

# Mercury in Maine watersheds, biota, and people: *The Acadia Learning Project*

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## Introduction

Acadia National Park has been engaged in research into the sources, movement, and concentration of mercury in the park ecosystem for more than two decades (Kahl et al. 2007). The research has added to our understanding of the effects of terrain, forest type, soils, snowfall, lake and pond chemistry, and other factors on the availability and bioaccumulation of mercury in the park's food webs. The research is important because mercury is a potent neurotoxin and can have significant effects on animals in the park, including humans – and because mercury has been identified as a problem for the entire northeast region (Evers et al. 2005, Schmitt et al. 2007), making it of interest to students and teachers statewide. These projects support the science standards in the Maine Learning Results, particularly those related to skills and traits of scientific inquiry and technological design. This collaborative project provides professional development for teachers, who have conducted hands-on mercury research with their classes during the academic year 2008-2009. Their findings are providing mercury data for a number of environmental media statewide.

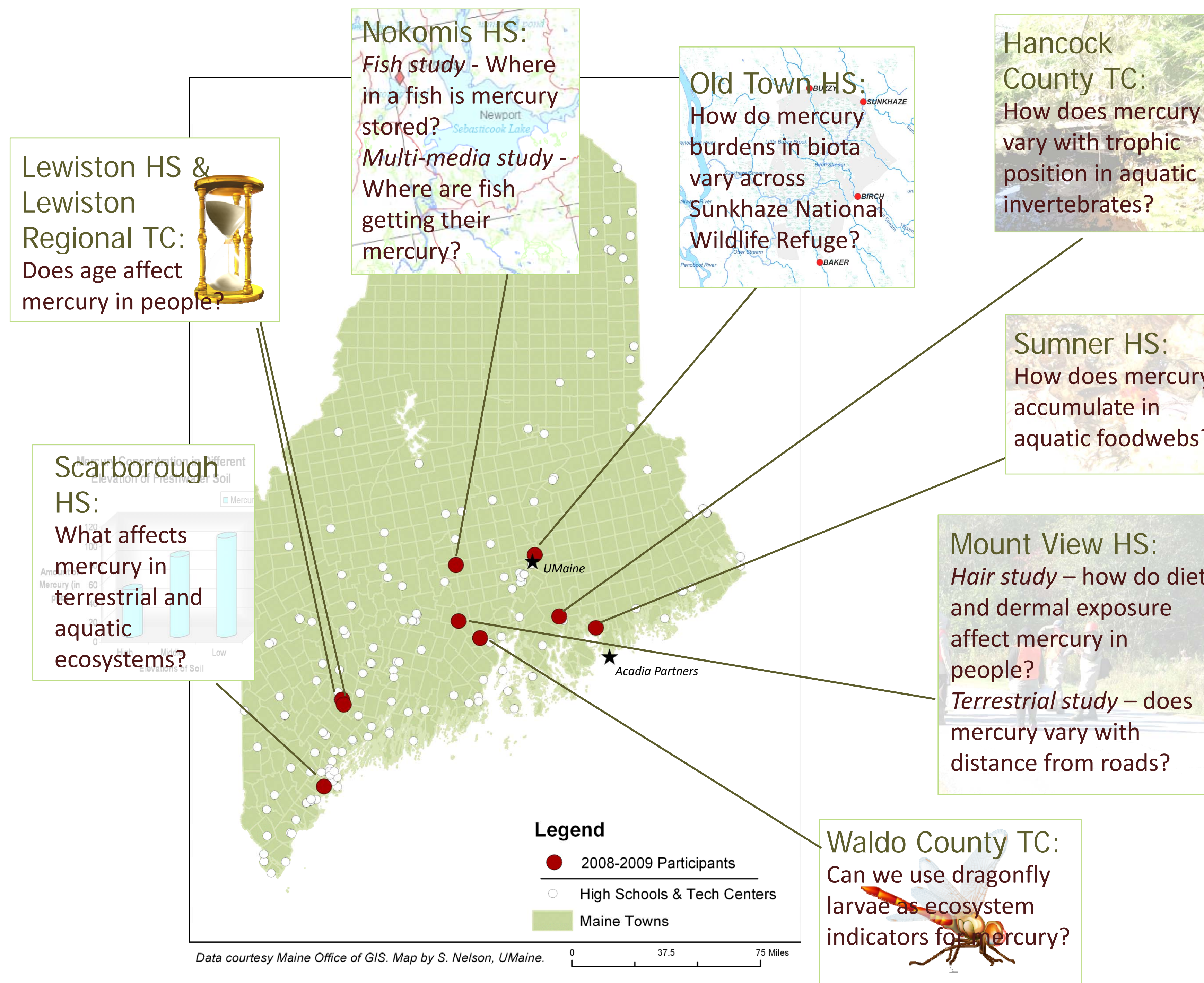
## Approach

Recent advances in mercury measurement technology have dramatically reduced the cost of analyzing mercury content in soil and tissue samples (US EPA 2007). This cost reduction has opened up the possibility of getting high quality measurements of mercury content in fish, macroinvertebrates, and soil from around the state that would add to our understanding of mercury movement, "hotspots," and general levels of contamination at different trophic levels.

In this project, teachers learn the methods and approaches used by practicing research scientists, particularly how to ask and begin to answer a research question. We provide professional development (workshops, field training), curriculum materials, and support in lab analysis of samples collected in student-designed and executed research. This type of support is critical when teachers embark on projects where an outcome is unknown, and data and results may be difficult to interpret.

