

Education Needs Assessment for the Lake Superior National Estuarine Research Reserve

by:  
Bryan Sederberg

A practicum submitted  
in partial fulfillment of the requirements  
for the degree of  
Master of Science  
Natural Resources and Environment  
at the University of Michigan  
April 2010

Co-advisors:  
Thomas Johengen—University of Michigan  
Ellen Brody—National Oceanic and Atmospheric Administration



## **ABSTRACT**

This project was conducted to assist in the development of the educational component of the overall Management Plan produced for the designation of the St. Louis River as the Lake Superior National Estuarine Research Reserve (LSNERR). The study was designed to complete a preliminary education needs assessment for the region using the framework of the NOAA Coastal Services Center's Needs Assessment Training Module. An inventory of existing education programs was completed and meetings were held with 21 representatives from 13 different organizations that identified several themes for the focus of the future education programming at the LSNERR. A survey of 25 education stakeholders validated the need for education programming in the following areas:

- Adult Education
- Teacher Training and Curriculum Development
- Coordination of Area Education Programs
- Promoting the idea of the St. Louis River as a Working Estuary
- Professional Development

Recommendations were developed for each of the identified educational themes to help ensure that the future LSNERR's education programming successfully address the program areas identified in the needs assessment. The recommendations were formulated based on the results of the needs assessment along with additional education material from the NERR system website, a review of the Old Woman Creek (OWC) NERR, primary literature, and information gathered from stakeholder meetings and surveys.

## **ACKNOWLEDGEMENTS**

I would like to thank the following individuals for assisting me with this study and offering assistance whenever needed throughout the process.

**Becky Sapper**, University of Wisconsin Extension

**Ellen Brody**, National Oceanic and Atmospheric Administration

**Thomas Johengen**, University of Michigan

**Cathy Techtman**, University of Wisconsin Extension

## TABLE OF CONTENTS

Abstract.....	ii
Acknowledgements.....	iii
Table of Contents.....	iv
List of Tables and Figures.....	v
List of Appendices.....	v
List of Acronyms.....	v
Executive Summary.....	1
Introduction.....	9
The National Estuarine Research Reserve System.....	9
The Lake Superior National Estuarine Research Reserve System.....	10
Practicum Purpose and Objectives.....	12
Study Approach.....	13
A Needs Assessment.....	13
Results.....	18
Review of Existing Education Programs.....	18
Stakeholder Meetings.....	18
Survey.....	22
Discussion.....	25
Future LSNERR Education Programs.....	25
Recommendations.....	26
Conclusion.....	33
Future Research.....	33
Final Recommendation.....	33
References.....	34

**LIST OF TABLES AND FIGURES**

Figure 1: Map of NERR System .....9

Figure 2: Proposed LSNERR .....10

Table 1: Members of the LSNERR Coordination Team.....11

Table 2: Draft Timeline for LSNERR Management Plan.....12

Figure 3: Stakeholder Meeting Questions.....15

Table 3: Stakeholder Survey.....16

Table 4: Stakeholder Meeting Participants.....19

Table 5: Inventory of Existing Education Programs..... 20

Table 6 Survey Results by Percentages.....23

Table 7: Survey Results by Ranking.....23

Figure 6: Pie Graphs of Survey Results.....24

**LIST OF APPENDICES**

Appendix 1. Program Overviews.....38

Appendix 2. Survey Comments .....53

**LIST OF ACRONYMS**

- GLA:** Great Lakes Aquarium
- K-12:** Kindergarten through high school, 12<sup>th</sup> grade
- LSNERR:** Lake Superior National Estuarine Research Reserve
- LSRI:** Lake Superior Research Institute
- MN:** Minnesota
- DNR:** Department of Natural Resources
- MPCA:** Minnesota Pollution Control Agency
- NERR:** National Estuarine Research Reserve
- NGLVC:** Northern Great Lakes Visitor Center
- NOAA:** National Oceanic and Atmospheric Administration
- OWC:** Old Woman Creek (National Estuarine Research Reserve)
- RSPT:** Regional Stormwater Protection Team
- SEEK:** Sharing Environmental Education Knowledge
- UWEX:** University of Wisconsin-Extension
- UWS:** University of Wisconsin-Superior
- WCMP:** Wisconsin Coastal Management Program
- WI:** Wisconsin

## **EXECUTIVE SUMMARY**

This project was conducted to assist in the development of the educational component of the overall Management Plan produced for the designation of the St. Louis River as the Lake Superior National Estuarine Research Reserve (LSNERR). The study was designed to complete a preliminary education needs assessment for the region using the framework of the NOAA Coastal Services Center's Needs Assessment Training Module. An inventory of existing education programs was completed and meetings were held with 21 representatives from 13 different organizations that identified several themes for the focus of the future education programming at the LSNERR. A survey of 25 education stakeholders validated the need for education programming in the following areas:

- Adult Education
- Teacher Training and Curriculum Development
- Coordination of Area Education Programs
- Promoting the idea of the St. Louis River as a Working Estuary
- Professional Development

Finally, recommendations were developed for each of the identified educational themes to help ensure that the future LSNERR's education programming successfully address the program areas identified in the needs assessment. The recommendations were formulated based on the results of the needs assessment along with additional education material from the NERR system website, a review of the Old Woman Creek NERR, primary literature, and information gathered from stakeholder meetings and surveys.

## **Education Themes and Recommendations**

### ***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. Old Woman Creek 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 targets 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.*

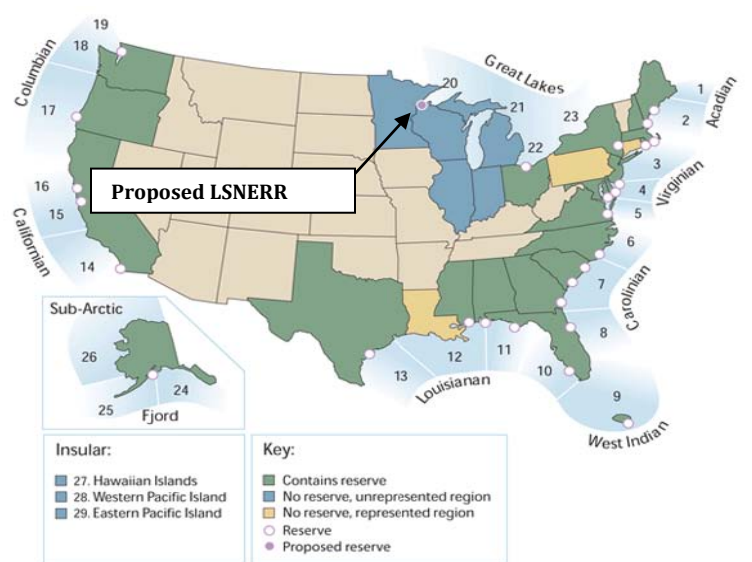
The Duluth-Superior region is fortunate to have several governmental and non-governmental research organizations, such as the Wisconsin Department of Natural Resources, UWS-LSRI, WI and MN Sea Grant, the University of Minnesota Duluth, the Environmental Protection Agency, United States Geological Survey, 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.

## INTRODUCTION

### The National Estuarine Research Reserve System

The National Estuarine Research Reserve (NERR) System is a network of 27 reserves located throughout the United States that represent a variety of different biogeographical regions (Fig. 1). The primary goals of the reserve system are to protect fragile estuarine habitat for long-term research and monitoring, and to offer educational programming to local communities and decision makers to promote stewardship of these natural resources. The NERR system is structured as a partnership between the National Oceanic and Atmospheric Administration (NOAA) and the coastal state in which the reserve exists. NOAA's role in this partnership is to fund and guide the reserve's management which is the responsibility of the state, typically a university or state agency.

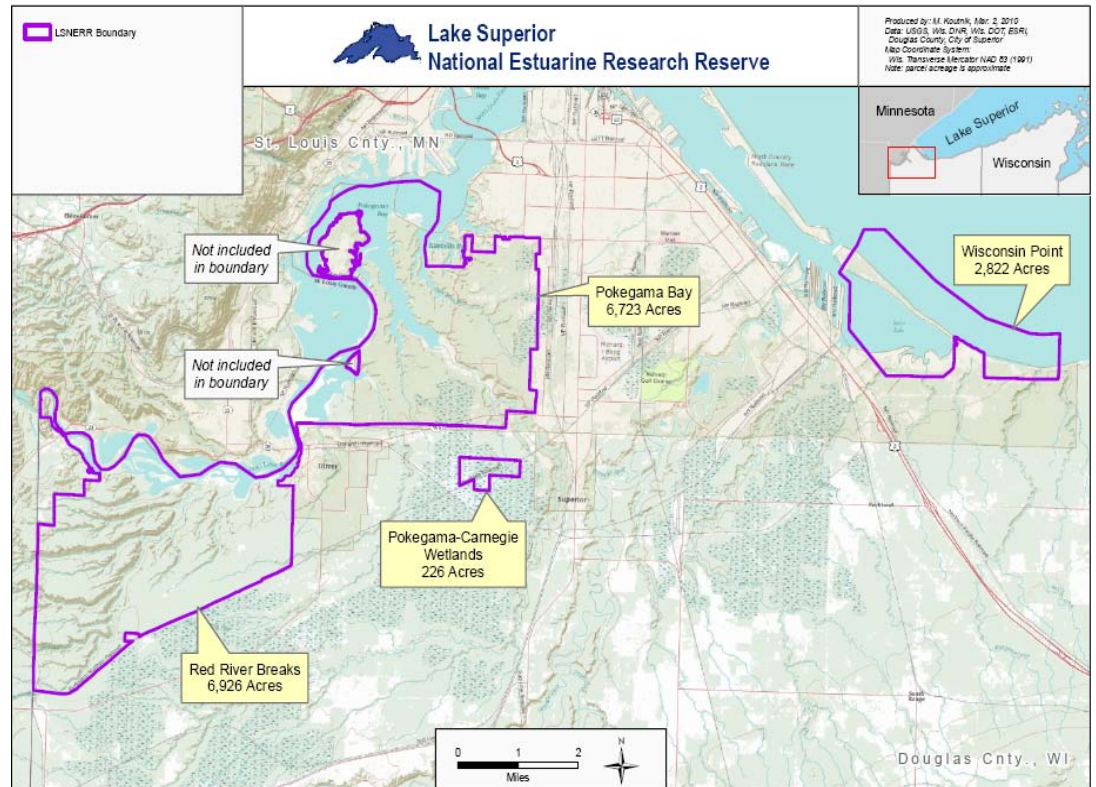


**Figure 1.** Map of the NERR System and the proposed LSNERR.

The NERR mission is to practice and promote coastal and estuarine stewardship through innovative research and education, using a system of protected areas. The reserve works at the local community and regional level to address natural resource management issues and to provide educational opportunities for K-12 students as well as coastal training for decision makers. The reserve also provides research opportunities for research professionals and college students by providing research facilities and equipment. The core management priorities the NERR system wishes to address are land use and population growth, habitat loss and alteration, water quality degradation, and the changes in biological communities. In order to effectively address these issues, the NERR system's guiding principles establish strong partnerships between federal, state, and local levels to implement an ecosystem based management approach (NERRS 2010).

## The Lake Superior National Estuarine Research Reserve

The St. Louis River is located at the western tip of Lake Superior. Portions of the freshwater estuary located on the St. Louis River are being considered for a designation as the LSNERR (Fig. 2). The LSNERR is not yet officially designated, but if designated will join the Old Women Creek NERR as the only two NERRs in the Great Lakes region. The watershed of the St. Louis River crosses state boundaries between the states of Wisconsin and Minnesota and serves as the state boundary for 23 miles before it empties into Lake Superior. The lead state, Wisconsin, plans to designate more than 16,000 acres as the future reserve to be used as the “living” laboratory for scientists and a classroom for the general public (LSNERR 2010).



**Figure 2.** Detailed map of the proposed LSNERR including the area of the St. Louis River confluence with Lake Superior

The St. Louis River is the largest United States tributary to Lake Superior and creates a large freshwater estuary as it enters Lake Superior. The estuary plays a vital role in environmental and social processes. Wisconsin’s portion of the reserve is home to nine rare natural communities and several endangered and threatened species (LSNERR 2010). The area possesses several estuarine features such as a drowned river mouth and its large bay mouth bar. The estuary also serves as the location where warmer river water meets the cold water of Lake Superior creating a unique ecosystem that is necessary for different stages of many species’ life cycles. The estuary’s water level is also

affected by wind tides and seiche events creating unique shoreline habitats that are often submerged and dry in short time periods of time.

The landscape of the estuary saw many changes during and after the 19<sup>th</sup> century when European immigrants arrived. The bay mouth bar that separated the estuary from Lake Superior was cut to create the Duluth canal. Major dredging and shoreline development occurred to allow for shipping and commercial land use. The Duluth-Superior area is now home to over 275,000 people and serves as the largest port by volume on the Great Lakes (LSNERR 2010).

