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Lake Superior National Estuarine Research Reserve

NOAA Extension | Lake Superior NERR Education Strategic Plan
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Introduction

National Estuarine Research Reserve System: Advancing Estuary Education

National Estuarine Research Reserves (NERRS) are federally designated "to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation." Each research reserve is an active member of the local and regional education community and a representative of the state and NOAA stewardship community. Through this network of 28 placed based areas around the country, the reserve system takes a local approach in advancing estuarine education and generating meaningful experiences for all kinds of people interested in learning about, protecting and restoring estuaries.

NERR System Education Goals, Objectives and Strategy

The goal of NERR education programs, according to the 2011-2016 NERRS Strategic Plan is to "NERRS education and training increases participants’ environmental literacy and ability to make science-based decisions related to estuaries and coastal watersheds." The Reserve System Education Program strives to enhance student, teacher and public awareness, understanding, and appreciation of estuaries by providing hands-on, investigative field experiences, curriculum and information material, multi-exposure opportunities, teacher training programs, and public outreach events (National Estuarine Research Reserves, 2005).

Objectives of the NERR System in regards to education include:

- **Objective 1.** Enhance the capacity and skills of teachers and students to understand and use NERRS data and information for inquiry-based learning.
- **Objective 2.** Increase estuary literacy and promote active stewardship among public audiences through the development and delivery of tools and programs addressing climate change, habitat protection and water quality.
- **Objective 3.** Improve the capacity and skills of coastal decision makers to use and apply science-based information in decisions that affect estuaries and coastal watersheds.

The priority strategies for accomplishing these objectives are:

1. Provide place-based educational experiences that facilitate hands-on exploration of estuary environments.
2. Include relevant estuarine research and data in reserve professional training and education programs.
3. Implement teacher training programs using Estuary 101 curricula.
4. Expand training for coastal decision makers focused on climate change, habitat
Desired outcomes of NERRS educational programming include the following program results:

1. Participants can define what an estuary is, can explain the importance of estuaries (functions and values) and can explain how their actions in the watersheds affect estuaries.
2. Participants increase their willingness to protect and conserve estuaries.
3. Participants practice environmentally friendly behaviors that help protect/restore estuaries.
4. Participants can interpret, locate, download and use NERRS data about estuaries.
5. Participants can describe how their actions in watershed affect estuaries and how the estuary impacts them.

The Lake Superior National Estuarine Research Reserve

The Lake Superior National Estuarine Research Reserve was designated in Superior, WI in October, 2010. In the reserve’s first year, the education coordinator was recruited and hired. From September to December, 2011, a needs assessment and market analysis were conducted. This document can be found on the reserves website at http://lsnerr.uwex.edu/. These recommendations from interviews, focus groups, surveys and a literature review were used to inform the education program strategic plan.

Lake Superior NERR Mission, Goals, and Guiding Principles and Objectives

The mission of the Lake Superior National Estuarine Research Reserve (LSNERR) is to work in partnership to improve the understanding of Lake Superior fresh water estuaries and coastal resources and to address the issues affecting them through an integrated program of research, education, outreach and stewardship. The goals of the organization are as follows:

**Goal 1.** Conduct applied research and monitoring to increase the understanding of Lake Superior freshwater estuaries and coastal ecosystems

**Goal 2.** Educate youth, students, community members, and visitors about Lake Superior freshwater estuaries and coastal resources and improve their ability to address coastal issues

**Goal 3.** Increase the ability of community leaders and other decision makers to address critical Lake Superior coastal management issues

**Goal 4.** Protect and enhance the ecological health of the St. Louis River Watershed and Lake Superior coastal habitats

Note that the education program is specifically referred to in Goal 2, with efforts toward that goal then leading to progress towards Goal 4.
Through the LSNERR guiding principles, the program is charged with the following:

- Promote understanding, appreciation, and protection of the unique freshwater estuary systems of Lake Superior
- Demonstrate the application of watershed principles
- Create a vital community asset and a destination for visitors
- Become a model for long-term community involvement and inter-governmental cooperation
- Conduct research of local, statewide, regional, national, and international importance
- Provide leadership for integrated research, management, and educational outreach related to freshwater estuaries

The management plan also provides several objectives for 2010-2015. Those that apply to the education program are listed here:

**Objective 2.** Improve understanding of the socio-economic aspects of the St. Louis River Freshwater Estuary.

**Objective 3.** Increase public awareness of the ecological and cultural significance of the St. Louis River Freshwater Estuary.

