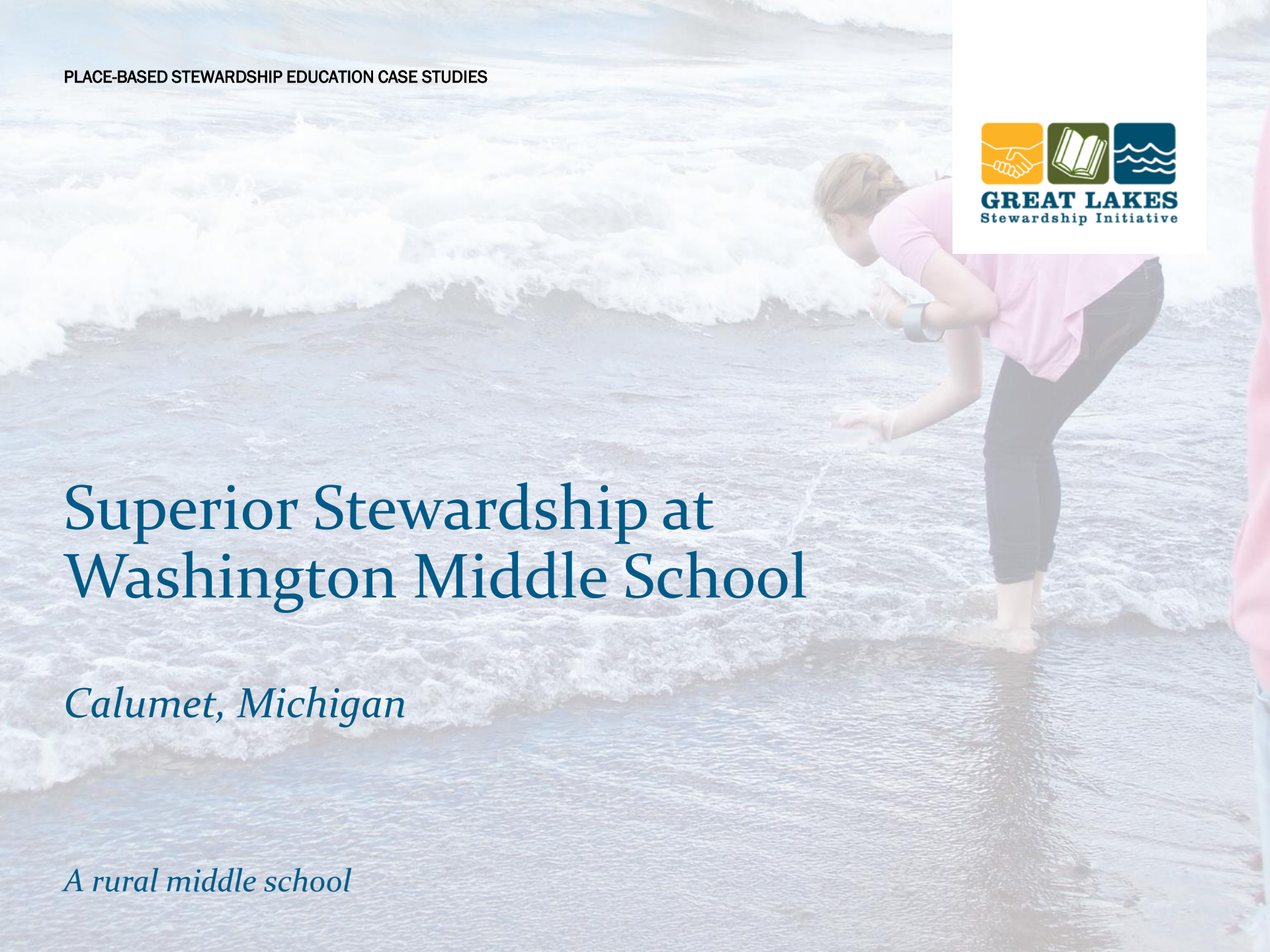

GREAT LAKES
Stewardship Initiative

Superior Stewardship at Washington Middle School

Calumet, Michigan

A rural middle school

About the case study

This case study of place-based stewardship education (PBSE) at Washington Middle School is one of 11 case studies developed by staff of the Great Lakes Stewardship Initiative (GLSI), staff of the GLSI's nine regional hubs, and the educators whose work is featured in the study.

The case studies focus on PBSE efforts during the 2014–15 school year. At most of the sites featured in these studies, the PBSE approach has been developed over the course of several years.

Each school featured in a case study works with the GLSI through a regional hub. Hubs provide professional development for educators, help schools connect and partner with community-based organizations, and provide funding and other PBSE supports with an environmental stewardship emphasis. Washington Middle School has a longstanding relationship with its hub, the Lake Superior Stewardship Initiative, or LSSI.

Cover: A Washington Middle School student takes a water sample from Lake Superior.

Superior Stewardship at Washington Middle School

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Contents

Conventions in this document

As you read this study, you will see special icons in the text.

This icon marks a teaching tool, resource, or product that you can access and download from the case study.

This icon marks a connection between the work being described and the GLSI's Guiding Principles for Place-based Stewardship Education, developed by GLSI central and hub staff to describe the GLSI's vision for exemplary place-based stewardship education. Certain aspects of each case study illustrate how one or more of the principles can be enacted in classrooms and communities.

Quick Summary

Students show ownership and responsibility for their community through year-round interdisciplinary efforts

Students participate in PBSE activities: testing water quality and cleaning up the beach (top), measuring tree height (middle right), analyzing invasive and native species (bottom), and measuring snowpack (middle left).

Since 2008, Washington Middle School (WMS) seventh graders have participated in year-round learning opportunities at the Calumet Township Waterworks Park. In the 2014-15 school year, they participated in the Adopt-a-Beach program, contributed to the school's forest management plan, removed invasive species, restored habitat, and planted native lupine. In recent years, sixth-grade students have been included in aspects of the project, paving the way for their full involvement as seventh graders.

Students wrote research papers on organisms in the Lake Superior watershed, developed informational trailhead signs for the township park, and created personal portfolios documenting their yearlong project. With U.S. EPA support, students were able to add a unique experimental study to their work to control invasive knapweed.

QUICK SUMMARY

Community Context

Context is essential in place-based stewardship education

There is perhaps no more distinctive characteristic of PBSE than its treatment of place as the context for learning.

Our sense of place does not exist in only one geography, and it changes as we age. When we are very young, we may experience our strongest sense of place in our homes, neighborhoods, and favorite places for play. As we grow, we begin to understand that we are members of other communities, too—a school community, a city or town, a watershed, a state, or a bioregion such as the Great Lakes.

PBSE relies on place—including lands and waters, people and organizations, history, and culture—as a starting point for teaching and learning. Reading about rainforests or deserts may be interesting, but environmental learning grounded in students' home communities builds on a foundation of community attachment and place-based knowledge.

That foundation for Calumet youth includes Lake Superior, extensive forest resources, and historic copper mines.

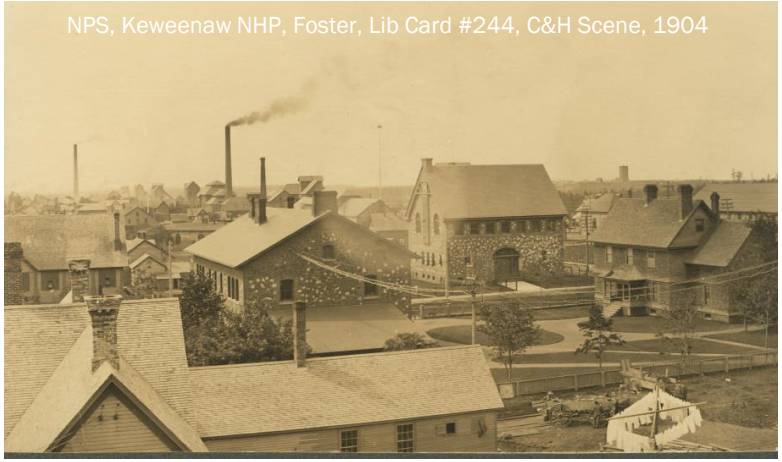
Calumet is located on the Keweenaw Peninsula in Michigan's Upper Peninsula, more than a nine-hour drive from the Detroit area, Michigan's largest population center, and more than an eight-hour drive from the state capital, Lansing. Map : Michigan Department of Technology, Management & Budget (2011).

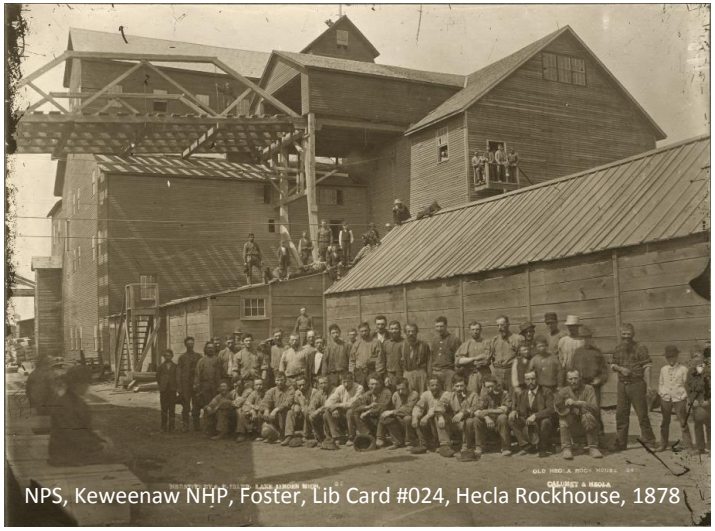
Calumet is known as the "Heart of the Copper Country"

Calumet is located in the Keweenaw Peninsula, in an area known as the "Copper Country." Copper was mined by Native Americans and then by immigrants who came to Calumet from around the globe. This industrial period lives on in visible relics on the land and in the memories of those who live here.

In 1992, Calumet was designated as the headquarters for the Keweenaw National Historical Park. The area is a destination point for those interested in history as well as those who enjoy outdoor recreation (both motorized and silent sports). The region's vast forests and the "big water" of Lake Superior, the largest of the Great Lakes, are critical to the local economy.

Calumet "then" and "now" pictures show profound change in the landscape


NPS, Keweenaw NHP, Foster, Lib Card #244, C&H Scene, 1904


NPS, Keweenaw NHP, Foster, Lib Card #024, Hecla Rockhouse, 1878

At the turn of the century, Calumet was a center for copper production, and natural resources were consumed to support the mining industry.