#### *Designation Process*

The nomination of the St. Louis River freshwater estuary as the future site for the LSNERR is a result of a thorough site selection process where 35 sites along Wisconsin's coast of Lake Superior were evaluated. Following the site nomination, a Coordination Team (Table 1) was created with members from the University of Wisconsin-Extension (UWEX) and Wisconsin Coastal Management (WCMP). The responsibility of the team is to coordinate the Management Plan process which includes the gathering of relevant information, the holding of public advisory committee meetings, and serving as acting liaison between NERR partners.

**Table 1.** Members of the LSNERR Coordination Team

<b>Team Member</b>	<b>Member Organization</b>
Becky Sapper	University of Wisconsin-Extension
Patrick Robinson	University of Wisconsin-Extension
Cathy Techtmann	University of Wisconsin-Extension
Travis Olson	Wisconsin Coastal Management Program
Sue O'Halloran	University of Wisconsin-Extension

The planning and evaluation process for establishing a new research reserve site encompasses a rigorous process requiring over 18 months to complete (Table 2). The initial scoping meeting for the LSNERR occurred in December 2008 with a goal for the final designation to be completed in July 2010. As part of this process, NOAA requires the responsible state to develop a Management Plan and to assist NOAA with drafting an Environmental Impact Statement for the reserve. The Management Plan requires a thorough review process which includes a public comment and review period. The Management Plan outlines, in detail, a number of strategies for addressing specific issues. This includes a detailed description of the reserve goals and objectives, management issues, and strategies or actions for meeting the goals and objectives. It also includes an administrative plan that includes staff roles in administration, research, education/interpretation, and surveillance and enforcement. The writing of the Management Plan requires a large amount of information. The majority of the information is readily available, but some requires further investigation, the reason for this study.

**Table 2:** The Draft Timeline for the LSNERR Designation and Management Plan.

Step 1: Scoping Meetings in Superior	December 1, 2008
Step 2: Draft Environmental Impact Statement Draft Management Plan	November 1, 2009
Step 3: Public Hearing in Superior	December 1, 2009
Step 4: 45-day Comment Period Ends	January 1, 2010
Step 5: Final Environmental Impact Statement/ Final Management Plan	April 2010 (estimated)
Step 6: 30-day Cooling-off Period	May 2010 (estimated)
Step 7: Record of Decision	June 2010 (estimated)
Step 8: Designation Ceremony	July 2010 (estimated)

**Practicum Purpose and Objectives**

The purpose of this study was to conduct an education needs assessment of the region’s education community to aid in the development of education programs at the future LSNERR as part of the larger Management Plan. In this context the region is defined as the Duluth-Superior area, the Minnesota North Shore, and the Wisconsin Shoreline of Lake Superior extending to the western portion of the Upper Peninsula of Michigan. The objectives of this study were to inventory the existing education programs in the region, to assess the gaps that existed in present educational programming as related to estuaries and wetlands, and to provide a recommendation to the future LSNERR of possible “niches” the reserve can fulfill. This Practicum report has also been included as an appendix within the first management plan for LSNERR and its recommendations have been incorporated into the ongoing LSNERR designation planning process. The following is a brief discussion of each of the study objectives:

1) Inventory of existing education programs

An understanding of the existing education programs in the region provides the foundation for partnerships and collaboration. It also provides the future LSNERR with an idea of the existing programs that exist and how programming is done in the area.

## 2) Assessment of educational programming

An inventory of existing resources will help identify possible education program areas for the future LSNERR. Stakeholder meetings will provide participants the opportunity to express their opinion of how they feel future LSNERR resources should best be utilized in the region.

## 3) Recommendation for future LSNERR education programming

Information gathered from the inventory and the assessment as well as the use of primary research and material from the NERR website will provide information to give a well formulated recommendation for future education program at the future LSNERR.

## **STUDY APPROACH**

### **A Needs' Assessment**

After initial meetings with members of the Coordination Team it was determined that completing a thorough needs assessment was the best approach to accomplish the objectives of the study and aid in the development of the Management Plan. The use of NOAA's Coastal Services Center's Needs Assessment Training (NAT) Module provided the proper training and framework to use for this study.

The Coordination Team was aware that valuable education programming is already occurring in the area and that a thorough analysis of the educational community was needed to determine the best possible role for the future LSNERR. NOAA's training module provided a logical sequence for completing the needs assessment and assured that the necessary steps and protocols were taken. Specifically, the needs assessment followed the steps outlined in the module's "12 Steps of a Needs Assessment" (NAT 2008). Each step played a critical role in identifying the needs of the region's education community. A summary of the desired outcomes and activities that were completed under each of the steps of the needs assessment is described below:

#### Step 1: Confirm the Issues and Audience

Confirming the issues and audience clarified the purpose of this study. Discussions with the Coordination Team made it clear that more information was needed on the education programs in the area and how the future LSNERR would fit into the community. An understanding of the available programs at the local community level would open up possibilities for partnerships as well as establish a platform for regional and national collaboration. A market needs assessment would assist in gathering necessary material for the Management Plan and provide useful information for future LSNERR education programming.

#### Step 2: Establish the Planning Team

A Planning Team plays a critical role in providing assistance in project design and support. The Planning Team must possess knowledge of the subject area to provide useful insight to the study. The Planning Team for this project included Becky Sapper (UWEX), Ellen Brody (NOAA-Office of National Marine Sanctuaries), and Thomas Johengen (University of Michigan). The main role of the Planning Team for this study was to help with creating the questions for the stakeholder meetings, structuring the secondary survey, and reviewing the study.

#### Step 3: Establish the Goals and Objectives

The goals and objectives of the study were formulated with the help of both the Coordination Team and the Planning Team. The goal of the study was to learn more about existing education programs in the Duluth-Superior region and to find potential education program areas for the future LSNERR. In order to attain the goal it was necessary to

inventory the existing education programs in the community and assess the educational gaps that exist in current programming. This would provide the necessary information to develop recommendations for future education programs at the LSNERR.

#### Step 4: Characterize the Audience

Characterizing the audience is critical to provide the scope of the study. The target audience was comprised of the region's education stakeholders who, in this context, are defined as being environmental education coordinators and managers, K-12 teachers, and outreach coordinators. The study paid particular attention to stakeholders with education programming interests in estuaries, wetlands, and coastal habitats. The main providers of education programming in the region include the NGLVC, the GLA, and LSRI. Tribes, cities, and counties also offer educational programming. There was an effort to include local K-12 schools, universities, and colleges but this had limited success.

#### Step 5: Conduct Information and Literature Search

Information found on the internet and literature received from stakeholders provided crucial background information on existing education programs. The review of this information occurred throughout the study but was used the most for the inventory of existing education programs and for the formulation of the recommendations. The internet was the primary source for the education program inventory and the program evaluations overviews.

Several sources were used to assist in the formulation of the recommendations. This includes the review of the Old Woman Creek NERR programs, the national NERR system website, and a review of primary literature. The recommendations also draw on information gathered from the stakeholder meetings and the survey taken by the stakeholders.

#### Step 6: Select Data and Collection Methods

In addition to data collected from the internet and the review of existing literature, information was gathered using more interactive methodologies including stakeholder meetings and a written survey. The inclusion of a written survey for social science research required an application for exemption from the University of Michigan's Internal Review Board.

#### *Stakeholder Meetings*

In order to learn more about the programs offered in the area, meetings were scheduled with key stakeholders in the region. Questions (Fig. 3) were developed to provide a framework for the meetings. Questions were targeted towards information that was difficult to find from the internet research. Question 1 focused on identifying existing education programs in the region, while questions 2 and 3 were asked to help identify the goals and audiences of those programs. Lastly, questions 4, 5, and 6 were intended to identify the needs or gaps in the region's education programming. The overall goal of the meetings was to learn



more about current environmental education programs and to identify education program areas for the future LSNERR.

- 1) What watershed, coastal wetlands, or freshwater estuary education programs are you aware of that are offered in the Duluth/Superior area or within the broader LS Basin?
  - *What are the agencies, organizations, schools, or other providers offering these programs?*
  - *Who are their target audiences?*
- 2) How are these programs coordinated within the basin?
  - *In your opinion are programs coordinated effectively?*
- 3) Please describe the goals of your education program.
  - *What is your program's take away message?*
- 4) What would help you in your educational programming as it relates to the St. Louis River and freshwater estuaries issues?
- 5) Given what you know about NERR System, how do you envision the role of the LSNERR within the education community at the St. Louis River and Lake Superior Basin?
- 6) What other suggestions or ideas do you have to guide the development of educational programs at the LSNERR?

**Figure 3.** The stakeholder meeting questions were sent prior to the meetings.

### *Survey*

Following the analysis of the information gathered from the stakeholder meetings, a written survey (Table 3) was conducted to validate and further analyze the results summarized from the meetings. Several common themes for future education programs arose during the interviews and in order to authenticate these results a survey was created. The survey consists of four questions. The first two questions were used to gauge the familiarity the population had with the NERR system and whether they supported the designation or not. The third question allowed the respondent an opportunity to weigh the importance of each theme. The fourth question provided space for the participant to provide any additional comments they felt were important to share with needs assessment study. The goal of the survey was to gauge whether the themes identified in the meetings are needed by the area's education community.

### Step 7: Determine Sampling Scheme

It was identified that stakeholder meetings were the best way to learn about current education programs in the area. This would also be the best way to learn of the needs of the education community. The Planning Team agreed the best way to validate the needs of the community would be the use of a written survey.

**Table 3.** The questions used in the Stakeholder Survey.

<p><b>1. How familiar are you with the National Estuarine Research Reserve System?</b>          Very Familiar          Familiar          Heard of it          What is that?</p> <p><b>2. Do you support the designation of the St. Louis River as a National Estuarine Research Reserve?</b>          Yes          No          Not Sure</p> <p><b>3. Please rate the importance of each "need" of the Duluth/Superior area environmental education community as it relates to freshwater estuary education.</b>  <i>Choices: Not Needed, Needed but not necessary, Important, Very Important</i></p>
<p>Teacher/Professional Development          Coordination of Area Education Programs          Teacher Training and Curriculum Development          Adult Education          Message of Working Estuary          Education Programs for Coastal Decision Makers, etc          Interpretative Educational Facilities</p>

*Stakeholder Meetings*

Meetings were scheduled during the months of July and August 2009 using an online scheduler. Participants were identified by internet research of existing education programs, from the list of stakeholders who participated in the public advisory committees, and from stakeholder referrals. In total, emails were sent to 35 education stakeholders in the region to schedule meeting times. The majority of meetings were held either at a neutral location or at the organization's office. A few of the meetings were teleconferences. The questions for the meetings were sent to stakeholders prior to the meeting to allow them to prepare answers. During the meeting the questions provided a loose framework to work from and responses were recorded for later evaluation.

*Survey*

During the fall and early winter of 2009 results from the meetings were evaluated. In January 2010, the survey was designed and distributed to the representatives who participated in the stakeholder meetings, and to additional stakeholders who were not available to meet during the summer of 2009.

Step 8: Design and Pilot the Collection Instrument

The questions for the stakeholder meetings and the survey was reviewed by the Planning Team and piloted with members of the

LSNERR Coordination Team. Comments were provided by the pilot group and changes were made before distribution to assure effectiveness of the questions for the stakeholder meetings and the survey.

#### Step 9: Gather and Report Data

##### *Stakeholder Meetings*

In order to increase the likelihood of participation, emails were sent to remind participants to schedule meetings. Meetings were held with 21 different representatives from 13 different agencies. Information during the meetings was recorded and later used to supplement the program overviews and in developing the recommendations.

##### *Survey*

The survey was distributed using an online survey (SurveyMonkey.com) to the same 35 education stakeholders who received meeting invitations. 25 anonymous participants responded to the survey. Results of the survey are included in the results section.

#### Step 10: Analyze Data

##### *Stakeholder Meetings*

Analysis of the data collected during the meetings occurred following the completion of the interviews. Information from questions 1-3 was used for program overviews to supplement the information from internet research. Questions 4-6 targeted the gaps and/or needs of the region's education community. The responses were evaluated paying particular attention to recurring themes or ideas. Information from these questions was later used to formulate the survey and eventually the final recommendations.

##### *Survey*

The survey was used to validate the results found in the meetings. Question 3 of the survey allowed the themes from the meetings to be ranked. Participants were able to choose from four rankings: Very Important, Important, Needed but Not Necessary, and Not Needed. To assist the Coordination Team, two additional themes were added to the online survey to help gauge the need for programming related to the NERR System's Coastal Training Program and the perceived needs of an educational facility. These themes were not identified through the stakeholder meetings and are not directly tied to this study.

#### Step 11: Manage Data

Information collected from the meetings was analyzed and summarized for the Management Plan in this present report. The data from the survey was collected by surveyMonkey.com and are also included in this report.

### Step 12: Synthesize Data and Create Report

After validating the themes with the survey, it is reasonable to say the needs identified in the stakeholder meetings are the true needs of the education community. This study goes on to develop recommendations for how the future LSNERR can address each need. A variety of information was used to develop the recommendations; this includes stakeholder input, a primary literature review, a review of the NERR system education program, and input from the Old Woman Creek NERR staff.

