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Using Watersheds as a Framework for Learning

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By **Ashley Eaton**

A group of students huddles around a model of their watershed. They are discussing what they know about their community, the challenges related to water quality that need to be addressed, and the valuable components that need to be safeguarded. Students share — "I went to the beach once and it was closed because of toxic [cyanobacteria] blooms" — and compare notes — "I really love fishing on the lake and often eat fish from Lake Champlain; do blooms affect the fish?" Among the topics woven through their conversations are key concepts in ecology, geology, public health, economics, and community planning.[1]

Later, they wade into the stream near their school to assess the health of the waterway. They catalog the presence of benthic macroinvertebrates and shout excitedly to one another as they capture new specimens — "This one has pinchers... another one with three tails" — and glean from this collection of tiny organisms an indication of the health of the ecosystem they are exploring. One young person examines a net-spinning caddisfly larva on the underside of a rock; in class they learn about the net this creature spins from silk to collect sustenance carried by the flowing waters. This student is simultaneously spinning their own web of connection to this caddisfly, the stream, the falling leaves, the fish, a mink, their classmates, and their place.[2]

Since 2002, Lake Champlain Sea Grant has partnered with University of Vermont (UVM) Extension to bring the Watershed Alliance education program to elementary, middle, and high school students in the Lake Champlain basin. Students receive hands-on watershed education in their classrooms, in the classroom at UVM's Rubenstein Ecosystem Science Laboratory, on Lake Champlain aboard the UVM research vessel, as well as in basin tributaries. More than 15,000 students, teachers, and family members have participated in this program since its inception. As a bridge between research and the community, this program aims to connect K–12 teachers and their students with real-world challenges and engage students in hands-on field science and stewardship to improve water quality in the Lake Champlain basin, which is located in the northeastern United States and southeastern Canada, spanning Vermont, New York, and Québec.

Over the past year, many school campuses have become outdoor classrooms, where teachers have leveraged their local ecosystems as learning spaces. Watersheds can provide a framework for learning and offer a powerful systems-based approach for engaging students in explorations of place. Waterways are complex systems designed by nature over geologic time scales and offer many entry points for students to experience the natural world. Directly engaging students in the natural world sets the stage for inquiry.[3] Educators can skillfully guide reflection and assist in forming connections between different aspects of the natural system in students' minds. As we begin the academic year and reflect on the year

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behind us, this article highlights examples of entry points as well as an ecological approach to using watersheds as a framework for learning. In the sections below, I will demonstrate the impact of using a watershed-focused approach by presenting information collected through program evaluations, including participant quotations, to share programmatic outcomes from the Lake Champlain Sea Grant and University of Vermont Extension's Watershed Alliance program.

Benefits of watershed learning framework

Deeply rooted in systems and relationships

There are many systems within a watershed that extend beyond water quality (e.g., social, ecological, cultural). A watershed framework aids students in deepening their understanding of these connected systems and examining their own relationships with land and water. This fosters the development of an ecological perspective of the world which is founded in relationships.[4] Additionally, issues of water quality often intersect with issues of equity, access, and race; this provides an opportunity to engage students in exploring social systems and justice.[5]

Classroom context: "Despite living so close to the lake, many of my students have never been on the lake," said Sonal Patel-Dame, a teacher at Plattsburgh High School in Plattsburgh, New York, which is situated along the shores of Lake Champlain. Patel expressed the importance of the Watershed Alliance program in helping students build connections to place and reflected on engaging her students in learning aboard the Melosira, the University of Vermont Research Vessel. Watershed-focused activities can reduce barriers for students to engage in safe recreation on and in water and illuminate local inequities. Many of the freshwater challenges we face today are the direct result of anthropogenic activities. In the United States (U.S.), the impacts of these activities disproportionly impact people of color and Indigenous communities.[6] One way to explore equity and justice through a watershed lens is to ask students, *what does environmental justice in their watershed look like?* This can be a pivot point for students to explore more deeply issues of local water quality, such as access to clean drinking water, the impacts of superfund sites, and water pollution. Students can then overlay their knowledge of watershed science with social dimensions to examine systemic inequities and environmental racism. As a tangible example, teachers from Vermont and New York engaged in stream monitoring near the Saranac River to assess water quality, and then used U.S. census data and the Neighborhoods at Risk tool to examine impacts of a local superfund site.[7]

Superfund

In 1980, the United States passed the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which is often called Superfund. Superfund allows for offending parties to be held accountable and clean up the contaminated site, and/or for them to cover the cost of the clean-up by the US Environmental Protection Agency (EPA). Contaminated areas are often referred to as Superfund sites. [8]

Acknowledges and identifies ecological systems and boundaries

Using the framework of a watershed offers a new way of thinking about and defining a place. It offers an opportunity to decolonize the modern political land boundaries and view a natural system through multiple perspectives, creating a space to explore the human relationship and connection to land and place, and our dependence on fresh water.[9] Additionally, it offers space to examine how our actions impact the landscape.