**Objective 4.** Increase educator and student understanding of Great Lakes freshwater estuaries and coastal habitats.

**Objective 6.** Conduct stewardship activities that protect and enhance the ecological health of the LSNERR.

**Objective 7.** Incorporate citizen-science programs and volunteer monitoring into LSNERR research and monitoring activities.

Lake Superior NERR Education Program Goal

The proposed goal of the Lake Superior NERR education program is as follows:

“The Lake Superior NERR builds exemplary model education programs that elevate public connection to and concern for fresh water resources through deeper understanding of freshwater estuarine systems.”

The education program will serve P-12 students and teachers as well as local and visiting public audiences through training, programs, and an interpretive center. Strategies for each program are presented in the remainder of this document.
K-12 and Teacher Education Programs

Summary of Needs Assessment Findings

Interviews with educators and administrators as well as a teacher focus group resulted in key recommendations for the P-12 education programs.

Some classrooms include the study of Lake Superior and ecological concepts in their curriculum, but this is typically not in-depth instruction. When possible, teachers do take advantage of field trip opportunities to regional environmental education providers, such as Hartley Nature Center or the Great Lakes Aquarium. In-school programs emphasizing science and the environment have existed in regional schools and respondents expressed a desire to continue these or similar programs.

The time needed to meet the requirements of core curriculum, especially reading and math, was the most significant limitation to including environmental and science content. Lack of financial and other resources are a barrier to incorporating environmental field experiences into the curriculum, especially the cost and logistics of transportation. Some teachers said that taking students outdoors also presents challenges.

When educators were asked to describe the type of programs they would like for their students, they stated that programs should be relevant to students’ lives and interdisciplinary in nature. Several teachers mentioned a need for outdoor and environmental programming in the elementary grades. Most recommendations for teacher professional development programs indicated that teachers desire hands-on experiences that provide the most possible impact for their time investment. Teachers also expressed an interest in having an in-school support person to mentor and train them in Lake Superior NERR related content and outdoor education methods.

Key initiatives in the Superior School District include an emphasis on literacy (especially using instructional texts), use of technology including digital whiteboards, and positive behavior interventions and supports.

The teacher survey showed primarily that this group of teachers has attended minimal professional development related to estuarine topics and includes limited content related to estuaries or Lake Superior in their curriculum, indicating an educational and training need.

Key K-12 Education Recommendations

Based on the needs assessment, Lake Superior NERR programs that educate school audiences should:

- Produce interdisciplinary programs that meet core standards (including reading,
math, science and social studies) while connecting students and teachers to the St. Louis River Freshwater Estuary and its watershed through direct experiences.

- Collaborate with teachers to seek funds for transportation and resources that aid direct connections to the Estuary.
- Utilize SWMP data as a means of incorporating math, inquiry and technology into classrooms.
- Provide programs that are accessible to multiple age groups, especially elementary aged students and younger children.
- Work directly with administration, teachers and students in classrooms and on school grounds to provide support for outdoor and environmental education and increase content related to the St. Louis River Freshwater Estuary.’
- Enhance and compliment Superior School Districts’ School Forest educational programming, drawing connections between the upper and lower watershed.
- Incorporate established NERR curriculum and online resources whenever possible and appropriate.

K-12 Education Strategies

1. Lake Superior Rivers2Lake Program provides comprehensive mentoring in order to integrate cross-curricular watershed education in regional schools.

The Rivers2Lake program combines the K-12 education program with teacher professional development to provide a centerpiece program for the Lake Superior NERR. Rivers2Lake will utilize the Lake Superior watershed and the St. Louis River as a foundation for educator and student learning, increased Great Lakes literacy, and engagement in watershed restoration. This is accomplished by providing extended training, mentoring, and support resources to teachers in order to provide interdisciplinary inquiry-based and outdoor experiences for students. Rivers2Lake improves learning, enhances engagement and fosters a sense of place.

   Rivers2Lake will provide extended training based on the St. Louis River watershed, outdoor and environmental education methods followed by in-school mentoring for teachers. Mentors will provide assistance with St. Louis River/Lake Superior related content, outdoor education, curriculum integration. The program will also provide an online meeting place for Great Lakes educators and researchers, operated primarily through Minnesota Sea Grant. Education students from the University of Minnesota Duluth also participate in the program through a winter institute.

   Students in Rivers2Lake will experience at least 2 off-site field experiences over the course of the school year as well as integrated inquiry-based experiences based on school grounds. Students are also responsible for completing a service learning or restoration project, as well as public presentations.
Rivers2Lake collaborates with a wide range of partners to achieve its goal, including the Superior School District, Fond Du Lac Resource Management, Minnesota Sea Grant, the Great Lakes Aquarium, University of Wisconsin-Superior and UW-Extension. The Lake Superior NERR is soliciting grant funding to launch Rivers2Lake in 2012 and will work with 6 schools in the St. Louis River watershed and along Lake Superior’s south shore.