The Old Woman Creek NERR is the only existing NERR in the Great Lakes Region. Old Woman Creek offers similar types of programs that could be offered at the future LSNERR. A meeting was held with Old Woman Creek's reserve manager, coastal training program coordinator, and education coordinator in the fall of 2009. This study and its results were discussed and the Old Woman Creek staff provided advice and input to how they have addressed similar needs with Old Woman Creek Reserve.

## RESULTS

### Review of Existing Education Programs

Completing an inventory of the existing education programs related to estuaries was the starting point for this assessment. Information was provided by the Coordination Team of the major educational organizations in the region and further research uncovered additional educational programs. The internet was a valuable tool to learn about specific programs in the region. The internet provided useful information on individual programs, such as its purpose and contact information, but it usually lacked the detail the assessment needed. Often the information was outdated and specific information regarding the target audiences, the program's focus, and program partners were unclear. Internet research provided much of the information used for the program overviews but more information was needed for a more thorough assessment of the community.

### Stakeholder Meetings

Meetings were held with 22 representatives from the education community (Table 4). Information gathered in the meetings provided useful information for the program overviews, the identification of the community's needs, and the final recommendations.

The following describes the responses from the stakeholder meetings.

*Question 1: What watershed, coastal wetlands, or freshwater estuary education programs are you aware of that are offered in the Duluth/Superior area or within the broader LS Basin?*

Responses to question 1 identified several programs that were previously not yet inventoried. A large variety of environmental education programs exist in the region and it was important to focus on programming specifically related to estuaries, wetlands, and coastal resources. Internet research and information provided by question one resulted in the inventory and review of 33 different educational programs from 13 different organizations (Table 5).

*Question 2: How are these programs coordinated within the basin?*

The meetings expanded on the information found during the internet research. Question 2 asked about how the coordination of education programs occurs in the region. Many participants noted that there was no formal coordination body within the community and it mainly works on an 'everybody knows everybody' network. This meant if an event or program was to be offered it travels by word of mouth or emails. During the meetings it was not uncommon to learn of the same programs from different organizations and it was quickly recognized that several partnerships exist within the community.

**Table 4.** These members of the education community participated in the Stakeholder Meetings.

<b>Stakeholder</b>	<b>Job Title</b>	<b>Organization</b>
Deb Anderson	Water Resources Faculty	Lac Courte Oreilles Ojibwe Community College
Sandra Carey	Environmental Services	City of Superior
Jane Edwards	Environmental Services	City of Superior
Heather Elmer	Coastal Training Program	Old Woman Creek NERR
Sarah Erickson	Education Director	Great Lakes Aquarium
Betty Gumm	Environmental Services	City of Superior
Jeff Gunderson	Director	Minnesota Sea Grant
Shannon Judd	Education Coordinator	Fond du Lac Reservation
Mike Kennedy	Environmental Educator	Minnesota Pollution Control Agency
Kate Kubiak	Conservation Specialist	South St. Louis Soil & Water Conservation District
Nadine Meyer	MinnAqua Coordinator	Minnesota Department of Natural Resources
Diane Nelson	Environmental Services	City of Superior
Susan O'Halloran	UWE	Lake Superior Research Institute
Ruth Oppedahl	UWE	Northern Great Lakes Research Institute
Carrie Sanda	Environmental Services	City of Superior
Jim Sharrow	Facilities Manager	Duluth Seaway Port Authority
Richard Stewart	Co-Director	Great Lakes Maritime Research Institute
Cathy Techtmann	UWE	Northern Great Lakes Visitor Center
Molly Thompson	Program Manager	Sugarloaf
Jenny Thoreson	Environmental Services	City of Superior
Sarah Wilcox	Youth Educator	University of Wisconsin-Extension
Joan Wimme	Youth Educator	University of Wisconsin-Extension
Adele Yorde	Public Relations Manager	Duluth Seaway Port Authority

Existing Partnerships

One of the larger partnerships is the Regional Stormwater Protection Team (RSPT), which is coordinated by the South St. Louis Soil and Water Conservation District. The RSPT is comprised of 21 different municipalities and organizations whose mission is “to protect and enhance the region's shared water resources through stormwater pollution prevention by providing coordinated educational programs and technical assistance” (RSPT 2009). The focus of RSPT is stormwater prevention and their efforts are directly related to the health of the St. Louis River estuary.

The MPCA sponsors a website called SEEK, Sharing Environmental Education Knowledge. This website provides useful information on current education programming in the area. SEEK is an interactive website where education events, material, jobs, and additional materials are available specifically for Minnesota environmental education. It provides information on an array of education materials and is well maintained and updated (SEEK 2010).

Several large environmental education events sponsored by multiple organizations occur in the area. This includes the St. Louis River Watch (lead: Fond du Lac Tribal & Community College), River Quest (lead: Duluth Seaway Port Authority), and the Lake Superior Youth Symposium (lead: Western Upper Peninsula Center). These events are coordinated by the lead agency but include education material by a number of organizations in the area (see appendix 1 for partners).

**Table 5.** Inventory of Existing Education Programs by Organization

<b>Organization</b>	<b>Education Program</b>
City Of Superior	1. Public Education Involvement Relations
Duluth Seaway Port Authority	1. River Quest
Fond du Lac Tribal & Community College	1. St. Louis River Watch
Great Lakes Aquarium	1. Scouts 2. Voices of the Lake Speaker Series 3. Whirlgigs/Dive In Deeper 4. Partners in Education
Lake Superior Research Institute	1. View From the Lake 2. Environmental Education and Stewardship 3. Elderhostel Education
MinnAqua(MN DNR)	1. Leader's Guide 2. MinnAqua Educator Workshops 3. Festival of Fish
MN Sea Grant	1. Ask a Scientist Speaker Series 2. Traveling Trunk Adventure 3. Water on the Web
Northern Great Lakes Visitor Center	1. Paddle Through Time Curriculum 2. Fish Creek Estuary Education 3. Lake Superior Basin Stewardship Education 4. Adopt-An-Estuary
Regional Stormwater Protection Team	1. Lake Superior Streams Website 2. Lake Superior Watershed Festival 3. RSPT Workshops
South St. Louis Soil and Water Conservation District	1. Class Presentations 2. Conservation Education Curriculum 3. Watershed Friendly Service and Fundraising Projects 4. Envirothon
Sugar Loaf	1. Learning Cart
St. Louis River Citizen Action Committee	1. Watershed Guardian Program 2. Natural and Cultural History of the St. Louis River
Western UP Center	1. Great Lakes Maritime Transportation Education 2. Lake Superior Stewardship Initiative 3. Lake Superior Youth Symposium

*Question 3: Please describe the goals of your education program.*

Question 3 focused on the specific goals of each education program. The purpose of this question was to learn more about each education program and to check the information found on the internet. Specifically the question sought information on the program's target audience, education goals, and take away messages. This allowed for a more

thorough overview of each organization and education program (appendix 1) and added credibility to the assessment of available education programs.

*Questions 4-6: The Needs of the Education Community*

After learning about each organization's programs, questions 4-6 probed the needs of the education community. Each question asked what is needed in terms of education programming in a slightly different way. The responses to the questions did not always pertain to education, so the answers were sorted simply two different categories, educational needs and non-educational needs:

Educational Needs

Access to River/Estuary	Human Impacts on Estuary
Adult Education	Hydrological Cycle
College Educational Programming	Internships
Coordination of Education Programs	Market Science
Educational Facilities and Materials	Professional Development/Training
Environmental Ed. into K-12 Curriculum	Promote Idea of Working Harbor/Estuary
Family Learning	Public Programming
Historical Significance of Estuary	Real Time Data
	Recreational Education
	Regional Collaboration
	Sturgeon Re-introduction
	Target ages 17-23
	Teacher Training/Curriculum Dev
	Volunteer Training and Education

Non-Educational Needs

Collaborative Stream Monitoring  
Interpretive Center with Technical Support/Expertise  
Invasive Species Research  
Partnerships between MN and WI  
Sustainable Development of Harbor/Twin Ports  
Volunteer Base/Volunteer Training

As the meetings progressed, it became obvious that some of the needs were of higher priority than others, and that many ideas were part of a larger theme. The common themes that arose were:

- Adult Education
- Teacher Training and Curriculum Development
- Coordination of Area Education Programs
- Promoting the idea of a Working Harbor/Estuary
- Professional/Teacher Development

These ideas were frequent topics of conversation during the stakeholder meetings and were regularly expressed as potential areas where the future LSNERR should focus its programming. Along with these specific needs arose an emphasis on community and regional collaboration. This concept wasn't identified as a particular need of the community, but as a management strategy that should be used with all of the future LSNERR programming, specifically its education programming.



## Written Survey

In order to validate the results of the meetings, a survey was written to allow the meeting participants and other education stakeholders to rank the importance of the common themes that came out of the meetings. Two additional questions were added to the survey to gauge the familiarity participants have with the NERR system and their support for a LSNERR designation. Two additional themes, Education Programs for Coastal Decision Makers and Interpretative Educational Facilities, were added to the list to assist the Coordination Team. Twenty-five participants took part in the survey which was distributed on January 14, 2010 and collected on February 5, 2010. It is worth noting on question 3 that three themes, Professional/Teacher Development, Coordination of Area Education Programs, and Message of Working Estuary, only had 24 participants. All the others had 25. This could have been a technical error, but someone may have chosen not to rank these three.

### *Familiarity and Support*

In gauging the participants familiarity with the NERR system, 44% (n=11) were very familiar, 32% (n=8) were familiar, 20% (n=5) had heard of it, and 4% (n=1) chose the response “What is that?” meaning they were not familiar. In measuring the support for the LSNERR designation 100% of the respondents indicated that yes they support it. Several participants provided comments to question two. The comments, which are in appendix 2, encouraged the designation of the future LSNERR at the St. Louis River Estuary and stressed the importance of understanding the importance of freshwater estuaries.

### *Survey Results*

Based on the results of the survey, there is overwhelming support for the themes identified in the needs assessment. The pie charts in Figure 4 on page 21, shows the majority of participants ranking the themes either as very important or important. In gauging whether or not the themes should be considered, the results of the survey are grouped very important and important vs. not needed and needed but not necessary. Each theme received greater than 70% of votes in favor of very important or important with Teacher/Professional development being the lowest at 70.9% (Table 6).

**Table 6.** The percentage of votes for Very Important/Important vs. the percentage of votes for Not Needed/Needed, but not necessary.

<b>Educational Theme</b>	<b>Very Important/ Important</b>	<b>Not Needed/ Needed, but not necessary</b>
Professional/Teacher Development	70.9%	29.2%
Coordination of Area Education Programs	87.5%	12.5%
Teacher Training and Curriculum Development	76.0%	24.0%
Adult Education	96.0%	4.0%
Message of Working Estuary	87.5%	12.5%
Education Programs for Coastal Decision Makers	100.0%	0.0%
Interpretative Educational Facilities	84.0%	16.0%

The results were also ranked and the average rank for each theme was calculated. Rankings were based off of Very Important (1), Important (2), Needed, but not necessary (3), and Not Needed (4)(Table 7).

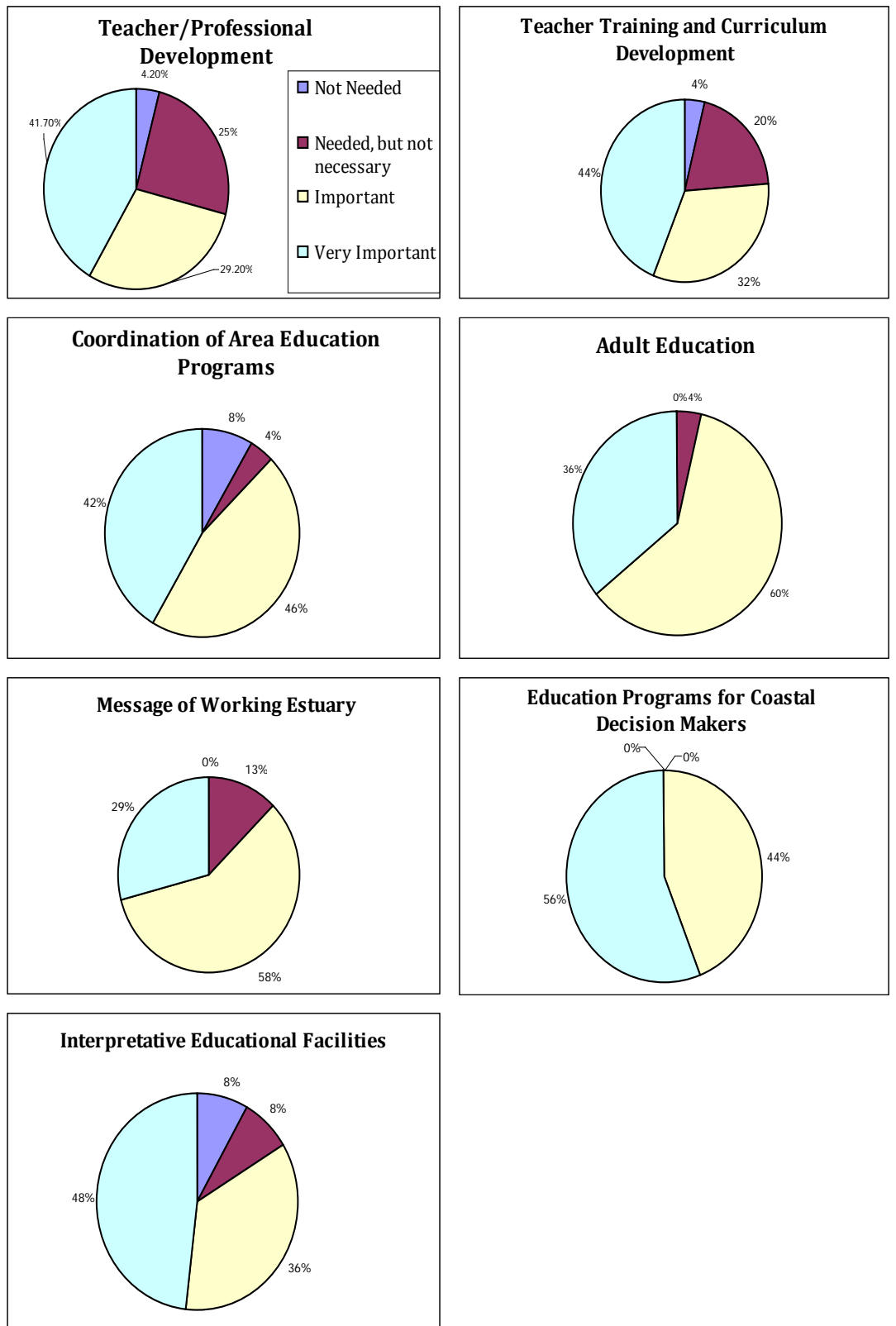
**Table 7.** The themes are ranked based on the survey results.

