

EPAR5-GL2010-1

Focus Area I.E.: Accountability, Education, Monitoring, Evaluation, Communication, and Partnerships
Program I.E.2: Coordinated Implementation of Lakewide Management Plans, Programs, and Projects

Name of Proposal: **Great Lakes Earth Partnership**

Cheryl Bauer-Armstrong
University of Wisconsin-Madison Arboretum
1207 Seminole Highway, Madison, WI 53711
608-262-5264; 608-262-5209 (fax)
cherylbauer@uwarb.wisc.edu

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Type of organization: University and community partners.

Proposed Funding Request: **\$686,889**

Brief Project Description: (594 characters)

In the Lake Superior, Green Bay and Milwaukee River basins, teams of teachers, students, resource personnel and citizens will engage in research, restoration and outreach, and adapt *Earth Partnership* curricula to extend the schoolyard to the shores of the Great Lakes and their watersheds. This pilot will combine with other Great Lakes education programs to create a comprehensive, inquiry and restoration-based approach, integrated with sustainability, biodiversity, pollution prevention, environmental literacy and service learning. The Second Phase will include basins in IL, IN, MI, OH, NY.

Initial Phase Project Locations:

Ashland, WI, 54806, Ashland County
Bayfield, WI, 54814, Bayfield County
Superior, WI, 54880, Douglas County
Green Bay, WI, 54311, Brown County
Milwaukee, WI, 53211, Milwaukee County

Second phase locations:

Porter, IN 46304, Porter, Lake and LaPorte Co's
Muskegon, MI 49441, Muskegon County
Traverse City, MI 49684, Grand Traverse Co
Cuyahoga, Lake, Ashland, Erie Co's, OH;
Buffalo, NY 14260, Erie County

8. Full Project Description:

Great Lakes Earth Partnership will employ ecological restoration of native plant communities on schoolyards, in rain gardens and nearby shoreline, wetland, riparian and estuarine habitats as a basis for a) interdisciplinary K-16 curriculum activities, b) professional development of teachers and c) citizen science resulting in greater applied environmental literacy, outreach and action in Great Lakes schools and communities. These goals reflect Great Lakes Restoration Initiative Long Term Goal #3: Increase outreach and education for the Great Lakes, and provide ongoing K-12 education for students to understand the benefits and ecosystem functions of the Great Lakes so they are able to make decisions to ensure that restoration investments are enhanced over time.

Focus Area 5 of the Draft Great Lakes Restoration Initiative Action Plan (2009) calls for *hands-on, service learning* focused on *stewardship* of the Great Lakes for “*upcoming decision makers, so tomorrow they are capable of learning from and extending today’s restoration efforts*” (EPA 2009). Noting that existing Great Lakes curricula have not been embraced into the core objectives of most schools, and that further efforts are needed to reach teachers and nontraditional educators in nature centers, national and state parks, aquaria and museums, etc., the plan calls for “*high-quality education specifically centered on the concept and practice of Great Lakes “restoration.”*” Further, the plan notes that “*current education efforts lack coordination, duplicate and fail to move the Great Lakes education community toward collaborative best practices supportive of Great Lakes restoration. Support is especially lacking for the sustained implementation of high-quality standardized curricula through ...support for teachers’ professional development and efforts focused on underserved communities...*”

Great Lakes Earth Partnership addresses issues of ecological restoration, pollution prevention, biodiversity, environmental literacy, professional development and standardized curriculum reform. Native plantings can actually improve the ecological functioning of school grounds, prevent pollution and enhance the health of the landscape and water quality beyond the schoolyard boundaries. Rain gardens collect water from roofs and paved areas and allow it to infiltrate the ground. Students can be active participants in lessening storm water impacts by creating rain gardens and other restorations on the schoolyard and in the watershed.

Earth Partnership for Schools (EPS) increases the capacity of teachers, students, community educators, resource professionals and citizens to restore native habitat on school grounds and nearby natural areas through a 10-step Restoration Education Process. By focusing on schoolyards, neighborhoods, and local watersheds, environmental literacy is brought down to a scale to which students, teachers and community members can relate.

Program evaluation indicates that the EPS model is highly successful in: 1) generating enthusiasm and acceptance in the school and community; 2) developing school-wide coalitions for ecosystem restoration; 3) getting children and adults meaningfully involved in restoration and scientific processes; and 4) addressing needs and abilities of children with different learning styles. EPS staff demonstrate and share experiential techniques for teaching science and core subjects, grounding the lessons in the context of habitat restoration, academic standards and watershed awareness. EPS teachers encourage students to practice mental and physical skills that prepare them for the real world of work and citizenship—critical thinking, communication, collaboration, persistence, and flexibility.

Concerns about students' and the general public's ecological literacy have heightened over the past few decades, especially as public participation in natural resource management issues has increased and the scientific complexity of issues like climate change has magnified (Balgopal & Wallace, 2009; Coyle, K. 2005, 2009; Magthorn & Hellden, 2007; McBeth, B. et.al., 2008). Improving science literacy is a national education priority shared by the National Research Council, National Science Foundation, and National Environmental Literacy Council (2000, 2003), and National Environmental Education Training Foundation (NEETF) (2002).