At the peak of the mining era, Calumet was home to over 40,000 people. Copper was king, and at one time, the Calumet and Hecla Mining Company was the leading copper producer in the world. Calumet had over 35 mine shafts, although they did not all operate at one time. Much of the land was deforested to provide fuel, building materials, and supports for underground mines.

Today, about 6,000 people live in Calumet, and there are no longer any active mines. With miles of Lake Superior shoreline, hundreds of acres of forestland, historic landmarks, and small-town charm, Calumet has become a tourist destination. An integrated trail system for snowmobiles, four wheelers, hiking, skiing, and bikes provides miles of year-round recreation.

Today, the Calumet area's forests and beaches attract tourists who admire the area's natural beauty and four-season outdoor recreation opportunities.

Lessons and Activities

PBSE adapts to fit different students, curricula, and communities

A long list of factors affect the design of PBSE projects in a given teaching and learning context:

- Students' ages/grades/readiness
- Students' interests and questions
- Community stewardship needs and opportunities
- State and local curricular expectations
- Participating community partners and their interests, needs, and assets
- Access to transportation and funding
- Climate and weather

Washington Middle School students' place-based education experiences reflected their particular setting, the school's curriculum and learning goals, and the unique opportunities presented by community partners.

PBSE at Washington Middle School occurs throughout the full academic year

The timeline shows the 2014–15 schedule. Many activities are repeated on this approximate schedule year to year.

2014

Sept. Seventh-grade students partake in Adopt-a-Beach event, and sixth/seventh graders remove knapweed and seed lupine plants at Calumet Township Park.

Oct. Seventh-grade students evaluate test plots with knapweed and lupine.

Fall—Spring Seventh graders conduct survey of the sugar maple forest. The data will be used in the forest management plan.

Fall—Spring Seventh graders develop trailhead signs and brochures for Calumet Township Beach and the school forest.

Jan.—March Students write pieces on the school forest and beach activities and start lupine plants in the lab.

Feb.—March Seventh graders measure snowpack.

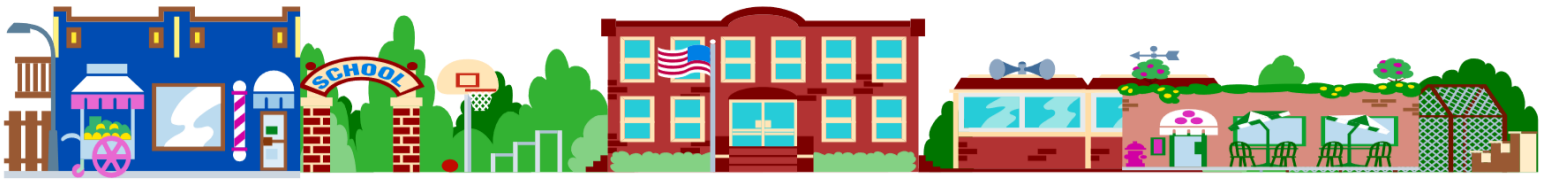
March—May Seventh graders plan lupine planting using the Earth Force Process. Seventh-grade student portfolios and the school forest management plan are completed and Adopt-a-Beach cleanup data is compiled.

May Seventh-grade student portfolios and the school forest management plan are completed and Adopt-a-Beach cleanup data is compiled.

June Seventh graders take part in WMS Family Day Community Event; sixth graders take part in Adopt-a-Beach. Students gather local lupine seed and prepare it for planting. Data is analyzed, and incoming seventh graders are oriented to the yearlong project.

2015

Early in the year, students took the quiz, "How Well Do You Know Your Place?"



How Well Do You Know *Your Place?*

Try this quiz to find out how well you know your local community (both human and natural).

The quiz was adapted in 2008 from Alternatives Journal 28:3 (Summer 2002) by the LSSI.

This open-ended, 25-question quiz works in any community. Questions cover topics about the local area, including:

- The local economy
- The growing season
- Where your water, electricity, and food come from
- The watershed and water quality
- Recycling and waste disposal
- Native American tribes associated with the land
- When the town was established and what was significant about the location
- Native plant and wildlife species

LINK: *HOW WELL DO YOU KNOW YOUR PLACE QUIZ*

The Calumet Township Waterworks Park is a key venue for stewardship activities

A popular recreational area, the Calumet Township Waterworks Park is located on the shores of Lake Superior and adjacent to the district's school forest, providing an excellent venue for stewardship activities and outreach.

Seventh graders began the year with an Adopt-a-Beach cleanup

In the Adopt-a-Beach program, students collect trash and report its kind and quantity to the Alliance for the Great Lakes, which uses the data for outreach and advocacy.

***LINK:** ADOPT-A-BEACH, A PROGRAM OF THE ALLIANCE FOR THE GREAT LAKES*

Students count and classify pieces of trash picked up at Waterworks Park.

Every fall since 2005, Washington Middle School's seventh-grade students have participated in Adopt-a-Beach. In 2014, the seventh graders cleaned the beach at Calumet Township Waterworks Park—sorting and weighing the garbage on site, and classifying the types of garbage they found (e.g., cigarette butts, food wrappers, balloons, cans, tiny trash). Students also took water samples at the park.

Later, back at school, students charted and reported their findings, and compared the results of their cleanup and sampling to the results in past years.

Students removing spotted knapweed, an invasive plant.

In the fall, students also began invasive species mitigation work at the park

Spotted knapweed is a widespread, invasive flowering plant that affects native plant communities.

Seventh graders mapped and removed spotted knapweed at the Calumet Township Waterworks Park, while sixth graders prepared plots and harvested lupine seeds from the park's roadside. Work in the fall laid the foundation for classroom projects later in the year, including making brochures and interpretive signage for the park.

Students learned about the science and practice of restoring native plant communities

Big leaf lupine may help limit the spread of spotted knapweed.

These students are scarifying big leaf lupine seeds. Scarification is a process of weakening a seed's tough outer hull to encourage germination.

WMS students learned about competition, allelopathy, and the basics of community ecology using spotted knapweed (*Centaurea maculosa*) as a focus organism. Big leaf lupine (*Lupinus polyphyllus*) may be resistant to the allelopathic (i.e., growth-inhibiting) chemicals released by spotted knapweed, and may also increase and facilitate the growth of other native plants in areas invaded by spotted knapweed.

Big leaf lupine is a legume native to the Keweenaw Peninsula and grows along borders of the park. Students gathered and scarified lupine seeds in the fall, started these in the classroom, and then planted seedlings in test plots at the township park.

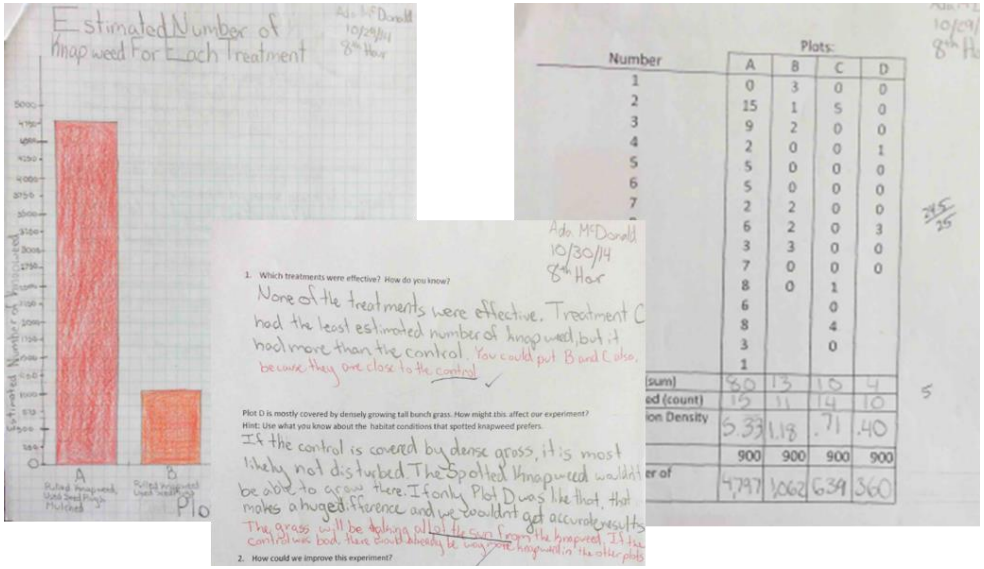
Students applied the scientific method to an authentic problem in their community

In recent years, a National Science Foundation grant allowed several schools working with the LSSI to host an assigned graduate student in science from Michigan Technological University (MTU) in nearby Houghton, Michigan (a "fellow"). At Washington Middle School, fellow Tony Matthys worked closely with teachers and students on their efforts to reduce spotted knapweed in the Calumet Township Waterworks Park.

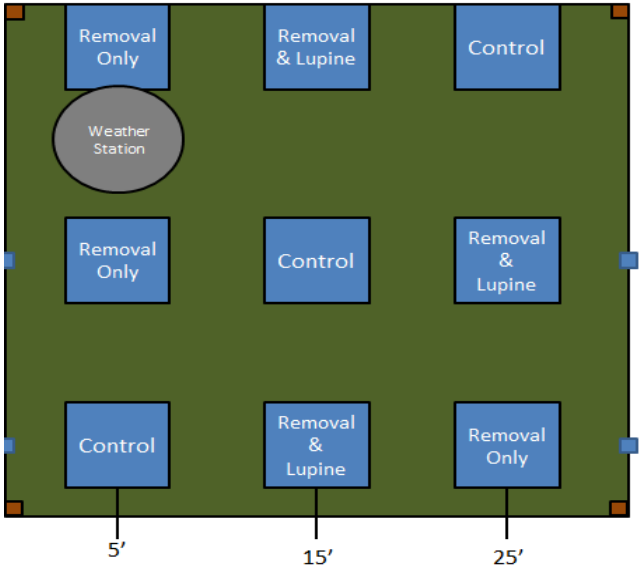
Matthys helped teachers and students devise a quantitative and explicit test of how a native plant might be used to control spotted knapweed, an invasive plant.