<b>Theme</b>	<b>Average Scores</b>
Education Programs for Coastal Decision Makers, etc	1.44
Adult Education	1.68
Interpretative Educational Facilities	1.76
Coordination of Area Education Programs	1.79
Message of Working Estuary	1.83
Teacher Training and Curriculum Development	1.84
Teacher/Professional Development	1.92

Additional ideas were provided by participants in question three. The comments included the following: on-line public access to information, education programs for the general public, on-the-water programs, development of web-based educational outreach materials, volunteer opportunities, and hands on learning (appendix 2).

*Additional Comments*

Several survey participants made additional comments regarding the future of education programming at the future LSNERR. The subject of the comments include: hands-on learning for teachers and students; the use of pre-existing educational infrastructure and coordination with existing programs; and the coordination and integration of the future LSNERR programs into local schools, colleges, and universities. Complete comments from the survey can be seen in appendix 2.



**Figure 1.** The results of the survey displayed in pie charts.

## **DISCUSSION**

### **Future LSNERR Education Programs**

An array of suggestions came from meeting with the area's education stakeholders. The information from these meetings will be used in the development of programming at the future LSNERR. The purpose of the survey was to validate the results of those meetings and to assure that the themes identified are truly priorities for the community. The themes included in the survey were ideas and suggestions that frequently were offered during meetings and were given more attention by stakeholders

The results of the survey indicated complete support (100%) for the designation of the St. Louis River estuary as the future site for the LSNERR. Furthermore, there was a large amount of support for each of the themes included in the survey. For example, the majority of participants voted very important or important on each of the themes. This confirms the findings of the meetings and the suggestions offered by the stakeholders interviewed. The rankings allow an order to be established among the themes. All themes received a high ranking between 1 and 2. The order of the themes identified in the needs assessment according to ranking are: Adult Education (1.68), Coordination of Area Education Programs (1.79), Message of a Working Estuary (1.83), Teacher Training and Curriculum Development (1.84), and Teacher/Professional Development (1.92).

In order to make the most of available resources, the future LSNERR should target the themes identified in the needs assessment. Each theme received a high ranking and the difference between ranking is very small, but if an order needs to be established it should be: 1) adult education programming 2) coordination of area education programs 3) promotion of the idea of a working estuary 4) teacher training and curriculum development resources and 5) teacher/professional development programs. It is important to note that the two additional themes added to the survey, Education Programs for Coastal Decision Makers and Interpretive Educational Facilities received a ranking of 1.44 and 1.76, respectively. Recommendations were not made for these themes since they did not arise from this needs assessment. But these needs need to be considered in future LSNERR education programming.

### **Recommendations**

Recommendations were made for future LSNERR's education programming. The recommendations use a variety of information. This includes a primary literature review, a review of the current education programs in the NERR system, stakeholder input, and the review of the Old Woman Creek NERR education programs. The following section provides a recommendation for each theme and gives justification to why resources are needed in that area. The recommendation also offers ways for the future LSNERR to address the specific area.

## **Adult Education**

**Recommendation:** *The future LSNERR should partner with local organizations already offering adult education programs to increase the variety and frequency of programs. The future LSNERR should also provide its own adult education programming related to estuaries and coastal resources. This in turn will give the community greater appreciation for the Lake Superior Region and take pride in the services it provides.*

Support for additional education programming came from the Minnesota DNR's MinnAqua program, the MPCA, Minnesota Sea Grant, the Duluth Seaway Port Authority, UWEX, and Fond du Lac Community College. The following are specific points from these organizations related to the need for additional adult education programs.

- The St. Louis River freshwater estuary is an epicenter for outdoor recreation including fishing, hunting, boating, canoeing, birding, and site seeing. Very little educational programming is targeted towards recreators or promotes recreation on the estuary (Gunderson 2009).
- Members of the Duluth Seaway Port Authority stressed the importance of highlighting the value of the resource and providing local residents with a sense of place in the region so they can take pride and ownership of the resource (Yorde and Sharrow 2009).
- Educational programming is often focused specifically towards children. Very seldom are there programs offered for a shared learning experience amongst a family or between adults and children (Wimme 2009).

Adult education programming is limited within the region as few opportunities are offered by different organizations in the education community. The NGLVC and the GLA use informational and interpretative displays that provide educational material targeted towards adults. The GLA has its voices of Lake Superior Speaker Series where once a month from April through October a local expert gives a presentation on a topic pertaining to local history and/or an environmental topic (Erickson 2009). Other programming is irregular and is dependent upon available funding.

### *Community Partnerships*

Several different techniques should be used to provide the community with additional resources for adult education. First off, the Great Lakes Aquarium offers an opportunity for a unique community partnership with the future LSNERR to offer additional adult education programming (Meyer 2009). In the future, the LSNERR and the GLA can pool resources to offer more speakers and presentations targeted towards adults. The NGLVC UWEX office developed its Estuary Ed-venture Programs for adults that inform the community of the natural processes occurring in an estuary. The adoption and modification of this curriculum could be

used on the St. Louis River freshwater estuary to get adult education programming up and running sooner (Techtman 2009). Old Woman Creek NERR staff recommend partnering with organizations already offering programs. This will enable the organizations to share the responsibility of offering programs as well as being able to pool resources together to increase the variety of programs and speakers in the community (Van Zoest 2009). Secondly, the Old Woman Creek NERR offers opportunities for hands on learning with outdoor classrooms where learners use hands-on sampling equipment to help them understand the complexities of the natural world. They also offer audio-visual presentations, interpretive field trips, guided tours, and guest lecturers. Old Woman Creek has a Volunteer Monitoring program where local citizens are trained to monitor Old Woman Creek and nearby streams as well as interpret the data collected. As part of the NERR system, the future LSNERR can collaborate with Old Woman Creek to offer similar programming for the St. Louis River freshwater estuary (OWC 2009).

Old Woman Creek also provides canoes for local citizens to use on the estuary to experience the resource (Lopez 2009). Although the St. Louis River freshwater estuary is much larger than Old Woman Creek estuary, the future LSNERR could still provide canoes for near shore tours and larger boats or pontoons for longer and more offshore tours. Competitive grants are available through the NERR system to provide these types of equipment (Education 2009). The future LSNERR should focus its efforts on getting people out on the water to understand and appreciate its importance.

More information needs to be directed at the land—water connection in order to understand the effect humans have on the freshwater environment. The City of Superior and the RSPT offer programs with the intent of providing this information. This type of information will give the community more appreciation for the estuary and a deeper understanding of the impact they can have on the estuary's health and the overall environment. The future LSNERR needs to provide these types of resources to the region to supplement the already existing facilities and programming intended for adults.

### ***Coordination of Area Education Programs***

***Recommendation:*** *The future LSNERR must pay specific attention to collaborating and coordinating programs in the region to increase the variety of outreach and environmental education programs available in the area. The future LSNERR needs to be sure not to duplicate existing programs in the area by partnering with local organizations and becoming a member of the Regional Stormwater Protection Team.*

Many stakeholders stated there is a need within the educational community to coordinate the education programming that occurs in the area. Programming is occurring throughout the area and proper coordination and collaboration would provide an opportunity for organizations to pool resources and offer a larger variety and more in

depth programs. It would also assure education programs would not duplicate pre-existing programs with similar goals and concepts.

Particular points outlined by stakeholders were to:

- Coordinate education work with the pre-existing Regional Stormwater Protection Team (RSPT) (Kubiak 2009).
- Continue and promote the state partnership between Wisconsin and Minnesota (Meyer 2009).
- Market education programs on the Minnesota Pollution Control Agency's SEEK (Sharing Environmental Education Knowledge) website (Kennedy 2009).
- Promote and build community and regional collaborations within the Lake Superior and Great Lakes basin for educational programming (Techtman 2009).

#### *Community Partnerships*

The RSPT is a collaborative group in the Duluth-Superior area whose mission is "to protect and enhance the region's shared water resources through stormwater pollution prevention by providing coordinated educational programs and technical assistance." The group is comprised of 21 different organizations and municipalities (see appendix 1 for listing) (Kubiak 2009). Although the overall goal of the RSPT is to use education and outreach material for the prevention of stormwater, it provides an opportunity to connect with major organizations within the region in an existing collaborative setting. Stormwater is an issue in the Duluth-Superior area and the shared resource of the St. Louis River freshwater estuary between the states of Wisconsin and Minnesota creates a unique situation of resource management. It is essential the future LSNERR participates in the RSPT since stormwater is an identified issue and the RSPT provides an existing network of organizations. The framework of this team may provide an opportunity for future collaboration for a LSNERR education advisory committee.

The states of Minnesota and Wisconsin are working cooperatively to share resources among all of their state agencies (Meyer 2009). The state boundary created by the St. Louis River makes this an even greater priority. Many state partnerships already exist and it is important the future LSNERR continues to promote these cooperatives. The MPCA's SEEK website is one of the ways the future LSNERR can participate in sharing resources between states. The use of the SEEK website is one way for both WI and MN state agencies, local organizations, and non-profits to take advantage of the available educational resources that exist in the region.

There was a general concern shared by all stakeholders whom participated in the needs assessment to assure the future LSNERR would not duplicate pre-existing programs and efforts that already occur in the area. Several large organizations including the GLA, NGLVC, and LSRI, already offer education programming related to estuaries. Building collaborative partnerships with these organizations would allow the

region to have a greater capacity to offer more programs. Upon designation, the LSNERR anticipates four state positions: reserve manager, research coordinator, education coordinator, and coastal training program (CTP) coordinator. One of the primary responsibilities of the education coordinator and the CTP coordinator is to work collaboratively with pre-existing educational organizations in the region (Barstow 2007). These coordinators will need to pay particular attention to working successfully with organizations and entities in both Wisconsin and Minnesota.

### ***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 St. Louis River freshwater estuary is the heart of the Duluth-Superior Harbor. The Twin Ports serve as the largest port by volume in the Great Lakes and is an epicenter for regional commerce. It is home to over 275,000 residents whom frequently use the estuary for fishing, hunting, birding, boating, and camping. Not only does the area serve as a recreation hot spot, but it is also rich with cultural history. The history of Native American settlement is culturally significant as well as the area's history of fur trading, logging, and shipping. Educational stakeholders stated that it is crucial for the history and anthropogenic uses of the estuary are highlighted in future education programming (LSNERR MP 2010).

- Emphasize the area's historical and cultural significance (Judd 2009).
- Offer specific material on how humans have shaped and influenced the estuary (Meyer 2009).
- Stress the importance the estuary plays as a sustainable working harbor with a healthy balance of environmental and economic education (Sharrow & Yorde 2009).
- Incorporate the idea of a working estuary by including both shipping and tourism (Stewart 2009).

### ***Local History***

It is crucial to include Native American culture and settlement into the environmental education programs at the future LSNERR (Judd 2009). This can be done in several different ways, but Mike Kennedy of the MPCA suggested a living history scene that incorporates Native American heritage and fur trading, similar to that of Thunder Bay's Old Fort William (Kennedy 2009). There are other organizations that touch on this idea and can provide useful insight in program development. The Fond du Lac Band of Lake Superior Chippewa volunteered to help provide the necessary information to develop education materials for all ages (Judd 2009). The NGLVC has informational displays that highlight the development and founding of the Chequamegon Bay area as well as



programming on Native American culture and traditions. UWEX, at the NGLVC, has also developed a portion of its Lake Superior Basin Stewardship Education Curriculum to target European Migration and Lake Superior Resources (Techtmann 2009). Coordinating the use of this material can provide a good starting point for the future LSNERR until further material is developed in cooperation with Fond du Lac Band of Lake Superior Chippewa.

