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EDUCATION PROGRAM NEEDS ASSESSMENT & MARKET ANALYSIS

Lake Superior National Estuarine Research Reserve

NOAA

UW Extension University of Wisconsin–Extension

| Lake Superior NERR Education MA/NA

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Executive Summary

Introduction

The Lake Superior National Estuarine Research Reserve (Lake Superior NERR) was designated in 2010 and is the 28th reserve in the NERR system. The reserve is the second freshwater estuarine reserve designated on the Great Lakes. It is situated on the freshwater estuary at the confluence of the St. Louis River and Lake Superior located on the southwestern tip of Lake Superior and is bordered by Wisconsin and Minnesota.

The Lake Superior NERR is in the pre-operational phase of developing an education program to complement the developing research and coastal training programs by addressing the educational needs of teachers, K-12 students, and community members.

Needs Assessment Objective

As the Lake Superior NERR concludes its first year, a needs assessment was conducted to provide an opportunity for community input and communication in the formation of the LSNERR education programs, as well as an opportunity to build and enhance relationships with key education partners through collaborative development of the program.

Methods

The Lake Superior NERR Education Coordinator met with and interviewed 15 representatives of stakeholder groups, educators, and school administrators. Two focus groups were held, in addition to a presentation that solicited feedback from members of the Wisconsin Association for Environmental Education. The first focus group consisted of eight educators and was held in a school in Superior WI. The second was open to the public and held in the Superior Public Library, attended by five people. Teachers also received a survey instrument common to all education needs assessments in the NERR system. A review of literature relevant to estuary education and environmental education program formation was conducted. All results build upon and enhance an education market analysis and needs assessment conducted in 2010 prior to NERR designation.

Overview of Regional K-12 Schools

The Superior School District, the most immediate school district to the Lake Superior NERR, had a total enrollment of 4,858 students in the 2010-2011 school year and is the 27th largest district in the state. Further demographics of Superior students are given in the table below. Within the district, there are six elementary schools, one middle school and one high school and one district-run preschool.

The Duluth School District in Duluth, MN is the second nearest school district. There are a total of 8787 students in the district, with nine elementary schools, two middle schools, and two high schools. While this initial needs assessment focuses primarily on Superior, it is worthwhile to consider students in Duluth as a potential future audience for Lake Superior NERR programs.

Student Demographics	Superior, WI	Duluth, MN
White	89%	82.1%
American Indian	5	5.8
Asian	1	2.6
Black	4	7.7
Latino	2	1.8
Percent Economically Disadvantaged (as measured by % free and reduced lunch)	51	43.0
English Language Learners	1.0	0.3

Key Findings

Public Recommendations

Results of interviews with community members and the public focus group provided a clearer picture of public perception and use of land included in the Reserve, as well as key recommendations for community and K-12 programs. Key findings appear below in Table 1.

Table 1. **Public Recommendations for Lake Superior NERR education programs.**

Public use of land included in NERR boundaries	• People use the reserve for nature-based and motorized recreation, especially boating and fishing. • The St. Louis River Estuary (SLRE) fuels the local economy. • The freshwater estuary provides intangible benefits to the community. • Many people are not aware of the Lake Superior NERR or SLRE.

Importance of the St. Louis River Estuary to the community	The St. Louis River Estuary… • provides a sense of place and a cultural context. • is important to regional biodiversity and the health of Lake Superior. • provides recreation and tourism opportunities • is a regional economic driver • provides aesthetic value	
Recommendations for education program content	**Information**	• Estuary 101: What is it? How does it function? • Biotic Communities: What lives there and what problems exist? • Economics: What is the value of the estuary and how do people use it?
	Stewardship	• The SLRE is a unique and important ecosystem • Stewardship of the SLRE is important and requires public participation.
Recommendations for program format	• The LSNERR educational approach should be experiential and provide direct connections with the estuary.	
Interpretive Center recommendations	• Use a variety of methods to reach different learning styles. • Include information about historical and present condition of the SLRE and explain what caused these changes. • Estuary Basics: what it is, how it functions, and its' ecological significance. • The story of the river's human history, from Ojibwe settlements through industry to modern day, should be included. • Portray the importance of the SLRE to culture and economy. • Include important Native American connections to the estuary.	
Recommendations for school programs	• Look to other successful area programs for examples of what might work for LSNERR. • A variety of general recommendations were given, especially regarding access to the reserve, marketing, and program format.	

Educator Recommendations

Educators and school administrators from the Superior School District provided recommendations for the structure and format of K-12 programming through interviews, focus groups and a survey. Key findings appear below in Table 2.

Table 2. **Educator Recommendations for LSNERR K-12 programming**

Existing and previous outdoor and environmental programming	• Some classes study Lake Superior and more general ecological concepts but this is not typically in-depth. Many do not study Lake Superior. • Superior School District makes use of their school forest and provides some EE opportunities, including outside providers . • Respondents, including administrators, express a desire to continue past environmental programs or create similar ones.
Barriers and limitations to environmental and outdoor programming	• Time required to meet core standards limits teachers' ability to include environmental and science content. • Financial resources, especially for transportation, are a barrier to environmentally based field experiences. • Taking students outdoors presents challenges to some teachers.
Desired programming for students	• Lake Superior NERR programming should be relevant to students lives and interdisciplinary in nature
Desired professional development programming for teachers	• Teachers expressed interest in having in-school support to mentor and train them in Lake Superior NERR related content and outdoor education methods. • A variety of professional development format recommendations were given, but most indicated that teachers desire the most possible impact for their time investment, especially in an experiential format.
General program strategy	• Teach estuary basics, and make it relevant to people who don't live by estuaries. • Include economics and history in displays and programming. • Connect to the Superior School Forest. • Emphasize stewardship of Lake Superior Freshwater estuaries. • Compliment school district strategies and calendar. • Reach younger students.

Survey results	• Most surveyed elementary teachers had little PD related to estuaries or Lake Superior, and included limited estuary related content into their curriculum.

Literature Review

A literature review was conducted in order to triangulate support for the recommendations of needs assessment participants. Surveying key components of literature related to the NERR program, the most applicable findings appear in *Table 3.*

Table 3. **Key Findings from the LSNERR Needs Assessment Literature Review.**

Education and Stewardship	• Studies have shown consistently that increasing knowledge through education, whether related to health, safety or conservation, does not lead to a change in behavior (Schultz p. 1080). Motivation is the key driving force. • Environmental sensitivity is key to motivation. • Environmental sensitivity develops through significant, positive contact with the outdoors through time.
Environmental Education Program Development	• Environmental literacy consists of knowledge, attitudes, and behaviors. • Environmental Literacy is the key objective of environmental education programs within NOAA and the NERR system.
The state of environmental literacy	• Overall, U.S. environmental literacy is low to moderate. • Particularly missing is an understanding of cause-and-effect relationships in environmental issues. • However, 85% of WI 5th and 11th graders showed interest in learning more about the environment. • 80% of WI teachers strongly agreed that environmental education should be a priority. • This contrasts with the fact that 42% of WI teachers spent less than 1/2 hour per week on EE.

Recommendations from other relevant needs assessments	• Recommendations are compiled from the NERR Education Needs Assessment, the Great Lakes Educational Needs Assessment, Wolf Ridge Environmental Learning Center K-12 Classroom Teacher Needs Assessment Survey, and the Wisconsin's Great Lakes Freshwater Estuary Needs Assessment.

Market Analysis

Before the designation of Lake Superior NERR, Graduate student Bryan Sederberg from the University of Michigan conducted both a market analysis and a needs assessment in 2010. The market analysis provides a partial picture of regional needs by surveying existing regional programs that provide environmental or water resources related educational content. While this analysis surveyed a limited audience (only program providers), it provides a valuable overview of these programs and the potential role of the Lake Superior NERR. Methods and detailed results are documented in Appendix 3 of the Lake Superior NERR 2010-2013 Management Plan. Key program recommendations will be duplicated here.

Programs by Audience and Region

The 45 programs operated by the regional organizations surveyed in the needs assessment were divided by audience and region served (*Figures 1* and *2)*. No programs appear to be serving early childhood and family audiences specifically, although other regional organizations not included in the needs assessment (such as the Lake Superior Zoo and Hartley Nature Center, both in Duluth) do provide programs for these audiences. Only one program serves elementary students specifically, a finding that correlates with reports of limited elementary programming from the teacher focus group and interviews. Three programs (7%) target the university and college audience.

When the programs are divided by region, the fewest number of programs (n=4) served the Superior area and the North Shore communities, although these numbers rose when considering programs serving the entire region (n=5). The Duluth area was served by the greatest number of programs (n=16, 45%), followed by the South Shore region of Wisconsin and upper Michigan (n=6). Most South Shore programs were provided by the Northern Great Lakes Visitors Center.

This suggests a need in regional communities for science and outdoor education programs that reach early childhood audiences, elementary classrooms, and university/college students, while specifically reaching those audiences in the Superior area. While a similarly small number of programs exist on Minnesota's North Shore of Lake Superior, these sites may not be suitable to Lake Superior NERR programming due to our inherent focus on freshwater estuaries. However, the need for programming in this region should be further assessed as the program develops.