The experiment involved nine different 5' by 5' plots, each receiving a distinct treatment—knapweed removal alone, removal with lupine seeding, and control plots not altered in any way. Applying knowledge of spotted knapweed biology, students mapped the incidence of spotted knapweed within the park and monitored the effectiveness of the experimental treatments, developing graphs, charts, and text-based examinations of the outcomes.

GLSI Guiding Principle 3a: *Rely extensively on hands-on, inquiry-based experiential teaching and learning.*



Students graphed the quantity of knapweed plants in each subplot as part of their study of the efficacy of the various treatments.



Each subplot was a 5' X 5' Quadrant with one of three treatments.

A student measures tree diameter.

Students surveyed the school forest and updated its management plan over the course of most of the school year

LINK: *LEARN MORE ABOUT SCHOOL FORESTS*

LINK: *MANAGEMENT PLAN ASSIGNMENT*

LINK: *MANAGEMENT PLAN POWERPOINT ASSIGNMENT WITH ADDITIONAL RESOURCES*

A student measures tree height using a clinometer.

Since 2003, students at Washington Middle School have been involved in developing, then implementing and updating, a management plan for timber resources at the district's school forest, which is adjacent to the Calumet Waterworks Park.

To develop their management plan, students measure tree diameters and height; study soil types and habitat suitability; and estimate the basal area (the average amount of an area of land that is covered by tree stems), the average age of the trees, and possible cords of wood available for harvest per acre.

The management plan includes recommendations for rotation or harvest, methods of cutting, and prioritizing the trees to be cut.

Students developed interpretive signage for the park and forest through their Integrated Technology "encore" course

Every seventh-grade student rotated through the six-week class at some point in the year.

Using computer software, seventh-grade students generated signage during their Integrated Technology "encore" rotation. The "encore" courses provide Washington Middle School students with access to music, art, technology, and more. They are not elective—every student rotates through the encore subjects—but they do provide variety in the curriculum.

As new groups of students rotated through Integrated Technology, new signs were made throughout the year. All were unveiled during the Community Day Celebration (see page 25 for more about this event). The signs were then displayed at the Calumet Township Park for the summer.

A student-made sign for Calumet Township Park.

Students also produced informational brochures

The student-generated signs and brochures integrate lessons about technology, English/language arts, and science content, while also providing an opportunity for students to engage in acts of service.

LINK: *POSTER ASSIGNMENT*

LINK: *POSTER RUBRIC*

A student-made brochure describes ways to take stewardship action for Calumet Waterworks Park.

A student-made sign for Calumet Township Park.

In midwinter, students dug a snow pit to measure and characterize snowpack

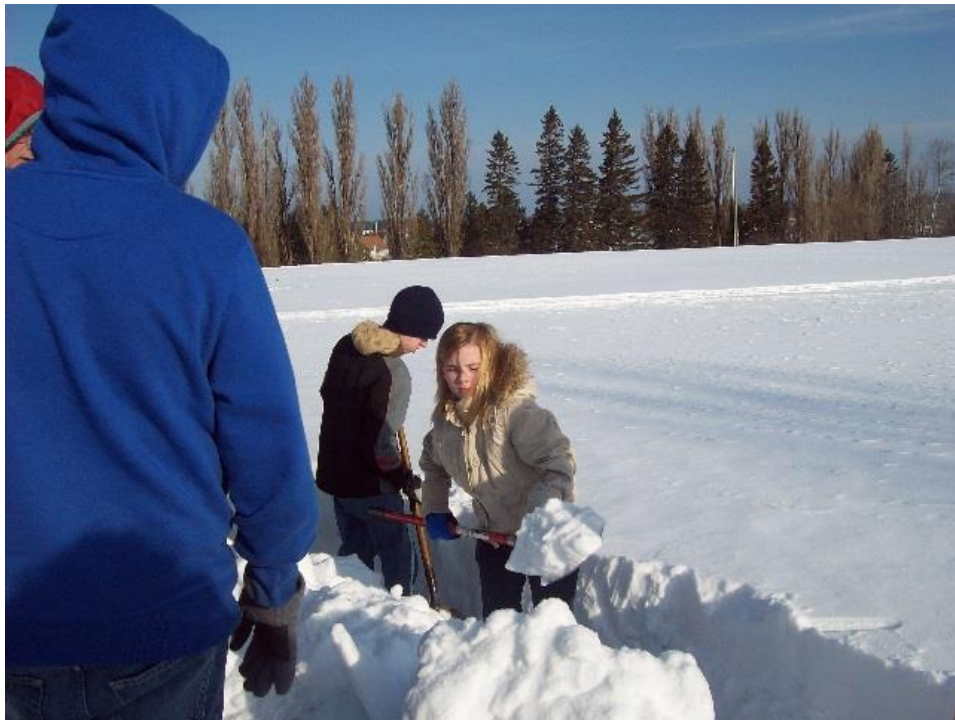
Students applied measurement and math skills to determine the total water equivalent of many snow events.

In early February, before the spring melt, students dug a snow pit—a trench to the ground on the school's practice football field—an effort that required the contribution of every student in every science class.

Students used the pit to collect data about each snow event that occurred throughout the winter. By passing a thin piece of plastic (like a spatula) along the carved-out edge of the snow, they detected the transitions between snow events—the separate layers formed by each distinct snow event can be felt by pushing toward the ground. Students marked each layer with a plastic straw, and measured the depth of each layer.

Students used a snow density gauge to calculate the percent water of each layer. Percent of water indicates what fraction of the sample is snow crystals versus trapped air. With this knowledge, inches of snow can be easily converted to their water equivalents, and the water equivalents totaled to arrive at the total precipitation as snow for the year. (Snow density gauges are also used by avalanche hunters; once the density of snow reaches a critical level, charges are deployed to release dangerous snowpack.)

The activity addresses standards related to the water cycle, and provides data needed for the school's forest management plan. This data also allows students to compare their precipitation totals to local yearly totals, and over time.



Students help dig the snow pit.

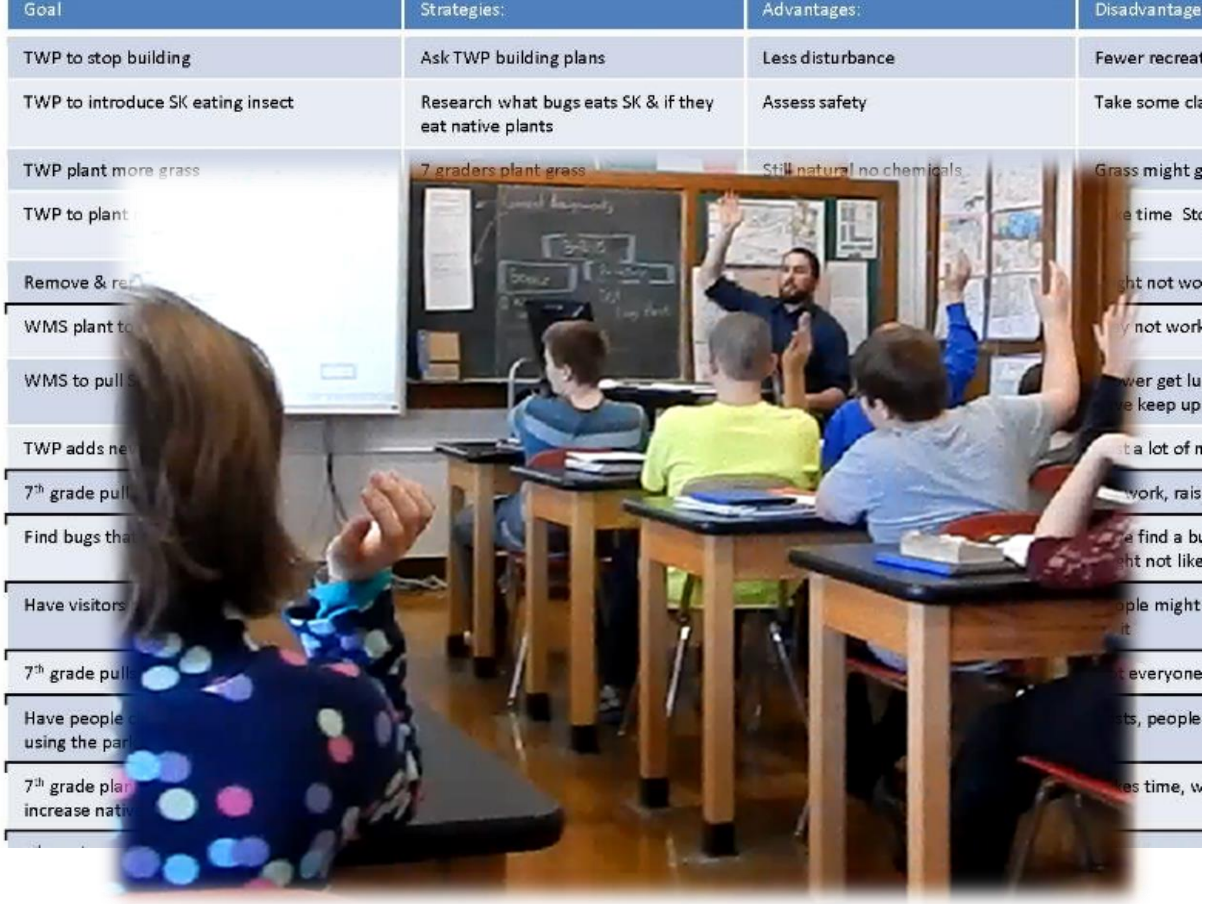
LINK: *SNOWFALL CHANGE: A CLIMATE CHANGE INDICATOR FROM NOAA*

LINK: *NASA RESOURCE FOR TEACHING WITH A SNOW PIT*

In the spring, seventh graders debated future strategies for battling spotted knapweed in the park

Students used the Earth Force Community Action and Problem Solving Process to identify, rate, and select future strategies.

LINK: [EARTH FORCE PROCESS]



Students generated ideas, discussed them, and voted, using the Earth Force Process.

In their science classes, students were asked to develop several reasonable future strategies to combat spotted knapweed in the township park, considering all they had learned over the course of their time in the sixth and seventh grades. Students brainstormed strategies in each of the five hours of seventh-grade science. Each class then reviewed and ranked all of the collected strategies.

The process students used is a part of the Earth Force Community Action and Problem Solving Curriculum. It helps students learn how to select from a range of alternatives on the basis of criteria.

Seventh-grade students chose the strategies for the incoming seventh-grade class of 2015–16. Teachers planned that those students, in turn, would evaluate and select strategies for the class following them.