### *Working Estuary*

The NERR system outlines in its “Estuary Principles and Concepts” how humans rely on goods and services that are supplied by estuaries and that human activity can impact estuary. It is recognized by the NERR system that educational material related to human influences and development of estuaries is necessary (Education 2009). The Western Upper Peninsula Center for Science, Mathematics and Environmental Education with cooperation with Michigan Tech and the Duluth Seaway Port Authority, has developed a curriculum based on Great Lakes Maritime Transportation Education. The curriculum offers resources for K-12 teachers such as lesson plans, photos, and teaching activities all based off of maritime commerce (GLMTE 2009). The St. Louis River estuary plays a significant role in not only natural processes, but also in many human’s day to day lives. Curriculum based on the development of the St. Louis River estuary needs to be developed to show the impact and importance the estuary has had on the community, region, and country. The future LSNERR should promote the use of existing curriculum while further educational material on other anthropogenic influences is developed.

### ***Teacher Training and Curriculum Development***

***Recommendation:*** *The future LSNERR should provide teacher training to assist educators in implementing estuary 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. The use of estuary related curriculum depends on the material’s ability to satisfy state and federal education standards. In order to see the successful implementation of the material, teachers and educators must fully understand the concepts and ideas used in the curriculum. Several regional organizations can provide assistance to the future LSNERR in getting curriculum available sooner.*

Based on results from the stakeholder meetings, there exists a need for more expansive and in-depth curriculum related to freshwater estuaries. Many educators themselves were not familiar with what an estuary was and the role they have in the environment. Specific points made by stakeholders follow:

- A partnership should exist with the NGLVC to assist in implementation and development of estuary related curriculum (Techtmann 2009).

- Estuary learning programs should be integrated into local school curriculum (Oppedahl 2009).
- Provide an education curriculum that satisfies state education requirements (Stewart 2009).
- Use real-time data on estuaries for service learning and lesson plans (Meyer 2009).
- The development of curriculum related to freshwater estuaries that uses real-time data (Gunderson 2009).

A variety of educational curricula exists in the region's education community but only a few of them relate directly to estuaries. The NGLVC offers an *Adopt-An-Estuary* and *Fish Creek Estuary Curriculum*. The *Adopt-An-Estuary Curriculum* is an issue based curriculum where students learn to resolve real world problems that harm estuaries every day. The Fish Creek Estuary material deals directly with the estuary of Fish Creek located just west of Ashland, WI (Techtmann 2009).

#### *Community Partnerships*

The estuary curriculum developed by the NGLVC provides a clear starting point for the implementation of estuary curriculum. The staff at the NGLVC possess the knowledge and ability to develop and implement the necessary types of curriculum needed by the St. Louis River freshwater estuary and other nearby estuaries. The use of NGLVC's pre-existing curriculums can be used to get the future LSNERR programming off and running earlier with slight modifications to apply to the St. Louis River freshwater estuary (Techtmann 2009). It is important that a cooperative partnership exists between the future LSNERR and the NGLVC.

Other resources and opportunities exist in the community. Fond du Lac Tribal and Community College coordinates the St. Louis River watch program and the Duluth Seaway Port Authority coordinates the River Quest program. Both of these programs offer opportunities for field work and service learning projects. It is very important the future LSNERR supports these programs because it was recently found these types of learning methods are infrequently done in environmental education programs (Barstow 2007).

#### *NERR System Resources*

The NERR system provides a number of resources for the implementation of estuary related curriculum. Curriculum is available on the NERR system website for grades 5-12 with resources related to estuarine biology, natural and human disturbances, the estuarine ecosystem, and estuaries and humans (Education 2009). The NERR system offers the *Estuaries 101* curriculum as its first component of its *K-12 Environmental Education Program (KEEP)* (Barstow 2008). It is intended for high school students and consists of 4 different modules: Earth Science, Life Science, Physical Science and the Chesapeake Bay (Education 2009). It is important to note, that in some cases the

material only pertains to salt water estuaries and it needs to be tailored for the application to freshwater estuaries. But this should not inhibit its application at the future LSNERR.

The Old Woman Creek NERR provides opportunities for hands on learning with outdoor classrooms. It was recommended by Old Woman Creek's education coordinator, Phoebe Van Zoest, for the future LSNERR to focus curriculum on research-based ideas and develop lesson plans to specific research projects (Van Zoest 2009).

The NERR system also provides real-time data for educational materials and curriculums to be based off of. This is found in the *System Wide Monitoring Program* (SWMP) and with the *EstuariesLive* program. SWMP occurs at all reserves across the country providing real time monitoring data of different environmental parameters (Ibanez 2006). *EstuaryLive* uses the internet to allow for real-time contact between educators, scientists, and students. This can help eliminate logistical issues that arise from field trips and the additional costs associated with these trips (Ibanez 2005). It was also found that teachers had interest in using real time data, but preferred having the data already incorporated into some type of lesson plan. The NERR system provides this with its *EstuariesLive* program and other material available on the estuaries.gov website (Ibanez 2006). The future LSNERR will have access to these resources and the capacity to offer these types of programs. The use of these programs will increase the variety and effectiveness of the area's education programs.

#### *Successful Implementation*

It has been found that the use of educational material depends on the material's ability to satisfy state education requirements and the teacher's understanding of the material (Barstow 2007). Before the future LSNERR adopts the *Estuaries 101* curriculum, it is important to review both Wisconsin's and Minnesota's state education requirements to assure the curriculum satisfies the necessary requirements. In a comparison study that looked at how well *Estuaries 101* satisfied several different states requirements, *Estuaries 101* modules gave insight to big ideas of life, physical, and earth science as well as the important concepts and processes that are required by most state and national education standards. It was also found that most state standards call for the use of hands-on experiments, direct observations, and the active use of data, all of which are accomplished with the use of the *Estuaries 101* curriculum (Barstow 2008).

In order to see the implementation and use of the *Estuaries 101* curriculum it is important to explain to school administrators and teachers how curriculum pertaining to estuaries is able to satisfy state education requirements (Barstow 2008). It will also be useful for the future LSNERR to offer assistance and training to teachers in order to see the successful use of estuary based curriculum. Upon designation, the use of NGLVC's *Adopt-An-Estuary* will not only help with faster program offerings, but it provides a useful background section for

teachers to be able to review and learn important concepts and to advise them of any relevant safety issues (Techtmann 2009). The NERR system also provides teacher training for its high school *Estuaries 101* curriculum, labeled *Teaching On The Estuary program* (Education 2009). In order for programs to be used, it is key for teachers to feel comfortable with the curriculum material.

It may be beneficial to adopt similar training methods as OWC NERR. This would allow Old Woman Creek and the future LSNERR to pool resources in the formation and development of training materials and programs for educators. Currently Old Woman Creek uses several different ways to offer teacher development programs. Old Woman Creek hosts workshops three times a year and uses *Project Wet and Wild* for teacher development. These workshops are often held during the summer to try to get more interest from area teachers by getting them on the water to experience and understand the function of an estuary (OWC 2009). Locally, the LSRI uses the L.L. Smith in its *View from the Lake* education program for coastal decision makers. Similar types of programs could be offered for teacher development to get teachers on the water to truly understand the resource.

Several studies have been done to find the most effective ways of offering teacher development programs. First off, it is important to regularly review reserve education programs. This will allow local teachers to provide input to how the reserve can improve its programming (Pandion Systems 2003). Another study on the state of estuarine education, found that NERR education coordinators should be available for consulting support so teachers can use them as a resource when necessary (Barstow 2007). Teachers also preferred development programs relevant to their local community that gave them a personal understanding of how they and their students can effect the environment. This gave teachers a sense of responsibility to develop their students as responsible citizens who can make a difference with environmental issues (Barstow 2007). The future LSNERR needs to establish a good relationship with local school districts so they can work cooperatively on the implementation of estuary related curriculum.

### ***Professional/Teacher Development***

***Recommendation:*** *The future LSNERR needs to contribute research and educational support to develop the region's natural resource professionals by providing the opportunity for a dialogue between scientific experts.*

The region is home to a wealth of federal, state, tribal and non-profit organizations whom are leaders in environmental science. The area also possesses several colleges and universities who are on the forefront of many research areas. Some more informal groups, such as the Twin Ports Freshwater Folk, provide an opportunity for local professionals in the environmental field to meet and discuss current topics of research, policy, and regulation issues (Twin Ports Freshwater Folk 2010). The stakeholder meetings unveiled a need to increase the amount of

professional development opportunities in the area. The specific requests were to:

- Provide a dialogue with local scientific experts (Erickson 2009).
- Offer training opportunities in a variety of fields (Meyer 2009).
- Host “brown-bag lunches” for informal discussions (Oppedahl 2009).

The future LSNERR has the potential to provide these types of opportunities to the region. First, the future LSNERR should attempt to join the Twin Ports Freshwater Folk. It is an excellent avenue for the future LSNERR to learn of local efforts and to also make the community aware of the potential resources available as part of the NERR system. Eventually, the future LSNERR may be able to coordinate the meetings as well as bring in key note speakers from outside the region.

The NERR system provides professional workshops that are offered all year round at various reserves throughout the country. The NERR website displays a calendar of events with the location and details of these workshops (Education 2009). The Old Woman Creek reserve hosts a brown bag lunch series for local professors, researchers, and regulators (OWC 2009). As the future LSNERR establishes itself within the community and eventually the region, the ability of the reserve to host training opportunities and “brown bag lunches” will increase. Upon designation, the LSNERR should participate in local meetings and events to learn how it can specifically fit into the area’s professional community.

## **CONCLUSION**

The material produced by this study has been given to the future LSNERR staff for their own use, as well as incorporated into the LSNERR Management Plan. Upon designation of LSNERR, it will be important for the reserve's staff to occasionally review the current education programs offered in the area to be sure the results of this assessment are up to date.

During the course of this study it proved difficult to meet with local school districts. This difficulty may have occurred because the timing of this study took place mainly during the summer when teachers were on vacation. The sample population of this study mainly consisted of environmental educators and outreach agents. Meeting with teachers and school administrators may provide more insight to the conclusions of this study, but it is not expected to alter the recommendations in this paper.

### *Future Research*

There exist several areas where more research could be done. It may be useful to distribute a survey with all the needs that arose from the assessment to gauge the importance of each theme. An assessment of the local universities, colleges, and schools districts would help indicate the specific programming each organization desires.

Many opportunities for collaboration exist within the community and even at a larger regional and national level. The review of other reserves and their programming may identify possible means of addressing similar types of needs. The NERR system consists of a large variety of reserves throughout the country and many of them have probably have programming that could be adopted at the future LSNERR.

### *Final Recommendation*

The future LSNERR should address the educational themes found in the present needs assessment by providing 1) Adult Education programs 2) Coordination of Area Education Programs 3) Promoting the idea of the St. Louis River as a Working Estuary 4) Teacher Training and Curriculum Development Resources 5) Professional/Teacher Development programs. The recommendations made for each theme provide a good starting point for the future LSNERR and will assist future staff in the implementation and management of the reserve's education programs. The idea of community and regional collaboration was a recurring theme that was emphasized in each recommendation. This focus is recommended for current resource management and should be used at the future LSNERR. The future LSNERR has the ability to an international leader in advancing understanding and stewardship of Great Lakes freshwater estuaries and coastal resources.

## Appendix 1: Program Overviews

---

**Organization:** City of Superior: Environmental Services

The City of Superior provides a variety of services for wastewater treatment and collection, stormwater treatment, and inspects construction of roads, streets, and sidewalks. The City of Superior also offers educational material for these services. The availability of these programs depends on contracts and availability of grants.

The City of Superior maintains a website providing information on a number of Environmental Services including wastewater, stormwater, and pollution prevention.

*Wastewater:* This portion of the site goes through the process of wastewater treatment and the facilities used to do so. Virtual tours of both primary and secondary treatment processes can be taken to help understand the role of each step. *Stormwater:* Under the Stormwater tab exists information about the water cycle, the ways watersheds become impaired, stream sampling methods, and northern Wisconsin Watersheds. The stormwater section also provides information on ways local residents can help and improve the health of their watershed. This includes information on rain gardens and rain barrels. The Environmental Services division has held workshops on how to build rain gardens and rain barrels.

*Pollution Prevention:* This site provides information on preventing specific pollution including: Mercury, Medicines, Battery recycling, burn barrels, and E-waste (Environmental Services Divisions of Public Works 2009).

**Program:** Public Education Involvement Relations (PEIR)

**Website:** <http://www.ci.superior.wi.us/index.aspx?NID=116>

**Contact:** Carrie Sanda

**E-mail:** [sandac@ci.superior.wi.us](mailto:sandac@ci.superior.wi.us)

**Phone:** 715-394-0392

**Summary:**

PEIR is the Environmental Services' outreach committee who is responsible for their workshops and events. In the past they hosted rain barrel workshops where people were able to purchase a barrel and learn the proper use and installation of rain barrels. Currently, the PEIR program is focusing on collecting and recycling mercury pollutants, dioxins, and PCBs along with trying to reduce the use of burn barrels. They also host an annual Lake Superior Day celebration, Beech Sweep cleanup day, and a tour of Superior's

wastewater treatment facility to Superior Schools' fifth graders. The PEIR program is also working closely with the Wisconsin DNR and Douglas County on organizing a stream bank restoration project to take place in the Spring of 2010(Edwards, Gumm, Nelson, Thoreson, Carey 2009).

