WDNR Aquatic Invasive Species Control Grant Proposal
Subchapter II – Education, Prevention, and Planning Projects

Ecosystem Effects of Zebra Mussels in the Spread Eagle Chain of Lakes (Florence County, Wisconsin)

A Proposal Submitted to:

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1. INTRODUCTION – *AN INTEGRATED APPROACH*

A population of zebra mussels (*Dreissena polymorpha*) was discovered in North Lake of the Spread Eagle Chain of Lakes in September 2012. The zebra mussel is a deleterious aquatic invasive species (AIS) that over the past several years has begun to invade lakes in northern Wisconsin and Michigan's Upper Peninsula. This highly connected Spread Eagle Chain of Lakes is vulnerable to the zebra mussel population spreading throughout. In fact, six of the eight lakes in the Chain were found to contain young adult zebra mussels in low densities during a June 2013 survey.[1] The presence of a growing population of zebra mussels in the Spread Eagle Chain is of grave concern to the Spread Eagle Chain of Lakes Association (SECOLA), Wisconsin Department of Natural Resources (WDNR), Florence County Lakes and Rivers Association (FCLARA), Florence County Land Conservation Department, the Wild Rivers Invasive Species Coalition (WRISC), and all people concerned with the health of surface waters in northern Wisconsin and Michigan. In fact, AIS such as the zebra mussel invade not just a single lake, but an entire waterscape since the invader has created an outpost from which it can more easily colonize other water bodies.

The recent establishment of zebra mussel in the Spread Eagle Chain of Lakes presents an opportunity to examine the potential ecosystem effects of zebra mussels in nutrient poor oligotrophic lakes during the early period of colonization and anticipated population expansion. Zebra mussels are prodigious filter-feeders and can reach extraordinary population sizes. They feed on planktonic algae and thereby cause the water to become clearer. The increased light penetration allows aquatic rooted plants to become established in deeper areas of the lake. The filter-feeding zebra mussels select against blue-green algae and therefore alter the phytoplankton community balance toward these more noxious algae. Zebra mussels compete with native zooplankton for a finite phytoplankton food base. This can have potential impacts on the entire food web. Water chemistry, benthic macroinvertebrates, and even fish are potentially affected.

The study we propose aspires to monitor several ecosystem elements as the zebra mussel population expands in the Spread Eagle Chain of Lakes. Additional years of study may be carried out to document later stages of the ecosystem response. We plan to gather both existing and new data on the zebra mussel population, aquatic plant community, algae and zooplankton communities, benthic macroinvertebrates, water quality, and more in order to understand the

[1] *Spread Eagle Chain of Lakes Zebra Mussel Population Initial Report. 2013. Florence County Land Conservation Department (Authors: Robert Richard, Haley Winchell, Margie Yadro)*

changes in this aquatic ecosystem. The proposed two year project will include research, education, and planning components.

Environmental impacts such as the Spread Eagle Chain of Lakes zebra mussel invasion often provide a powerful catalyst for innovative partnerships and approaches to natural resources issues. The current proposal results from such a partnership and approach. The Lumberjack Resource Conservation &Development Council (Lumberjack) is the project sponsor for this proposed project. Other project partners include the ecological consulting firm White Water Associates, Northland College, WDNR, SECOLA, FCLARA, Florence County Land Conservation Department, and WRISC. From 2011 to 2013, Lumberjack was the project sponsor for a large scale research, education, and planning project on Keyes Lake (Florence County) and the Menominee River Watershed that included several of the same project partners and revealed important new practical information on zebra mussel populations in northern lakes. This proposed project is a natural next step in Lumberjack's contribution to the stewardship of the region's aquatic resources.

A key contribution of the Keyes Lake-Menominee River Watershed project was ***A Strategic Plan to Address Zebra and Quagga Mussels in the Menominee River Watershed***.[2] The Spread Eagle Chain of Lakes is also part of the Menominee River Watershed (a watershed that includes parts of Wisconsin and Michigan). The Strategic Plan provides actions and guidance that will be useful in the proposed project and is a fine example of previous WDNR projects that underpin and inform the next generation of projects.