Students presented their work to their families and the broader community as the school year ended

The culminating event for seventh-grade students was the annual Community Day Celebration at Calumet Township Waterworks Park. Community partners and key stakeholders were invited to the event, including the district's administrators and the school board.

Serving as interpreters, students guided participants from the beach through the forest, showing their projects and demonstrating their skills.

Student-generated brochures were created for the event, and made available throughout the summer for recreational visitors. Students also shared the signs they made for Calumet Waterworks Park's beach and their portfolios with family and community members.

LINK: *BLOG COVERAGE on KEWEENAW NOW*

At the Community Day Celebration, a student guides his great-grandfather to numerous sites where students worked to improve the park.

The PBSE activities supported the district's goals for the integration and use of technology

Washington Middle School is a part of the Public Schools of Calumet-Laurium-Keweenaw (CLK), founded in 1867.

CLK schools are transforming student learning through a Universal Access to Technology Initiative. In 2011, U.S. News and World Report ranked CLK Schools fifth in its annual ranking of the country's "Most Connected Classrooms."

Technology has played an important role in the WMS Superior Stewardship project. Students have used technology to analyze and report Adopt-a-Beach data, to make signage for the Calumet Township beach and school forest, to analyze data, and to make decisions related to stewardship of the school forest.

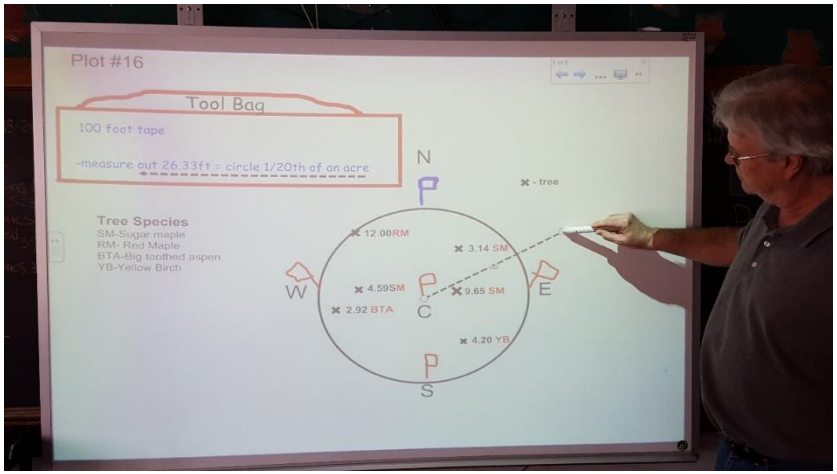
GLSI Guiding Principle 3e: *Use PBSE to inform, enhance, and support school building and district priorities.*

LINK: DISTRICT TECHNOLOGY PLAN

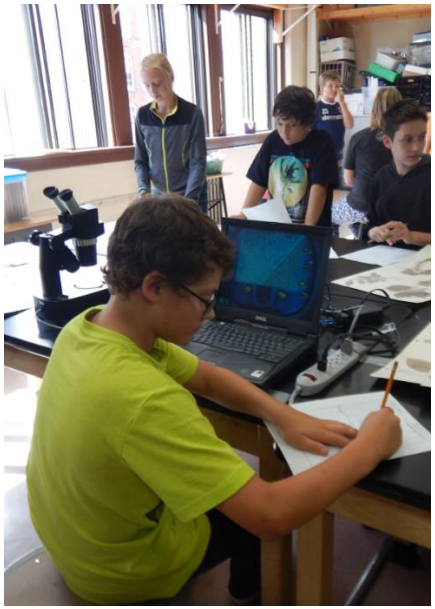
LINK: DISTRICT iPAD INITIATIVE

Washington Middle School is co-located with CLK Elementary School.

The project helped CLK schools "lead with technology for teaching and learning"



Lead teacher Darrell Hendrickson uses the interactive whiteboard to talk with students about trees in the school forest.



Students using computers, microscopes, and measuring tools.

Interactive whiteboards, personal iPads, and six-week technology courses all aid in getting the work done more efficiently and with a higher standard of performance.

Improved communication, graphing, and calculation skills can result from regular use of technology in the classroom. In-class practice sessions help increase understanding and translate to a higher success rate in the field.

"One of the best compliments we get with this program is that our community is proud to see Washington Middle School apply classroom learning to a real-life project that helps our community and the environment."

—Mike Steber, WMS Principal

Team and Planning

PBSE builds relationships that support teachers

Relationships are an important part of most PBSE efforts. Teachers can work in grade level, multidisciplinary teams on a common PBSE effort, or on teams that span grades or even schools. This does not mean that a single teacher cannot implement PBSE, just that the benefits are far greater when they can work with a team.

Teachers also form partnerships with community members who have environmental expertise or resources to share, or an ongoing community or environmental project that would benefit from the involvement of students.

Over the years that the GLSI has been operating, many teachers have said that they particularly value this opportunity to collaborate with other teachers and experts in the community.

The benefits of teacher collaboration are supported by research like The Missing Link in School Reform, from the Stanford Social Innovation Review.

LINK: *THE MISSING LINK IN SCHOOL REFORM*

Twelve teachers engaged in the PBSE effort

Darrell Hendrickson, seventh-grade science teacher at Washington Middle School, served as the lead teacher for the project. In the 2014–15 school year, Hendrickson was joined by a full seventh-grade team: Carl Arko (math), Margery Gronlund (integrated technology), John Larson (social studies), Trista Soumis (special education),and Kristin Svoke (language arts). At the end of the 2014-15 school year, Lisa Twardzik replaced Margery Gronlund (who served on this team from 2008 until 2015) as the seventh-grade integrated technology teacher.

Since 2004, Washington Middle School teachers have worked together conducting PBSE efforts to strengthen student learning. Teachers have participated in numerous professional development opportunities, including self-designed professional learning communities.

Although the efforts described in this case study were mainly those of seventh graders, sixth grade students were involved in knapweed removal and supplemental planting at test pilots. Teachers in the sixth-grade team included John Asiala (science), Steve Lancour (math), Julie Goldsworthy (integrated technology), John Lund, (social studies), Amy Machiela (language arts), and Kelly Roland (special education).

Members of the seventh-grade team: Carl Arko, John Larson, Kristin Svoke, Lisa Twardzik, Darrell Hendrickson.

The full sixth-grade team: John Asiala, Steve Lancour, Julie Goldsworthy, John Lund, Kelly Roland, and Amy Machiela.

"I enjoy teaching this way, because it is the way I would have liked to learn as a seventh grader! This project has instilled a sense of pride and accomplishment in our youth as they develop a feeling of stewardship for our community and Lake Superior."

—Darrell Hendrickson

LINK: *VIDEO INTERVIEW WITH DARRELL HENDRICKSON*

Students and teachers partnered with seven community organizations

Community partners can augment classroom learning, giving students firsthand insight into career paths and opportunities.

Kathleen Harter of the Keweenaw National Historical Park has worked with LSSI schools for many years.

Community partners included:

Calumet Township Supervisor Paul Lehto, a lifelong resident of Calumet. Lehto has a great deal of local knowledge with a special interest in stewarding recreational areas in the township. The township provided access to the park, garbage bags for cleanups, and sign kiosks to display student-created signage.

Steve Dlubala, general manager of the **Michigan American Water Company**, contributed logistical support, marking underground water and power lines in areas where students worked, as well as providing insight on well locations.

The **Alliance for the Great Lakes** supports the Adopt-a-Beach program and has worked with Washington Middle School for several years.

Kathleen Harter, Chief of Interpretation at the **Keweenaw National Historical Park,** has worked with students and teachers over the course of many years on heritage and nature interpretation. Her guidance helped students develop interpretive signage and brochures.

Other partners included **BHK Great Explorations** (after school and summer programming), **Earth Force** (which provided a curriculum for problem-solving and related professional development for the teacher team), and **Michigan Technological University**. Read more about the partnership with Michigan Technological University on the following pages.

LINK: *VIDEO INTERVIEW WITH KATHLEEN HARTER*

The GK-12 Global Watershed Program provided the team access to a Michigan Tech University graduate student

Michigan Tech's GK-12 Global Watershed Program partners PhD students (fellows) with middle- and high-school teachers to create lesson plans and activities that transfer their doctoral research on watershed science topics to teachers and students. Emphasis is placed on hands-on, inquiry-based research, and the program helps teachers establish scientific research as an integral component of curricula.

Tony Matthys is a PhD candidate in biological sciences at Michigan Tech; his research interests are how fish use and select habitats. Matthys helped the WMS team of teachers design the native seed experiment, and his placement allowed WMS students to conduct high-quality scientific inquiry.

The GK-12 program is funded by the National Science Foundation.

LINK: *VIDEO INTERVIEW WITH TONY MATTHYS*

Tony Matthys looks at spotted knapweed with a Washington Middle School student.

"This project gave me the opportunity to develop lessons, demonstrations, and to expose many students to science and ecology. Working at WMS has improved my communication and teaching skills in ways that translate directly into my teaching at the collegiate level."

—Tony Matthys

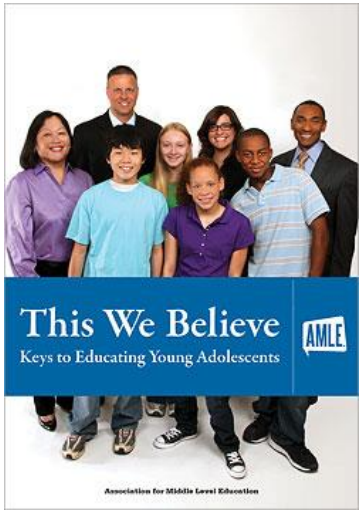
Common prep time is a key asset when planning an interdisciplinary PBSE effort

At Washington Middle School, common prep time at each grade level reinforces the link between teachers and subject areas.

At the seventh-grade level, four main core subjects form the backbone of the project, with integrated technology serving as the common thread unifying the yearlong study.

Primetime—a class for every student, similar to homeroom—is used to provide opportunities for planning, and to develop student products such as posters, bulletin boards, and displays of student work.

Many auxiliary lessons directly relate to the overall project. For instance, *Writing to Learn* is a collaboration between language arts and science. (*Writing to Learn* activities are short, informal writing tasks that allow students to think through key concepts that have been presented. The tasks often take less than five minutes of class time.)



