamination.*

- *Characterize and evaluate sites in NADP's Hg monitoring program to identify priority sites to maintain.*
- *Identify data gaps, monitoring needs, and potentially important new areas for monitoring, including in disadvantaged, underserved communities.*
- *Synthesize and identify siting criteria, survey for candidate sites and existing data, and create a map to overlay paired measurements and ancillary data networks.*
- *Issue white paper on Considerations for a U.S.-centric Minamata Effectiveness Evaluation Plan.*
- *Support Minamata Air Open Ended Science Group (OESG) efforts to contribute data and write and edit text for scientific report, as requested.*
- *Develop interactive tools for navigating and querying national mercury monitoring data.*

**2025 Updates:** WG-1 activities were paused due to on-going changes across federal agencies starting in early 2025.

#### *WG-2: Measurements and Modeling*

The Measurement and Modeling working group aims to provide guidance and technical expertise for the modeling of NADP-collected mercury monitoring data. Specific goals of this working group are to:

- *Continue to support strategic data collection and interpretation for Hg monitoring networks (MLN, MDN, AMNet, Passive Hg Pilot).*
- *Provide guidance on the effect of network-level changes to sampling design, sampling and analytical methodology, and data analysis.*
- *Support development of new trends tool for Hg concentration at MDN sites (from [Spring 2023 notes](#)).*
- *Refine a Hg dry deposition model (from [Fall 2022 notes](#)).*

**2025 Updates:** WG-2 activities this year largely focused on exploring the effects of cost-savings measures on data quality and application. These included changes like 2-week MDN sampling options, alternatives to glass MDN bottles, and changes to network analytes (e.g., litter methylmercury, speciated atmospheric mercury fractions). A preliminary analysis of Q1-Q3 2025 gaseous Hg data from the passive Hg pilot network was presented at the 2025 Fall MELD workshop. Data comparisons between Tekran-prepared and WLSH-prepared samplers and trip blanks were evaluated to determine whether reducing samplers and trip blanks and/or utilizing more WSLH-prepared and fewer Tekran-prepared samplers and trip blanks would be feasible to retain the Hg monitoring signal while also enabling cost-saving measures.

#### *WG-3: Litterfall*

The Litterfall working group was assembled to produce an analysis of MLN data.

**2025 Updates:** A trend analysis using MLN data, spanning from 2007 to 2021, was published by [Gustin et al. 2025](#) in *Atmospheric Environment*. This manuscript represents the completion of the MLN working group.

## 5.0 Recent Publications

Below is a selection of recent publications relevant to MELD published in part by community members.

Arienzo, M. M., Gleason, K. E., Sexstone, G. A., Gustin, M. S., Schwan, M. R., Choma, N., Dunham-Cheatham, S.M., McConnell, J.R., Weisberg, P.J. and Csank, A., (2025). Latitudinal gradients of snow contamination in the Rocky Mountains associated with anthropogenic sources. *Environmental Pollution*, 373, 126094. <https://doi.org/10.1016/j.envpol.2025.126094>

Burger, J., & Feigin, S. (2025). Trace element contamination in three shorebird species migrating through Delaware Bay, New Jersey: arsenic, mercury and selenium are increasing. *Ecotoxicology*, 34(1), 89-101. <https://doi.org/10.1007/s10646-024-02816-1>

Geyman, B. M., Streets, D. G., Olson, C. I., Thackray, C. P., Olson, C. L., Schaefer, K., Krabbenhoft, D. P., & Sunderland, E. M. (2025). Cumulative Anthropogenic Impacts of Past and Future Emissions and Releases on the Global Mercury Cycle. *Environmental Science & Technology*, 59(17), 8578–8590. <https://doi.org/10.1021/acs.est.4c13434>

Goss, P., Landis, J. D., Wang, T., & Taylor, V. F. (2025). Atmospheric and river-derived mercury fluxes in distinct natural communities of a river delta. *Frontiers in Environmental Chemistry*, 6, 1552966. <https://doi.org/10.3389/fenvc.2025.1552966>

Gu, B. (2025). Long-term trends (1998–2022) of total mercury in mosquitofish (*Gambusia holbrooki*) from the Everglades Protection Area, Florida, USA. *Science of The Total Environment*, 1004, 180804. <https://doi.org/10.1016/j.scitotenv.2025.180804>