This proposal seeks a WDNR Aquatic Invasive Species Control Grant (Education, Prevention, and Planning). Our vision is to ensure the perpetuation of a healthy landscape of water bodies, including the Spread Eagle Chain of Lakes. We believe that the approach by which we can realize this vision consists of three components: (1) an integrated education and response program, (2) research on components of the Spread Eagle Chain of Lakes ecosystem most likely influenced by the zebra mussel population and (3) a Spread Eagle Chain of Lakes management plan. We conceive of an ongoing program that will continue beyond the duration of that we propose. The project proposed herein is intended to be carried out over approximately two years. This technical proposal was prepared by White Water Associates and is submitted by the

[2] *Premo, Dean and Angie Stine. 2013. A Strategic Plan to Address Zebra and Quagga Mussels in the Menominee River Watershed. White Water Associates, Inc.*

Lumberjack Resource, Conservation, & Development Council along with other application requirements.

The SECOLA has committed to lake stewardship by way of an integrated adaptive management plan. After review and approval of the management plan resulting from this proposed effort, the SECOLA will formally adopt the plan.

We follow the concept of "adaptive management" in our approach to the proposed program. Simply stated, adaptive management uses findings from planned research and monitoring activities to inform future management actions and periodic refinement of the plan. An adaptive management plan accommodates new findings by integrating this information into successive iterations of the comprehensive plan. The plan will therefore be a dynamic entity, successively evolving and improving to fit the needs of the Spread Eagle Chain of Lakes. Adaptive management admits to our uncertain knowledge about natural ecosystems and allows us to adjust the plan to changing conditions and new information. Monitoring the outcomes of plan implementation is essential to the process of adaptive management. We think that monitoring should focus on specific indicators designed to measure the progress toward program goals. Future project phases will define indicators for monitoring plan implementation.

We have organized this technical proposal in the following sections (1) Introduction (this section), (2) Project Area, (3) Problem Statement, (4) Project Goals and Objectives, (5) Methods and Activities, (6) Project Products, (7) Data to be Collected, (8) Existing and Proposed Partnerships, (9) Role of Project in Planning and/or Management of Lake, (10) Timetable for Implementation of Key Activities, (11) Plan for Sharing Project Results, (12) Project Budget, and (13) Supplemental Information in Support of Project.

2. PROJECT AREA

The Spread Eagle Chain of Lakes in Florence County, Wisconsin is the subject of the proposed program. The Chain consists of eight lakes (see Exhibit 1 and Table 1) located in Florence Township just north of the town of Spread Eagle. Other lakes, both large and small, are in this landscape. The Menominee River is located immediately east of the Spread Eagle Chain of Lakes. This major river system is a known biodiversity corridor and adds to the biological uniqueness of the area. This interconnected water landscape is a target for migrating and breeding waterfowl and other birds. The Spread Eagle Chain of Lakes has value and function in this larger landscape as well as its own watershed.