Inquiry is recognized as a goal for student learning in the *National Science Education Standards* (1996), the American Association for the Advancement of Science’s *Benchmarks for Science Literacy* (1993) and the *Wisconsin Model Academic Standards* (1998). Yet, many teachers feel uncomfortable

teaching inquiry because they are not familiar with the methods and thought processes used by scientists (National Research Council, 2000). EPS provides a context for inquiry and observation taking science from the abstract to everyday life. Schoolyard outdoor experiences can help avoid what Robert M. Pyle (1993) described as *extinction of experience*, the trend toward loss of wildness where children play (Nabhan 1994). Richard Louv (2006) describes as *nature deficit disorder* the intellectual, biological, emotional, and developmental impacts of depriving young people of intimate interactions with nature. Conversely, a study reported in the *American Journal of Public Health* found that children as young as five years old had significant reductions in Attention Deficit Hyperactivity Disorder (ADHD) symptoms when they became engaged in nature. (Kuo & Taylor, 2004). State Education & Environment Roundtable (SEER) research shows that environment-based education improves academic performance and learning regardless of socioeconomic or cultural factors (Lieberman & Hoody, 1998).

Some observers are concerned that “top-down” approaches which emphasize ecosystems, watersheds, cycles, etc. result in students feeling cut-off from real life. Better, they say, is to start with a single organism like fresh water shrimp (*Palaemonetes paludosus*), then taxonomy, then systems knowledge. (Magntorn & Hellden, 2007). The same authors also argue that students still need to learn about energy and matter cycles to be able to understand appropriate actions they can take. This is echoed by researchers observing students’ understanding of connected and human-engineered systems at multiple scales ranging from molecular levels to watersheds, aquifers and human water purification and distributions systems. (Covitt, Gunkel & Anderson, 2009).

All of the researchers see the trend toward less fieldwork and less time outdoors as contributing to increased water-related environmental illiteracy. Earth Partnership for Schools (EPS) students get to know individual plant and animal species, how these fit into food webs, cycles, climate change, diversity and other ecological concepts. School site restoration provides a powerful context in which students can engage in learning that is relevant to their everyday lives. A Milwaukee teacher noted, “*Kids need to feel important, to feel that they make a difference in this world. ... EPS provides ways to give kids a sense of purpose and build competency*”. . By learning “how it all works together” they can work on solutions to the problems which threaten the well-being of our eco-systems and watersheds.

Richard Louv (2006) notes that there are children in Los Angeles who have never seen the ocean. Greening Milwaukee’s Joe Wilson laments the Milwaukee kids who have never seen Lake Michigan. Cathy Techtmann, UWEX Educational Coordinator, Northern Great Lakes Visitor Center and former Iron County Extension Agent adds, “*Hurley School should be included in GL-EPS so that the entire Lake Superior Basin is represented. Most Iron County youth and adults do not appreciate or understand their connection to Lake Superior.*” Project advisor Mary Balcer gives a compelling rationale for a Great Lakes Earth Partnership:

“Although I grew up on the shore of Lake Superior in Duluth, Minnesota, I never had an opportunity to venture out on the “Big Lake” until my junior year of high school. ...Through an NSF workshop at the UW-Superior I worked with scientists on a research vessel for six weeks, exploring the geology, chemistry, and biology of Lake Superior. ...I decided to become an aquatic ecologist, even though I couldn’t swim. I earned a B.S. in biology at UW-Superior and worked at the Lake Superior Research Institute (LSRI) collecting fish, zooplankton, and aquatic insects and plants. I earned a doctorate in zoology in Madison, but couldn’t stay away from the lake. ...I returned to UW-Superior and 17 years of lake research and am now the chair of the Biology Department and Director of LSRI. I strongly believe that if people understand what a unique and fragile ecosystem exists in Lake Superior, they will be more willing to protect it.” (2002)

Bayfield is the northernmost school district in Wisconsin. 75-80% of the students are Ojibwe from the Red Cliff Band of Lake Superior Chippewa. A similar percentage is eligible to receive free or reduced lunch. A survey by Bayfield teachers found the most cited barriers related to teaching outdoors were time, behavior problems, curricular activities and quick access to natural areas. Bohn observed that students who regularly journaled outdoors showed a remarkable improvement in writing and observation skills over the school year. (Bohn and Filipczak, 2008) Superintendent Linda Kunelius says, “*EPS is already helping with engaging activities keyed to standards. We still need to*

get students even more connected to the watershed and lake that provides many of our families their livelihood. Great Lakes Earth Partnership could do that.”

In nearby Washburn, similarly situated on the lake District Administrator Sue Masterson sees *Great Lakes Earth Partnership* as a way to increase motivation and achievement in all subject areas. A Florida study found that environment-based education boosted student achievement motivation (Athmann and Monroe 2004). Students in schools using the environment as an integrating context score higher on standardized tests in reading, writing, math, science, and social studies according to surveys across the nation (Liebermann & Hoody 1998; NEETF 2000; SEER 2000; Bartosh 2003).

“Northern Wisconsin teachers want their students connected to the lake as their place and to understand how the land and water interact, “says Spring Rosales, parent and Washburn District Ranger, Chequamegon National Forest. She notes that Moquah Barrens is a G2 – globally impaired ecosystem site. *“This is a very special place... there is a need for citizens to know that what they do has an impact on the water quality and the importance of good land practices that do not impair the water flowing from the barrens to the coast. This is one reason why the USDA Forest Service is involved with EPS.”* Ms. Rosales sees that through the schools and students, the community can be educated to make good choices.

Ashland High School students monitor Bay City Creek which flows by both the high school and middle school and into Lake Superior. Middle School students are doing creek restoration projects. Science teacher Ron Nemec observes that *Great Lakes Earth Partnership could be crucial to the success of their current projects.* He will form a Great Lakes Earth Partnership team of both middle and high school teachers with support from Ashland Middle School principal Brian Anderson.