Figure 1. **Programs by Audience**

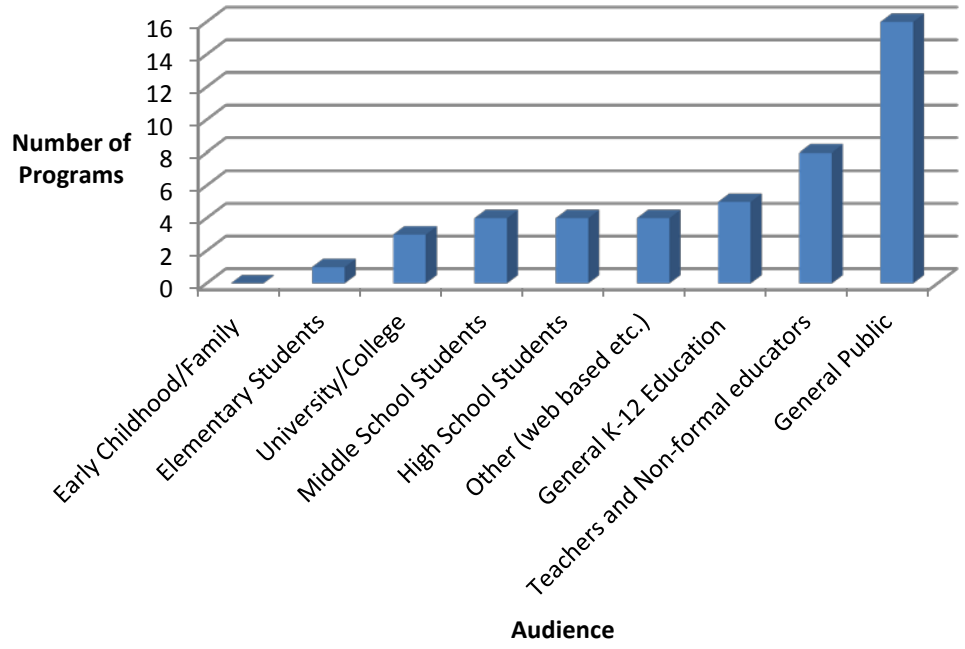
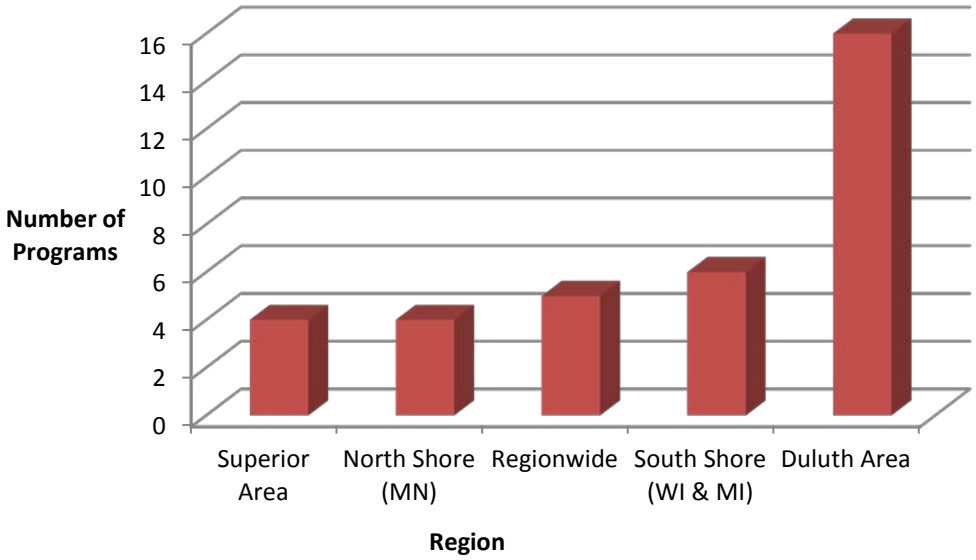


Figure 2. **Programs by Region**



Key Recommendations (*excerpted from Sederberg, 2010*)

The following recommendations were developed in 2010 from the recommendations of personnel providing environmental or water resources related educational content.

Adult Education Recommendation: *The future LSNERR should partner with local organizations already offering adult education programs to increase the variety and frequency of programs. This in turn will give the community greater appreciation for the Lake Superior Region and the resources it provides.*

An often overlooked audience and non-targeted audience are adult members of the general public. The Old Woman Creek NERR offers Estuary Explorations where community members are offered opportunities to hike, kayak, or canoe the estuary to truly experience the resource. Few opportunities currently exist in the region for adult education programming related to freshwater estuaries and the future LSNERR should take the lead in developing more education programs targeting adults.

Teacher Training and Curriculum Development Recommendation: *The future LSNERR should provide teacher training to assist educators in implementing estuary related curriculum. The future LSNERR needs to capitalize on the resources available in the NERR system to offer newly expanded curricula using real-time data and field trip experiences.*

Many efforts are being made to expand estuary curriculum in the K-12 classroom to improve the understanding of the Great Lakes and their coastal resources. Frequently the use of curriculum depends on whether it satisfies state education requirements. The NERR system has developed a variety of curricula and lesson plans for K-12 students that satisfy many state requirements, particularly the *Estuaries 101* curriculum targeting grades 9-12. These curricula are often taught by NERR educators but most regularly by classroom teachers. The use of these curricula often depends on the teacher's ability to understand the material and content of the curriculum and the availability of proper resources required by the curriculum. It is important that NERR educators are available to assist classroom teachers with the implementation of estuary related curriculum.

Coordination of Area Education Programs Recommendation: *The future LSNERR needs to pay specific attention to collaborating and coordinating programs with other organizations to increase the variety of outreach and environmental education programs available in the area.*

Part of the role of the future LSNERR will be to encourage and facilitate coordination and collaboration with community and regional partners, including the educational community. Several organizations offer educational programming related to estuaries in the Duluth-Superior Region. This includes the Great Lakes Aquarium (GLA), the Northern Great Lakes Visitor Center (NGLVC), University of Wisconsin – Extension (UWEX) Office, and University of Wisconsin – Superior's (UWS) Lake Superior Research Institute (LSRI). Along with these

organizations exists a collaborative group, the Regional Stormwater Protection Team (RSPT), which coordinates and organizes area education events. These organizations offer opportunities for partnerships and collaboration in the region.

Promoting the idea of the St. Louis River as a Working Estuary Recommendation: *The future LSNERR should convey the message of a sustainable harbor rich in natural and cultural resources, complemented by vibrant economic and industrial development.*

The Duluth-Superior Harbor is the largest port by volume of shipped goods in the Great Lakes and is a focal point for regional commerce. The area is home to over 275,000 residents who frequently use the estuary for various recreational purposes. The area has a rich history rooted in Native American heritage, fur trading, logging, and shipping. The future LSNERR should recognize and acknowledge the identity of the St. Louis River freshwater estuary and the importance the resource has on the region.

Professional/Teacher Development Recommendation: *The future LSNERR needs to contribute research and educational support to develop the region's natural resource professionals.*

The Duluth-Superior region is fortunate to have several governmental and non-governmental research organizations, such as the Wisconsin Department of Natural Resources, UWS-LSRI, WI and MN Sea Grant, the University of Minnesota Duluth, the Environmental Protection Agency, United States Geological Survey, and the Minnesota Pollution Control Agency (MPCA). These organizations work on the forefront of environmental research. These experts provide a unique opportunity to the region in their ability to present and share ground-breaking research and publications. Existing groups such as the Twin Ports Freshwater Folk offer established platforms to share this knowledge through sponsored professional development opportunities. The future LSNERR has the ability to increase the types and quality of education programs in the Duluth-Superior region. These recommendations offer a good starting point to guide education programming for the newly designated reserve. It is important to note the common theme present in these recommendations: the importance of regional collaboration and partnerships. Current resource management stresses the importance of these concepts and it is crucial the future LSNERR is a strong advocate of these practices.

Needs Assessment Results

The education program needs assessment was conducted between September 1st and November 15th, 2011. The fifteen participant interviews typically lasted between 45 minutes and 1 hour. Interviews were recorded by hand.

The education focus group was conducted on Monday October 17th at Lake Superior Elementary, and was attended by seven teachers and the principal. The public focus group was conducted on Thursday, October 20th at the Superior Public Library. It was attended by 5 participants and lasted one hour. Both focus groups were recorded using a digital recorder and transcribed by the education coordinator and education intern.

All qualitative data was evaluated by question and the most common answers in each category were grouped into themes. In the reports below, each theme is followed by the number of responses and the total percentage this represents in the category, allowing themes to be prioritized.

Data from educators and other community members was evaluated separately because of the different question sets asked to each group, and because most recommendations from educators pertain to only the K-12 component of the LSNERR education program.

Recommendations from Educators

Information was collected directly from teachers and administrators in the Superior school district via interviews (n=4, 25% of all interviews) and a focus group held at Lake Superior School with a group of eight elementary teachers and the school principal. Input was also collected from a group of 22 primarily non-formal environmental educators at the Wisconsin Association for Environmental Education. This allowed the program to receive input from education professionals in other parts of the state, a potential future audience. A total of 35 participants contributed recommendations from the K-12 and non-formal education sector.