Gustin, M. S., Gay, D. A., & Choma, N. (2025). Assessment of recent mercury trends associated with the National Atmospheric Deposition Program Mercury Litterfall Network. *Atmospheric Environment*, 347, 121097. <https://doi.org/10.1016/j.atmosenv.2025.121097>

Kotalik, C.J., Willacker, J.J., Wesner, J.S., Johnson, B.L., Flanagan Pritz, C.M., Nelson, S.J., Walters, D.M., & Eagles-Smith, C.A. (2025). Ecosystem drivers of freshwater mercury bioaccumulation are context-dependent: insights from continental-scale modeling. *Environmental Science & Technology*. 59(3): 1780–1789. <https://doi.org/10.1021/acs.est.4c07280>

Lepak, R. F., Hoffman, J. C., Janssen, S. E., Tate, M. T., Shanoff, M. B., Mahon, M. B., Rumschlag, S. L., Yarnes, C. T., Lenell, B. A., Krabbenhoft, D. P., Ogorek, J. M., & Hurley, J. P. (2025). Ecological Factors Decouple Great Lakes Fish Mercury Concentrations Trends from Decadal Declines in Atmospheric Mercury. *Environmental Science & Technology*, 59(23), 11799–11808. <https://doi.org/10.1021/acs.est.5c01359>

Mason, R. P., Inman, H. M., Smith, S. K., & Taylor, V. F. (2025). An examination of the importance of air-sea exchange in mercury cycling in the Gulf of Maine. *Frontiers in Environmental Chemistry*, 6, 1701684. <https://doi.org/10.3389/fenvc.2025.1701684>

Miller, H. R. (2025). *Mercury Cycling in the Rocky Mountains: Sources, Fates, and Climate Change Impacts* (Doctoral dissertation, University of Colorado at Boulder).

Olson, C. I., Jane, S. F., Geyman, B. M., Montesdeoca, M. R., McHale, P. J., Beier, C. M., Mills, J. S., McIntyre, P. B., Sunderland, E. M., & Driscoll, C. T. (2025). Soil Mercury Accumulation Delays Fish Recovery from Atmospheric Deposition Declines. *Environmental Science & Technology*, 59(25), 12656–12666. <https://doi.org/10.1021/acs.est.5c00834>

Poulin, B. A., Tate, M. T., Janssen, S. E., Aiken, G. R., & Krabbenhoft, D. P. (2025). A comprehensive sulfate and DOM framework to assess methylmercury formation and risk in subtropical wetlands. *Nature Communications*, 16(1), 4253. <https://doi.org/10.1038/s41467-025-59581-w>

Qin, C., Scott, D. E., Lance, S. L., Calloway, D., Love, C. N., & Xu, X. (2025). Influence of hydroperiod and canopy cover on mercury accumulation and methylation in Carolina bay wetland sediments in the Southeastern United States. *Environmental Research*, 123139. <https://doi.org/10.1016/j.envres.2025.123139>

Ross, D. S., Shanley, J. B., Quintana, A. T., Villars, T. R., Halman, J. M., Bailey, S. W., & Bower, J. A. (2025). Long-term monitoring of mercury in Vermont's forest soils: Trends over 20 years in near-surface horizons. *Environmental Monitoring and Assessment*, 197(8), 895. <https://doi.org/10.1007/s10661-025-14306-w>

Weiss-Penzias, P. S., Lyman, S. N., Elgiar, T., Gratz, L. E., Luke, W. T., Quevedo, G., Choma, N., & Gustin, M. S. (2025). The effect of precipitation on gaseous oxidized and elemental mercury concentrations as quantified by two types of atmospheric mercury measurement systems. *Environmental Science: Atmospheres*, 5(2), 204–219. <https://doi.org/10.1039/D4EA00145A>

Yasar, M. (2025). *Atmospheric Mercury Dry Deposition Across Eastern North America: Addressing Data Gaps, Environmental Drivers, and Measurement Limitations* (Doctoral dissertation, The University of Wisconsin-Madison).

Zhang, Y., Xu, Z., Han, G., Chu, Z., Zhou, Q., Chen, Q., ... & Chen, L. (2025). Improved Mechanistic Modeling on Reproducing Particle-Bound Mercury in the Marine Atmosphere. *Environmental Science & Technology*, 59(5), 2611-2622. <https://pubs.acs.org/doi/full/10.1021/acs.est.4c09481>