Karen Green, H.S. Science Teaching Specialist and STEM coordinator and Mary Staten, Science Curriculum Specialist Milwaukee Public Schools (MPS) note that, *“The objectives of Great Lakes Earth Partnership, such as increasing staff proficiency using inquiry-based science methods and teacher collaboration, fulfill our goals for professional development. Teachers currently participating in Earth Partnership for Schools excited about the educational benefits of instructing students in ecological restoration as a meaningful context for understanding and applying scientific concepts.”* MSP Service Learning Coordinator, David Weingrod sees that Service Learning projects could extend the impact of rain gardens into communities. *“What’s been a value of EPS is that it supports community, gets parents, school and community together, involving students in their neighborhoods helping to make them better”.*

9. Outcomes, Outputs, Expected Results

Outcomes: The Great Lakes Earth Partnership will:

1. Provide professional development for teams of teachers, community educators, natural resource professionals and citizens that, in turn, provide training for school teams to establish Great lakes Restoration-based curricula in at least 72 school districts by 2013.
2. Adapt EPS activities to riparian and shoreline habitats to extend the schoolyard to the shores of the Great Lakes; align EPS with existing curricula from other programs to create a more comprehensive, restoration-based approach, integrated with state standards across subject areas. Consult with other Great Lakes education providers to coordinate efforts.
3. Develop new models and tools for students to collect and organize data about rain garden effectiveness in capturing and infiltrating water in demonstration gardens and on a landscape scale, and use data in models to predict and track change over time.
4. Develop community outreach and Service Learning projects using existing EPS Stormwater and Rain Garden Curricula, in which students take action to restore native habitat. These projects will relate behaviors to lake water quality impacts and promote understanding of the risks to Great Lakes ecosystem health -- one schoolyard, neighborhood or watershed at a time.

Outputs (Action items):

1. Teams of teachers, community educators, natural resource professionals and citizens will attend a 10-day Great Lakes Earth Partnership Leadership Institute (training of trainers) at the Urban Ecology Center and Great lakes Visitor Center in June 2010; and at the Indiana Dunes National Seashore in 2011.

1.1. Provide professional development to at least 9 GL-EPS Teams to work with teachers and students to design and build rain gardens, collect and input data and develop outreach materials

1.2 Orient GL-EPS Teams to *EPS 10-Step Restoration Education Process* and guiding principles for professional development. These teams will integrate Great Lakes EPS at participating schools in a minimum of six districts in 2010-2011 (WI) and in at least 12 districts in 2011-2012. (IL, IN, MI, OH, NY)

1.3 Plan and conduct one-week professional development for additional teachers and community partners in 2011 and 2012. Schools with underserved populations will have priority along with participants from “coastal” and watershed communities. Teachers trained will implement Great Lakes Earth Partnership curricula in at least 18 additional schools in 2011-2012 (WI) and in 36 additional schools in 2012-13. (IL, IN, MI, OH, NY)

1.4 Invite School District administrators and policy makers to attend or visit the Great Lakes EPS Institutes in Milwaukee, Superior/Ashland, Green Bay, WI (2010-2011) and Porter, IN (2011-2012) to lay the ground-work for wide-spread adoption of Great Lakes Earth Partnership curricula and restoration-based approaches.

1.5 Provide *Great Lakes-EPS Facilitator Manual, Curriculum Guide, Resource Binder, and Rain Garden and Storm Water* curricula in print and digital forms. All EPS activities are keyed to WI Standards. New and adapted activities will be keyed to WI, IL, IN, MI, OH, NY standards.

1.6 Include on-the-water experiences for the “training for trainers” on research and education vessels on Lakes Superior and Michigan.

1.7 Recruit and develop additional partnerships and action plan for second phase (2011-2012) GLEPS training teams in IL, IN, MI, OH and NY. through conference calls (see pp.9-10 below)

2. EPS staff and collaborators will adapt EPS activities and incorporate existing Great Lakes curricula

2.1 Adapt activities from EPS Rain Garden, Stormwater and Schoolyard curricula to include species and land and water dynamics from riparian and shoreline habitats

2.2 Incorporate activities from existing curricula: *Great Lakes in My World, COSEE Greatest of the Great Lakes, Great Lakes Aquarium: Lake Effects, UW-Extension’s “String of Pearls” and “Estuary Ed-Ventures”* Freshwater Estuary and Coastal Wetlands programs, *Just Add Water*, NERR programs, B-WET and several others.

2.3 Integrate state standards and learning objectives into all new activities Examples include science standards: designing, conducting and reporting on inquiry-based investigations (C.8.3 – C.8.11, C12. – 12.6); math standards: working with data in real world situations (E.4.1, E.8.1, E.12.1); language arts standards: reading to acquire information (A.8.4), creating editing, & publishing writing (B.8.1-2, B.12.1-2), conducting and communicating research (F.8.1, F.12.1).

2.4 Join with the Alliance for the Great Lakes, the Great Lakes Education Collaborative, Sea Grant and other Great Lakes Education providers to discuss ways of maximizing collaboration and integrating curriculum materials and professional development opportunities through annual meetings and on-line venues.

2.5 Seek additional funding for alternative venues including summer courses, winter experiences (i.e. sub-nivian adventures), on-the-water experiences for students and teachers, transportation for

students with little or no experience with the Lakes, supplies for monitoring and Citizen Science and on-line and distance learning experiences.

3. Develop new models

3.1 University researchers, students and natural resource professionals will work with K-16 students and teachers to develop models for tracking the number and size of rain gardens in their communities and determining the aggregate reduction of storm water run-off.

3.2 Students will observe before and after storm water outflows from subject areas and then follow these impacts through the watershed from the school to the lake, providing a more visceral experience of where water goes, and connecting them to both lake and community.