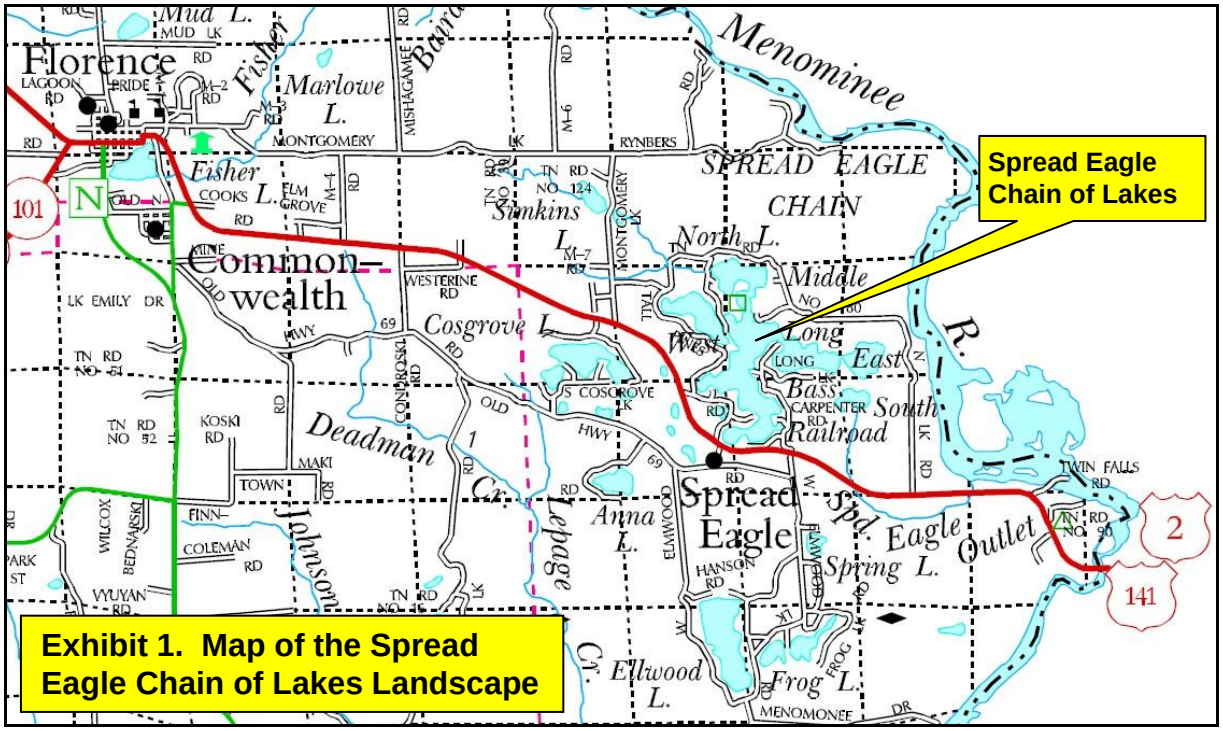


Exhibit 1. Map of the Spread Eagle Chain of Lakes Landscape

The total surface area of the Spread Eagle Chain of Lakes is 548 acres. The Water Body Identification Codes (WBIC) for the individual lakes are shown in Table 1 along with lake size, maximum depth, and AIS presence. The combined shoreline perimeter for the chain is 14.8 miles.

The USGS topographic map shows a small stream that flows into North Lake. It emanates from Montgomery Lake about one mile to the northwest and flows through wetlands. No streams enter any of the other lakes in the Chain. Springs, precipitation, and runoff from the watershed

supply water directly to the lakes. A stream called Spread Eagle Outlet flows about two miles before emptying into the Menominee River. A small concrete compensation dam on the south end of South Lake controls the water level of the Chain of Lakes.