Comments from interviews, the WAEE conference, and the educator focus group were divided and coded into the following themes:

1. Existing and previous outdoor and environmental programming
2. Barriers and limitations to environmental and outdoor programming
3. Desired programming for students
4. Desired professional development programming for teachers

5. General program strategy recommendations

After information was organized, themes were analyzed for sub-themes which were combined into program recommendations.

A survey, required as a component of educational needs assessments in the NERR system, was administered to teachers in the focus group (n=8). Results of the survey are also included here.

Key Findings

1. Existing and previous outdoor and environmental programming

The following sub-themes were drawn from the theme of existing outdoor and environmental programming, which attempted to delineate current practices regarding environmental education in area public schools (numbers in parentheses are the total number of comments made regarding the sub-theme):

- Other existing outdoor, science and environmental education programs are also utilized by regional schools (12 responses, 38% in category).
- The Superior School District makes use of their school forest and provides some environmental education opportunities, particularly water quality monitoring (10 responses, 31% in category).
- In-school programs emphasizing science and the environment have existed in regional schools and respondents expressed a desire to continue these or similar programs (10 responses, 31% in category).
- Some classrooms include the study of Lake Superior in their curriculum, but this is typically not in-depth instruction (5 responses, 16% in category).
- Ecological and ecosystem concepts are taught in some classrooms (3 responses, 9% in category).

While some classrooms in the Superior School District include Lake Superior and regional watersheds into curriculum, it appears that neither Lake Superior nor the St. Louis River is heavily integrated into classroom instruction. One elementary teacher commented, "We're on Lake Superior but we don't teach much about it directly. It's when our kids talk about it, and we try to embed it in the things we do." However, more in-depth instruction currently is provided in 5th and 6th grade, due to the influence of programs like RiverQuest and Water Watch, as well as state curriculum standards. Said a fifth grade teacher "Every year in the spring we do a Lake Superior study." This study lasts for a month, according to the same teacher. A first grade teacher reported that "In first grade, we learn about the Great Lakes and learn Superior is the

largest lake. They locate it on a map."

Ecological and ecosystem concepts are taught in some classrooms. A few teachers reported including content on ecosystems, invasive species, and the Lake Superior ecosystem. One teacher said "We're tying into ecosystems more because of our resource," their textbook.

Elementary teachers in the Superior School district use Scott Forsman science textbooks and, according to an administrator, teach primarily the content in this text. Teachers reportedly dedicated between 30 and 45 minutes to science curricula weekly.

The Superior District makes use of their school forest and provides some other environmental education opportunities, particularly water quality monitoring. In the words of one teacher, "We also use our school forest site. Several of us do. So that's a really good link, not necessarily to Lake Superior but to the environment in general." Another teacher reports that most teachers are "really supportive" of the school forest. The school forest instructor reports working to provide a context for interdisciplinary learning experiences, especially experiences for writing. The school forest includes two outdoor classrooms and a lodge and is about five miles south of the city, making transportation necessary. Forest resources include wooden snowshoes and mountain bikes owned by the district.

Additional activities in district schools include a water quality inventory on Lake Nebagamon at the high school level and water quality monitoring on the Black River in 7th grade. A teacher at Lake Superior Elementary also stated "We're planning to do more outdoor experiential learning, not directly related to Lake Superior or the estuary, but because we realize that doing more experiences outdoors will help breach the gender gap. It's a way of getting it in there and still doing what we're directed to do from the district."

Other existing outdoor, science and environmental education programs external to the school are also utilized by the Superior School District. Teachers, especially in fifth grade, reported utilizing such programs as Hartley Nature Center, the Marine Museum, the Great Lakes Aquarium, and Wolf Ridge, in addition to taking students on the vessel *LL Smith* through Water Watch. Ability to use these programs is funding dependent. Some teachers also reported training in developed curriculum such as Project Wet, Project Learning Tree, the Leopold Education Project and Lake Effects, a curriculum developed by the Great Lakes Aquarium.

Teachers also spoke about previous programs that had existed in the district, but were discontinued for a variety of reasons. Programs included an early program of the Great Lakes Aquarium that provided regular in-school assistance, such as a beach sweep. Other environmental programs cited were Water Watch, trips on the *LLSmith*, and a program that allowed a classroom to adopt a Lake Superior shipping vessel and communicate with its crew. Teachers expressed a desire to continue or replace these programs. Thinking back one teacher

reflected, “It’s kind of sad to talk about all the things we used to do.”

2. Barriers and limitations to environmental and outdoor programming

If science-related outdoor and environmental programming is to be included in regional schools, it is important to understand the barriers teachers face when incorporating these methods. The following sub-themes describe these barriers and limitations:

- The time needed to meet the requirements of core curriculum, especially reading and math, limits teachers ability to include environmental and science content. (12 comments, 39% in category)
- Lack of financial and other resources are a barrier to incorporating environmental field experiences into the curriculum. (6 comments, 19% in category)
- The cost and logistics of arranging transportation for trips has been a barrier to providing field experiences. (4 comments, 13% in category)
- Taking students outdoors presents challenges to teachers. (3 comments, 10% in category)

Teachers mention time as a barrier to including science and outdoor education more than any other limitation. The lack of time limited teacher’s ability to include science or environmental lessons in curriculum and to prepare these lessons, especially when limited time is combined with a strong emphasis on math, reading and meeting core requirements. Said a school administrator, “Our teachers have been only directed to teach truly only reading and math.” Another teacher cited the lack of time saying he’s “pounding to get through the benchmarks” but noted that ecology wasn’t included in the benchmarks at his grade level. There may be an impact on the level of comfort teachers have teaching science, for example, “We aren’t science experts, we are reading and math experts.” Said a school principal, “It’s an absence of something we need to do, revolving around our kids need to read, [and] do math.” In addition to this, a few teachers mentioned that it can be difficult to get students outdoors and manage their behavior there. One teacher commented, “Managing more than 12 kids outdoors in a group is just crowd management. [We] need to increase the ratio of professionals to students.”

The school district of Superior has an average of 50% of students receiving free and reduced lunch, with some schools as high as 70%. A lack of financial resources, coupled with state cut backs, are especially reported as a barrier for the inclusion of off-site field experiences. “It’s stressing (sic) to ask families for money for field trips.” said one teacher. A fifth grade teacher stated regarding trips to other environmental facilities, “I try to get to all of those every year, depending on how much money we have…”

Financial limitations were closely tied to the difficulty of arranging and paying for transportation. Field trips are allocated to bus drivers with seniority, and as a result the cost can be significant. The Great Lakes Aquarium, when funding school transportation to their site,

typically allocates $150 for schools in the Duluth/Superior area. The Superior school forest instructor stated that "It would be helpful if we could band together to share transportation costs in the future."

3. Desired programming for students

When discussing the characteristics of science and outdoor programming they would like for their students, educators predominantly made two recommendations:

- Lake Superior NERR education programming should be relevant to students' lives. (13 comments, 72% in category)
- Lake Superior NERR education programming should be interdisciplinary in nature. (5 comments, 28% in category)

Teachers said that effective programs "make it real for them," are "meaningful," "get the kids out there" and "connect to their lives." Said another, "[We need] something for these younger kids, they need to feel it and understand it for themselves." The desire for relevant programming was connected to Lake Superior by one teacher who said "We have this great resource being by the lake. I'd like to be able to tell them more about it."

Some teachers also mentioned a desire for interdisciplinary materials such as books and instructional texts on environmental topics, as well as "math and science on real stuff." Another teacher spoke of integrating through the curriculum, saying "in 3rd grade, part of the curriculum we have to teach is rocks, so tying that in to the rocks in Lake Superior, Superior history, the shipping industry, the environment and the lake. There's lots [sic] of natural tie-ins that I just don't know a lot about."

4. Desired professional development programming for teachers.

In regards to professional development (PD):

- Teachers and administrators made a variety of format recommendations. (14 comments, 60% in category)
- Teachers 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. (9 comments, 39% in category)

Recommendations for the format and structure of PD varied widely. Some recommendations mirrored those for student programming ("interesting and purposeful," "stimulating," "hands-on," "something that we can use directly with our kids, our classrooms"). As far as structure, one teacher said "Streamline things that really make an impact. I don't want 40 activities. I want to do five really powerful activities so that my kids really get how important Lake Superior is…" Other recommendations included getting dates on the school calendar early, tying in to

new teacher programs, and providing credit and compensation. A teacher did note regarding credit that "the carrot is largely taken away now," due to teacher certification changes.

A science and outdoor education professional who was able to provide support for science and outdoor education in the school was mentioned by several teachers and an administrator. Said one, "I want someone to come and teach me to teach it". Said another "It would really be great to have a personal resource – someone that could come into the classroom and give us ideas, come in the classroom [and] be part of our community." Another teacher recommended having a person available to help with "expanding teacher comfort zones to get people out there. Kids aren't comfortable until teachers are."