3.3 Adapt and share data and practices among monitoring projects such as LFRWMP, River Watch, Testing the Waters, etc.

3.4. Employ Participatory Photo Mapping, a community-based partnership model, in which students use digital photography, GPS, GIS and Google Earth to document, track and map their projects and data collection activities. The collective map, which gathers together all student projects, will serve as the centerpiece of a Great Lakes Earth Partnership website and/or part of the website proposed by the Alliance for the Great Lakes, and link to other sites.

4. Develop Service Learning projects using existing EPS Stormwater and Rain Garden Curricula, Connecting the Coasts and other approaches:

4.1 Service learning projects will utilize the **Connecting the Coasts** (CTC) website that invites students to take a systems approach to creating service learning experiences developed by the NGLVC UW-Extension. Students Investigate, Create, Act, and Reflect using research from the Lake Superior Binational Program and critical issues in the "LaMP" for Lake Superior.

4.2 Students and their partners will be involved in citizen monitoring, assessing the causes and potential risks from storm water run-off, deciding on what impacts may be of greatest concern in their communities, strategizing how to mitigate these impacts, and evaluating the results.

4.3 Data generated will be contributed to citizen science databases.

4.4 Students will generate public information materials and strategies such as news conferences, public letters, powerpoint presentations or PSA's.

These outputs will meet or exceed the GLRI Interim Objectives: *“By 2011, outreach and education efforts are increased, including identifying and revising existing curricula to incorporate sustainable education needs for the Great Lakes that meet state and other relevant learning standards.”* and the principal actions for FY 2010 to 2014 to achieve significant, measurable objectives, including: *Develop coordination mechanism(s) for Great Lakes restoration education efforts that meet state and other relevant learning standards; Identify participating educators and facilities; additional institutions incorporating Great Lakes lessons into their curricula.*

10. Collaboration, Partnerships, and Overarching Plans

Great Lakes Earth Partnership will extend the education and outreach of both the Lake Superior LaMP and the Lake Michigan LaMP making available data and priorities from the plans to teachers and students. GLEP also addresses UW Sea Grant's strategic focus area for (2010-12 and 2012-14) Enhance Coastal Community Sustainability and Resilience.

Collaborators: The following university researchers and resource professionals will work with EPS staff to develop rain garden, storm water and watershed tool kits, models, and assessments during the pilot phase funded, in part, by Wisconsin Sea Grant

Kenneth W. Potter, PhD, UW-Madison Professor of Civil and Environmental Engineering, will help design the tools to evaluate and track the performance of rain gardens and will explore with teachers and students ways to manage stormwater in Wisconsin's changing climate.

Roger Bannerman, Wisconsin Department of Natural Resources, Bureau of Fisheries Management and Habitat Protection, directs research projects investigating solutions to problems caused by urban runoff. Mr. Bannerman will provide resources and ideas for student-friendly monitoring and sampling techniques for "moments of discovery.

Samuel Dennis Jr., PhD, a geographer in the UW-Madison Department of Landscape Architecture and the Nelson Institute for Environmental Studies, developed a community-based qualitative research method called "participatory photo mapping" (PPM). Dr. Dennis will adapt a tool kit for students at different grade levels to use PPM on a watershed level to learn about their place, and water and land relationships; assess human activities on the watershed; and record real time events with digital cameras, GPS units and GIS. Photos, videos and narratives encoded with GPS coordinates will be located on "Google Earth" for connecting site scale projects to the larger landscape scale, constructing watershed scale explanations and sharing data with other students in Great Lake coastal communities.

Robert Bohanon, PhD, UW Center for Biology Education's current research on progressions of learning in ecology K-20 includes development and analysis of EPS integrated curriculum that connects classroom experiments using on site rain gardens. The gardens are laid out in plots varying abiotically and biotically to motivate and support student inquiry about connections among humans-land-water. Dr. Bohanon will develop customized assessments of teacher and student work to determine the ability of the EPS curriculum to support development of evidence-based explanations.

Sandra McLellan, PhD, Great Lakes WATER Institute, Associate Scientist, UW Milwaukee, the GLWI fosters multidisciplinary interactions among scientists, water resources managers and educators. "My research focuses on understanding impacts of non-point source pollution in Lake Michigan. It is only through this type of education and outreach that I am able to translate our findings into actions that citizens and communities can engage in to protect and restore our water resources."

Nancy Frank, PhD, Department Chair, School of Architecture and Urban Planning, UW-Milwaukee. Board member, School for Urban Planning and Architecture (SUPAR) Charter School, Southeastern WI Watersheds Trust, Inc. will coordinate SUPAR's participation in GLEP and works with students on a range of sustainability issues through a project-based approach –monitoring, building rain gardens and participating in the Great lake Sturgeon Bowl, etc.

Project Advisors: In addition to our principal partners and regional collaborators, the following individuals will advise on program design and dissemination:

Mary Balcer, PhD, chair, UW-Superior Biology Department; Director, Lake Superior Research Institute

Julie Ernst, PhD, Associate Professor, Center for Environmental Education, HPER, U of MN-Duluth

Dennis H. Yockers, PhD, Associate Professor of Environmental Education, Center for Environmental Education, UW Stevens Point; Great Lakes Education Collaborative member.

James F. Lubner, PhD, Great Lakes WATER Institute, Wisconsin Sea Grant Education Coordinator

Lake Superior Basin Key Collaborators:

Linda Kunilius, Superintendent, Bayfield School District

Susan Nelson, Northern Great Lakes Visitor Center, USDA Forest Service Interpretive Services Specialist

Cathy Techtmann, Northern Great Lakes Visitor Center, UW-Extension Office, Education Coordinator,
Dept. Head and Professor, Community Resource Development

Jim Nepstad, Acting Superintendent, Apostle Islands National Lakeshore

Susan O'Halloran, Lake Superior Research Institute (LSRI), UW-Superior, Public Education Director.

