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Engaging Youth in Great Lakes Stewardship through School-Community Partnerships and Place-Based Education Practices

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Ella White Elementary students work with fisheries researchers to tag a Lake Sturgeon they raised in the classroom before its release into the river.

NEMIGLSI applies a PBE approach that is anchored in national scholarship (Smith and Sobel, 2010; Yoder, 2012; Demarest, 2015) and the Guiding Principles for Exemplary Place-Based Stewardship Education (GSLI, 2016), a set of principles co-developed among all GLSI hubs with support from the U.S. Environmental Protection Agency. Statewide and locally, NEMIGLSI embodies three strategies in support of PBE partnerships and programming. The network:

- Supports innovative and collaborative student-driven environmental stewardship projects connected with the community.
- Provides sustained training opportunities for educators and community partners through professional development that reflects content training (e.g. Great Lakes science), pedagogical process and PBE best practices, and relationship building through mentoring and networking opportunities.
- Facilitates school-community partnerships by offering opportunities for schools to expand learning beyond classroom walls and into the community. Schools gain access to community partners and assets while communities benefit from youth engaged as stakeholders and leaders in community conversations.

Since NEMIGLSI's creation in 2009, more than 24,800 students have engaged with the network as Great Lakes stewards and valued community leaders. NEMIGLSI has served 311 teachers from more than 30 schools across eight counties (approximately two-thirds of the region's total schools) in professional development opportunities and support for their students' projects. Sixty-six percent of these educators have adopted PBE strategies for use with their students in environmental stewardship projects, which vary by design in the context of the local community. Projects explore a wide range of environmental topics and last anywhere from one day, to a week, to across the entire school year. Projects may be seeded by community partners seeking student help, reflect the passions and interests of teachers, or result from questions raised by students' inquiry-based explorations. A few examples are discussed in this article.

Place-Based Education Drives Mutually Beneficial Outcomes

NEMIGLSI and its applied PBE strategy offer mutually beneficial outcomes for schools, communities, and youth in the state of Michigan. PBE positions schools for success in alignment with Next Generation Science Standards (NGSS Lead States, 2013), which are designed to engage students in three-dimensional learning around core ideas, crosscutting concepts, and learning applied in practice. PBE strategies also support school improvement goals set forward by the State of Michigan (Michigan Department of Education, 2016), where PBE has been featured as a strategy within this state school improvement initiative. [The Michigan School Improvement Framework](#) consists of four strands designed to help schools and districts move forward with continuous improvement, leading to increased student achievement. While PBE is most visible in Strand 4: School, Family and Community Relations, with its focus on facilitating and growing school-community relationships, it adds value across all the strands. PBE provides an instructional design that meets the needs of all learners and helps the educator and students understand the value of the content they are exploring through connection to the community. PBE helps ensure continuous improvements in teaching and learning and NEMIGLSI provides ongoing professional development focused on content and processes. Community development and conservation goals are accomplished through PBE efforts. Leadership partners facilitate opportunities to purposefully connect students with strategic needs or opportunities identified and prioritized by communities and conservation partners. Examples include aligning student projects with a bi-national Lake Huron Biodiversity Conservation Strategy, NOAA Great Lakes Marine Debris Action Plan, local watershed management plans, citizen science projects, and regional sustainable coastal tourism development strategies. These experiences also result in [Great Lakes Literacy](#) learning (Fortner and Manzo, 2011) among all involved – schools, educators, community, and youth.



Au Gres-Sims Elementary students collect water quality data on the Au Gres River.

NEMIGLSI Professional Development

The NEMIGLSI network supports educators through a sustained professional development (PD) model that offers many points of entry and values relationships in a lifelong learning process. Educators connect, benefit, and grow professionally within the NEMIGLSI network through their projects, attending PD workshops, or through peer and partner relationships. A diverse and broad range of PD opportunities are open to educators throughout their PBE journey. Some of these PD offerings include an annual regional networking meeting centered on relationships with community partners; multi-day, summer PBE institutes; and content or topic-centered trainings with resource experts. The network supports PBE planning or strategy sessions with school teams where administrators, educators, and partners convene to plan, discuss resource needs, or explore new opportunities. Collectively, these offerings foster a sustained relationship with educators over time and allow educators to go at their own pace and develop PBE learning processes that best fit their respective schools' needs.