5. General program strategy recommendations

General recommendations provide guidance for program content (14 comments, 48% in category) and methods (15 comments, 51% in category). In terms of content, recommendations from educators often mirrored those of the general public found in the next section:

- Teach estuary basics, and "Relate how estuaries are important…in areas that do not have estuaries."
- Economics and history should be included in displays and programming. Said one non-formal educator, "Know what is culturally and economically important- incorporate that into programs (and) displays."
- Stewardship of freshwater resources should be included in programming. "I really do think that all of the things associated with stewardship fit with Work/Respect/Belong [the Superior School District motto]. And I think…no I don't think, I know…it fits with this, with the earth" said a principal.
- Teachers also emphasized the importance of a connection between forestry, school forest lands and the watershed, for example, "bigger emphasis on the watershed- finding connections to the schools."

In terms of methods, respondents mentioned several key district initiatives.

- District administrators mentioned that key school initiatives are literacy, positive behavior interventions and supports, and instructional technology in the classroom (especially using Promethean boards, an interactive digital whiteboard). Teachers also talked about the importance of informational texts, for example "If they're realizing the value of informational texts, to me that's our in [for environmental education]."
- A few teachers mentioned that more initiatives are needed for younger grades, which correlates with *Figure 1* chart above. One teacher noted that programs like Water Watch are, "more the upper grades. For 1st and K, we really don't [have many programs]."

Teacher Survey Results

All National Estuarine Research Reserve educational needs assessments are to include a survey instrument designed to measure the amount of estuarine and NERR-related content in classrooms. A convenience sample of eight teachers from the Lake Superior Elementary School in Superior, WI received the survey in September of 2011. Key findings, in chart form, are below. The most significant finding from the survey was that this group of teachers has attended minimal professional development related to estuarine topics and includes limited content related to estuaries in their curriculum, indicating an educational need.

Figure 3. **Responses to "How many class or activity periods of estuary, watershed, Lake Superior and/or ocean instruction do your students receive in a typical school year?"**

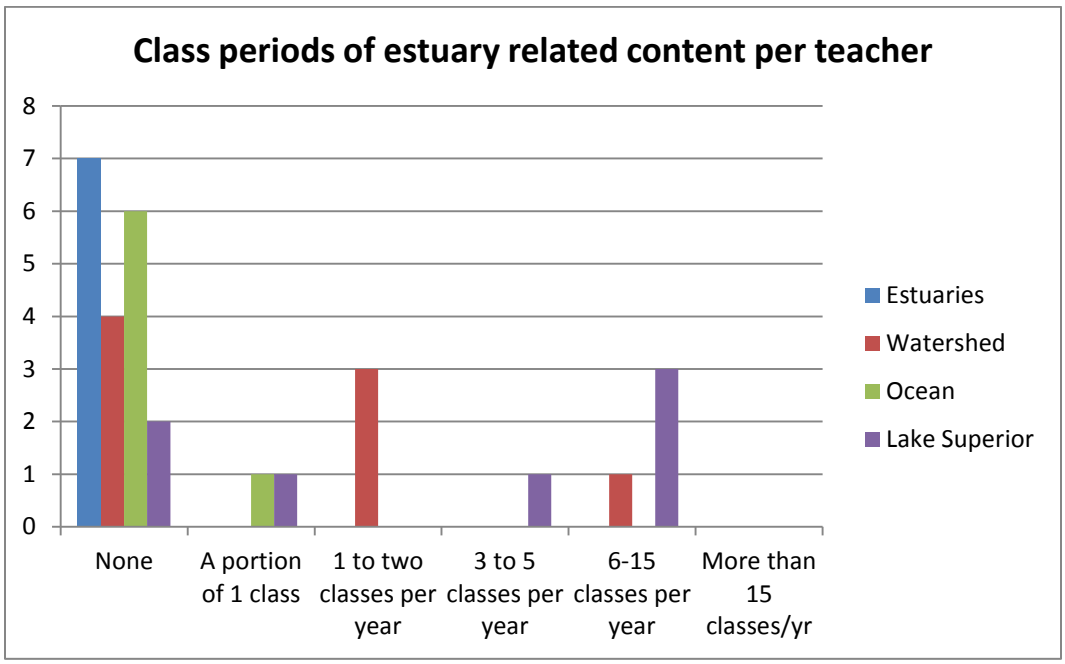


Figure 4. **Responses to "In the last three years, how many hours of professional development trainings in science have you obtained related to estuaries, watersheds, Lake Superior, and the ocean?**

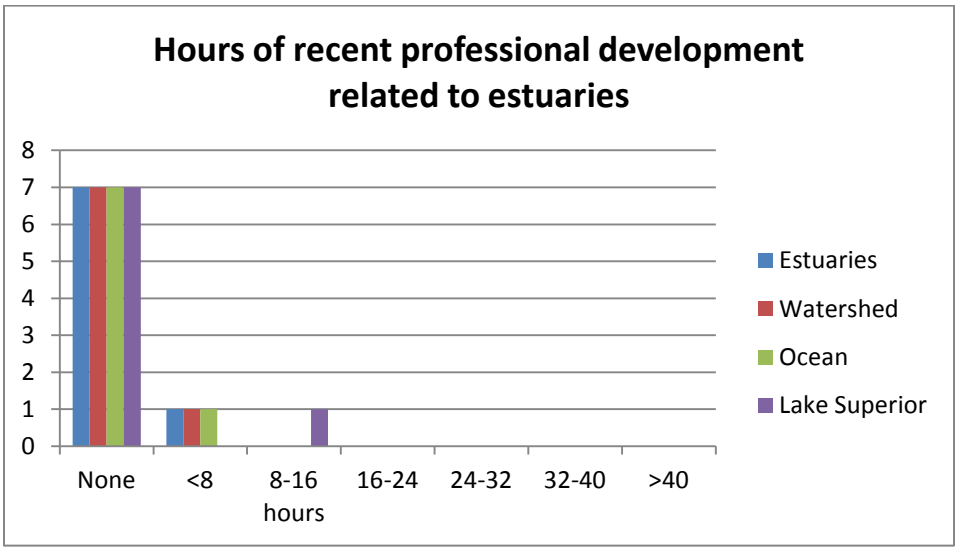


Figure 5. **Reponses to "Which professional development trainings have you taken to supplement your estuary/watershed/ocean education?**

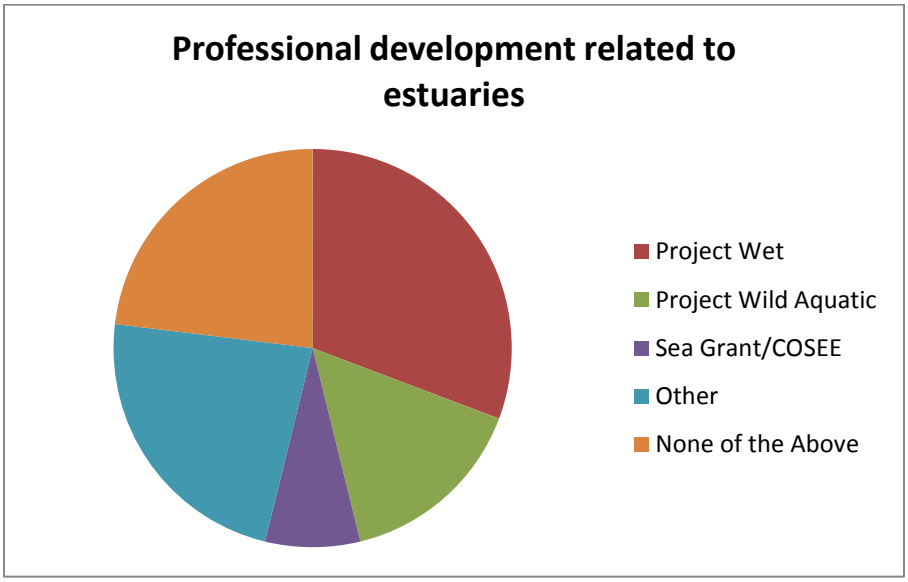


Figure 6. **Responses to "How often do you incorporate discussion about the effects of climate change on coastal areas in your classroom?**