Dr. Ted Cox, UW-Superior, Associate Professor of Education, (LSRI).

Spring Rosales, Washburn District Ranger, Chequamegon-Nicolet National Forest

Northern Great Lakes Visitor Center (NGLVC), Ashland, WI is a collaborative of the USDA Forest Service, National Fish and Wildlife Service, National Parks Service, UW Extension, and the Wisconsin Historical Society. Centrally located in the Lake Superior Basin, NGLVC is an established destination for off-campus school programs and has hosted EPS Institutes since 2008. Other partners include Great Lakes Indian Fish and Wildlife Commission (GLIFWC), School Districts of Ashland, Bayfield, Washburn, CESA 12, Northland College, Red Cliff and Bad River Tribes, Douglas County Soil and Water Conservation and the Alliance for Sustainability.

The UW-Extension Office at NGLVC conducts classroom, field-based, and on-the-water, experiential coastal wetland educational programs for youth to adult audiences, stressing watershed, estuary, and coastal wetlands connections and sustainability. Experiential curricula in place would complement the goals of the Great Lakes Earth Partnership.

Lake Superior Research Institute (LSRI), UW-Superior's mission includes environmental research, education, and public information for the Great Lakes Region. Major research focuses on biological monitoring of aquatic communities, ballast water treatment research, invasive species monitoring, and toxicity tests. UW-Superior students participate as student research assistants. The Northern WI Watershed Education Resource Center reaches more than 1400 K-12 students who sample and identify aquatic organisms and measure water chemistry in the Kimmes-Tobin wetland area.

Lower Fox River/ Green Bay Basin Key Collaborators

Vicki Medland, PhD, Cofrin Center for Biodiversity, UW Green Bay; Natural and Applied Sciences Libby Dorn, Director, Fallen Timbers Environmental Center are current EPS partners and offered their first EPS teacher institute in summer 2009. Together with Jill Fermanich, Watershed Outreach Education Coordinator, UW-Green Bay, will host a GLEP Institute for teachers in 2011.

Cofrin Center for Biodiversity (CCB) mission is to promote education, research, and community services that contribute to conservation of the western Great Lakes fauna and flora. CCB can facilitate faculty support for educators interested in watershed-based projects including expertise in GIS, water chemistry, macro-invertebrates, coastal wetlands, and phosphorus issues in the Great Lakes. CCB partners with Sea Grant, Fallen Timbers Environmental Center, UW Extension's Estuary Initiative, the Lower Fox River Water Monitoring Program (LFRWMP) and Earth Partnership for Schools.

Fallen Timbers Environmental Center is owned by six area school districts in the Lower Fox River Basin: Ashwaubenon, De Pere, Little Chute, Seymour, West DePere, and Wrightstown and operated by CESA 6. The mission of Fallen Timbers is to facilitate hands-on experiences that will enable students to realize the interdependence of people and the environment. Nearly 20,000 students (K-16) participate annually.

Lower Fox River Water Monitoring Program (LFRWMP) is a collaborative watershed education and stream monitoring program focused on identifying non-point source pollution within the Fox River watershed. Teams of high school students and teachers assess aquatic ecosystems by performing a variety of coordinated monitoring activities in selected watersheds of the Fox River Basin.

Milwaukee River Basin key collaborators:

Beth Fetterley, Senior Director of Education, Kathy Palmer, Environmental Educator Urban Ecology Center (UEC) UEC has partnered with Earth Partnership for Schools since 1998, and will co-host a Great Lakes Earth Partnership Institute in 2010 and 2011 with the partners listed above. UEC is a neighborhood-based, environmental education center with "outdoor laboratories" in two urban parks, including 15 acres of wooded land and riparian habitat on the east bank of the Milwaukee River. UEC's green building teaches students and the public with its multifaceted rainwater system (rain gardens, rainwater flush toilets, rain barrels, green roof and water retention pond), monitored by UW-Milwaukee. UEC partners with Riveredge Nature Center offering watershed classes along the upper (rural) and lower (urban) Milwaukee River. Citizens participate fully in all education, restoration and monitoring projects.

Mary Hollebock, River Edge Nature Center, Research and Stewardship Educator. At Riveredge, the land provides a context for understanding biodiversity, interconnectedness, and development of

sustainable systems for energy, shelter, food, waste-water, and land management. Riveredge programs offer teachers and students opportunities to experience and investigate the natural environment, and through science-based, hands-on inquiry, build their own answers. *Testing the Waters* and *River Connections* programs provide training for teachers and students in riverine ecology, Milwaukee River issues and intervention strategies, networking high schools, collecting and reporting water quality data through a website.

Todd Brennan, Alliance for the Great Lakes, Wisconsin Outreach Coordinator will provide training in the Great Lakes in My World and Adopt-a Beach programs.

Kay DonLevy, Coordinator, Just Add Water Project and WI Beach Sweep will provide Ocean Conservancy's International Coastal Cleanup lesson plans to GL-EPS schools and communities, a booth at the Gathering Waters Festival in Milwaukee in 2011, and will assist with training and networking.

Cora Lee-Palmer, Milwaukee Metropolitan Sewerage District, Community Affairs Coordinator will consult with schools on rain garden neighborhood tours and watershed restoration sites, provide real-time water quality data and make the Pelagos Research Vessel available for educational excursions.

Karen Green, H.S. Science Teaching Specialist and STEM coordinator, and Mary Staten, Science Curriculum Specialist, Milwaukee Public Schools (MPS) will recruit and support MPS teachers, integrate GLEP with the MPS science curriculum, and assist with professional development implementation.