PBE strategies have shown success for fostering positive attitudes around community and environmental stewardship, community connections, and civic engagement values among youth in Northeast Michigan, as evidenced in NEMIGLSI evaluations (Rote et al., 2015; Gallay et al., 2016). Through NEMIGLSI, students are empowered to use their voice in addressing critical Great Lakes and natural resource issues through environmental stewardship efforts that challenge them to apply their learning in ways that make a difference in their communities. Results from a 2015 university-led research program that explored PBE through the lens of students found that youth placed high value on PBE experiences that were hands-on and engaging, community connected, career oriented, and fun (Rote et al., 2015).



Au Gres-Sims Elementary students use GPS units to map the federally threatened Pitcher's Thistle in the coastal dunes of Charity Island.

Photo: Michigan Sea Grant, Michigan State University Extension



Rogers City Middle School students take a closer look at the biodiversity of vernal pool woodland wetlands.

Photo: Michigan Sea Grant, Michigan State University Extension

Place-Based Education in Action in Northeast Michigan

The best way to illustrate PBE strategies is through the lens of youth who are successfully engaged in this style of learning. The following collection of examples shows how students across Northeast Michigan are engaging as community and conservation leaders in addressing a wide range of locally relevant Great Lakes and natural resource issues. While these examples are specific to Northeast Michigan, life on Earth is dependent upon water, so similar studies offer unlimited PBE opportunities for educators and students anywhere.

Watershed Studies

Michigan is rich in water resources – and opportunities for water education (LaPorte et al., 2013). More than half of NEMIGLSI-supported students find themselves engaged in wader-wearing, feet-wet watershed science studies and stewardship

experiences. From elementary to high school, teachers are addressing Michigan science standards through PBE. In the water, high school students learn about the flow of energy, cycling of matter, chemistry, habitat diversity, adaptations, and the impact of humans on ecosystems while conducting water quality monitoring to collect physical, chemical, and biological data on their local waterways in partnership with science agencies, regional conservation groups, and local watershed coalitions. At [Alcona High School](#), students used the Black River as their classroom to complete biomonitoring assessments that will help inform the Alcona Black River and Coastal Watershed Management Plan. Similarly, [Onaway High School](#) students collected water quality data in support of the Banwell River habitat restoration project.

Elementary students explore the properties of water, ecosystem relationships, environmental impacts on organisms, human impacts on ecosystems, food webs, and the structure and function of organisms.

Elementary students in Alpena lead annual river investigations through their Thunder Bay River Watershed Project, while elementary students from [Au Gres-Sims Schools](#) do the same for their local Au Gres River Watershed. These annual investigations collect water quality data and engage students in research framed around issues affecting the river, such as invasive species and marine debris, while meeting Michigan's educational science standards. Collectively, these watershed studies have been regionally supported by Michigan State University's 4-H₂O and [Great Lakes Bay Watershed Education and Training \(B-WET\)](#) programs.

Fisheries Values

Like all fisheries around the world, Lake Huron and inland lakes provide economic, ecological, and recreational value (Lynch and Taylor, 2013) for Northeast Michigan communities through sustainable commercial and recreational fishing opportunities. [Ella White Elementary](#) students learn about life cycles

and human impacts on ecosystems and freshwater reef habitats while connecting with a Lake Huron reef habitat restoration project and raising native lake trout eggs in their classroom. With Great Lakes scientists, they study Great Lakes ecosystems and release lake trout fry on restored reef habitats using underwater robots engineered and built by students. Several other area schools are working with [Sturgeon for Tomorrow](#) and the Michigan Department of Natural Resources (MDNR) to raise state threatened Lake Sturgeon in their classrooms. The sturgeon live in classroom tanks and are introduced to hundreds of students, community members, and decision-makers during native species restoration outreach efforts before being released to their river home. [Alpena High School's](#) 'Science in the Sanctuary' class brings local fisheries heritage to life while blending in Great Lakes science and social studies learning. These students gather stories about the history of local Lake Huron fisheries, addressing social studies (e.g. geography, culture, economics, history) and communication educational standards. This work