The Association for Middle Level Education's position paper, This We Believe: Keys to Educating Young Adolescents, includes information about the benefits of common planning time among interdisciplinary teams.

***LINK:** THIS WE BELIEVE, ASSOCIATION FOR MIDDLE LEVEL EDUCATION*

***LINK:** ABSTRACT, TEACHER COLLABORATION IN INSTRUCTIONAL TEAMS AND STUDENT ACHIEVEMENT, AMERICAN EDUCATIONAL RESEARCH JOURNAL*

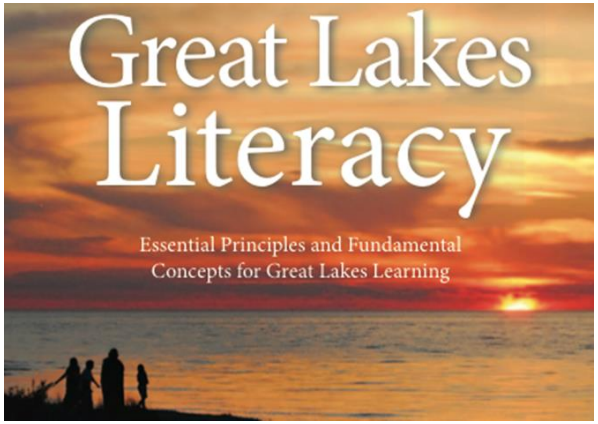
The LSSI requires the teams it supports to address the Great Lakes Literacy Principles

This expectation brings focus to planning and creates shared experiences for the schools and teams involved with the hub.

Developed in 2009 by a network of committed educators and scientists affiliated with the Sea Grant system, the Great Lakes Literacy Principles identify the concepts that students, teachers, and residents of the region need to understand about the Great Lakes. At Washington Middle School, the PBSE efforts reflect each principle in some way.

LINK: *THE GREAT LAKES LITERACY PRINCIPLES*

LINK: *RELATED TEACHING RESOURCES*



The Great Lakes Literacy Principles brochure cover.

Example links between the Superior Stewardship Project and the Great Lakes Literacy Principles

Principle 1. The Great Lakes, bodies of fresh water with many features, are connected to each other and to the world ocean.

The interconnections of Great Lakes waters are explored in connection to the Adopt-a-Beach program.

Principle 3: The Great Lakes influence local and regional weather and climate.

Snow pit activities generate measures of snowfall and lead into discussions of the influence of the Great Lakes on precipitation.

Principle 5. The Great Lakes support a broad diversity of life and ecosystems. Part I: Life cycles, behaviors, habitats and the abundance of organisms in the Great Lakes have been altered by intentional and unintentional introduction of nonnative plant and animal species.

This principle aligns to the students' efforts to remove invasive spotted knapweed and to study the value of big leaf lupine as a deterrent to the spread of knapweed.

Impacts of the Project

PBSE offers deep learning and community enhancement

One of the key principles of PBSE is that when students are able to create tangible, meaningful benefits for the community and the environment through their own efforts, they benefit academically. Not “either or,” but “both and.”

This win-win quality of PBSE makes it particularly attractive when resources for community and environmental enhancement are scarce, and when schools are challenged to meet new, higher expectations for student learning.

Involving students in their communities makes learning more relevant and engaging. Students are intrinsically motivated to learn when the work is interesting and consequential.

Students participating in PBSE efforts supported by the U.S. EPA grant to the Great Lakes Stewardship Initiative participated in pre- and postexperience surveys, pre- and postexperience tests, and other data-collection efforts to document their responses to these opportunities. Teachers had some choices to make regarding the subject matter of tests (Great Lakes or general ecological literacy).

This section explores the benefits to the Calumet community and environment achieved through PBSE at Washington Middle School. It also reviews selected findings regarding student impacts.

PBSE improves the community

Students created signs that leave a positive, educational message for the community, and contributed to the health of the CLK school forest.

Calumet Township makes use of students' products at Waterworks Park, and the signs are professional-looking contributions.

Similarly, students' work in the school forest results in real recommendations and management decisions, helping to sustain the value of the forest as a resource for everyone.

A student-created sign in Calumet Township Waterworks Park exhorts visitors to put garbage in trash cans and keep the water clean.

The Adopt-a-Beach cleanup removed more than 80 pounds of trash from the beach

In 2014–15, students picked up, classified, and reported more than 80 pounds of trash from the beach at Waterworks Park. Food-related items were common, as were cigarette butts and tiny pieces of plastic. Through students' efforts, this Lake Superior beach was restored to a more natural condition.

The Alliance for the Great Lakes, which sponsors the Adopt-a-Beach program, uses data collected by groups throughout the region to understand the stresses on the Great Lakes and to advocate for changes in policies and practices.

LINK: VIEW THE CLEANUP DATA ONLINE

Here's what they found (seven bags)	Totals, fall 2014 (80.5 lbs)
Cigarette butts	942
Food wrappers	344
Take-out containers	32
Caps and lids	116
Straws	6
Cups, plates, and dinnerware	138
Bottles and cans	45
Plastic bags	130
Paper bags	145
Packaging materials	62
Fishing gear	5
Balloons	18
Personal hygiene	7
Construction materials	31
Fireworks	19
TINY TRASH	<2.5 cm
Foam pieces	21
Glass pieces	95
Plastic pieces	244

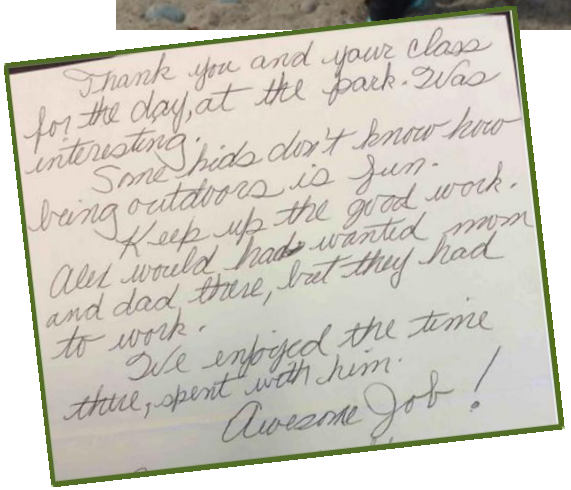
Students pick up candy wrappers, a shoe, and other debris.

Students sample water to test quality while at the beach.

Students extended the lessons they learned to friends and family

Held each year in early June, the Washington Middle School Community Day is an impactful way to highlight stewardship and showcase student learning.

The public presentations, trailhead signs, and brochures leave a lasting impact that helps extend the lessons learned to friends, family, and visitors.



Thank you and your class for the day, at the park. Was interesting. Some kids don't know how being outdoors is fun. Keep up the good work. Alex would had wanted mom and dad there, but they had to work. We enjoyed the time there, spent with him. Awesome Job!

Top: family members watch as students demonstrate water sampling. Left: a letter from grandparents who attended the Community Day Celebration. Right: students admire one of several displays created for the Community Day Celebration.

Teachers share their expertise with other teachers

Time and again, WMS teachers have generously shared their knowledge and success through presentations at LSSI professional development workshops, MTU Summer Teacher Institutes, and at statewide conferences—such as the Michigan Alliance for Environmental & Outdoor Education Conference and the GLSI Place-based Education Conference. Teachers new to PBSE value the opportunity to hear from those with several years of experience.

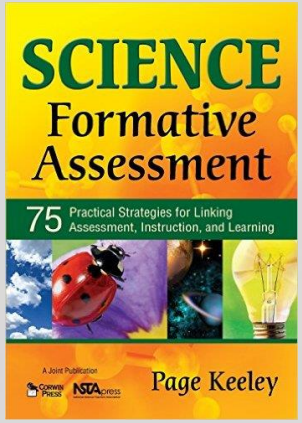
Members of the seventh-grade teacher team.

Students began the year with several misconceptions about invasive knapweed

As part of the evaluation for the GLSI's U.S. EPA grant, students at Washington Middle School completed a worksheet with three prompts:

"I used to think"
"Now I know"
"This is how I learned it"

Seventh-grade students were instructed to focus their answers on spotted knapweed. Things they "used to think" are shown at right.



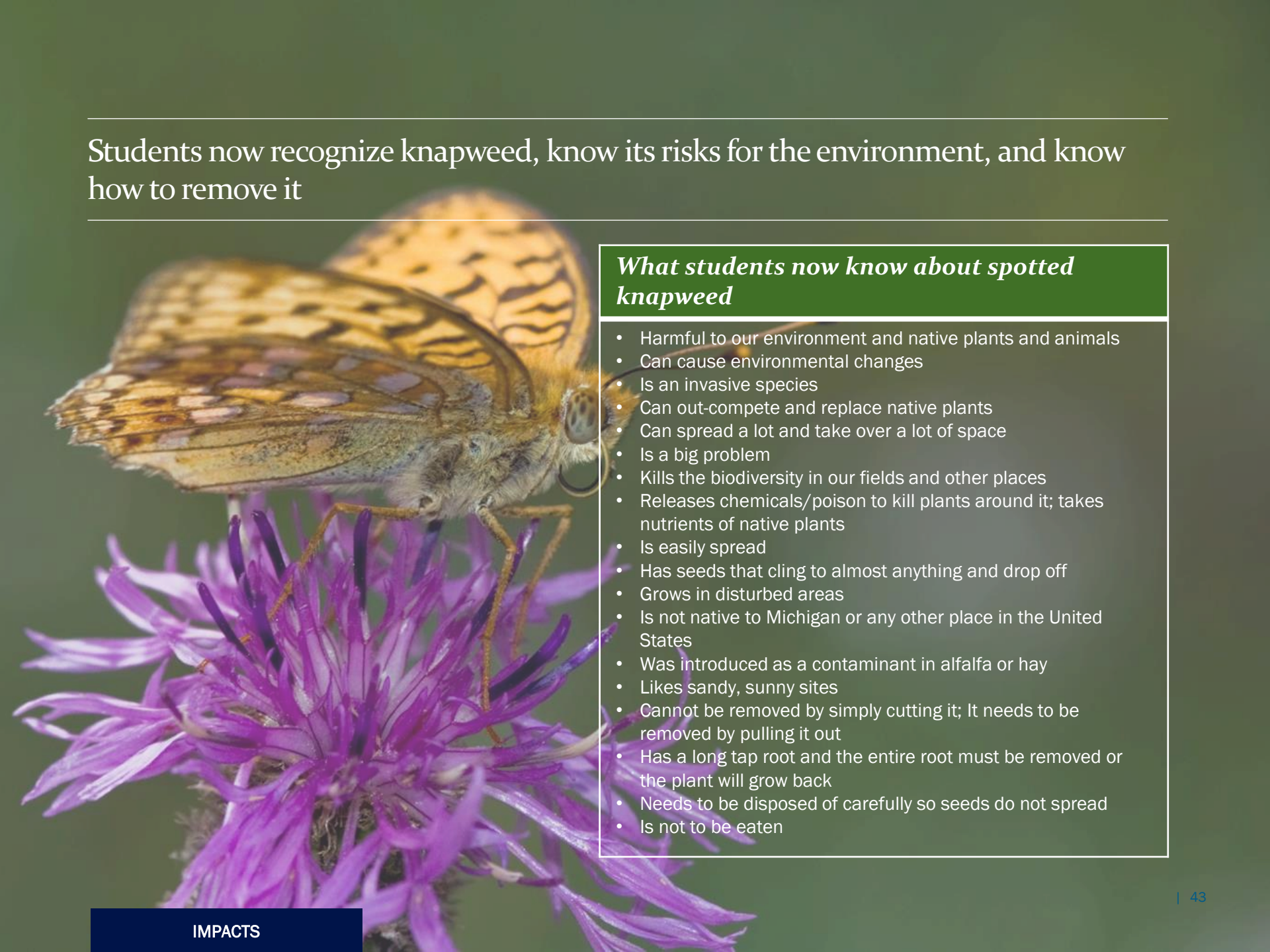
The worksheet prompts were derived from a formative assessment in this 2008 text.