Jean Claasen, USDA Forest Service, Urban Connections will facilitate linking schools in Milwaukee to those in the Chequamegon National Forest and other areas to allow sharing student work

Megan Forseth, Discovery World, will make resources and facilities at the Milwaukee waterfront site available to schools and community partners.

Second Phase Key Collaborators 2011-2012:

Dunes Learning Center, Brian Forist, Education Director Chesterton, IN 46304. Dunes Learning Center (DLC) is a residential education facility within the Indiana Dunes National Lakeshore that works in close partnership with the National Park Service (NPS). Our mission is to help learners of all ages explore the dynamic relationship between people and their environments and provide high quality, professional development opportunities for k-12 teachers and non-formal educators, using the natural and cultural resources of the Indiana Dunes region.

Great Lakes Research and Education Center (GLREC), Wendy Smith, Education Coordinator. Indiana Dunes National Lakeshore includes 15 miles of Lake Michigan shoreline and 15,000 acres of beach, woods, marshes, and prairie in the northwest corner of Indiana. More than 9 million people live within a 1-hour drive of the park. The Indiana dunes have a long and fascinating history of attracting scientists, teachers, and students to study and explore its globally rare ecosystems. The park's interpretive staff has a tradition of excellence in environmental education and teacher professional development. partnering with the Dunes Learning Center to provide high-quality professional development opportunities for K-12 classroom teachers and non-formal educators. Workshops feature experts in various fields of study, hands-on activities and adventures within the national lakeshore and the surrounding communities.

Annis Water Resources Institute (AWRI), Dr. Janet Vail, Grand Valley State U. Muskegon, MI 49441 AWRI operates its own research and education vessels, the D.J. ANGUS and the W.G. JACKSON, and offers the Water Resources Outreach Education Program for schools and community groups. Almost 122,000 students and others have experienced the Great Lakes and adjoining waters through this unique hands-on science program on the vessels. AWRI facilitates two hubs for the Great Lakes Stewardship Initiative (GLSI)

Grand Traverse Conservation District, Colleen Masterson, Education Director, Traverse City, MI GTCD is one of eight regional hubs for the Great Lakes Stewardship Initiative (GLSI) funded by the Great Lakes Fishery Trust (GLFT). The GTSI provides leadership, training and support to help cross-curricular teams of teachers, students and community partners work together on water-related issues in the region. at elementary, middle and high school levels with access to professional development

workshops and online resources. Leadership is provided by the GTCD, in partnership with Inland Seas Education Association (ISEA), the Traverse City Area Public Schools (TCAPS), the Traverse Bay Area Intermediate School District (TBAISD) and over a dozen partner organizations including the Boardman River Nature Center.

SW Michigan EPS team:

Lisa Appel, Watershed Education Coordinator, Cranbrook Institute of Science, focuses on science literacy and Great Lakes issues with its *Water on the Go!* outreach program. Cranbrook will join the training for trainers team, host GLEPS Institutes and include local partners including Friends of Rouge River, Flint River Coalition, Michigan Nature Association, Stewardship network, and local school districts, supporting schools for long-term curriculum integration and sustainability and help to evaluate program effectiveness.

Megan Thomas, Executive Director, Heather Huffstutler, Stewardship Director, Six Rivers Land Trust. Six Rivers works in the Huron, Clinton, Rouge, Flint, Belle and Shiawassee watersheds, and its work impacts Lakes Huron and Erie, the Detroit River, Lake St. Clair and the St. Clair River. Six Rivers will work through a Michigan DEQ Water Quality Education grant to get Michigan EPS off the ground, engaging 2 school teams in a watershed over the course of the next two years, involving local partners, the Flint, MI hub of the Great Lakes Stewardship Initiative, and the University of Michigan Flint.

Sarah Haller, Director of Environmental Education, The Greening of Detroit, has collaborated with EPS and local partners and works with > 30 schools in Detroit, many without access to natural environments. This GLEP Initiative would allow reaching more educators in the city and strengthen Great Lakes oriented curricula. We will promote GLEP to Friends of the Rouge River, Flint River Coalition, Michigan Nature Association, Stewardship Network and the Land Conservation Association. We will also continue to model outdoor teaching strategies with > 8,000 students each year in Detroit, Highland Park and Hamtramck.

Herbert W. Broda, PhD, Professor of Education, Ashland University, Ashland OH is a nationally recognized author on Schoolyard-Enhanced Learning and will work with the Ohio Department of Natural Resources, the Environmental Education Council of Ohio and the Cuyahoga Environmental Education Center to bring Great Lakes Earth Partnership to Ohio educators.

Cuyahoga Environmental Education Center (CVEEC), Cuyahoga Valley National Park, Stacey Heffernan, Director. CVEEC offers an interdisciplinary standards-based curriculum about the Cuyahoga River watershed using hands-on, minds-on, discovery and place-based pedagogy for more than 43 NW Ohio schools and 3,500 students.

Stephanie Smith, Education Director, Alliance for the Great Lakes, coordinates the Great Lakes Education Collaborative, Wisconsin Great Lakes Education Clearinghouse, Great Lakes in My World, an educator resource for kindergarten through eighth-grade that addresses Great Lakes state learning standards, and Adopt-A-Beach, a service-learning and citizen science program tailored to all ages. GL-EPS supports our goal of fostering an ethic of learning, appreciation and care for the Great Lakes through hands-on, place-based stewardship projects.

Eliza Russell, National Wildlife Federation's (NWF) Eco-Schools USA Initiative, Reston, VA. NWF's Eco-schools USA is an internationally endorsed program of the Foundation for Environmental Education based in Denmark aimed to increase student engagement and environmental literacy for areas of focus with a particular country. NWF through its Eco-School program would leverage its work to green school building, grounds and enhance the student experience through engagement in project and service learning. NWF work will include leveraging its water, consumption, school ground (Schoolyard Habitats) and green hour work to increase student literacy and engagement for the project.