2. Provide teacher professional development through long term support and mentoring.

In a needs assessment for education about the Great Lakes, Fortner (2004) found that only 4% of teachers would use a developed curriculum without training. In an environmental education needs assessment along Minnesota’s North Shore, Zak and Smerud (2007) found that teachers were not lacking in curricular materials, but rather in funding, transportation, and in-school support to modify their curriculum to include outdoor and environmental content. Hence it will likely serve Lake Superior NERR better to establish long term relationships with teachers and schools and to focus on providing in-school long-term training and support. This also meets established best practices for teacher professional development (Erickson, 2011). This will happen primarily through the Rivers2Lake program, but other similar opportunities should be considered if staff time and funding permit.

Some shorter term workshops lasting 1-2 days will certainly be needed to reach long-distance teachers or teachers unable to make a more in-depth commitment. The July 2011 COSEE Great Lakes workshop operated through the Lake Superior NERR provides an excellent example of using applied science as a means of providing professional development to teachers.

3. Collaborate with the Superior School Forest to reach local school audiences.

The Lake Superior NERR can leverage existing programs in the Superior School District by collaborating with school forest programming. Transportation funding is already allocated to the school forest and the forest lies within the St. Louis River watershed. The forest emphasizes interdisciplinary and science learning. The forest has a need for increased funding and increased personnel and staff have expressed an interest in collaboration, allowing the Lake Superior NERR to provide a value-added service to the community while incorporating content related to the LSNERR into a broad range of classrooms.

4. Use field experiences and technology to reach long-distance audiences.

As a biological resource, migratory stopover, and source of clean freshwater, Lake Superior freshwater estuaries are important to a broad audience, including students who may not live in the region. The Lake Superior NERR staff will need to use a multi-pronged approach to reach these students.

First, because of the beneficial educational impact of direct experience, field experiences should be prioritized when possible. Education staff should develop a means of outreach to
long-distance schools, pre- and post- curriculum for such field trips, and should assess reserve properties and reserve research projects for appropriate field trip locations and topics.

Second, for classrooms unable to visit the reserve, the Lake Superior NERR should provide a means of digital outreach that engages students in the reserve through video, audio and interactive formats. This might include a series of videos, podcasts, or smartphone applications available free of charge through the LSNERR website and public school-accessible online venues such as Teacher Tube. Such programs should also make use of NERR resources and SWMP data when possible.

5. Engage university and college students in order to foster estuary awareness and provide career development.

Working with students in universities and colleges provides a unique opportunity for the Lake Superior NERR. The Lake Superior NERR should collaborate with education certification programs, which often lack pre-service training in environmental and outdoor education, in order to provide content and methods to future teachers. Additionally, interviews with University of Wisconsin-Superior faculty suggested possible collaborations between biology and environmental science classes and Lake Superior NERR staff. This will require advance planning in order to modify class syllabi and plan appropriately for possible field experiences. LSNERR staff should identify interested faculty in order to begin the process of incorporating Reserve research and education into university course work.

Community Education Programs

It is worth noting here that the NERR system identifies two types of programming for the general public. Both types of programs will be offered by the Lake Superior NERR.

Community education programs foster behavioral change to promote resource conservation and to support the mission of the Reserve System. Community education focuses on audiences whose choices directly impact the integrity of our estuaries and their associated watersheds, but who are outside of Coastal Training Program and formal education programs, including K-20.

General education programs provide a public audience (not Coastal Training Program or K-20) with general information and experiences related to estuaries.

Summary of Needs Assessment Findings

Interviews with members of stakeholder groups and a public focus group resulted in key recommendations for community programs. Needs assessment participants also provided
insights regarding uses and importance of the lands included in the Reserve.

Respondents reported that community members use the reserve lands for nature-based recreation and motorized recreation, especially fishing and boating, however many people in the region do not use or are not aware of these public lands. Nonetheless, the St. Louis River Estuary provides intangible benefits to the region, such as a sense of place. The estuary also fuels the regional economy through tourism, commerce and research.

Similarly, respondents reported that the SLRE is important because it provides a sense of place and a cultural context for people in the watershed. It also provides important recreation and tourism opportunities and is an economic driver. Its importance to water quality, biodiversity and the health of Lake Superior was also mentioned frequently, as well as the aesthetic qualities the estuary provides to the Twin Ports region.