Hinks Elementary students work in the Thunder Bay River to identify and remove invasive European frogbit.

inspired the formation of a fisheries heritage exhibit committee at the local [Besser Museum for Northeast Michigan](#). The committee, with student help, restored a historical commercial fishing vessel and exhibit.

Biodiversity Conservation

Threatened and endangered species are of global concern and are often topics for projects within schools. Through PBE, students explore rare species in their local communities. [Alcona Elementary School](#) students learn about biodiversity conservation through the lens of pollinators. They contribute data to the [Monarch Watch](#) citizen science project by tagging migrating butterflies while learning about life cycles, how humans impact species survival, and how these migrating butterflies connect us with other parts of the world. They also study the importance of pollinator habitats and have established pollinator gardens at their school and the local community library. Elsewhere, students have pulled out their muck boots and GPS units and partnered with the [Michigan Natural Features Inventory](#) (MNFI) to map coastal habitats for the federally endangered Hine's emerald dragonfly. Students from several schools (and 4-H clubs) collaborate annually with MNFI in a citizen science effort to monitor biodiversity in vernal pool woodland wetlands. Au Gres-Sims Elementary School students board a boat to Charity Island in Lake Huron's Saginaw Bay each spring and fall to partner with the U.S. Fish and Wildlife Service, [Huron Pines](#), [Michigan Sea Grant](#), and others to monitor coastal dunes for federally threatened Pitcher's Thistle plants. These students gather data and apply math and writing skills to evaluate (and communicate) the effectiveness of treatments designed to reduce invasive phragmites encroaching along this same coastline. A 2010 Lake Huron Biodiversity Conservation Strategy (Franks Taylor et al., 2010) prioritizes northeast Michigan's coastal habitats as biodiversity strongholds and a strategic opportunity for biodiversity conservation efforts like these. The report also identifies invasive species as a primary threat to biodiversity in the region.

Invasive Species

Invasive species monitoring and management present a wealth of hands-on learning opportunities. [Tawas Area Middle School](#) students partner with the local conservation district and others to monitor and manage an invasive phragmites stand in their community. At [Thunder Bay Junior High](#), students reclaimed their schoolyard nature area, which had been overrun with glossy buckthorn. Over a three-year period, students monitored and removed buckthorn with community partners and mulched what they removed to restore nature trails now used by school and community alike. On local public lands, students from [Oscoda Area Schools](#) partnered with the U.S. Forest Service to remove invasive garlic mustard, while middle school students in Alcona helped MDNR remove spotted knapweed from a coastal state park. In the water, Alpena Elementary students contribute to a community effort to remove European frogbit from the downtown waters of the Thunder Bay River. Upstream, another class explores science and math while monitoring invasive zebra mussel populations with the U.S. Fish and Wildlife Service, as well as invasive rusty crayfish populations with Michigan State University and Michigan Sea Grant scientists.