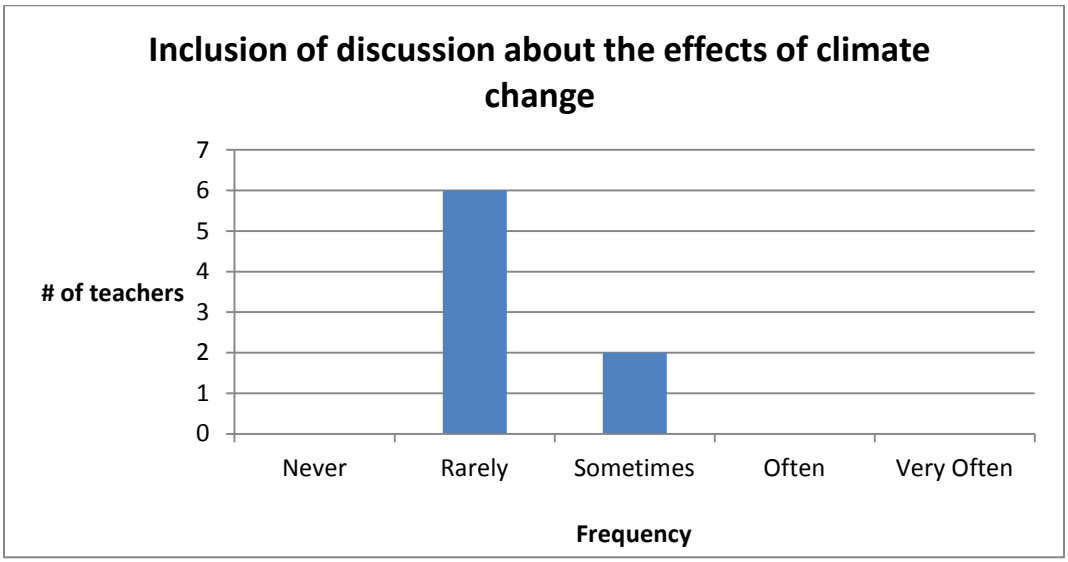


Figure 7. **Responses to "Which of the following real time/archived data sets would you need synthesized into age-appropriate learning materials and visualizations for your teaching?"**

Topic	# Responses
temperature: air	6
animal tag/tracking	4
fish species & abundance	4
temperature: water	4
water depth	3
water contaminents	3
aquatic plants	3
nutrients	2
pH	2
invasive species	2
algal blooms	1
dissolved oxygen	1
ocean color	1
water turbidity	1
waves	1
zooplankton species	1
sedimentation	1

Recommendations from Community Members

Input was solicited from community members through ten interviews and a focus group held at the public library. Participants were selected for interviews from a list of community members interested in the reserve and representatives of relevant organizations. Comments were divided into sub themes based on the interview question asked. For example, in response to the question "How do you use the lands within the Reserve boundaries?" answers were coded into non-motorized recreation, motorized recreation, do not use reserve lands, etc. Wherever possible, categories were compressed to produce the themes described here.

Public comments were coded into the following themes:

1. Public use of reserve lands
2. Importance of the St. Louis River estuary
3. Content recommendations
4. Program recommendations
5. Science interpretation center recommendations
6. Education program recommendations

After information was organized, themes were analyzed for sub-themes which were combined into program recommendations.

Key Findings

1. *Public use of reserve lands*

The following sub-themes surfaced when respondents talked about both how they personally use the reserve property and how they believe others use the reserve, listed from most cited to least.

- People use the Reserve properties for non-motorized nature-based recreation (47 responses, 43% in category).
- The Reserve provides intangible benefits to the community surrounding it (25 responses, 23% of total in category).
- Many people in our region do not use and/or are not aware of the public lands included in the St. Louis River estuary (13 responses, 12% in category).
- The St. Louis River estuary fuels the regional economy through tourism, commerce and research (12 responses, 11% in category).
- Reserve lands are also used for motorized recreation, especially boating (11 responses, 10% in category).

Most respondents reported that they or people they know use the reserve property for nature-based outdoor recreation. This included things like fishing, canoeing, bird watching, hunting,

skiing and hiking, to list some of the most frequently cited uses. Beach going and gathering plants or mushrooms were also cited by multiple respondents.

According to the information gathered, many area residents are either unaware of the reserve lands or do not use them. Some respondents had not been to the Superior Municipal Forest or the Red River Breaks. One focus group respondent stated that "[There are] large parts of the community that are oblivious to the valuable aspects of the Research Reserve." Despite this reported lack of awareness, respondents said that the St. Louis River estuary contributes intangible benefits to the community. "Just having it there does something for the town" said one interviewee. Other respondents remarked that it "contributes a sense of character to the community" and "improves quality of life".

Mirroring content recommendations made by some educators, the economic impacts of the St. Louis River harbor are also an important use. The economic versatility, commerce and jobs provided by the estuary were all cited, as well as the economic impacts of tourism and research.

Motorized use of the reserve included nine references to boats, boating and charter fishing, though few respondents used the reserve this way themselves, a possible indicator of selection bias. Attempts were made to meet with representatives of a local fishing and hunting organization, but an interview was not able to be arranged. It is recommended that further input from this group is gathered in the future, particularly when developing interpretive displays.

2. ***Importance of the St. Louis River estuary***

When interviewees were asked why the St. Louis River estuary was important to the local community, they responded:

- The St. Louis River Estuary provides a sense of place and a cultural context for people in the watershed (17 responses, 29% in category).
- The water quality and overall health of the St. Louis River Freshwater Estuary is important to regional biodiversity and the health of Lake Superior (13 comments, 22% in category).
- The St. Louis River estuary provides important recreation and tourism opportunities (13 responses, 22% in category).
- The St. Louis River estuary is an economic driver in the region (10 responses, 17% in category).
- The St. Louis River provides aesthetic value to the region (6 responses, 10% in category).

The strongest theme in this category is the sense of place and culture the St. Louis River estuary provides to the communities around it. One respondent stated that the estuary is "why the community is here." Another said that Lake Superior freshwater estuaries provide "renewal

for people." Others cited the significance of the reserve lands in Ojibwe culture, referencing wild ricing, sturgeon, historic village sites and spiritual values.

The importance of water quality and health of the Reserve lands to regional biodiversity and the health of Lake Superior was also of strong importance. Participants referenced wildlife, plants, birds and general biodiversity as well as water quality and coastal protection. A few participants emphasized the important influence that the SLRE has on water quality in Lake Superior.

Recreation and tourism opportunities were also important. One respondent said, "People can bring their friends and relatives from out of town to visit [the Reserve]." The SLRE is a source of enjoyment for canoeing, fishing, and outdoor recreation and provides a travel destination.

Again, the economic influence of the SLRE was listed as regionally important. Respondents described it as an economic driver, industrial hub, water source, energy source and as a key element in the management of the Great Lakes Seaway.

Dovetailing with the importance of a cultural backdrop and providing a sense of place, respondents also spoke of the aesthetic values of the estuary with terms like "beautiful", "cool" and "unique".

3. Content recommendations

Participants were asked about what they wish they knew more about in regards to the SLRE and also what they wished others knew more about. From these recommendations, key concepts that should be included as content in the educational program were developed. The recommendations fell under two sub-categories; information about freshwater estuaries and stewardship of the SLRE.

- Information: Lake Superior Estuary Basics: What is the estuary and how does it function (16 responses, 27 % in category)?
- Information: Biotic Communities in the estuary: what lives there and what problems exist (10 responses, 17% in category)?
- Information: Economics: What is the value of the estuary and how do humans use and benefit from it (5 Responses, 8% in category)?
- Stewardship: The St. Louis River Freshwater Estuary is a unique and valuable ecosystem (13 responses, 22% in category).
- Stewardship: Stewardship of the St. Louis River Freshwater estuary is important and requires public participation (11 total responses, 19% in category).

Perhaps because reports indicate that many community members are not familiar with the SLRE, the strongest recommendation here is to teach people the basics. Respondents felt that people needed to understand "the size and complexity of the system," connections between the

estuary and the lake and even simply "that it exists." In the Estuary Basics recommendation, participants also said the NERR should explain biota. Recommendations included plant communities (especially wild rice), rare communities, and migratory and invasive species.

Again the economic importance of the SLRE was mentioned, specifically the need for decision makers to understand estuary function before making decisions regarding public lands in the reserve. Others mentioned that the industrial history of the area is a relevant topic. Said one respondent, "Young people don't know anything about the history of the area."

Participants strongly stated the need for stewardship messages regarding reserve lands. On one hand, respondents expressed a desire for the broader community to understand and appreciate the unique St. Louis River Estuary. One respondent stated "There's nothing more precious than fresh water." Another wished others to know "how valuable the estuary is to the community." Others cited its uniqueness, such as "it's ecological importance" and "it's regional significance."

In addition to this appreciation, participants hoped for conservation-oriented action on behalf of the SLRE. One said that the community should "be aware when things are wrong so they can fix them." Another emphasized that people should know "where the river came from thirty years ago" and that there is "no guarantee [it won't go back] without environmental safeguards." Others said they wanted to know "how best to protect it," and "how to be better stewards."

4. Program recommendations

This hybrid category was created as a response to the idea of experiential education that was referenced throughout most interviews. The primary recommendation here is:

- The Lake Superior NERR educational approach should be experiential and should provide participants with opportunities to connect directly with the estuary. (18 responses, 100% in category)

"Get them outside!" was a typical comment from respondents. Other comments include:

> "You need to get people out there so they know what they have."
>
> "The biggest thing is to get people out into the environment."
>
> "[Get them] down and dirty with the estuary!"

In general, respondents strongly emphasized the need for direct contact to foster appreciation of the SLRE, and mentioned experiences such as canoeing and hiking in reserve properties. There was also an additional suggestion of "citizen scientists supporting (LSNERR) study." One respondent also noted that programs operated through UW-Cooperative extension

are “educational, not just recreational.”