LINK: *SCIENCE FORMATIVE ASSESSMENT: 75 PRACTICAL STRATEGIES FOR LINKING ASSESSMENT, INSTRUCTION, AND LEARNING*

What seventh-grade students used to think about spotted knapweed:

- A regular, common plant
- A beautiful plant with a pretty flower
- Good to have in gardens
- Didn't harm native species
- Not harmful, not important, or not a problem
- Not an issue in places other than Michigan
- Native to Michigan and other parts of the country
- Just a plant that reproduced quickly
- Could just pull it out
- Didn't have long tap roots
- Saw them everywhere
- People liked them
- It would be impossible to control or get rid of
- Thought it was a weed
- Didn't know or think about what it was so really didn't care about it

Students now recognize knapweed, know its risks for the environment, and know how to remove it



What students now know about spotted knapweed

- Harmful to our environment and native plants and animals
- Can cause environmental changes
- Is an invasive species
- Can out-compete and replace native plants
- Can spread a lot and take over a lot of space
- Is a big problem
- Kills the biodiversity in our fields and other places
- Releases chemicals/poison to kill plants around it; takes nutrients of native plants
- Is easily spread
- Has seeds that cling to almost anything and drop off
- Grows in disturbed areas
- Is not native to Michigan or any other place in the United States
- Was introduced as a contaminant in alfalfa or hay
- Likes sandy, sunny sites
- Cannot be removed by simply cutting it; It needs to be removed by pulling it out
- Has a long tap root and the entire root must be removed or the plant will grow back
- Needs to be disposed of carefully so seeds do not spread
- Is not to be eaten

I used to think: *"That invasive species were not that bad, and that they would affect nothing in the environment. I did not think that there were even any invasive species in the Great Lakes region."*

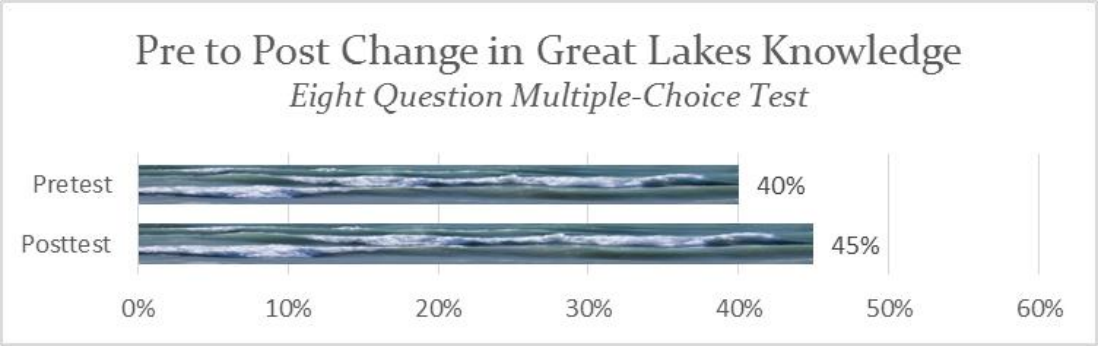
Now I know: *"That invasive species are something to worry about. I also know that even in a small space, there is tons of weeds."*

Here's how I learned it: *"I learned it when we pulled spotted knapweed. At the park there were countless weeds, and we filled like five garbage bags. Plus, we didn't even get it all. So, it takes up a lot of space where good plants could be growing."*

—A WMS student

Students also made modest gains in general Great Lakes knowledge

LINK: *TEST OF GREAT LAKES KNOWLEDGE*



WMS students also took a pre- and posttest of their Great Lakes knowledge. This test was one of two available to middle- and high-school teachers participating in the GLSI's U.S. EPA grant as a standard measure of student learning. The eight-question test was based on the *Great Lakes Literacy Principles*, a document created by Sea Grant educators that outlines essential knowledge of the Great Lakes for citizens of the region.

WMS students improved on several test questions. At year end, they were more likely than at pretest to be able to identify the correct definition of a watershed, and more likely to know that the acreage of Great Lakes wetlands is declining. The gain of +5 percent on the test represented approximately 25 percent of a standard deviation, and this Great Lakes learning is a supplement to the chief focus of their work, invasive species.

Teachers and students reflect on their PBSE experiences

Teachers and students shared positive observations about the influence of PBSE on their thinking and actions.

> "I have always been aware of our water and land, and how lucky we are to live where we do. Being a teacher of sixth graders, I have the opportunity to share that with them. We have created a strong bond between our young people and our water and land. They start in elementary school, and we build upon it through middle and into high school. They are the future. They will understand, share, and take care of what we have."
>
> *—Amy Machiela, sixth-grade language arts teacher*

> "My teaching has been impacted by seeing how motivated and excited my students are when there is real hands-on learning. It has brought new thinking and insight into my classroom."
>
> *—Kristin Svoke, seventh-grade language arts teacher*

LINK: *STUDENT VIDEO*

In their postprogram survey, students were asked, "What do you think you learned about yourself and your community from your stewardship work this year?"

Students wrote about their ability to make a difference and the importance of the natural environment to the health of the community.

Some students' quotes:

> "I learned that I can make a difference and that there are others in the community who feel the same."
>
> "That we have to keep our community clean because it makes it a better place."
>
> "I learned that the Great Lakes are a wonderful ecosystem and they provide our water supply in the U.S. so we shouldn't pollute them or any environment."
>
> "I learned that getting out and doing something good for the community helps make yourself become a better person. I also learned how to work with people and my community and have fun while doing it."
>
> "What I learned about myself and my community from the stewardship work this year was that if we all take time out of our day we will accomplish something no one thought we could."
>
> "I learned that humans can have a huge impact on the environment. Invasive species also have big impacts on our environment. I have learned that we should try to take care of nature because it takes care of us a lot and helps us live a better and easier life."

“This has solidified my feeling that engaging young students is an important way to create an educated public by kindling students’ innate interest . . . to a more advanced realization of the importance of water in our community. Middle-school students are at a unique stage where they can grasp this idea and get excited about it. There is the potential for partnerships with LSSI to change the career trajectories of many students.”

—Dr. Alex Mayer, professor of civil and environmental engineering at Michigan Technological University and co-director of the GK-12 grant

Photo: Michigan Technological University

Other PBSE efforts could yield a different set of benefits

There is a lot of freedom within the PBSE framework, so many benefits are possible, depending on the direction taken.

BENEFITS OF PLACE-BASED STEWARDSHIP EDUCATION CAN INCLUDE:

STUDENT ACADEMIC GAINS

- Improved academic scores and grades
- Improved critical thinking skills
- Increased engagement in school and motivation for achievement
- Increased professional skills, such as leadership, persistence, taking responsibility, teamwork, developing plans to reach a solution, managing time, motivating others, and dealing with unexpected challenges
- Deeper learning and action competence
- Increased awareness of career options

POSITIVE YOUTH DEVELOPMENT AND STEWARDSHIP GAINS

- Social-emotional development, including increases in self-esteem, a sense of empowerment and agency, social interaction skills and capital, and awareness of cultural diversity
- Sense of place and community attachment
- Civic-democratic competencies and attributes
- Pro-environmental attitudes
- Environmental sensitivity and awareness
- Responsible environmental behaviors

TEACHER BENEFITS

- Opportunity to pursue their interests and advance their values
- Skill development
- Motivated students

SCHOOL AND DISTRICT BENEFITS

- Teacher engagement and satisfaction
- An integrated option to reach numerous and robust standards and curricular priorities as well as youth development priorities
- Increased awareness from the community of the conditions, needs, and efforts of the schools
- Stronger connections with community-based organizations, parents, and individual community members
- Access to grants, funders, and recognition

PARTNER ORGANIZATION BENEFITS

- Engaged youth and schools in their work
- Raised awareness of the mission
- Increased capacity
- Networks with other organizations in the field
- Access to grants, funders, and recognition

AREA BENEFITS

- Community revitalization and environmental improvements
- Sense of place
- Social capital and community capacity

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IMPACTS

Support from the Hub

The GLSI works through regional hubs

Regional hubs implement the GLSI's three core strategies—they deliver professional development for PBSE educators, foster partnership between schools and communities, and provide direct support for PBSE experiences.

The GLSI currently has nine regional hubs throughout Michigan. Some work with predominantly rural communities, some with urban communities, and some with various communities that span the urban-rural continuum.

Hubs have the local knowledge and relationships needed to adapt the strategies to the needs and culture of the local area.

LINK: *GREAT LAKES STEWARDSHIP INITIATIVE*

The Lake Superior Stewardship Initiative

Located in the western Upper Peninsula and established in 2008, the Lake Superior Stewardship Initiative brings together schools and community partners to prepare K–12 students to become knowledgeable citizens concerned about the Lake Superior watershed and actively engaged in stewardship projects in their community.