---

**Organization:** Duluth Seaway Port Authority

The Duluth Seaway Port Authority (DSPA) is an independent public agency created by the Minnesota Legislature to promote maritime and trade development for the port of Duluth Superior. The DSPA does this primarily through marketing and the promotion of legislative initiatives. The DSPA aims to enhance the regional economy with environmentally sustainable industrial development (Sharrow & Yorde 2009).

**Program:** St. Louis River Quest Environmental Educational Program

**Website:** <http://www.duluthport.com/rqfs.html>

**Contact:** Adele Yorde

**E-mail:** AYorde@duluthport.com

**Phone:** 218-727-8525

**Partners:** City of Duluth, Duluth Power Squadron, Como Oil, MN Pollution Control Agency, MN Sea Grant, EPA, Great Lakes Aquarium, Hallet Docking Company, Murphy Oil, US Army Corps of Engineers, US Coast Guard, Western Lake Superior Sanitary District

**Summary:**

The River Quest program began in 1993 with a goal to teach area 6<sup>th</sup> graders the importance of environmental stewardship and conservation. The program also teaches the students the idea of a "working harbor" with the industrial, commercial, and recreational uses that occur on the St. Louis River. Over a three day period over 800 sixth graders visit learning stations hosted by area organizations such as the Minnesota Pollution Control Agency and Murphy Oil (St. Louis River Quest Environmental Education Program 2009).

---

**Organization:** Fond du Lac College

Fond du Lac Tribal and Community College is the leading organization responsible for the St. Louis River Watch program. Fond du Lac College is located in Cloquet and offers a variety of academic programs. The St. Louis River Watch Program is funded by



the US Department of Agriculture (Welcome to the St. Louis River Watch 2006).

**Program:** St. Louis River Watch

**Website:** <http://www.sriverwatch.org/>

**Contact:** Courtney Kowalczak

**E-mail:** [ckowalcz@fdltcc.edu](mailto:ckowalcz@fdltcc.edu)

**Phone:** (218) 879-0789

**Summary:**

The St. Louis River Watch program is a youth based water quality monitoring program for the St. Louis River and its tributaries in Northeastern Minnesota. In past years, teachers and students from 25 different schools collect chemical, biological, and physical data from the St. Louis River Watershed twice during the year. The majority of the schools incorporate the monitoring directly into their science curriculum. The program began in 1997 and has been organized and hosted by Fond du Lac Tribal and Community College with funds from the US Department of Agriculture (St. Louis River Watch Project 2009).

---

**Organization:** Great Lakes Aquarium (GLA)

The Great Lakes Aquarium was established in 2000 as a not-for-profit organization whose mission is to “capture the wonder and excitement of Lake Superior, inspire responsibility for the world's large lakes and fresh waters and create understanding of their value.” The aquarium mostly features the flora and fauna of the Great Lakes Basin but also has changeable displays for other topics including the Amazon River and some saltwater animals and habitats.

The GLA provides on-site education programming along with outreach services for all ages. Daily programming gives learners the opportunity to see native and exotic animals feed and interact. The aquarium has provided educational programming to over 10,000 pre K-12 students each year and also offers teacher development and adult learning opportunities (Educational Resources 2009).

**Program:** Partners in Education

**Website:** <http://www.glaquarium.org/index.php>

**Contact:** Sara Erickson

**E-mail:** [serickson@glaquarium.org](mailto:serickson@glaquarium.org)

**Phone:** 218-740-FISH

**Partners:** MN Sea Grant, University of Minnesota Duluth

**Summary:**

MN Sea Grant, the University of Minnesota Duluth, and the GLA train undergraduate education students to provide free outreach programs to twin ports schools. Undergraduate students travel to area schools to teach k-12 students Great Lakes and aquatic issues. The teaching opportunity also counts towards the undergraduate's education degree (Erickson 2009).

**Program:** Scouts

**Website:** <http://www.glaquarium.org/index.php>

**Contact:** Sara Erickson

**E-mail:** [serickson@glaquarium.org](mailto:serickson@glaquarium.org)

**Phone:** 218-740-FISH

**Summary:**

The GLA offers workshops for Boy Scouts, Girl Scouts, and Brownies to earn badges. The GLS will tailor specific programs in order to do so (Erickson 2009).

**Program:** Voices of the Lake Speaker Series

**Website:** <http://www.glaquarium.org/visitor/speakerseries.php>

**Contact:** Sara Erickson

**E-mail:** [serickson@glaquarium.org](mailto:serickson@glaquarium.org)

**Phone:** 218-740-FISH

**Summary:**

The voice of the Lake Speaker Series is an adult learning opportunity hosted by the Great Lakes Aquarium. Once a month from October-April local experts give a presentation on local cultural history and/or an environmental topic (Erickson 2009).

**Program:** Whirlgigs/Dive In Deeper (pre K- 12 Education)

**Website:** <http://www.glaquarium.org/education/index.php>

**Contact:** Sara Erickson

**E-mail:** [serickson@glaquarium.org](mailto:serickson@glaquarium.org)

**Phone:** 218-740-FISH

**Summary:**

Whirlgigs and dive in deeper education programs are designed specifically for pre K-12 education. Each program has a curriculum tailored specifically to particular age groups and are offered for classroom visits and fieldtrips (Erickson 2009).

**Program:** Voices of the Lake Speaker Series

**Website:** <http://www.glaquarium.org/visitor/speakerseries.php>

**Contact:** Sara Erickson

**E-mail:** [serickson@glaquarium.org](mailto:serickson@glaquarium.org)

**Phone:** 218-740-FISH

**Summary:**

The voice of the Lake Speaker Series is an adult learning opportunity hosted by the Great Lakes Aquarium. Once a month from October-April local experts give a presentation on local cultural history and/or an environmental topic (Erickson 2009).

---

**Organization:** MinnAqua: Minnesota Department of Natural Resources( MN DNR)

The MN DNR created the MinnAqua education program to teach angling recreation and stewardship along with conservation and ecology of aquatic habitats. MinnAqua is a statewide project with coordinators in Duluth, the Twin Cities, and New Ulm. MinAqua focuses on professional development to target children less than 16 years of age (MinnAqua-Fishing Education 2009).

**Program:** MinnAqua Leader's Guide/Professional Development

**Website:**

<http://www.dnr.state.mn.us/minnaqua/leadersguide/index.html>

**Contact:** Nadine Meyer

**E-mail:** [nadine.meyer@dnr.state.mn.us](mailto:nadine.meyer@dnr.state.mn.us)

**Phone:** 218-740-2063

**Summary:**

The Leader's Guide, titled *Fishing: Get in the Habitat*, provides the necessary information in order to plan an easy, safe, and fun fishing trip. The guide is intended for teachers, youth leaders, and environmental educators. It includes lessons on aquatic habitats, Minnesota Fish, water stewardship, fisheries management, fishing equipment and skills, and safety during the fishing trip. The lesson guide assists with the completion of Minnesota Academic Standards for grades 3-5, Boy Scout badge requirements, Junior Girl Scout badge requirements, and 4-H fishing sports project requirements (Meyer 2009).

**Program:** MinnAqua Educator Workshops

**Website:** <http://www.dnr.state.mn.us/minnaqua/index.html#>

**Contact:** Nadine Meyer

**E-mail:** [nadine.meyer@dnr.state.mn.us](mailto:nadine.meyer@dnr.state.mn.us)

**Phone:** 218-740-2063

**Summary:**

Workshops are lead by MinnAqua education coordinators who train environmental educators using the Leader's Guide, *Fishing: Get in the Habitat*. Workshops are held at various locations and are scheduled throughout the year (Meyer 2009).

**Program:** Festival of Fish

**Website:** <http://www.dnr.state.mn.us/minnaqua/index.html#>

**Contact:** Nadine Meyer

**E-mail:** [nadine.meyer@dnr.state.mn.us](mailto:nadine.meyer@dnr.state.mn.us)

**Phone:** 218-740-2063

**Summary:**

The festival of fish is a meeting of Minnesotan's to learn and celebrate the role fishing plays in the history, foods, traditions, art, recreation, and social customs of our many cultures. The DNR shares information and gives presentations to participants to teach them more about outdoor recreational activities including fishing (Meyer 2009).

---

**Organization:** Minnesota Sea Grant

Minnesota Sea Grant is part of a network of Sea Grant offices spread along the nation's coastline. Minnesota Sea Grant's goal is to improve Minnesota's coastal environment and economy through research and public education programs (Outreach & Education 2009). Sea Grant aims to do this by conveying the needs of communities, industries, and management agencies to state university scientists and by promoting the best and most current resource management practices regarding Lake Superior and inland lakes to resource users, managers, and policy-makers (Gunderson 2009).

**Program:** Water On the Web(WOW)

**Website:** <http://www.waterontheweb.org/>

**Contact:** Jeff Gunderson

**E-mail:** [jgunder1@umn.edu](mailto:jgunder1@umn.edu)

**Summary**

Water on the Web is a web-based curriculum intended for college and high school students to help learn about real-world environmental problems using advanced technology. WOW contains

two sets of curriculum to provide knowledge in a plethora of different scientific fields (Outreach & Education 2009).

**Program:** Traveling Trunk Adventure

**Website:** <http://www.seagrant.umn.edu/educators/tt>

**Contact:** Doug Jensen

**E-mail:** [djensen1@umn.edu](mailto:djensen1@umn.edu)

#### **Summary**

Traveling Trunk Adventure is an educational program given by Minnesota Sea Grant to teach age's 8 to adult about invasive species and the effect they have on the region's aquatic ecosystems. Two different programs exist: Exotic Aquatics for ages 9 to adult and Zebra Mussel Mania for ages 8 to 14(Outreach & Education 2009).

**Program:** Ask A Scientist Speaker Series

**Website:** <http://www.seagrant.umn.edu/news/aas/>

**Contact:** Sharon Moen

**E-mail:** [smoen@umn.edu](mailto:smoen@umn.edu)

#### **Summary**

The speaker series is held once a month during the summer where a café hosts a free coffee hour for people to come and listen to a scientific expert. The science topics discussed usually have societal, political, and/or business ramifications for Lake Superior's coastal waters and communities (Outreach & Education 2009).

#### **Other Environmental Education Programs**

Center for Ocean Sciences Education Excellence (COSEE) Great Lakes

Habitattitude Campaign

Stop Aquatic Hitchhikers!

---

#### **Organization:** Regional Stormwater Protection Team

The Regional Stormwater Protection Team's (RSPT) mission is "to protect and enhance the region's shared water resources through stormwater pollution prevention by providing coordinated educational programs and technical assistance." The RSPT is comprised of 21 different municipalities and organizations. A major part of RSPT's plan is education and outreach of material to help the prevention of stormwater pollution (Regional Stormwater Protection Team 2009).

#### **Members**

MN Sea Grant

MN Pollution Control Agency

South St. Louis Soil and Water Conservation District.  
City of Duluth, Cloquet, Hermantown, Oliver, Proctor, Superior, Duluth,  
Rice Lake, and  
Midway Townships, Village of Superior  
St. Louis County  
St. Louis River Citizens Action Committee  
University of WI Superior  
Fond du Lac Reservation  
Lake Superior College  
MN Department of Transportation  
MN Department of Natural Resources  
WI Department of Natural Resources  
Natural Resources Research Institute  
University of Minnesota Extension  
Western Lake Superior Sanitary District  
MN Coastal Program

**Program:** Lake Superior Streams Website

**Website:** <http://www.duluthstreams.org>

**Contact:** Chris Kleist, Rich Axler

**E-mail:** [ckleist@duluthmn.gov](mailto:ckleist@duluthmn.gov), [raxler@nrri.umn.edu](mailto:raxler@nrri.umn.edu)

**Partners:** City of Duluth, Natural Resources Research Institute, MN Sea Grant, University of Minnesota Extension, MN Pollution Control Agency, Western Lake Superior Sanitary District, South St. Louis Soil and Water Conservation District, MN Coastal Program

### **Summary**

The Lake Superior Streams website is a collaborative effort among local agencies who provide real time data and other information regarding Western Lake Superior Streams. Information on stormwater, local streams, and the region is available for public viewing. The website also provides material for volunteering, and educational resources for teachers and students (Lakesuperiorstreams 2009).

**Program:** Lake Superior Watershed Festival

**Website:**

<http://www.lakesuperiorstreams.org/stormwater/watershedFestival/index.html>

**Contact:** Kate Kubiak

**E-mail:** [kate.kubiak@southstlouisswcd.org](mailto:kate.kubiak@southstlouisswcd.org)

**Phone:** 218-723-4867

**Partners:** City of Duluth, City of Superior, Great Lakes Aquarium

**Summary:**

The festival provides information and activities to stress the value and importance of protecting Lake Superior and its watershed. Attention is focused on how activities at home affect the health of Lake Superior and its tributaries. The festival hosts several workshops on a variety of topics including fly-fishing, gardening and rain-barrel construction. Overall, the festival offers information to the community about water resource protection and conservation (Regional Stormwater Protection Team 2009)..