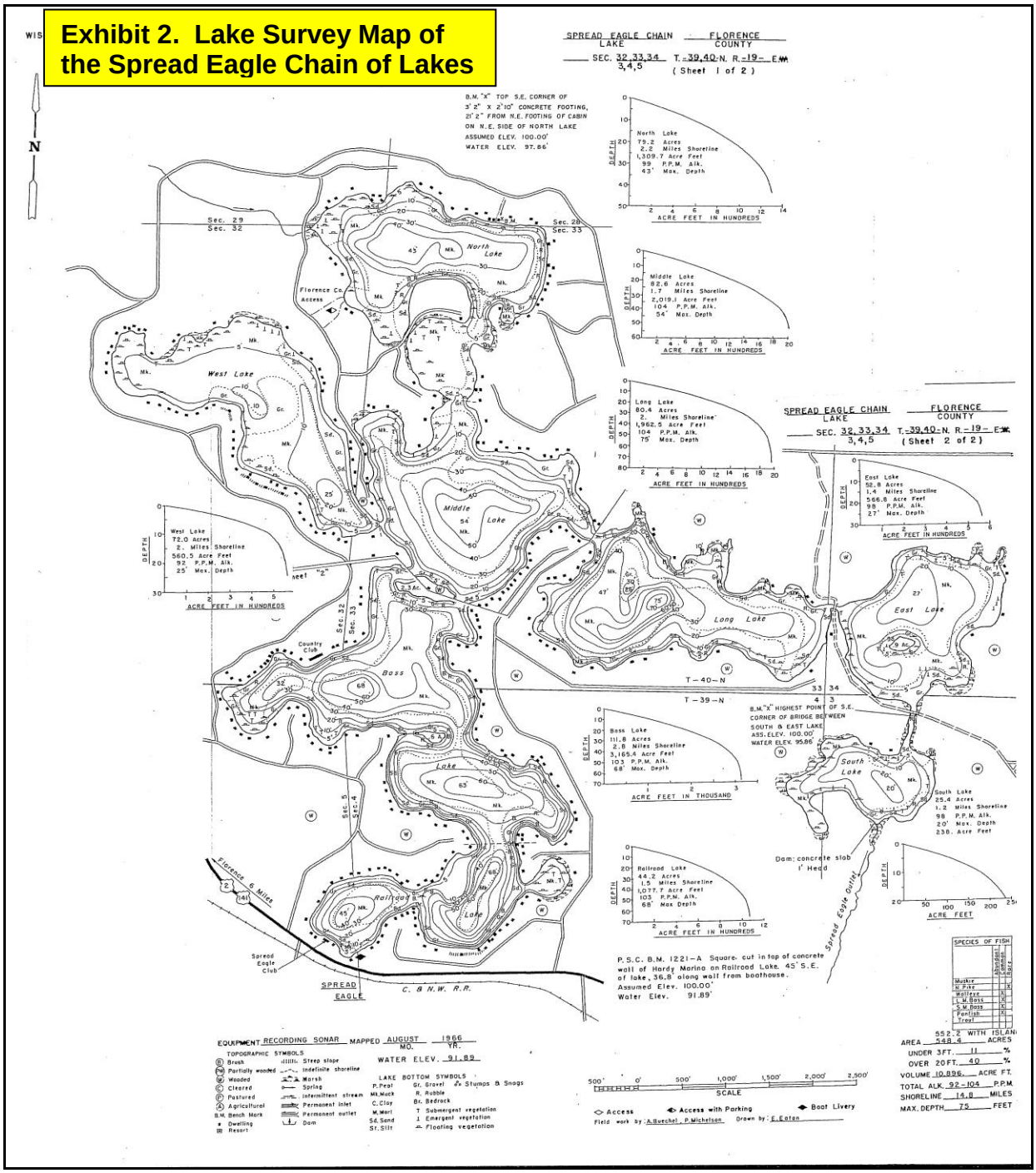
Table 1. Lakes Comprising the Spread Eagle Chain of Lakes

LAKE NAME	WBIC	SIZE	MAX DEPTH	AIS PRESENCE
Bass Lake	702700	112 ac	68 feet	zebra mussel, banded mystery snail, rusty crayfish
East Lake	702400	48 ac	27 feet	banded mystery snail
South Lake	702200	24 ac	20 feet	banded mystery snail
Middle Lake	702600	91 ac	54 feet	zebra mussel, banded mystery snail, rusty crayfish, Eurasian water-milfoil
West Lake	703500	71 ac	25 feet	zebra mussel, banded mystery snail, Chinese mystery snail, rusty crayfish
Long Lake	702500	73 ac	75 feet	zebra mussel, banded mystery snail, rusty crayfish
Railroad Lake	702800	37 ac	68 feet	zebra mussel, banded mystery snail, rusty crayfish
North Lake	703000	79 ac	43 feet	zebra mussel, banded mystery snail, freshwater jellyfish, rusty crayfish, zebra mussel, Eurasian water-milfoil