In terms of program content, respondents recommended two key approaches: providing information about the freshwater estuary and encouraging stewardship of the reserve. Participants suggested that the level of public knowledge about freshwater estuaries is rather low, and thus recommended including “Lake Superior Estuary Basics” in order to explain what freshwater estuaries do and how they function. This was followed by recommendations to include information about biotic communities. Programs should also include economic value of the estuary and its value to human society. In terms of stewardship, respondents emphasized the uniqueness of the SLRE and the importance of public participation to its preservation.

Most respondents emphasized the importance of experiential programming that provides hands-on contact and experience with the estuary. “Get them outside!” was a typical comment.

Key Community Education Recommendations

Based on the needs assessment, Lake Superior NERR programs that educate community audiences should:

- Provide direct experiences that connect participants to lands included in the Reserve whenever possible.
- Use technology and media as a gateway to encourage public use and awareness of the St. Louis River Estuary for community members who are unaware of this natural resource.
- Work with partners to improve access to and available information about the St. Louis River Estuary through maps, tours, trails, and on-site interpretation where appropriate.
- Community programs should emphasize the value of the St. Louis River Estuary from an ecological and economic perspective. Such values should be made relevant to participants’ lives.
- Community programs should empower participants to participate in research and take stewardship action on behalf of freshwater estuaries through citizen science projects,
service learning, hands-on experience, and demonstration programs.

- Education programs might gain increased interest by emphasizing topics already important to St. Louis Estuary users, including fishing, boating and nature based recreation.
- Lake Superior NERR should provide opportunities to use resources and equipment that enable further exploration of the reserve, especially for community members who are economically disadvantaged or might not experience the Reserve otherwise.

Community Education Strategies

1. **Provide experiential programming for adults and families.**

   The 2010 education needs assessment revealed that 11% of 35 surveyed programs comparable to LSNERR served the city of Superior, while 46% served greater Duluth. No programs served early childhood or family audiences specifically. The needs assessment also states “Few opportunities currently exist in the region for adult education programming related to freshwater estuaries.” The Lake Superior NERR can capitalize on this by offering programming in Superior to adult and family audiences. Research should be conducted as to how to market and reach these audiences and program formatting that is relevant and appropriate to the community should be established.

   Experiential outdoor programming, such as hiking, birding, biking, canoeing, and kayaking, will help audiences build skills that enable them to engage in the St. Louis River Estuary on an ongoing basis while laying the grounds for environmental literacy. Hands-on programs at NERR facilities will provide access to engaging programs that build a sense of place and connection to the estuary for mature adult audiences or families with small children. Programs that occur in a sequence or build new levels of skills through multiple experiences are recommended to build a base audience for NERR programs.

2. **Collaborate with existing organizations.**

   The Lake Superior NERR is a new organization and has not as yet received high visibility among the general public. By reaching out to existing clubs and organizations, the NERR can build its audience while enhancing the membership experience of existing organizations.

3. **Provide opportunities for public engagement in science.**

   Several regional citizen science events and experiences have been successful in the past. Citizen science also compliments the mission of the Lake Superior reserve by combining science with public participation and education and is a management plan objective. The Lake Superior NERR will pursue opportunities for the public to collaborate with research conducted by Lake Superior NERR scientists and to contribute to wider state, national and international monitoring
efforts where appropriate and applicable to achieving LSNERR goals and objectives.

4. **Use technology and media to reach a broader audience.**

Videos, podcasts and radio programming developed for and by the K-12 education program can also be modified to reach long-distance and regional audiences who might not otherwise be aware of the St. Louis River Estuary. Both the University of Wisconsin-Superior and the University of Minnesota Duluth operate public radio stations that might be willing to feature the Reserve. The St. Louis River augmented reality smart phone application being developed by Minnesota Sea Grant can also be used in this way. Lower level technology may also be appropriate in some circumstances, for example, providing a driving tour of the reserve that can be played in a cars’ CD player.

5. **Improve access to the St. Louis River Estuary.**

In the needs assessment public focus group, several participants cited lack of available access to the reserve as a reason many people do not participate in nature-based recreation there. The Superior Municipal Forest Plan, written in 1996, provides a plan for trails and an environmental education center in the city forest. The Reserve should work with the city of Superior and other partners to improve access, which will enhance NERR programs public awareness of the estuary. In regards to the remote Red River Breaks, such development should only take place if it provides significant benefit, and carefully considers environmental impact and WI DNR management priorities.