Classroom context: "It is important to preserve our culture and stories for the benefit of future Abenaki generations. It is equally important that non-Abenaki people understand our rich history and our connection to the environment around us. Without that connection to our environment or source of life, it could be easily discarded and not preserved for those future generations," Don Stevens, Chief of the Nulhegan Abenaki, shared. *Nebi: Abenaki Ways of Knowing Water*, a short film, was created in an effort to preserve and share cultural history and knowledge with public and school audiences who participate in watershed education programs. The film's production stemmed from the desire of Lake Champlain Sea

Grant staff to authentically elevate the Indigenous voices in the watershed. A developing relationship between these staff and Chief Stevens revealed that their goals are complementary. Nebi was produced in partnership with chiefs and members of the Nulhegan, Missisquoi, and Elnu Bands of the Abenaki Nation, as well as Peregrine Productions, LLC; Lake Champlain Sea Grant; and UVM Extension. The film is available at www.uvm.edu/seagrant/nebi.

Interdisciplinary nature

The interdisciplinary nature of the watershed framework allows it to be woven through many contexts. This lens allows students to explore what they are most curious about, while providing a space for their ideas to flow together.

Classroom context: "The school grounds and campus was the best place to start [this learning process]… and it gave students hands-on experience in understanding the design of our rain garden and what it does in managing water on our impervious spaces." Vasanthi Meyette reflects on the green stormwater infrastructure work in which her class engaged. The work connected her students with a local environmental engineering firm and watershed groups to design a rain garden to catch stormwater runoff from their school parking lot. The students conducted site assessments to determine the best location and mocked up rain-garden sketches, including desired plants. The goal of their project was to slow the flow of water from the parking area, which had high chloride levels due to road salt.

A watershed state of mind

For educators, there are many pressing questions, one of which is *how do we best prepare students to tackle complex issues such as the climate crisis?* A place-based approach leverages the local ecosystems and community to strengthen student connections to one another and the places in which they live. [10]Engaging students by using a local framework also provides a valuable opportunity to connect their local place with the United Nations Sustainable Development Goals (SDGs) and set the stage to dive into larger cascading issues like global water stability and climate change in the future.[11] A watershed approach offers a uniquely scalable framework to scaffold student learning, enabling educators to start local and think global. Beginning with local water quality investigations, students are able to begin exploring systems, ask questions, and evaluate relationships. Through this process, students are building connections between themselves and their watershed.

Classroom-based programs that take a deep dive into environmental behavior are more impactful at cultivating long-term stewardship activities.[12] When students feel connected to their place or watershed, they have a vested interest in caring for it.[13] Following the installation of the rain garden at Shelburne Community School, Vasanthi shared, "[this project] gave them knowledge of the land around the school, awareness of reasons/patterns of erosion, and solutions that could be designed and managed by students… our work has been focused on maintaining our rain garden, planting and mulching, removing stones, observing after a rainstorm or heavy melt and creating a green space for learning." Projects like this are tangible evidence of the value of a watershed-based approach and the lasting impact this learning has on both the student and the community.

Resources

The Watershed Explorer Challenge is a self-paced booklet that guides learners to understand and appreciate watersheds and the impacts humans have on water quality as a result of land uses. The booklet is available online or in local libraries throughout the Vermont and New York portions of the Lake Champlain basin. It is designed for Grades 5–8 and can also be adapted for use with upper elementary or early high school students. It includes 11 different indoor and outdoor activities, with a glossary and links to additional resources to investigate a topic in more depth. The booklet and/or individual activities could

be modified to explore issues in freshwater lakes across North America. The booklet can be viewed online at https://www.uvm.edu/seagrant/watershed-explorer-challenge.

Stream Monitoring Investigations:

Learn how to use a kick net at https://www.youtube.com/watch?v=jH5KPfIDG6E or try our virtual steam investigation: https://spark.adobe.com/page/J9E3XQ5MPMZQG/

Nebi: Abenaki Ways of Knowing Water: View the film (just over 10 minutes in length) on the Lake Champlain Sea Grant website: https://www.uvm.edu/seagrant/nebi.

Learn more about Watershed Alliance: https://www.uvm.edu/seagrant/watershed-alliance

Ashley Eaton grew up in the Green Mountains of Vermont and her educational and professional pursuits have been dedicated to helping create a sustainable future for Vermont, the greater Lake Champlain basin, and beyond. Ashley works at the state and federal level to support watershed science and environmental literacy. Currently, Ashley is the Watershed and Lake Education Coordinator at the University of Vermont (UVM) for Lake Champlain Sea Grant and UVM Extension and a doctoral student at the University of Wisconsin Stevens Point, studying educational sustainability.

Endnotes

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