The lakes in the Chain have can be classified as oligotrophic. They have reasonably high alkalinity. The lakes are clear and several are quite deep. A bathymetric map of Spread Eagle Chain is shown in Exhibit 2. A single county-owned public access site with improved boat ramp serves the Chain. It is located on the west shore of North Lake. This landing provides area for parking, restroom, garbage cans, public fishing pier, and boat-launch facility. This site includes educational signage and is a site where boat inspections occur. This launch site is heavily used by boaters as the Chain is a popular recreational destination. Within the Chain of Lakes, Bass Island is available for public use: fishing, swimming, and picnicking. This is a state-owned island leased by the Town of Florence and maintained by SECOLA. There is also a commercial establishment on Railroad Lake at which boats can purchase gas and oil. This is available to boaters who launch from the North Lake public access. A private resort (SVECIA Country Club) also exists on the Chain. Several of the lakes in the Chain are fairly developed with permanent homes and cottages. Areas of natural riparian area also exist.

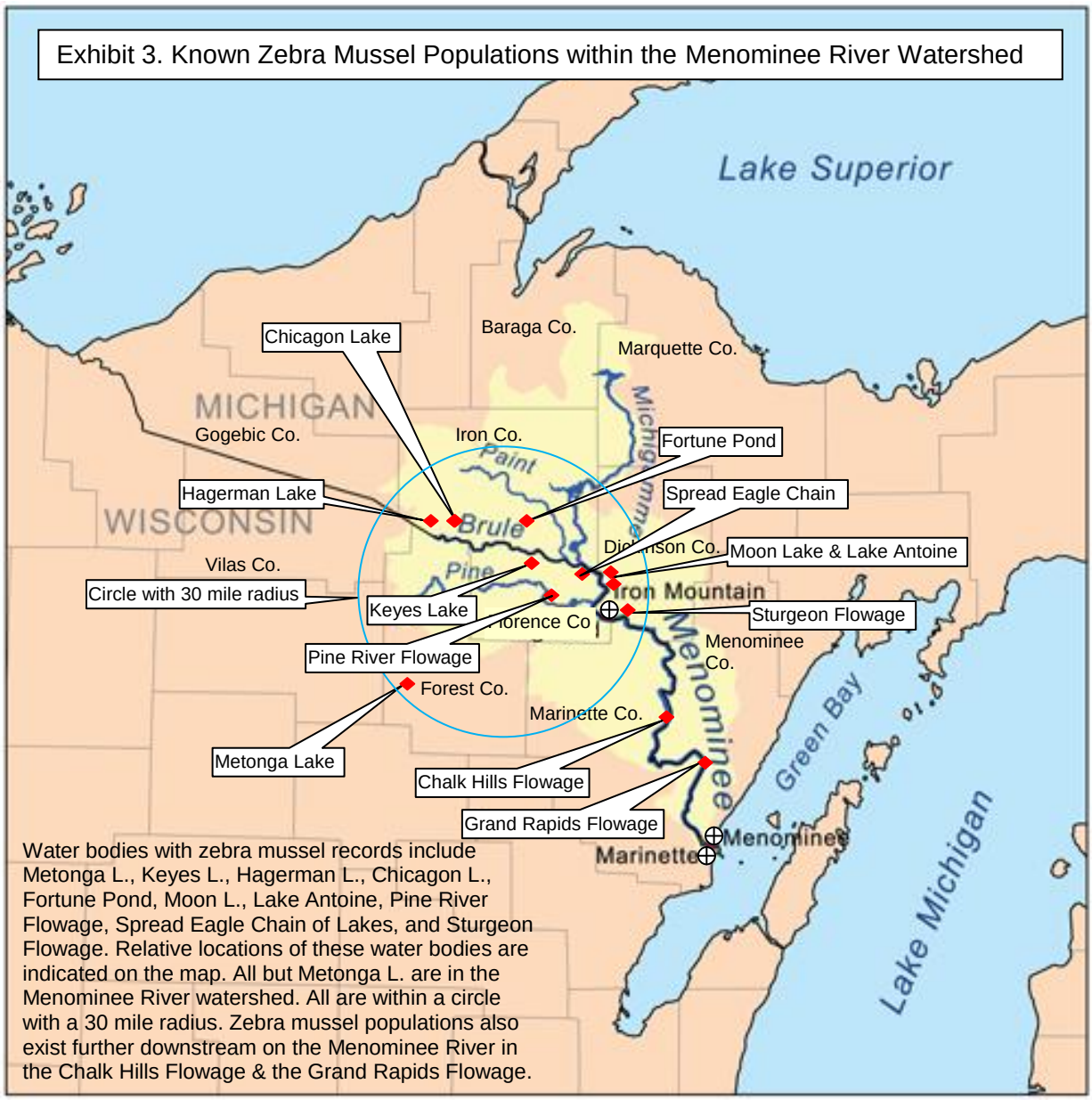
Four the lakes within the Spread Eagle Chain of Lakes will be selected for intensive study of some ecosystem elements (for example phytoplankton and water quality). We propose that these four include North Lake, West Lake, Bass Lake, and East Lake. Some ecosystem elements (such as aquatic macrophytes) will be studied in all lakes of the chain.