Marine Debris

Marine debris is a well-documented challenge and concern among the world's oceans, illustrated by littered beaches and the Pacific Ocean garbage patch. It is also a growing concern in the Great Lakes (Lowe, 2014). The National Oceanic and Atmospheric Administration's [Thunder Bay National Marine Sanctuary](#) and Michigan Sea Grant foster educational efforts to raise awareness about this issue locally. Students from several area schools partner with the [Alliance for the Great Lakes' Adopt-a-Beach](#) program to clean their local Lake Huron beaches and report their findings locally and regionally. Thunder Bay Junior High students presented at local government meetings to address excessive cigarette waste on local beaches. Along the shores of the Thunder Bay River, [Lincoln Elementary](#) students identified fishing line among their top litter finds and partnered with Michigan Sea Grant to install

monofilament recycling bins at popular fishing sites. Other elementary students organized a project to monitor microplastics present in the Thunder Bay River. Based on their studies, students produced an educational [Great Lakes marine debris awareness video](#) that was widely viewed locally and featured nationally. These marine debris projects have students learning science and math, while engaging in civics learning and community conversations.

Sustainable Coastal Tourism

Visitors to Negwegon State Park, along the shores of northern Lake Huron, will find the park's trails and rare coastal habitats interpreted by signage created by Alcona High School students. These signs help to accomplish biodiversity conservation education and sustainable coastal tourism development goals identified by MDNR. Lincoln Elementary students partnered with the Besser Museum for Northeast Michigan to develop a fossil park exhibit exploring the region's limestone geology. Students produced signs interpreting Devonian Era fossils representing ancient ocean life found locally in exposed limestone layers. In collaboration with the U.S. 23 Heritage Route tourism partnership, sustainable coastal tourism student projects align with multiple coastal community development plans (Michigan Sea Grant, 2009) that call for interpretive and educational materials about local coastal features. These important signage projects incorporate science, social studies, art, and writing instruction for students and promote sustainable coastal tourism as a community development opportunity.

Concluding Thoughts

At first glance, these student stewardship projects appear diverse and wide ranging, yet they share the common thread of PBE as a foundation for teaching and learning. They feature youth engaged in interdisciplinary learning experiences that are fun, hands-on, and applied in a community context; and the local community benefits. Educational standards are addressed in meaningful real-world context and Great Lakes literacy and natural resource conservation

goals are accomplished as well. These examples demonstrate how PBE can be applied in practice and showcase the value for schools, students, and their



Ella White Elementary students trawl for microplastics in the Thunder Bay River as part of their annual watershed studies.

communities.

The students, elementary to high school, engaged in these projects are actively applying their learning

to address critical Great Lakes and environmental issues relevant in their region. These projects empower youth voice in exploring locally relevant

in their communities today – as well as in the future (Gallay et al., 2016).

School improvement goals and sustained support for teachers serve as another foundation for the successes of this PBE network and partnership. The NEMIGLSI network serves to support educators through professional development offerings, networking and sharing among schools (including teacher mentoring opportunities), and connecting strategically with community partners and opportunities. PBE efforts supported by NEMIGLSI seek to align with school improvement goals, such as the Next Generation Science Standards, Michigan School Improvement Framework, and STEM educational priorities for the state and region. To this end, it is worth noting that NEMIGLSI was recently recognized with an Innovative Education Award from the North American Association for Environmental Education and Underwriter Laboratories (Schroeder et al., 2016) for excellence in Environmental-STEM education. This national Environmental-STEM conversation (Fraser et al., 2013) explores how environmental education can enhance STEM learning, or even better, how students might apply STEM learning to accomplish environmental stewardship projects within their community (Waters et al., 2018).

Finally, school-community partnerships thrive at the center of the NEMIGLSI network, expanding the capacity, depth of programming, and pride in PBE accomplishments across the region. Neighboring schools lean on and learn from each other, and community partners are better coordinated in their collective support offered to area schools. School classrooms and student learning expands into the community and community partners contribute to (and benefit) from schools as partners. By engaging youth meaningfully in locally-driven Great Lakes and natural resources stewardship projects, NEMIGLSI offers a model for investing in PBE strategies in a partnered way. Across Northeast Michigan, PBE principles and practices are evident as students succeed, school-community partnerships flourish, and community and conservation goals are accomplished.

Great Lakes and natural resource issues (Rote et al., 2015), and challenge and inspire students, as young citizens, to foster civic engagement values, practice environmental stewardship, and make a difference

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