5. Science interpretation center recommendations

The Lake Superior NERR expects to have an established science interpretation center by 2013 at the Barkers Island site. Respondents were asked for recommendations as to what should be included in interpretive exhibits:

- The interpretive center should use a variety of interactive methods to reach a diverse audience (18 responses, 25% in category).
- The interpretive center should include information about past and present ecological health of the St. Louis River estuary (16 responses, 22% in category).
- The interpretive center should explain what the freshwater estuary is, how it functions, and its ecological significance (16 comments, 22% in category).
- The story of the rivers history, from early Native American inhabitation through logging, industrial use and clean-up, is important to include in the interpretive center (10 comments, 14% in category).
- The importance of the St. Louis River estuary to culture and economy should be portrayed in the interpretive center (10 responses, 14% in category).
- Native American (especially Ojibwe) people have important connections to the St. Louis River Estuary and these stories should be included in the interpretive center (10 responses, drawn from other subcategories).

The fact that the visitors center would need to appeal to local audiences and tourists was highlighted by several respondents. Different learning styles should also be addressed. Said one former school teacher,

> “There should be visual, auditory and verbal definitions of terms. Appeal to as many senses as you can.”

Several people recommended the use of 3D models and maps. One person noted that “some people are turned on by research, but some will glaze over.” Another urged the Reserve to keep the interpretive center “pure education,” as opposed to entertainment. Respondents said the center should be “fun, interactive and pleasant” and “interesting, but not overwhelming.”

The ecological health of the estuary, and the research being done to support it, were also key topics. Participants referenced water quality (and human impact on it), flow rates, macroinvertebrates, birds, water chemistry, mercury pollution and aquatic invasive species. The impacts of climate change were also mentioned in this theme.

Again, many basics of the estuary were cited as important content for the center. Respondents suggested we include topics such as the seiche effect, fishery production, the Boreal forest, coastal wetlands, the St. Louis River watershed, and ecological processes. Said one

respondent when talking about the SLRE, “It’s like a body, all connected and interactive.” Others again emphasized the value of the estuary and the importance of coastal wetlands.

The story of the St. Louis River, from pre-colonialism to heavy use and striking environmental impact through clean-up and the current AOC delisting effort, was cited as important center content by several. One respondent said we should include “What did we learn in the past and how it’s affecting things now.” Another noted that in the past 25 years, the water has been cleaned up significantly. This change might provide a source of community pride and continued commitment to improve the quality of the estuary.

Human society was again cited as an important component in the center, including economic, culture and social uses of the reserve. This included Ojibwe connections to the reserve today and historically, with mentions of Spirit Island and wild rice. A respondent recommended “Personal narratives telling the story of [human] relationships with the river through time.” Respondents also noted that the river “sews Wisconsin and Minnesota together” as well as the idea of a working estuary that connects nature to human use.

Throughout the categories a consistent theme of Ojibwe use (traditionally and in the present) of the SLRE was apparent, and so a hybrid category was created to tally this. Ideas that were often cited (in reference to the interpretive center, but also in reference to content and importance of the SLRE) include wild rice, the historical use and recovery of sturgeon, traditional connections to Spirit Island and Wisconsin and Minnesota Point, and Ojibwe connections to the river today.

6. Education program recommendations

Programs for the K-12 education programs from community interviews and the focus group were tremendously varied and did not fit neatly into subthemes, however:

- Participants recommended a variety of activities for the education program, many of which had taken place in the past or had been successful in other organizations. (15 comments, 30% in category)
- A variety of other education program recommendations were provided. (35 comments, 70% in category)

Successful prior programs and events that were cited included a Bio Blitz in the Superior Municipal Forest and a beach clean-up on Wisconsin point as well as Lake Superior Days, the annual canoe paddle held by the St. Louis River Alliance and the watershed festival held by RSPT. Recommendations for program format included service learning programs, video outreach, and citizen data collection.

General program recommendations again emphasized the need to meet the needs of different learning styles. One respondent emphasized that UW Cooperative Extension

programming should be “research based and address issues.” Access was commonly mentioned, with several people recommending the construction of a trail system in the reserve built in the style of the Superior Hiking Trail, as well as the making maps, a smartphone application, geocaching or a driving tour available. Also recommended was a review of the master plan for Superior city parks to determine if access may be changing in the future. Recommendations were also made regarding marketing. Focus group participants suggested advertising in Chamber of Commerce brochures and inviting local news stations to educational events, or monitoring state and local science fairs.

Literature Review

The following literature review seeks to expand the reach of the needs assessment to include relevant research in environmental education and the recommendations from other key needs assessments in order to support and assist with Lake Superior NERR education program as it develops.

Foundations: Education and Stewardship

The Lake Superior NERR management plan states in Goal Two that the NERR will “educate youth, students, community members, and visitors about Lake Superior freshwater estuaries and coastal resources and improve their ability to address coastal issues.” On one hand, this goal has an informational component; the LSNERR will educate audiences on freshwater estuaries and coastal resources. On the other, it has an action-oriented behavioral component; LSNERR will improve the ability of people to address coastal issues. This literature review seeks to make recommendations from education research in order to help us meet both informational and behavioral components of this goal.

In a 1990 meta-analysis of environmental education literature, Hungerford and Volk attempted to determine the parameters of education that result in behavior change and established the following recommendations:

1. Developing awareness and ecological knowledge is not enough to cause long-lasting behavior changes.
2. Ownership- developing a personal connection with and knowledge of issues- is critical to responsible environmental behavior.
3. Instruction that focuses on ownership and empowerment (a sense of being able to make changes and resolve important problems, and use critical issues investigation skills to do so) changes behavior.

Hungerford and Volk, like many researchers since, refute the idea that injecting information alone will produce behavior change, or make an audience care about an issue. Schultz (2011) addresses this more directly, stating that “results of psychological studies have shown

consistently that increasing knowledge through education, whether related to health, safety or conservation, does not lead to a change in behavior (p. 1080)." Motivation, he states, is the key driving force. Kellert (1987 in Siemer, 2001) associates environmental sensitivity, an increased level of empathy towards the natural world, with behavior, stating that an individual distanced from the outdoors is more likely to make use of the environment in an exploitive way. Environmental sensitivity, studies suggest is "developed through significant, positive, contact with the outdoors over a period of time" (Chwala, 1998, 2000, in Siemer, 2001). Schultz (2011) supports this position, citing multiple studies that found increased conservation behaviors in those who perceive a higher degree of connectedness between themselves and nature. He recommends "experiential activities, citizen science and environmental education (p. 1081)" as a means to increase the likelihood of such behaviors.

Program Development

In an article titled "Elements of Effective Environmental Education Programs", Ernst and Monroe (2001) state that effective environmental education programs are:

- Relevant to mission of the agency, educational objectives of the audience and to the everyday lives of individual learners
- Involve stakeholders in all stages of the program from development to evaluation.
- Empower learners with skills to help prevent and address environmental issues and with a sense of personal and civic responsibility.
- Accurate and balanced, incorporating multiple perspectives and interdisciplinary aspects.
- Are instructionally sound, using best practices in education.
- Are evaluated with appropriate tools.

These recommendations echo those solicited from educators and community members through the needs assessment process. Such recommendations are based on foundational theories in education such as constructivism, the cognitive development theory of Piaget, multiple intelligences and multiple learning styles. Ernst and Monroe (2001) frame these recommendations around the goal of increasing environmental literacy, a key objective of environmental education programs. Environmental literacy includes attitude and behavior components, as well as knowledge.

This focus on environmental literacy as an outcome is also supported by NOAA. Write McDougall and Ibanez (2006), "Promoting environmental literacy…is a cross-cutting priority of the NOAA strategic plan and is indicative of broad commitment to education activities within the Agency." The NERR education sector, in the 2009-2014 Master Plan, also states as their first goal, "Citizens increase their estuarine literacy and/or perform environmentally sustainable behaviors that protect our local estuaries." NERR education programs should include

knowledge, attitudinal and behavior components in order to be effective at increasing environmental literacy.

Recommendations from other National Estuarine Research Reserves can also be found in the literature. Jacques Cousteau NERR education programs are designed to "build knowledge and skills by providing classroom teachers with basic ecological knowledge and the skills necessary to foster interesting and meaningful learning grounded in science." The reserve emphasizes investigative inquiry-based science content and pairs teachers with scientist mentors who aid and support them in the process of science, versus the end product of content. Education at the estuary is also used as a focal point through which students develop skills in reading, math, problem-solving and critical thinking. This program also applies a "Whole School Approach", where the reserve collaborates with teachers and administration to develop curriculum across classrooms and grade levels, and to share resources. As an evaluation measure, the program seeks to assess attitudes including perception of the environment, understanding of nature and a sense of curiosity, intellectual interest, and self-confidence. The Jacques Cousteau reserve appears to apply the recommendations of Ernst & Monroe (2001), and provides a feasible working model to the Lake Superior NERR.

State of Environmental Literacy

In an analysis of several different surveys of environmental literacy, Elder (2003) states, "all appearances are that the environmental literacy gap is *growing* instead of shrinking (p. 19)" and cites Volk and McBeth (1997) in rating overall US literacy as low to moderate. Particularly missing is the understanding of cause and effect relationships involved in environmental issues. Another deficient area is local knowledge, versus general knowledge provided by mass media. Because NERRs function at a local level and address cause-and-effect issues, their education programs are well suited to address deficiencies in environmental literacy.