**Program:** Regional Stormwater Protection Team Workshops

**Website:**

<http://www.lakesuperiorstreams.org/stormwater/workshops.html>

**Contact:** Kate Kubiak

**E-mail:** [kate.kubiak@southstlouisswcd.org](mailto:kate.kubiak@southstlouisswcd.org)

**Phone:** 218-723-4867

**Summary:**

The RSPT offers a variety of workshops including: Winter Parking Lot and Sidewalk Maintenance, Learn to be Eco-Friendly, Tips for Managing Excess Water on your Property, and Erosion and Sediment Control. The availability of workshops depends on grant money (Kubiak 2009).

---

**Organization: St. Louis River Citizen's Action Committee (SLRCAC)**

The SLRCAC is a local group who serves to monitor the activities and projects aimed at restoration and protection of the St. Louis River. The SLRCAC works to improve the communication between local industries, businesses, and stakeholders with public and tribal agencies (Projects 2009).

**Program:** Natural & Cultural History of the St. Louis River

**Website:** <http://www.stlouisriver.org/projects.html>

**Contact:** Julene Boe

**E-mail:** [slrcac@StLouisRiver.org](mailto:slrcac@StLouisRiver.org)

**Phone:** 218-733-9520

**Summary:**

The SLRCAC provides visitors with an on the water guide to the Lower St. Louis River from Fond du Lac to Grassy point. The guide provides information on the history and cultural heritage of the "Head of the Lakes" region. Fishing spots, birding opportunities, and parking areas are also identified (Projects 2009).

**Program:** Watershed Guardian Program

**Website:** <http://www.stlouisriver.org/projects.html>

**Contact:** Julene Boe

**E-mail:** [slrcac@StLouisRiver.org](mailto:slrcac@StLouisRiver.org)

**Phone:** 218-733-9520

**Summary:**

The SLRCAC assists school groups and volunteers with creating stencils for storm drains that have educational messages written on them. The Guardian program also trains school groups and volunteers to monitor water quality of the lower St. Louis River (Projects 2009).

---

**Organization:** South St. Louis Soil and Water Conservation District(SSLSWCD)

The SSLSWCD is a state government agency that provides technical, educational, and financial resources to landowners who chose land management techniques that protect and conserve water quality and other natural resources. The SSLSWCD has several grant based programs related to non-point source pollution, small acreage land management, as well as construction workshops for erosion and stormwater, these programs' availability varies with financial resources (Conservation Education 2007).

**Program:** Class Presentations

**Website:** <http://www.southstlouisswcd.org/education.html>

**Contact:** Kate Kubiak

**E-mail:** [kate.kubiak@southstlouisswcd.org](mailto:kate.kubiak@southstlouisswcd.org)

**Phone:** 218-723-4867

**Summary:**

SSLSWCD staff will visit classrooms to speak on forestry, water quality, soils, and careers in the Natural Resources (Kubiak 2009).

**Program:** Conservation Education Curriculum

**Website:** <http://www.southstlouisswcd.org/education.html>

**Contact:** Kate Kubiak

**E-mail:** [kate.kubiak@southstlouisswcd.org](mailto:kate.kubiak@southstlouisswcd.org)

**Phone:** 218-723-4867



**Summary:**

The curriculum consists of a series of activities targeted specifically at K-12 in Carlton and South St. Louis County. The curriculum is broken into four topics: water, soil, forests, and conservation. Each topic has a variety of lessons aimed at giving the student a better understanding of the resource (Kubiak 2009).

**Program:** Watershed Friendly Service and Fundraising Projects

**Website:** <http://www.southstlouisswcd.org/education.html>

**Contact:** Kate Kubiak

**E-mail:** [kate.kubiak@southstlouisswcd.org](mailto:kate.kubiak@southstlouisswcd.org)

**Phone:** 218-723-4867

**Summary:**

The SSLSWCD provides a guide to boy scouts, girl scouts, youth groups, church groups, service fraternities, or any group looking for service learning or fundraising activities that help protect and conserve the regions water resources. These activities include car washing, stream clean ups, and storm sewer stenciling (Conservation Education 2007).

**Program:** Envirothon

**Website:** <http://www.southstlouisswcd.org/education.html>

**Contact:** Kate Kubiak

**E-mail:** [kate.kubiak@southstlouisswcd.org](mailto:kate.kubiak@southstlouisswcd.org)

**Phone:** 218-723-4867

**Partners:** local businesses in St. Louis, Carleton, Lake, and Cook Counties

**Summary:**

The SSLSWCD hosts an outdoor environmental competition that helps high school aged students learn more about natural resources and the environment. In 2009 over 25 area schools registered for the competition. Teams of students compete in 5 different topic areas: aquatics, forestry, soils, wildfire, and current events. The topics are administered by a natural resource professional who gives general information about each topic before the competition. The top three teams from each area qualify for the state Envirothon. The Envirothon encourages students to learn about the environment and provides them with skills to practice basic resource management and ecology (Conservation Education 2007).

---

**Organization:** Sugarloaf Cove

Sugarloaf is a membership funded organization promoting the conservation and understanding of Minnesota's North Shore. At Sugarloaf Cove, located 73 miles north of Duluth, exists an interpretive center teaching the natural and human history of the North Shore. The center offers daily informational sessions by the Cove's own naturalist and hosts guests speakers weekly. Sugarloaf also works closely with private land owners to promote stewardship and the use of environmentally friendly land management (About Sugarloaf Cove 2009).

**Program:** Learning Cart

**Website:** <http://www.sugarloafnorthshore.org/index.html>

**Contact:** Molly Thompson

**E-mail:** [molly@sugarloafnorthshore.org](mailto:molly@sugarloafnorthshore.org)

**Phone:** 218-525-0001

**Partners:** local businesses, MN Coastal Program

**Summary:**

Learning cart is a mobile informational display containing materials for local parks, businesses, and tourist attractions. The cart spends the majority of its time in Canal Park located in Duluth, MN, but also travels to area state parks including Tettegouche and Gooseberry State Parks. The learning cart provides information about available recreation and informational resources that are available in the area (Thompson 2009).

---

**Organization:** Lake Superior Research Institute- University of WI-Extension

The Lake Superior Research Institute (LSRI), based at the University Wisconsin Superior campus, was created in 1967 with a mission that includes environmental research, environmental education, and public information for the Great Lakes Region. Research and education areas include biological monitoring, ballast water treatment research, biodiesel fuel research, invasive species research, and toxicity tests. LSRI operates and maintains a 58-ft research vessel for research and educational purposes (Lake Superior Research Institute 2008).

**Program:** View from the Lake/ Non-point source pollution Education for Municipal Officials (NEMO)

**Website:** <http://www.seagrant.umn.edu/vfl/>

**Contact:** Sue O'Halloran

**E-mail:** SOHallor@uwsuper.edu

**Partners:** Minnesota Sea Grant

**Summary:**

View from the Lake is a 3 hour educational cruise onboard LSRI's research vessel the LL Smith. The tour goes along Lake Superior's coastline where participants learn the importance of lake monitoring and are able participate first hand with different sampling techniques. LSRI staff explain how lake monitoring allows researchers to evaluate the economic and environmental sustainability of Lake Superior and its coastal communities. Visitors learn the concepts of sustainability and how they are implemented with local projects in progress (View from 2009).

The View from the Lake is a tool for the NEMO education program aimed at providing education to elected and appointed decision makers addressing the relationships between land use and natural resources, especially water. The NEMO mission is to "help Minnesota and Wisconsin communities better protect natural resources while accommodating growth and redevelopment"(Northland NEMO 2009).

**Program:** Environmental Education and Stewardship

**Website:** <http://www.seagrants.umn.edu/vfl/>

**Contact:** Sue O'Halloran

**E-mail:** SOHallor@uwsuper.edu

**Summary:**

The Kimmes-Tobin wetland area was set aside directly for wetland education activities. K-12 students sample and identify aquatic insects, learn about aquatic plants, and measure water quality parameters. By visiting the wetland students are exposed to a variety of wildlife and also learn the importance wetlands play in naturally processes (Lake Superior Research Institute 2008).

**Program:** University of Wisconsin Elderhostel Program

**Website:** <http://www.seagrants.umn.edu/vfl/>

**Contact:** Sue O'Halloran

**E-mail:** SOHallor@uwsuper.edu

**Summary**

Senior citizens have the opportunity to learn more about our natural resources, specifically the Great Lakes issues and concerns (Lake Superior Research Institute 2008)..

## **Other Educational Programming**

Teacher Workshops

Volunteer Stream and Marsh Monitoring

Aquatic Invasive Species Education

Land Use and Watershed Health

---

**Organization:** University of Wisconsin Extension- Northern Great Lakes Visitor Center

The Northern Great Lakes Visitor Center(NGLVC) is located just west of Ashland, WI and provides information and displays of the Lake Superior region and its heritage. The University of Wisconsin Extension uses the NGLVC to offer a variety of education programs aligned with WI Academic Standards. Programs are supported in part by grants from the WI Environmental Education Board and WI Coastal Management Program(Center Educational Program 2009).

**Program:** Adopt-An-Estuary Curriculum

**Website:** [http://www.nglvc.org/nglvc\\_educational\\_programs.htm](http://www.nglvc.org/nglvc_educational_programs.htm)

**Contact:** Cathy Techtmann

**E-mail:** [catherine.techtmann@ces.uwex.edu](mailto:catherine.techtmann@ces.uwex.edu)

**Phone:** 715-685-2671

### **Summary:**

The Adopt-An-Estuary Curriculum is comprised of 12 sequential lessons that target high school learners and older. It is modeled off of the National Oceanic Administration's Estuaries 101 curriculum which is based off of field-based lessons with supplementary classroom activities(Techtman 2009).

**Program:** Fish Creek Estuary Education

**Website:** [http://www.nglvc.org/nglvc\\_educational\\_programs.htm](http://www.nglvc.org/nglvc_educational_programs.htm)

**Contact:** Cathy Techtmann

**E-mail:** [catherine.techtmann@ces.uwex.edu](mailto:catherine.techtmann@ces.uwex.edu)

**Phone:** 715-685-2671

### **Summary:**

The Fish Creek Curriculum consists of 8 different lesson plans each focusing on different estuarine issues. The classroom, field, and on-the-water curriculum is intended for children ages 12 and above and is often used for local school field trips. The intent is to learn how the region's geology, culture, and history have shaped the unique estuarine habitats. The course covers watershed health, coastal wetland restoration, and estuarine processes (Techtman 2009).

**Program:** Lake Superior Basin Stewardship Curriculum

**Website:** [http://www.nglvc.org/nglvc\\_educational\\_programs.htm](http://www.nglvc.org/nglvc_educational_programs.htm)

**Contact:** Cathy Techtmann

**E-mail:** [catherine.techtmann@ces.uwex.edu](mailto:catherine.techtmann@ces.uwex.edu)

**Phone:** 715-685-2671

**Summary:**

The Lake Superior Basin Stewardship Curriculum uses 12 separate lesson plans intended for pre-K children all the way through high school. The lessons range from Lake Superior's aquatic and terrestrial biota to the different native tribes and European settlements. The lessons use both classroom and field experiences. This curriculum uses the lessons from estuaries education for junior and high school students, but also includes Lake Superior Watershed Education (Techtmann 2009).

**Program:** Paddle Through Time Curriculum

**Website:** [http://www.nglvc.org/nglvc\\_educational\\_programs.htm](http://www.nglvc.org/nglvc_educational_programs.htm)

**Contact:** Cathy Techtman

**E-mail:** [catherine.techtmann@ces.uwex.edu](mailto:catherine.techtmann@ces.uwex.edu)

**Phone:** 715-685-2671

**Summary:**

Paddle through Curriculum is given on board a 34 foot voyageur canoe intended for ages 12 and above. The focus of the voyage is to teach participants the role estuaries and wetlands have in the region's sustainability from Native American settlement until today (Techtmann 2009).

**Other Education Material:**

*String Of Pearl* series

Coastal Wetlands and Estuaries Exhibit at NGLVC

Coastal Wetlands Interpretive Trail Signs at NGLVC

---

**Organization:** Western Upper Peninsula Center for Science, Mathematics and Environmental Education (Western UP Center)

The Western UP Center is a partnership of the western counties of the Upper Peninsula Michigan to promote the teaching and learning of science and mathematics. The center's main goal is to build an education work force by providing quality learning opportunities for students and professional teacher development training [WUPCSMEE 2009].

**Program:** Lake Superior Stewardship Initiative (LSSI)

**Website:** <http://lakesuperiorstewardship.org/>

**Contact:** Joan Chadde

**E-mail:** [jchadde@mtu.edu](mailto:jchadde@mtu.edu)

**Summary:**

The LSSI focuses on Lake Superior and its watershed, specifically the natural environment and development. The initiative uses three strategies: 1) implementing classroom curriculum covering the community, the watershed, and the cultural heritage to give students a sense of place in the Great Lakes, 2) providing student and teacher learning opportunities to expand their knowledge of the Great Lakes and the region's resources, and 3) create school-community partnerships with local governments to better address local needs [WUPCSMEE 2009].