Marie Schrecengost, Fishery Biologist, Lower Great Lakes Fish and Wildlife Conservation Office, USFWS, in partnership with several local environmental groups including Buffalo Audubon Society and Buffalo Niagara Riverkeeper, plans to establish 2-3 Schoolyard Habitats as pilot projects in the Buffalo, NY area. Partnering with EPS on this proposal will allow us to further support teachers and provide resources through professional development for the implementation of Schoolyard Habitats.

William F. Rogers, Project Director, Science Firsthand, FIRST HAND LEARNING, INC., Buffalo, NY promotes inquiry-based learning, transforming outdoor spaces into natural learning labs, and has collaborated on professional development with the Buffalo Public Schools since 1998. This GLEP project suggests the possibility of involving community centers and after school programs in restoration projects. Our Science Firsthand mentoring program for middle school students is in thirteen community centers and about a dozen students do water sampling and analysis at three sites on the Buffalo River for Buffalo-Niagra Riverkeeper.

Third phase 2012-2014: Funding will be sought for a third round extending GLEPS to existing and new partnerships in WI, IL, IN, MI, NY and PA and throughout the Great Lakes region. Another project will seek funding from NSF and other sources to evaluate and improve student learning in terms of building skill (STEM skills) and will (motivation to learn and to apply learning.) and to document the effects of “citizen science” data gathering and restoration actions on student learning and on improvements in ecosystem functions of the Great Lakes. Third phase partners will include among others:

Carthage College, Environmental Science Program, Kenosha, WI (Dr. Tracy Gartner and Dr. Prisca Moore) is an existing EPS RESTORE center in the Pike-Root Watershed and will work with UW Parkside to bring Great Lakes Earth Partnership to the Kenosha-Racine, WI area.

Chicago Area Earth Partnership (Chicago Botanic Garden, DuPage Co. Forest Preserve, McHenry County Conservation District) is an existing EPS RESTORE center and will collaborate throughout the project in the Chicago Area Waterway System.

11. Programmatic Capacity and Past performance:

Since 1991, Earth partnership for Schools (EPS) has helped educators from 14 states and Puerto Rico to incorporate ecological restoration into their curricula, directly reaching more than 400 schools, 1600 teachers and 160,000 students. EPS has created >100 activities, with education standards and assessment ideas. Funders include the National Science Foundation, Environmental Protection Agency (EPA), Institute for Museum and Library Services, Howard Hughes Medical Institute, Wisconsin’s ESEA Program, and other public and private sources. EPS has generated local and regional partnerships with botanic gardens, arboreta, environmental centers, school districts, watershed groups, departments of natural resources, National Wildlife Federation, US Fish and Wildlife Service, USDA Forest Service, and other agencies. 25 EPS Centers provide local support to schools in CA (3), IL, IN, KS, KY, MI, MN (2), MO, NC, NH, NY, OR, TX, WI (7) and Puerto Rico(2).

In 2004, a regional EPA grant supported professional development to enhance scientific inquiry for 40 teachers in 15 WI schools, and directly working with 754 K-12 students. 729 students, along with teachers and parents attended field trips in 2005 to the Arboretum and other ecological sites. All projected outcomes were exceeded and reports were successfully completed as required.

In 2005, EPS received national EPA funding for the “Restoration-Education and Science Training for Outreach to Regional Educators” (RESTORE) initiative to promote and replicate EPS ecological restoration-based education in other states. Goals included establishing four EPS Centers, creating high quality professional development training resources, implementing a “Train the Trainer” Summer Institute for RESTORE teams, and creating a national learning community of professionals interested in schoolyard restoration-education. Five state teams (CA, IN, KS, KY, WI) including 22 educators and 12 partner organizations participated in the first RESTORE Leadership Institute (July 2006). Evaluations indicate a high level of satisfaction, learning, and capacity building (Clifford, 2006). Again, all projected outcomes were exceeded and reports successfully completed as required.

In 2006, UW-Madison Arboretum was awarded a nearly \$600K grant from the Institute of Museum and Library Services to expand the RESTORE concept and to further disseminate the EPS model teacher education program. Project activities included development of leadership institutes for state teams, videoconferences, and Web-based communication.

Progress on indicators:

Regional center teams participated in RESTORE train-the-trainer institutes in 2006, 2007, 2008 and 2009 and near-term survey data suggests (a) statistically significant gains in professional development knowledge and (b) in trainer readiness to implement ambitious professional development activities. On-line surveys are collecting data on teacher learning and behavioral changes. Document review and interviews are being conducted to determine the fidelity of regional center implementation of the EPS training model.

EPS has generated partnerships with 36 organizations forming 25 EPS Centers across the country. Organizations from Great Lakes states include Chicago Botanic Garden, DuPage Co. Forest Preserve, McHenry County Conservation District, Chicago area, IL; Kellogg Biological Research Station, Michigan State University, Lansing, MI; Cranbrook Institute of Science, Bloomfield Hills, MI; Six Rivers Regional Land Conservancy, Rochester, MI; The Greening of Detroit, MI; Urban Ecology Center, Milwaukee, WI; Carthage College, Kenosha, WI; Northern Great Lakes Visitor Center, Ashland, WI. A USDA Forest Service "More Kids in the Woods" project involves the Chequamegon-Nicolet National Forest and other local partners. A currently funded Sea Grant project involves partnerships with UW Lake Superior Research Institute; NGLVC, UW Green Bay Cofrin Center for Biodiversity, Fallen Timbers ELC, Urban Ecology Center, Riveredge ELC and other partners listed in this proposal.