Because the Reserve offices and interpretive center are remote from the actual lands included in the reserve boundaries, it will be important to provide interpretive displays in areas such as the Superior Municipal Forest and Wisconsin Point. Because these sites have high visitation, protecting interpretive resources from vandalism is an important consideration.

### Science Interpretive Center

The Lake Superior NERR has purchased two buildings on Barkers Island in Superior, WI. While one building will function as offices and the laboratory, the other building will be converted to a public space, including interpretive displays and a classroom.

### Summary of Needs Assessment Findings

Needs Assessment respondents were asked to make recommendations for content in the interpretive center displays. Several key ideas emerged from interviews and focus groups.

First and foremost, the interpretive center should use a variety of interactive methods to
reach a diverse audience of students, tourists, families and community members of many ages and abilities. This especially included maps of the estuary.

The interpretive center should include information on the ecological health of the estuary, as well as current NERR research. Participants again recommended that “Lake Superior Estuary Basics” be included; for example, the seiche, fishery production, boreal forest, ecological processes, and the importance of coastal wetlands.

Several participants reflected on the history of the St. Louis River Estuary, from pre-colonial days as an important Ojibwe center, through timber and industrial uses, followed by modern clean-up and restoration and new threats from climate change to invasive species. This story of the river represents the success of collaborative efforts between states, regulation, research and public participation.

Human connections to the estuary were emphasized, both historically and currently. This included the importance of fishing. Past and present Ojibwe connections to the estuary were often mentioned, especially wild rice, sturgeon, and the importance of Spirit Island and Wisconsin Point.

Key Interpretive Center Recommendations

The Lake Superior NERR science interpretation center should make use of the following recommendations:

- Capitalize on the St. Louis River success story to provide an example of environmental restoration and protection through research, policy and citizen action from historic times through the modern day Area of Concern delisting process.
- Relate current NERR research to the continued successful protection of the SLRE as well as to the lives of interpretive center visitors.
- Provide vivid visual maps or displays of the land included in the Lake Superior NERR along with access information as a means of encouraging visitation and recreation on lands included in the Reserve.
- Incorporate art work, interactive exhibits, and technology where appropriate to engage a variety of audiences.
- Include Reserve-related topics of special interest to Ojibwe people, especially wild rice, sturgeon, and Spirit Island and Wisconsin Point, from their perspective and in consultation with tribal representatives.
- Provide an open, accessible and comfortable community meeting space to encourage engagement with the Lake Superior NERR.
- Retrofit existing buildings to function as demonstration exhibits for best management practices in storm water management, climate change adaptation, and sustainable design.
in order to support education and CTP program objectives.

Interpretive Center Strategies

1. Interpretive exhibits.

Lake Superior NERR interpretive facility will function as a gateway to the St. Louis River Estuary by providing introductory information about freshwater estuaries on Lake Superior, visually impactful maps or diagrams of the estuary, and information about Reserve access. It will capitalize on NERR research and the history of the St. Louis River Estuary to provide a sense of the ecological and economic value of the Reserve to the region and beyond, as well as emphasize the historic and current importance of stewardship actions. The relationship of the St. Louis River and the estuary with Ojibwe people will be conveyed in a way that honors historic and modern tradition and demonstrates the importance of the estuary to human society. Future environmental threats to the estuary, such as climate change and invasive species, will be presented in a clear and impactful way alongside information that empowers visitors to take action. Exhibits will be both indoors and outdoors in order to provide an interpretive experience to visitors when the facility is closed.

2. Meeting spaces.

The interpretive center will provide a launch site for research presentations, teacher professional development experiences, public meetings related to the estuary, student field-trips and Coastal Training Program events. As such, meeting rooms should be separate from interpretive display space and should provide adequate space and seating for occasional larger groups. Meeting spaces should be equipped with digital projection equipment to enhance presentations, including microscope and document projectors and wireless internet. Spaces should provide for an environment friendly to families, including comfortable, safe nature-based play areas for toddlers. Amenities that reduce environmental impact should be considered wherever possible. Examples might include composting and recycling facilities, low flow toilets, showers to encourage bike commuting, and cooking and eating space to encourage on-site meals.


If the interpretive center is to have regular public hours to encourage visitation, it will require people to open and operate the facility. Given the duties assigned to the LSNERR education coordinator, this function may not be the best use of the coordinator’s time. Reserve staff will either need to seek a sustainable source of funding for staff (possibly interns), establish volunteer training and incentives to provide regular volunteers or employ a combination of both staff and volunteers. Should volunteer services be recommended, the LSNERR management plan recommends the use of the newly established Wisconsin Master Naturalist certification as a means of training.