At the regional level, Wisconsin undertook an assessment of student environmental literacy in 1997 and found that student's ecological knowledge was lower than the state environmental education standards established by educators and the Department of Public Instruction. However, 85% of 5th and 11th grade students showed interest in learning more about the environment. A survey of teachers found that 80% strongly agreed that environmental education should be a priority in the schools, though nearly half of the teachers (42%) stated that they spent less than 30 minutes/week on environmental education. Most administrators (90%) thought that schools should provide students with environmental education experiences. A third of administrators and teachers also reported that they did not have the knowledge to feel comfortable promoting environmental education.

Recommendations from other Needs Assessments

A 2007 needs assessment was conducted by the NERR system and surveyed 988 teachers and informal educators to investigate how they taught about estuaries. This report found that when teachers chose not to include estuarine content, it is often due to lack of time to add materials not required in standardized curriculum. The report added,

> *"Teachers also worry about their own knowledge of a topic, the availability of necessary materials and equipment or funds, and whether the materials are at the appropriate level for their students. Many say they wouldn't teach coastal topics because of their location away from the coast."*

In terms of professional development, middle school teachers expressed special interest in using real-time data like that provided by SWMP, as well as visualizations and data analysis software. Teachers preferred multi-day (1-3) focused workshops as well as consulting support over time. Programmatic recommendations from this needs assessment include:

- Materials that include innovative pedagogical techniques such as hands-on and inquiry methods will easily fit within teachers' current practices.
- Curriculum materials that focus on interdisciplinary learning opportunities use authentic contexts that are relevant to local communities. Curriculum that supports student understanding about human impact on the environment and to develop into responsible citizens who can make a difference about important global issues are especially interesting to teachers.
- All materials should address state or local curriculum standards (p. vii).

In 2002, Rosanne Fortner and Jeffrey Corney conducted and published an educational needs assessment for the Great Lakes region. Key findings from this document, which surveyed over 300 middle school science teachers, emphasized the importance of teacher training on Great Lakes topics. For example, only 4% of teachers said they would use Great Lakes curriculum materials without being instructed themselves. Topics that teachers most wanted information about included water quality, environmental responsibility, water uses and conservation, and toxic chemicals. The report also included results of a Great Lakes literacy survey which found that the general public scored 45% on an interdisciplinary test of Great Lakes knowledge. However, recreationists who used the Great Lakes scored 56%, suggesting a relationship between direct experience and knowledge.

In 2007, Patrick Robinson and Robin Shepard conducted a needs assessment to determine Wisconsin's freshwater estuary needs in terms of research, management and outreach. The high priority outreach needs for Lake Superior were

1. Address land use impacts and build local capacity related to land use decision making.

2. Foster and increase partnerships, citizen involvement, and sense of place related to freshwater estuaries.

3. Increase application of watershed management approaches.

4. Identify and protect critical freshwater estuary resources.

While all of these needs are applicable to the Lake Superior NERR, the second has the strongest implications for the education program. Programs should address citizen involvement in freshwater estuaries and foster a sense of place associated with them. This dovetails with recommendations made by the public in this needs assessment.

Another regional needs assessment investigating the needs of K-12 classroom teachers was conducted in Minnesota North Shore schools by Kevin Zak and Peter Smerud (2007) through the Minnesota Coastal Management program. In regards to environmental education, the biggest barriers were inadequate funding, lack of access to transportation, and lack of time amidst required core subjects. All of these barriers are echoed by teachers in this needs assessment. When asked to rate their level of knowledge on a variety of topics, teachers ranked "specific coastal resource management issues (fisheries, forestry, development etc.)" lowest (3.02 with 5 equaling the most knowledge). This topic was also ranked as the highest level of need for EE professional development, followed by aquatic ecosystems. The method in which training was most desired by teachers was outdoor education, followed by place-based education.

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Appendix 1. Educator Focus Group Script and Questions

Lake Superior National Estuarine Research Reserve
Education Front-end Evaluation: Educator Focus Group Question Set

Date_____ Time_____ Focus Group Location_____

Number of participants: Male_____ Female_____

Number of participants who work with the following age groups:

# Pre-K	# K-5	# Middle School (6, 7, 8)	# High School

Introductory Script: The Lake Superior National Estuarine Research Reserve was recently designated in Douglas County, Wisconsin and is one of 28 National Estuarine Research Reserves in the country, and the second freshwater estuary in NOAA's system. An Education Coordinator was recently hired and is charged with developing estuary-related educational programs for P-12 students, educators and community members. In planning for the education programs, she (I) is (am) conducting a front-end evaluation in order to provide an opportunity for community input in the formation of the LSNERR education programs, as well as an opportunity to build and enhance relationships with key education partners through collaborative development of the program. Your participation in this process is completely voluntary and should take about an hour of your time. Please answer the following eight questions to the best of your ability, using examples when needed. The facilitator will add you to a list of people who would like to speak if you raise your hand, but please consider this to be a free flowing discussion.

1. What resources (curriculum, activities, field trips, publications, websites), if any, do you use to teach about natural resources and the environment? Please provide specific examples.
2. What kinds of resources are the most useful to you? Please provide examples if you can.
3. What topics related to natural resources and the environment would you most like to teach more about? (Some examples include: ecology, climate change, scientific research techniques, environmental history, human impacts and water quality, environmental literature, plant/animal identification and natural history, or environmental ethics)
4. What barriers exist to teaching about natural resources and the environment in your school? What types of support help you to overcome those barriers?
5. What sorts of programs would you like to see for students at LSNERR?

6. What makes a good professional development experience for you?
7. What professional development needs do you see in this community that LSNERR might address? (ie, what do teachers need to know?)
8. What types of programs would you like to see for teachers at LSNERR?

Appendix 2. Educator Survey

Lake Superior National Estuarine Research Reserve
Education Front-end Evaluation: Educator Survey

Name (optional)_____ **Years spent teaching**:_____

Grade level(s) taught:_____ **School you currently teach at**:_____

INSTRUCTIONS: Please completely fill out all of the information requested in this form. All of your answers are for evaluative purposes only and will be kept strictly confidential. If information from this survey is used, it will be disassociated from your name or any personal identifiers.

Definition of Terms
Estuary: An estuary is a semi-enclosed coastal body of water where two different bodies of water meet and mix.
Watershed: An area of land where all the water drains to a common place.
Ocean: Related to a system of open-ocean habitats, characterized by exposure to wave action, tidal fluctuations and ocean currents.

1. **How many years have you been teaching estuary, watershed, Lake Superior and ocean related topics?**

	None	Less than 2 years	2-3 years	3-5 years	5-7 years	7-10 years	10-15 years	More than 15 years
Estuaries								
Watershed								
Ocean								
Lake Superior								

2. **How many class or activity periods of estuary, watershed, Lake Superior and/or ocean instruction do your students receive in a typical school year?**

	None	A portion of one class	One to two classes per year	3 to 5 classes per year	6-15 classes per year	More than 15 classes per year
Estuaries						
Watershed						
Ocean						
Lake Superior						

3. In the last three years, how many hours of professional development training in science have you obtained related to estuaries, watersheds, Lake Superior and the ocean?

	None	Less than 8 hrs	8-16 hrs (1-2 days)	16-24 hrs (2-3 days)	24-32 hrs (3-4 days)	32-40 hrs (4-5 days)	More than 40 hours
Estuaries							
Watershed							
Ocean							
Lake Superior							

4. Which professional development trainings have you taken to supplement your estuary/watershed/ocean education? Check all that apply.

- ☐ NOAA/NERRS Teachers on the Estuary Training
- ☐ Project WET
- ☐ Project Wild Aquatic
- ☐ Green Eggs and Sand Workshop
- ☐ The Jason Project Professional Development
- ☐ Earth Partnership for Schools
- ☐ Sea Grant/COSEE workshops
- ☐ Other, please specify_____
- ☐ None of the above

5. **Think about your plans for your class for the entire year. How much emphasis did you or will you give each of the following?**

	Little or no emphasis	Moderate emphasis	Heavy emphasis	N/A
Outdoor experiential activities				
Lab or Field Work/data collection				
Stewardship projects or activities				
Data analysis, statistics, and probability				
Scientific inquiry skills				

6. **There is a National Estuarine Research Reserve located in Superior, WI, called the Lake Superior National Estuarine Research Reserve, which is one of 28 Reserves around the country protected for the purposes of education, research, water-quality monitoring and coastal stewardship. Were you aware that your state has a National Estuarine Research Reserve?**
   - ☐ Yes.
   - ☐ No.

7. **How often do you incorporate discussion about the effects of climate change on coastal areas in your classroom?**

   Never Rarely Sometimes Often Very Often

8. **From which web resources do you currently obtain estuary, watershed, and ocean information for use in your classroom?** Check all that apply.