**Program:** Great Lakes Maritime Transportation Education

**Website:**

[http://wupcenter.mtu.edu/education/great\\_lakes\\_maritime/index.htm](http://wupcenter.mtu.edu/education/great_lakes_maritime/index.htm)

**Contact:** Joan Chadde

**E-mail:** [jchadde@mtu.edu](mailto:jchadde@mtu.edu)

**Partners:** Great Lakes Maritime Research Institute (UWS)

**Summary:**

Great Lakes Maritime Transportation Education provides workshops and materials for teacher development and training. The program also includes lesson plans and curriculums for teachers to use in the classroom. Information is provided to help educators teach students how vital the Great Lakes are to the region's economy and world commerce [WUPCSMEE 2009].

**Program:** Lake Superior Youth Symposium

**Website:** <http://lakesuperioryouth.org/>

**Contact:** Joan Chadde

**E-mail:** [jchadde@mtu.edu](mailto:jchadde@mtu.edu)

**Summary:**

Every other year the Lake Superior Youth Symposium is held in Wisconsin, Michigan, Minnesota, or Ontario for students and teachers who care about Lake Superior and the Great Lakes. The symposium takes place over 4 days that includes many events such as keynote lecturers, guest presentations, a variety of field trips, and student presentations [WUPCSMEE 2009].

## Appendix 2: Survey Comments

2. Do you support the designation of the St. Louis River as a National Estuarine Research Reserve? Comments:

- 1) we need to have estuarine reserves where research can occur over the long-term in a manner in which it is readily made understandable to the general public in order to improve environmental decision-making
- 2) Because it will bring additional resources to the region, especially in the areas of education and research.
- 3) It is important to learn more about how freshwater estuary processes work. Since only one other freshwater NERR exists, current understanding of these processes is very limited. The designation of the Lake Superior NERR will greatly increase our understanding.
- 4) There is only one other freshwater NERR in the nation and another one showcasing the estuaries on the largest great lake in the nation would be a valuable national resource.
- 5) I was on the site selection team and agree with the results!
- 6) Best option for NERR objectives in the Lake Superior region.
- 7) To bring the resources of NOAA to Lake Superior to learn more about freshwater estuaries. To connect more with agencies and governments for research, education and management. To share that info with others in freshwater estuaries.
- 8) The area is the largest, most diverse and logistically very critical
- 9) It's one of the largest Tributaries to Lake Superior and the Great Lakes, has a large estuary that meets many if not most of the criteria set out for such a nomination. It also is a working industrial port which provides even more research and educational opportunities.
- 10) after air and shelter from the elements, clean water is critical to life; we need to know more about how to protect and restore the headwaters to the great lakes
- 11) It is a valuable natural resource that needs to be protected. To protect it, people in general need to be taught about it. Once they are taught, they are more likely to want to protect it.

3. Please rate the importance of each "need" of the Duluth/Superior area environmental education community as it relates to freshwater estuary education. Others (Please specify)

- 1) On-line public access to information (data and interpretation)
- 2) Education programs for the general public, on-the-water programs, development of web-based educational outreach

- 3) Volunteer opportunities - hands on learning
- 4) Students

4. Please provide any comments related to the future of educational programming of the Lake Superior NERR.

- 1) Hands-on learning is the best. Get the teachers and students out in the environment (the estuary) as much as is possible.
- 2) Capitalize on existing educational infrastructure and programs that take people to the resources.
- 3) I think it's important that the educational programming at the Lake Superior NERR be coordinated and integrated with the schools, colleges, universities and other educational institutions in the Lake Superior Basin and area.
- 4) The above needs in my reasoning were based on "Yes our community needs these things" not necessarily that there is a gap in materials or a need for new materials, materials and professional are already available to do the task - just tweaks are needed for specific messaging and coordination. The only new project that is needed, from my perspective, is the Interpretive Educational Facility.
- 5) It is important to coordinate with estuary programming already being done across the Lake Superior Basin and to use existing curricula if appropriate.
- 6) Behavior consistent with the message: lots of hands-on involvement, minimal brochures, no plastic advertising trinkets, no Styrofoam cups and lack of recycling at events etc
- 7) There are some great local organizations in place currently that are working towards the same goals. I think it should be a priority to work with these groups to streamline operations and reach the largest audience possible.



## References

- About Sugarloaf Cove*. August 2009. Sugarloaf Cove. 20 August 2009. <[http:// www.sugarloafnorthshore.org/about.html](http://www.sugarloafnorthshore.org/about.html)>.
- Anderson, Deb. Lac Courte Oreilles Objibwe Community College. Questionnaire. 24 August 2009.
- Barstow, D., Hammerman, J.K.L., Ibañez, A. (2008). *How Learning About Estuaries Meets State and National Science Education Standards*. TERC: Cambridge, MA.
- Barstow, D., Hammerman, J.K.L., Ibañez, A. (2007). *The State of Estuarine Education K-12 Needs Assessment*. TERC: Cambridge, MA.
- Carey, Sanda. City of Superior. Personal Interview. 5 August 2009.
- Center Educational Programs*. 2009. Northern Great Lakes Visitor Center. 20 September 2009. <<http://www.nglvc.org/index.htm>>.
- Conservation Education*. 2007. South St. Louis Soil and Water Conservation District. 20 August 2009. <[http:// www.southstlouisswcd.org/education.html](http://www.southstlouisswcd.org/education.html)>.
- Education*. 2009. National Estuarine Research Reserve. 2 February 2009. <[http:// www.nerrs.noaa.gov/Education.aspx](http://www.nerrs.noaa.gov/Education.aspx)>.
- Educational Resources*. 2009. Great Lakes Aquarium. 12 September 2009. <[http://www. glaquarium.org/education/index.php](http://www.glaquarium.org/education/index.php)>.
- Edwards, Jane. City of Superior. Personal Interview. 5 August 2009.
- Elmer, Heather. Old Woman Creek National Estuarine Research Reserve. Personal Interview. 9 September 2009.
- Environmental Services Divisions of Public Works*. 2009. Superior, WI. 25 August 2009. <[http://www.ci.superior.wi.us/ index.aspx?nid=78](http://www.ci.superior.wi.us/index.aspx?nid=78)>.
- Erickson, Sarah. Great Lakes Aquarium. Personal Interview. 6 August 2009.
- [GLMTE] *Great Lakes Maritime Transportation Education*. 14 November 2008. Western Upper Peninsula Center for Science, Mathematics and Environmental Education. 3 February 2010. <[http:// wupcenter.mtu.edu/education/great\\_lakes\\_maritime/resources. htm](http://wupcenter.mtu.edu/education/great_lakes_maritime/resources.htm)>.
- Gumm, Betty. City of Superior. Personal Interview. 5 August 2009.
- Gunderson, Jeff. Minnesota Sea Grant. Personal Interview. 8 August 2009.

- Ibanez, A. Corridore, A. Coker, D., Simms, E., Alexander, G., Yokel, L., Sedlecky, M., Laurson, N., Weidman, R., Gaskill, T. (2005) *EstuariesLive: Linking Classrooms to the Natural World*. 3 February 2010. <<http://www.estuaries.gov/estuaries101/Resources/Default.aspx?ID=151>>.
- Ibanez, A., McDougall, C., White, S. (2006) *Achieving Environmental Literacy with NOAA's Observing Systems Data*. Marine Technology Society Journal. Vol. 39, 4.
- Judd, Shannon. Fond du Lac Reservation: Environmental Education. Personal Interview. 24 August 2009.
- Kennedy, Mike. Minnesota Pollution Control Agency. Personal Interview. 7 August 2009.
- Kubiak, Kate. South St. Louis Soil and Water Conservation District. Personal Interview. 8 August 2009.
- Lakesuperiorstreams*. 2009. LakeSuperiorStreams: Community Partnerships For Understanding Water Quality and Stormwater Impacts at the Head of the Great Lakes. 23 September 2009. (<http://lakesuperiorstreams.org>).
- [LSNERR MP] Lake Superior National Estuarine Research Reserve Management Plan. 2011-2016. University of Wisconsin Extension. 2010.
- Lake Superior Research Institute*. 2008. University of Wisconsin Superior. 22 September 2009. <<http://www.uwsuper.edu/lisri/>>.
- Lopez, Frank. Old Woman Creek National Estuarine Research Reserve. Personal Interview. 9 September 2009.
- [NAT] *Needs Assessment Training*. 2008. National Oceanic and Atmospheric Administration Coastal Services Center. Needs Assessment Training Module. 15 June 2009. <<http://www.csc.noaa.gov/needs/index.html>>.
- Meyer, Nadine. MinnAqua, Minnesota Department of Natural Resources. Personal Interview. 6 August 2009.
- MinnAqua-Fishing Education*. 2009. Minnesota Department of Natural Resources. 13 September 2009. <<http://www.dnr.state.mn.us/minnaqua/index.html>>.
- Minnesota Envirothon*. 2009. Minnesota Board of Water and Soil Resources. 21 August 2009. <<http://www.bwsr.state.mn.us/outreach/envirothon/index.html>>.

- Nelson, Diane. City of Superior. Personal Interview. 5 August 2009.
- [NERRS] *National Estuarine Research Reserve System*. 2010. National Estuarine Research Reserve System website. 20 January 2010. <<http://www.nerrs.noaa.gov>>.
- Northland NEMO*. 2009. 22 September 2009. <<http://www.northlandnemo.org/index.html>>.
- O'Halloran, Sue. University of Wisconsin Superior: Lake Superior Research Institute. Questionnaire. 8 July 2009.
- [OWC] *Old Woman Creek (Education at)*. 21 October 2009. National Estuarine Research Reserve System. 2 February 2010. <<http://www.nerrs.noaa.gov/ECReserve.aspx?ID=531&ResID=OWC>>.
- Oppedahl, Ruth. University of Wisconsin Extension. Questionnaire. 9 July 2009.
- Outreach & Education*. 2009. Minnesota Sea Grant. 17 September 2009 <<http://www.seagrant.umn.edu/projects/outreach>>.
- Pandion Systems. (2003) *Inventory and Assessment of K-12 and Professional Teacher Development Programs in the NERRS*. 3 February 2010. <<http://www.estuaries.gov/estuaries101/Resources/Default.aspx?ID=151>>.
- Projects*. 2009. St. Louis River Citizens Action Committee. 23 September 2009. <<http://www.stlouisriver.org/projects.html>>.
- [RSPT] *Regional Stormwater Protection Team*. 7 July 2009. Lake Superior Duluth Streams.org. 5 August 2009. <<http://www.lakesuperiorstreams.org/stormwater/rspt.html>>.
- [SEEK] *Shared Environmental Education Knowledge*. 15 July 2009. Minnesota Pollution Control Agency. 10 February 2010. <<http://www.seek.state.mn.us>>.
- Sharrow, Jim. Duluth Seaway Port Authority. Personal Interview. 12. August 2009.
- Stewart, Richard. Great Lakes Maritime Research Institute. Personal Interview. 25 August 2009.
- St. Louis River Quest Environmental Education Program*. 2009. Duluth Seaway Port Authority. 20 September 2009. <<http://www.duluthport.com/>>.

- St. Louis River Watch Project*. 2009. Fond du Lac Tribal and Community College. 23 September 2009. <<http://www.fdlccc.edu/academics/departments/special/stlouisriverwatch.shtml>>.
- Techtmann, Cathy. University of Wisconsin Extension: Northern Great Lakes Visitor Center. Completed Questionnaire. 4 August 2009.
- Techtmann, Cathy. University of Wisconsin Extension: Northern Great Lakes Visitor Center. Personal Interview. 24 August 2009.
- Thompson, Molly. Sugarloaf. Personal Interview. 3 Aug. 2009.
- Thoreson, Jenny. City of Superior. Personal Interview. 5 August 2009.
- Twin Ports Freshwater Folk*. 2010. University of Minnesota Duluth. 5 February 2010. <<http://www.d.umn.edu/cfrp/twinports.htm>>.
- Van Zoest, Phoebe. Old Woman Creek National Estuarine Research Reserve. Personal Interview. 9 September 2009.
- View from the Lake*. 2009. Minnesota Sea Grant. 22 September 2009. <<http://www.seagrant.umn.edu/vfl/>>.
- Welcome to the St. Louis River Watch*. 2006. St. Louis River Watch: Fond du lac College. 23 September 2009. <<http://www.slrivervatch.org/default.asp>>.
- [WUPCSMEE]. *Western Upper Peninsula Center for Science, Mathematics, and Environmental Education*. 2009. Michigan Tech. 20 September 2009. <<http://wupcenter.mtu.edu/index.html>>.
- Wimme, Joan. University of Wisconsin Extension. Personal Interview. 17 August 2009.
- Yorde, Adele. Duluth Seaway Port Authority. Personal Interview. 12 August 2009.