EPA grants are funding new partnerships with US Fish and Wildlife Service units in CA, OK, MD, MN PR and WI in 2008-2009; USFWS Region 8 Schoolyard Habitat Program, CA; USFWS Prairie Wetlands Learning Center, MN; Oklahoma Partners for Fish and Wildlife, OK; Patuxent NWR, MD; Vieques Historical & Cultural Trust, and Cabo Rojo NWR, PR. and in ID, OR, WA, CA and NV in 2010.

Evaluations show the EPS program's positive impacts on school culture and ability to create a sustainable learning laboratory on school grounds used for years to come (McCann, 2003). A survey of EPS participants from 1994 to 2003 showed that 94% of the respondents still make use of restoration sites that are on average five years old (Clifford, 2003). Respondents overwhelmingly indicated the institute was high quality (Clifford, 2003 - 2008):

"This institute has been a once in a life-time experience for me as a teacher. I have never taken any course that has left me so energized to improve my teaching and student learning."

Primary Staff Involved in EPS/RESTORE Implementation: 2006-2010

Cheryl Bauer-Armstrong, M.S., *EPS Program Director*, has developed EPS curriculum and teacher training institutes since 1994. With training and experience in natural resources, landscape design and ecological restoration, she has authored curriculum publications on phenology, rain gardens, storm water and schoolyard restoration and professional development.

Rick Hall, M.S., *RESTORE Program Manager*, has trained EPS teachers since 1998 and develops partner relationships and professional development institutes. His experience includes community and experiential education, land protection, ecological restoration, community gardening and service-learning with school districts and community-based non-profits.

Marian Farrior, M.S., *Earth Partnership Field Manager and Action Research Lead Instructor*, coordinates and trains volunteer stewards to lead ecological restorations. She authored *Emerging Trends in Communications and Social Sciences* for an NSF-funded Biodiversity Project.

Molly Fifield Murray, M.S., UW Arboretum Outreach Manager, author of *Prairie Restoration for Wisconsin Schools*, has designed and facilitated Earth Partnership Institutes for teachers since 1991.

Charles Bomar, Ph.D., *Professor of Biology, Applied Science Program Director, UW-Stout* serves as science and inquiry-based learning advisor.

Mathew A. Clifford, Ph.D., *Springboard Training & Evaluation*, has evaluated EPS programs since 2003.

Carolyn Kolstad, B.S., Biologist, *U.S. Fish and Wildlife Service* currently directs the national *Schoolyard Habitat Program* at USFWS Region 8 in Sacramento, CA.

Karen Kelly Mullin, B.S., coordinates the Schoolyard Habitat Partnership between MAEOE, USFWS, and NOAA-BWET. She worked as a teacher trainer and field trip leader for Chesapeake Bay Foundation

12. Evaluation:

Program evaluation will be conducted by Dr. Matthew Clifford, who has evaluated Earth Partnership for Schools and other federal and state-funded professional development and curriculum programs. Six evaluation questions organize the study and address program outputs/outcomes & success indicators.

Descriptive quantitative analysis from the following sources will answer the research questions:

1. **Participant database:** An online database with names, demographic information, for all people participating in train-the-trainer or regional professional development activities.
2. **Document review:** Meeting agendas, curriculum modules, and school improvement plans
3. **Annual trainer survey:** In addition to a baseline survey, an electronic survey will gather information about satisfaction, learning, and progress associated with GLEP participation.
4. **Annual participant survey:** In addition to a baseline survey, annual electronic participant surveys gather information about program satisfaction and behavioral changes (i.e., use of curriculum, time allocated to environmental education) associated with GLEP participation.
5. **Annual school principal survey:** In addition to a baseline survey, annual electronic principal surveys gather information about actions taken to enact and institutionalize GLEP curricula.
6. **Expert review of curriculum alignment** with academic standards: A panel of experts will rate the alignment of curriculum with respective state academic standards

Table 1. Evaluation Alignment with Great Lakes Earth Partnership (GLEP) Outputs & Outcomes

	Evaluation Questions	Success Indicators	Data Collection
Outputs	Did GLEP engage the targeted number of partners and regional (train-the-trainer) teams?	>50 programs and organizations from 5 Great Lakes states actively participate in GLEP.	Participant database
		GLEP meets escalating regional recruitment & training of trainers targets (9 teams over 2 years)	Participant database
	Did GLEP produce or adapt high-quality curricula aligned with state standards?	25 EPS curriculum modules will be adapted to Great Lakes ecosystems and all curricula will be aligned with state standards.	Document review Expert review of curric. alignment
	Has GLEP developed coordination among regional partners and schools?	90% of regional trainers actively engage in ongoing GL-EPS professional development.	Annual trainer surveys
	Did GLEP offer high quality professional development to the targeted number of teachers?	GLEP meets escalating annual school district recruitment and training targets (72 districts in 5 states and >400 teachers).	Participant database
		85% of the school district participants complete all aspects of the professional development program.	Participant database
90% of school teams rate training as high quality		Participant survey	
Outcomes	To what extent do teachers use > 4 GLEP curriculum modules each year for a minimum of two consecutive years?	100% of teachers in GLEP professional development report significant increases in preparedness to use Great Lakes curricula.	Annual participant survey
		90% of teachers report using >4 GLEP curriculum modules each year for two consecutive years.	Participant database
	To what extent do schools and districts institutionalize GLEP curriculum?	90% of school districts will integrate GL curricula into science learning objectives.	Annual school principal survey
		90% of school principals report GLEP curricula have been adopted by the school and/or school board.	

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