The approach can ultimately be used by science teachers to engage students in system-centered research where results are useful and matter. The program currently supports more than 20 teachers in a dozen high schools and career and technical education programs.

## Students' Findings



## Future Work

**Involve other citizen science organizations**  
Recently proposed expansion of this work would create and test an instructional framework and teacher development program that integrates citizen science programs with formal science education in middle and high schools in order to serve the needs of all students.

**Expand to more schools**  
Working with teachers enables us to reach many 'generations' of students. We hope to expand the number of participants each year to maximize the number of students reached, and reach schools statewide.

**Link watersheds to the coastal environment**  
Working with Maine Sea Grant, we plan to begin a study of eel mercury – which would link results from inland schools to marine science topics.

**Foster cross-school collaborations**  
We hope to encourage more teacher communication across schools, as well as to help facilitate multi-school research projects such as the dragonfly project at Waldo County TC.

## Literature cited

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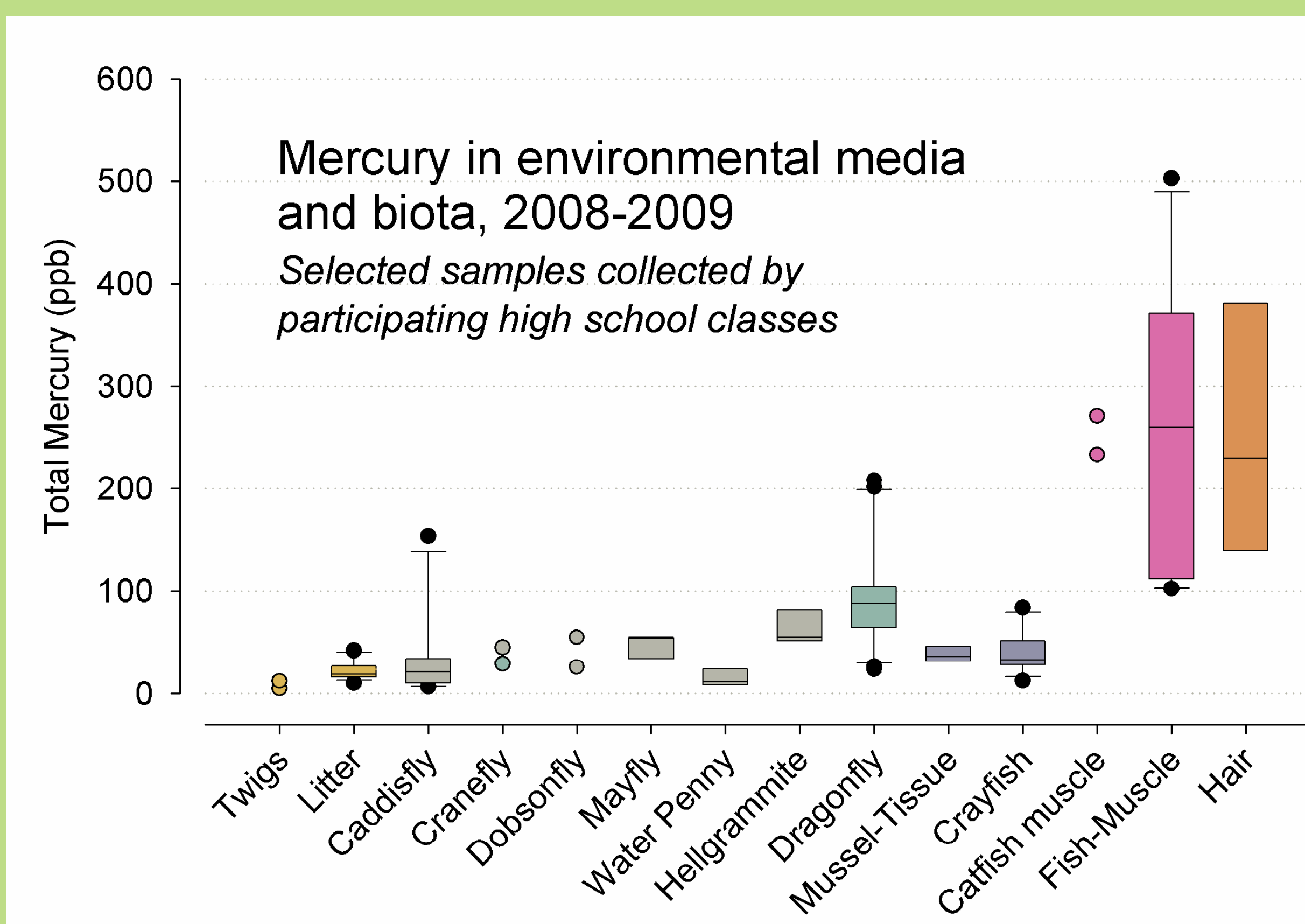
Further Information: [www.acadiapartners.org](http://www.acadiapartners.org)



Student results are within the ranges expected based on the scientific literature, suggesting our methods are providing high-quality data

Variability within values for a given organism is expected, and provides the foundation for research questions

For example, Waldo County TC is assessing differences in landscape context that might affect mercury in dragonfly larvae collected across five schools



### selected findings:

Some values for **fish muscle** are greater than the guideline for safe eating (300 ppb, US EPA 1997)  
The median for **hair mercury** in the one class shown\* (220 ppb) is similar to the national median for women of childbearing age (200 ppb, CDC 1999) and lower than the median for an opportunistic sample of Maine adults (396 ppb, Schmitt et al. 2007)

\* Another hair study is being conducted but data were not available at the time of publication.