The LSSI implements place-based curricula in the classroom that engages students in learning about their community, cultural heritage, local watershed, and the Great Lakes.

The LSSI provides teacher training and student programs that increase content knowledge about the Great Lakes and opportunities for students to visit and learn about Lake Superior, tributary streams, wetlands, forests, and other outdoor environments near their schools.

The LSSI develops school-community partnerships with local units of government and community organizations to address local needs by working together on local stewardship projects.

LINK: *LAKE SUPERIOR STEWARDSHIP INITIATIVE*

LINK: *LSSI VIDEO*

"Connecting schools and communities in the stewardship of Lake Superior and its watershed"

Hubs implement three core strategies for stewardship

Each GLSI hub provides a program of sustained professional development, brokers school-community partnerships, and supports place-based education. Their strategies are not inherently tied to environmental stewardship—that theme and content must be infused into each aspect of the work.

The GLSI's hubs have developed approaches that reflect the environmental character and needs of their respective communities, the interests and goals of their school districts, the strengths of the hub staff and the host organization, and the mix of community organizations engaged in stewardship work with youth.

Every hub shapes their strategies to meet the needs of its people and places.

SUSTAINED PROFESSIONAL DEVELOPMENT

A program of ongoing learning, building teaching skills and content knowledge for PBSE over a period of months or years, and forging a community of learners.

PLACE-BASED EDUCATION

A hands-on, inquiry-based, contextually embedded, and community-supported approach to teaching and learning that occurs in and with a place or community, is about a place or community, and yields benefits for a place or community.

SCHOOL-COMMUNITY PARTNERSHIPS

Teachers, students, and representatives of community organizations collaborate on projects to improve the community and environment, meeting grade level learning expectations through these efforts.

SUPPORT FROM THE HUB

Sustained professional development at the LSSI

Teachers appreciate being valued and feeling supported; sustained PD means teachers interacting with some of their colleagues across the LSSI.

The LSSI's strategy is to meet team members' needs within several important categories: pedagogy, content, and skills. Great Lakes Literacy Principles are woven in, and real-world applications are provided.

When addressing pedagogy, the teachers are a rich source of professional support for each other, so time is provided for them to share classroom experiences.

Teachers also benefit from working and talking with experts in the field. This builds teachers' confidence and inspires them.

The LSSI conducts biennial teacher surveys to assess teachers' professional development interests and needs.

"Working with LSSI has increased my knowledge, and has given me new strategies and resources to use with students."

—Heather Bradway, teacher at Hancock Middle School

The LSSI supports professional learning communities (PLCs)

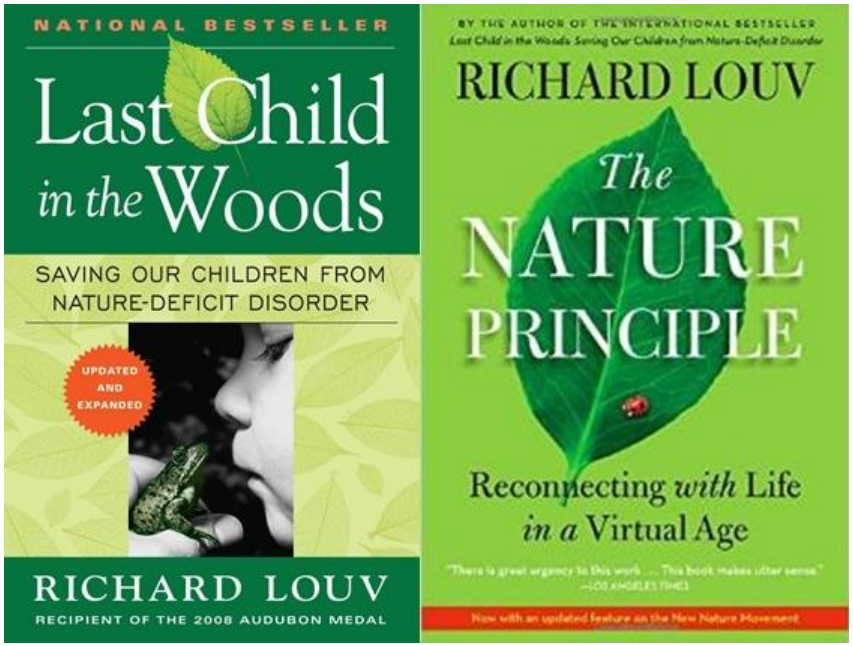
Teachers in PLCs have studied environmental books and films, hosted technology workshops, and trained each other to conduct outdoor lessons.

The graphic word cloud shows the varied topics PLCs have studied.

The professional learning community protocol was tested by LSSI as part of a 2012 NOAA B-WET grant. PLCs proved to effectively strengthen teams and advance teacher education while improving student learning. The LSSI has required its participating schools to operate PLCs (as a condition for receiving minigrants) since 2013.

PLCs meet a minimum of three times for a total of 12+ hours, and involve three or more participants. Topics are selected as a result of a needs survey conducted at the school level and have included school-wide in-services, book and film studies, teacher-led technology workshops, and lesson development for outdoor learning experiences. They take place on or off campus, at a time that is most convenient to participants. PLCs are conducted at the school level and reflect the needs and culture of individual teams.

At Washington Middle School, book studies have helped teachers learn together and build capacity as a team



The Washington Middle School team enjoys Richard Louv's books about getting kids outdoors; even in the remote areas of the Upper Peninsula, many young people spend little time outside.

LINK: *RICHARD LOUV BOOKS*

At Washington Middle School, the PLC has emphasized book studies. The books have been selected by the team members, who have met for 12 hours per school year to discuss each book. These sessions have been hosted at various community locations, introducing participants to new venues and cultivating a sense of team camaraderie. In some cases, school personnel not formally on the team have participated, too.

Teachers have shared in the responsibility for the discussions, generating and distributing questions in advance and taking turns leading discussion.

The teachers have earned continuing education credits for their book studies while deepening their knowledge of leading authors in environmental education like Richard Louv.

PBSE with the Lake Superior Stewardship Initiative

An advisory group reviews proposals and awards two-year grants to support PBSE.

Quality PBSE actively engages students, teachers, and partners in purposeful work to address recognized local stewardship needs or opportunities.

Proposals are submitted by school teams made up of at least two teachers, one administrator, and one community partner. All projects meet a community stewardship need, address school improvement goals, and are grounded in curriculum.

Students, teachers, and partners share in the responsibility to manage their time and resources to ensure intended outcomes are achieved.

The LSSI Advisory Board, made up of educators and community partners, approves the grant applications and makes suggestions as to how they might be improved. Typically, the LSSI makes two-year grants.

The LSSI Advisory Board reviews applications for minigrants submitted by school-based teams in the LSSI's service area, and offers suggestions to improve the submissions.

The LSSI works to foster school-community partnerships

The LSSI connects schools and communities in the stewardship of Lake Superior and its watershed.

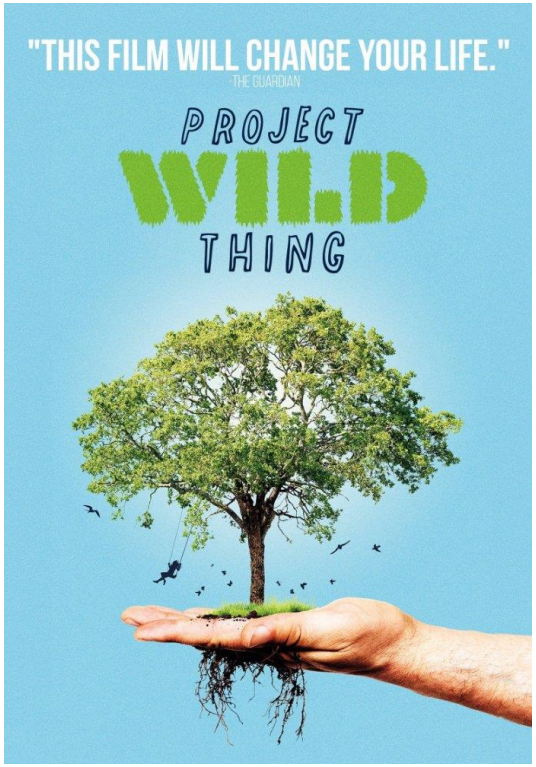
Each PBSE project supported by the LSSI must address a community need, and must involve at least one community partner in a stewardship project that is tied to grade level expectations. Each team of students, teachers, and partners must present its work to the community and to its school board.

LSSI helps teachers and partners get to know one another through community-building events:

Dessert & Dialogue and **Green Film Series** events provide an opportunity for participants to learn about stewardship issues in the Great Lakes region and a format for investigating solutions.

The annual **Lake Superior Celebration** is held at Michigan Technological University's Great Lakes Research Center during Earth Week in April. This event highlights the work of each school-community team, the work of community partners in the Lake Superior watershed, local foods, and work of local artists. Members of the community, school boards, local government, state government, business owners, parents, and the general public are invited.

LINK: *PROJECT WILD THING ON IMDB, THE INTERNET MOVIE DATABASE*



The poster for Project Wild Thing, *the LSSI Green Film for April 2016.*

The LSSI's impact on the work at Washington Middle School

Washington Middle School has received mini-grants in each of the four grant cycles offered by LSSI since 2009. Additionally, LSSI has provided supplemental funding for materials, PLC meetings, community events, interpretive signs, project enhancements, and travel to state and national conferences.

Working with the LSSI has positioned WMS teachers to receive other grants and opportunities, notably the GK-12 program, which provided graduate fellows and additional funding for students' work. LSSI has helped broker positive relationships with community partners, CLK administration, and the school board.

Teachers have taken advantage of numerous PD opportunities (dinner and dialogues, workshops, and teacher institutes) to support their projects. In turn, they have used their skills and knowledge to help other teachers, presenting at multiple PD sessions.

Finally, Darrell Hendrickson was a part of the 2007 LSSI planning grant and has been a valued member of the LSSI Advisory Board ever since.

Washington Middle School teachers and colleagues participate in an LSSI professional learning event.

"LSSI's support was the spark igniting our school's place-based endeavors, and has continued to fan that spark over time."

