

# Correlations of Hg Concentrations in Local Dragonfly Nymphs: Prepping for a Poster Session

**Subheader:** AP Environmental Science students learn the steps on how to go from field data to research poster.

## OVERVIEW

Students will be utilizing their prior knowledge of watersheds, energy flow and matter cycling within an ecosystem and bioaccumulation of methyl mercury. Various modality methods over the course of their school year will allow them to generate a unique research poster that will then be presented in front of a community audience.

## TIME REQUIRED

4 Weeks

## MATERIALS

- [Dragonfly Mercury Intro](#)
- [New England dragonfly Hg Database](#)
- [DragonflyMercury\\_NationalParks\\_2014-23](#)
- [Impairment Index and National Database](#)
- Google Earth tutorial (How to)
- [Dartmouth Research poster tutorial \(How to: Canva\)](#)

## PREPARATION

- Students will engage in a pre-stream monitoring, watershed lesson with UVM Sea Grant
- Students will take part in a UVM Sea Grant Stream Monitoring activity
- Students will learn about their local watershed and the greater Lake Champlain watershed, and how human impact is currently effecting them
- Students will have completed a dragonfly sampling activity in the field in conjunction with Dartmouth dragonfly Mercury project

## LEARNING GOALS & OBJECTIVES

- Students will understand how mercury is transformed into methyl mercury.
- Students will understand bioaccumulation, and how dragon fly nymphs act as biosentinels.
- Students will learn how to interact with a large data source; synthesizing their own scientific question to research.
- Students will learn how to generate a research poster and present their findings to their community

## INTRODUCTION

## AUTHOR

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## GRADE LEVEL

11-12

## ANCHORING PHENOMENON

Over time, mercury (Hg) has accumulated in the forest soils and watersheds of New England. It's concentrations vary, as there are lots of factors that affect its bioavailability. A biosentinel like dragonfly nymphs can be used to measure exactly how much mercury is entering the food chain, which is a source of potential exposure to humans and other wildlife.

## DRIVING QUESTION

How can the collected data be used to draw conclusions about mercury levels in the surrounding ecosystem? Each student group will come up with a specific question to research the potential for patterns and relationships.

## IMPORTANT VOCABULARY

- Watershed
- Mercury (Methylation)
- Biomagnification
- Nymph
- Biosentinel
- Bioavailability

## STANDARDS

- Investigating, Analyzing, and Communicating (School standards)
- NGSS HS-LS2-4. Use mathematical representations

Over the course of the year, the AP Environmental students have delved into a year-long discovery of the Lamoille and Lake Champlain watersheds. To begin their adventure, they did a river monitoring and stewardship program with the Watershed Alliance. This local experience provided a place-based education opportunity for the students, and helped anchor them for the rest of the year. Next, students worked with Dartmouth on their dragonfly mercury project, collecting nymphs in a pond on school property. While waiting for their nymphs to be processed we turned our focus to understanding how this work directly relates to the course content, strengthening their understanding of the science. With the raw complete, the AP students will now embark on a 4-week research poster project culminating in a symposium. Students will be generating unique questions, and testing for specific relationships and patterns as it pertains to the level of mercury in the environment.

to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

- NGSS HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

## SUPPLEMENTAL RESOURCES

1. Dartmouth Dragonfly Research Program: Teacher Materials [LINK](#)
2. Dartmouth: Designing a Research Poster [LINK](#)

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## LESSON PROCEDURE

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1. Students will begin the 4 week project with a one hour lecture discussion with Celia Chen. She is the director of Dartmouth's Toxic Metals Superfund Research Program, and will be explaining the national research effort of collecting the dragonfly nymphs. She will be reviewing information on Methylation, bioaccumulation, and how the data can help inform whether national and international policies on controlling mercury are effective.
2. Students will work with myself and Vivien Taylor, a research scientist at Dartmouth for the remainder of the project. Vivien did the initial nymph collections with us, and will be our scientist on retainer throughout the project.
3. The students will then be split into small groups of two or three to look at the data in depth, learning how to take raw data in Google sheets and having it aid them in looking for change in mercury levels across the landscape as well its change through time.
4. The potential for patterns will lead them to generating a scientific question to research that they are curious about. They will use the results to examine trends in their data and generate their own conclusions about the fate of mercury in their local streams. They will then manipulate the data to look for correlations, ultimately generating a claim. There will be a 1-day lesson on how to orient data in Google sheets.
5. Students will then think about how to show other people the relationships they have found. There will be a 1-day lesson on how to generate appropriate graphs. They will consider if what they are trying to convey is clear in their graph, or if they might need additional colors, text, and statistics.

6. Students will then have a 1-day lesson on how to use Google Earth to also make maps using the data from the spreadsheets.
7. After compiling their evidence, students will then spend time making sure that their reasoning is sound, and ready for sharing.
8. Students will then have a 1-day lesson on what a research poster is, and how to organize making one.
9. Students will then spend time completing the various components of their poster, organizing and then printing it.
10. Students will then host a Poster symposium to showcase their findings to the communities. This includes their peers, teachers, family, teachers, administration, the Lamoille County Conservation District, The Watershed Alliance, Vivien and Celia, etc...

## PROJECTED CONCLUSION

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Students will experience the process of “field to poster.” They will engage in field research to collect their specimens and then they will work with the data to generate a claim. Students will then use the evidence and reasoning to back up their findings. They will then put their information into a research poster format, and share this information in a public setting in the form of a Poster symposium. This project will assess the school’s standards of investigating, analyzing and communicating while also focusing on a couple Next Generation Science Standards. It should be a fantastic capstone project to end their AP Environmental Science year.

## SUPPORTING IMAGES/VIDEOS

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Dragonfly nymph collection day