   - ☐ NOAA's Education Website - http://www.education.noaa.gov
   - ☐ National Estuarine Research Reserve System's Website - http://nerrs.noaa.gov
   - ☐ National Estuarine Research Reserve System's, Education Website – http://www.estuaries.gov
   - ☐ NSTA Estuaries Sci Guide - http://sciguides.nsta.org

- ☐ Lake Superior Streams- http://www.lakesuperiorstreams.org
- ☐ Water on the Web- http://www.waterontheweb.org/
- ☐ EPA Education Website - http://www.epa.gov/enviroed/
- ☐ Wikipedia - http://wikipedia.org
- ☐ National non-profit. Which one(s)?_____
- ☐ Local non-profit. Which ones(s)? _____
- ☐ Other_____
- ☐ I do not use web resources.

9. **Which of the following real-time/archived data sets would you need synthesized into age-appropriate learning materials and visualizations for your teaching?** Check all that apply. **Note: We're defining real-time data streams as data that you can access as the data are being collected by scientific instruments, or shortly thereafter, to study current conditions or events. Archived data are defined as older data that are still important and necessary for future reference, but are stored and indexed so that they can be easily located and retrieved.*

- ☐ algal blooms
- ☐ animal tag/tracking
- ☐ atmospheric carbon dioxide
- ☐ bathymetry/topography
- ☐ currents
- ☐ dissolved oxygen (DO)
- ☐ fish species & abundance
- ☐ nutrients
- ☐ ocean color
- ☐ pH
- ☐ salinity
- ☐ sea level rise
- ☐ temperature: air
- ☐ temperature: water
- ☐ water depth
- ☐ water contaminants
- ☐ water turbidity (clarity/cloudiness)
- ☐ waves
- ☐ zooplankton species
- ☐ invasive species
- ☐ sedimentation
- ☐ aquatic plants
- ☐ None of the above
- ☐ Other, please specify_____

Appendix 3. Public Focus Group Script and Questions

Lake Superior National Estuarine Research Reserve
Front-end Evaluation: Public Focus Group Question Set

Date_____ Time_____ Focus Group Location_____

Number of participants: Male_____ Female_____

Introductory Script: The Lake Superior National Estuarine Research Reserve was recently designated in Douglas County, Wisconsin and is one of 28 National Estuarine Research Reserves in the country, and the second freshwater estuary in NOAA's system. An Education Coordinator was recently hired and is charged with developing estuary-related educational programs for P-12 students, educators and community members. In planning for the education programs, she (I) is (am) conducting a front-end evaluation in order to provide an opportunity for community input in the formation of the LSNERR education programs. Your participation in this process is completely voluntary and should take about an hour of your time. Please answer the following eight questions to the best of your ability, using examples when needed. The facilitator will add you to a list of people who would like to speak if you raise your hand, but please consider this to be a free flowing discussion.

1. Please share your name and why you decided to join this group today.

2. How did you first hear about the Lake Superior National Estuarine Research Reserve? What was your initial impression of this new designation?

3. Why is the St. Louis River Estuary important in this community?

4. How do you use the St. Louis River Estuary and the lands that are now part of the National Estuarine Research Reserve?

5. How do you think people in the community generally use the property that is designated as part of the reserve?

6. In regards to the St. Louis River Estuary, what do you wish you knew more about?

7. What kinds of public programs do *you* hope to see at the LSNERR?

Appendix 4. Individual Interview Questions

Lake Superior National Estuarine Research Reserve
Front-end Evaluation: Interview Questions

Date_____ Time_____ Location or phone call_____

Participant name:_____
Organization:_____

Introductory Script: The Lake Superior National Estuarine Research Reserve was recently designated in Douglas County, Wisconsin and is one of 28 National Estuarine Research Reserves in the country, and the second freshwater estuary in NOAA's system. An Education Coordinator was recently hired and is charged with developing estuary-related educational programs for P-12 students, educators and community members. In planning for the education programs, she (I) is (am) conducting a front-end evaluation in order to provide an opportunity for community input in the formation of the LSNERR education programs. Your participation in this process is completely voluntary and should take about an hour of your time. Please answer the following eight questions to the best of your ability, using examples when needed.

1. Describe your involvement, if any, in the Lake Superior NERR and the NERR designation process.

    a. If you have not been involved in the NERR or the designation process, how did you first hear about the Lake Superior National Estuarine Research Reserve? What was your initial impression of this new designation?

2. Why do you believe the St. Louis River Estuary is important in this community?

3. How do you use the St. Louis River Estuary and the lands that are now part of the National Estuarine Research Reserve?

4. How do you think people in the community generally use the reserve?

5. In regards to the St. Louis River, the estuary, and Lake Superior, what do you wish you knew more about?

6. What do you wish people in the broader community knew more about?

7. What kinds of programs in each of these categories do you think would of value to the regional community:
    - Early Childhood/Preschool programming:
    - K-12 Education programs:
    - University and College programs:
    - Adult Education programs:
    - Community and family programs:

8. The Lake Superior NERR has recently purchased two buildings on Barkers Island. One (the Boat House) will function as our office and research lab. The other (the Vista Building) will be a visitor's center with interpretive displays, open to the public. What themes, ideas or stories do you think are important to share in the visitors center displays?

9. Do you have any further recommendations for the Lake Superior NERR Education Programs?

Appendix 5. Wisconsin and Minnesota NERR-related State Standards

Grades	MN Science Standards				
K	Living things are diverse with many different observable characteristics (4).	Natural systems have many components that interact to maintain the system (4).			
1st	Scientists work as individuals and in groups to investigate the natural world, emphasizing evidence and communicating with others (1).	Designed and natural systems exist in the world. These systems are made up of components that act within a system and interact with other systems (1).	Earth materials include solid rocks, sand, soil and water. These materials have different observable physical properties that make them useful (3).	Living things are diverse with many different observable characteristics (4).	Natural systems have many components that interact to maintain the system (4).
2nd	Living things are diverse with many different observable characteristics (4).	Natural systems have many components that interact to maintain the system (4).			
3rd	Water circulates through the Earth's crust, oceans and atmosphere in what is known as the water cycle (3).				
4th	*n/a*				
5th	In order to maintain and improve their existence, humans interact with and influence Earth systems (1).	Natural systems have many components that interact to maintain the living system (4).	1. Humans change environments in ways that can be either beneficial or harmful to themselves and other organisms (4).		
6th	*n/a*				
7th	Natural systems include a variety of organisms that interact with one another in several ways (4).	The flow of energy and the recycling of matter are essential to a stable ecosystem (4).	Human activity can change living organisms and ecosystems (4).		

8th	Water, which covers the majority of the Earth's surface, circulates through the crust, oceans and atmosphere in what is known as the water cycle (3).				
9th 10th 11th 12th	Natural and designed systems are made up of components that act within a system and interact with other systems (1).	The interrelationship and interdependence of organisms generate dynamic biological communities in ecosystems (4).	Matter cycles and energy flows through different levels of organization of living systems and the physical environment, as chemical elements are combined in different ways (4).	Human activity has consequences on living organisms and ecosystems (4).	

Grade	Wisconsin Social Studies Standards					
1st	Describe and give examples of how people interact with the physical environment. (A.4.4)	Explain how some of Wisconsin's resources play a role to help out the economy. (D.4.3)(ITL D.4.1)				
2nd	Identify major changes in the local community that have been caused by human beings and their probable effects on the community and the environment. (A.4.8)	Describe and give examples of ways in which people interact with the physical environment, including use of land, location of communities and methods of construction and design of shelters. (A.4.4)(ITL A.4.5, B.4.7, C.4.1)	Give examples to show how scientific and technological knowledge has led to environmental changes. (A.4.9) (ITL B.4.7)	Compare past and present technology related to energy, transportation, and communications, and describe these changes on people and the environment. (B.4.8)(ITL B.4.7, a.4.2, B.4.3, B.4.6)	Explore the American Indians in history. (B.4.10)(ITL B.4.6)	

3rd	Use reference points, latitude, longitude, direction, size, shape, and scale to locate positions on the earth's surface. (A.4.1)(ITL B.4.3)	Locate on a map or globe, physical features such as resources, flora, fauna; and human features such as cities, states, and national borders. (A.4.2)(ITL B.4.3)	Describe and give examples of ways people interact with the physical environment, including use land, and location of communities. (A.4.4)(ITL A.4.5, B.4.7, C.4.1)	Identify weather patterns and seasons, floods, droughts, and describe the social and economic effects of these changes. (A.4.6)(ITL B.4.3)	Give examples to show how scientific and technological knowledge ha led to environmental changes, such as pollution prevention measures, and solar heating. (A.4.9)(ITL B.4.7)	Locate on map or globe physical, natural, and human features. (A.4.2)
4th	Describe and give examples of ways in which people interact with the physical environment. (A.4.4)	Locate on map or globe physical, natural, and human features. (A.4.2)	Construct a map of the world, showing the locations of major land and water masses. (A.4.3)			
5th	Utilize and construct various types of maps and apply appropriate vocabulary to describe aspects of physical geography of the United States. (A.8.1, A.8.2)(ITL B.8.3, C.8.4)					
6th	Construct maps of the world, past and present. (A.8.2)(ITL A.8.1, D.8.1)					
7-12th	*Standards not yet established.*					