—Darrell Hendrickson, teacher

Looking Forward

Over the course of many years, a team will develop PBSE experiences, skills, and sustainability strategies

The PBSE work at Washington Middle School started with far more limited efforts than are outlined in this case study; the work has since evolved. Many teachers have now been involved for years; some are newer to the school than others. Similarly, the partnerships shown in this study are at various stages in their development. Personnel change is an ongoing fact of life in education and in nonprofit and municipal organizations, so any ongoing PBSE effort must expect to continuously orient new team members to the work.

Even though the path forward is not always linear, experience is a real asset. Some researchers who have considered the stages an educator passes through in adopting a new educational strategy like PBSE have developed models to describe the process. One such model, the *concerns-based adoption model,* describes an evolution of concerns, a change from personal concerns ("How will this affect my routine?") to those about impact and expansion ("How will this affect students? How can I share ideas with other teachers?").

Experience creates capacity to think about how PBSE benefits students, teachers, and community, and how it might be enhanced and better supported.

LINK: *CONCERNS-BASED ADOPTION MODEL*

A future focus will be on developing students' skills in computation and analysis in connection with the school forest management plan

Thanks to a summer opportunity funded by the National Science Foundation through its Research Opportunities for Teachers (RET) program, lead teacher Darrell Hendrickson has attended a six-week program at Michigan Technological University called PLACE: Promoting Learning about Computational Tools and the Environment.

Along with graduate student Ashley Miller, a geologist, Hendrickson is developing a computational model and putting the finishing touches on a new teaching unit connected to the school forest management plan. The computational model draws upon the ten years of forest monitoring data collected by Washington Middle School students to examine which management strategies have been most effective.

LINK: *PLACE: PROMOTING LEARNING ABOUT COMPUTATIONAL TOOLS AND THE ENVIRONMENT*

This next phase of the Washington Middle School project will be implemented during the 2016-2017 school year, and the computational model will inform a new culminating assessment for the school forest management unit.

Hendrickson's goal is that the expanded unit will provide students with increased insight into real-world careers. Seventh graders will have the opportunity to present the findings to the school district for ongoing use as a management tool for the school forest.

The Michigan Tech grant runs for three years and will serve teachers from throughout Michigan's Upper Peninsula and northern Lower Peninsula.

Another focus could be on planting native trees

The Calumet Township Waterworks Park has lost nearly all of its White Birch trees owing to successional change.

Changes in the forest are opening up large areas of the park. Darrell Hendrickson imagines a native tree planting project as a next logical step for PBSE at the school, although additional work is needed to build out the concept and develop funding for it.

Native tree planting has cross-curricular potential. Seventh-grade students could conduct a needs assessment considering both the human and ecological communities, and—through study of succession, nutrient cycles, soils composition and more—develop a remediation plan.

Ideally, the following year, as eighth graders, these same students could begin to plant selected tree species.

The population of White Birch trees is declining.

Two steps forward, one step back . . . success is no stranger to setbacks!

Budget constraints, weather issues, testing schedules, and changes in teaching and support staff are just a few of the challenges Washington Middle School has faced over its years of work with the LSSI. Over the past nine years, the team of teachers has worked diligently to balance school and LSSI needs.

Overall commitment to the project has kept it moving forward. Having common prep time has helped the team work through many challenges.

Some of the most significant changes the team has had to process relate to the course structure at Washington Middle School. In 2007, PBSE was pursued through a yearlong technology class taken by every student and a six-week encore class focused on cross-curricular projects. Over the years, that course has been converted to an encore class, and that technology encore took the place of the encore focused on cross-curricular projects. These changes have required teachers to adapt and incorporate most of the work into their individual classes.

Based on student dynamics in any given year, the PBSE work may move forward quickly or slowly. Some aspects of the PBSE effort have been dropped over time, including park bridge and trail surveys, geocaching hunts, school forest cleanup, and outdoor writing. These activities may be reintroduced at some point in the future.

For More Information

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FOR MORE INFORMATION

About the Great Lakes Stewardship Initiative

The Great Lakes Stewardship Initiative was launched in 2007 to develop knowledgeable and active stewards of the Great Lakes and their ecosystems.

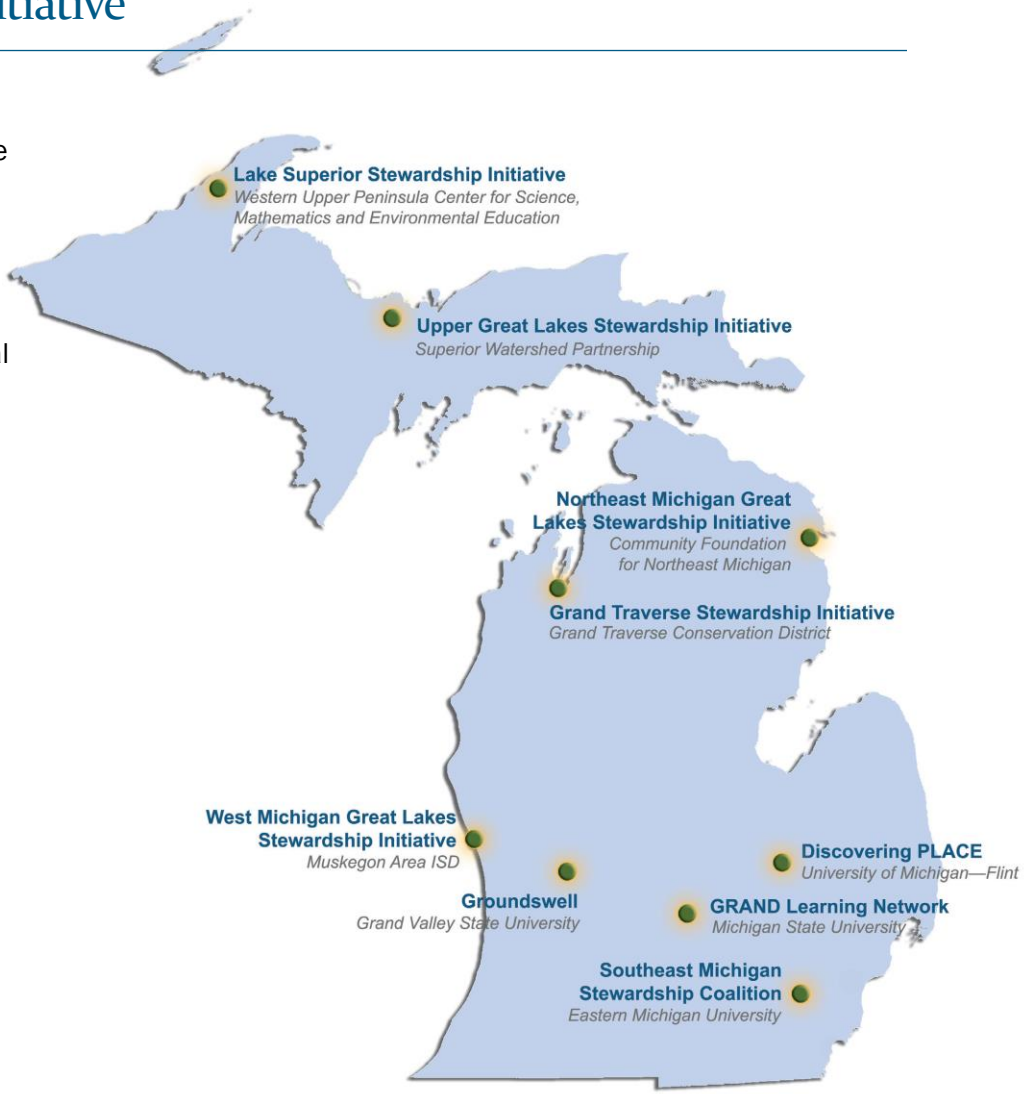
The GLSI enacts three key strategies (place-based stewardship education, sustained professional development, and school-community partnerships), mainly through the efforts of its nine regional hubs. A small central staff helps coordinate the work and provides technical assistance and support to hubs.

Hubs are funded, in part, by the Great Lakes Fishery Trust, which in 2007 pledged to provide more than $10 million through 2017 to support the GLSI's work. The GLSI and its hubs solicit and receive additional support from foundations, federal and state agencies, local and regional partners, and individual donors.

From 2007 through the 2014–15 school year, the GLSI has worked with more than 1,500 teachers in more than 280 schools across Michigan, engaged hundreds of community partners, and supported rigorous place-based stewardship experiences for more than 80,000 students—and the work continues.

LINK: GREAT LAKES STEWARDSHIP INITIATIVE

LINK: GREAT LAKES FISHERY TRUST



FOR MORE INFORMATION

The GLSI's 2014 grant from the U. S. Environmental Protection Agency supported this case study and other knowledge products

In 2014, the U.S. EPA awarded the GLSI a $150,000 grant through its Environmental Education Grant Program. Through this grant, the GLSI funded a collection of exemplary place-based stewardship projects across Michigan and documented these projects through case studies.

The grant also supported the development of several knowledge products to support the practice and spread of place-based stewardship education in K–12 schools and communities. The first knowledge product is a set of guiding principles that describes the GLSI's vision for place-based stewardship education in K–12 schools and communities. The principles can serve as a compass for practitioners, and also highlight the ways that place-based education connects to important goals and initiatives in education.

The second knowledge product is a rubric that supports the guiding principles. The rubric describes in detail the actions and practices that characterize various developmental stages in place-based stewardship education. It can be used for several important purposes, including a self-assessment of practice.

A third knowledge product is a white paper that focuses on expectations for and the educational, community, and environmental benefits of place-based stewardship education across urban, rural, and suburban contexts.

This document was developed under Assistant Agreement No. 00E01327-0 awarded by the U.S. Environmental Protection Agency. It has not been formally reviewed by EPA. The views expressed are solely those of the Great Lakes Fishery Trust and EPA does not endorse any products or commercial services mentioned.

LINK: *OTHER EPA KNOWLEDGE PRODUCTS*

LINK: *FULL SET OF CASE STUDIES*

EPA United States Environmental Protection Agency

FOR MORE INFORMATION

References

References

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GREAT LAKES
Stewardship Initiative

With assistance from participating educators, civic leaders, and community partners, the GLSI:

- Helps young people become effective and motivated environmental stewards
- Encourages schools and community organizations to work together for mutual benefit
- Creates a sustained effort across Michigan to expand classrooms, strengthen communities, and improve the environment