Exhibit 2. Lake Survey Map of the Spread Eagle Chain of Lakes



Eleven bodies of water within the Menominee River Watershed are known to have zebra mussels. These include Keyes L., Spread Eagle Chain, and Pine R. Flowage (all in Florence Co., WI), Hagerman L., Chicagon L., and Fortune Pond (all in Iron Co., MI), Lake Antoine, Moon L.

and Sturgeon Flowage (all in Dickinson Co., MI), and Grand Rapids Flowage and Chalk Hills Flowage (both on the Menominee R. in Menominee Co., MI and Marinette Co., WI). Located about 15 miles southwest of the Menominee River Watershed, Metonga Lake (Forest Co., WI) also has zebra mussels. Exhibit 3 shows the locations of these water bodies. All are popular fisheries with public access and considerable recreational traffic. Tourism is a principal economy in the region and the area is less than a half-day drive from large metropolitan areas. All the zebra mussel water bodies are short drives from other lakes that have no zebra mussel records.



3. PROBLEM STATEMENT

This section describes the unique opportunity to address an AIS problem through a three-pronged integrated strategy including (1) education and response, (2) research, and (3) adaptive management planning. Each of these components is addressed in this section.

A specific problem and focus for part of our education component are "recreational linkages" in the form of humans moving from one body of water to another with their watercraft, boat trailers, and fish bait containers. These recreational linkages are a potential major vector for AIS. Transport of AIS can more readily occur on this landscape because short travel distances between water bodies means that desiccation and exposure to UV light has less time to render AIS propagules inviable. For the education and response component of this project, we plan to draw guidance from ***A Strategic Plan to Address Zebra and Quagga Mussels in the Menominee River Watershed***. This document was created as part of a previous WDNR grant project on Keyes Lake and included input from several of the partners in this proposed project (including WRISC, FCLARA, SECOLA, White Water Associates, and WDNR).

A Strategic Plan to Address Zebra and Quagga Mussels in the Menominee River Watershed also recommended specific research topics on zebra mussel impacts on lake ecosystems. Despite the fact that several water bodies in the region have zebra mussels, little research has been devoted to determining the short and long term effects on lake ecosystems in northern Wisconsin. Several characteristics of the Spread Eagle Chain make this a desirable focus of a research project. First of all, the zebra mussel population is quite young (the Chain was likely colonized in 2010 or 2011). This means the population is not extremely dense and most individuals in the population area still young. Judging from water transparency records (Secchi depth), zebra mussel filtering in the Spread Eagle Chain has not yet influenced water clarity (an early indicator of zebra mussel impact). Very little research has been conducted on small, deep, oligotrophic lakes with zebra mussel populations. Of particular concern to resource managers is the susceptibility of water bodies to zebra mussel colonization. Toward this end, an important tool is the Invasive Species Interactive Mapping System produced by the University of Wisconsin-Madison Center for Limnology (http://www.aissmartprevention.wisc.edu/mappingtool.php). It categorizes lakes as *suitable*, *borderline suitable*, or *not suitable* for zebra mussels based on their lake chemistry. Lakes of the Spread Eagle Chain are categorized as *suitable*, except for West Lake which is *borderline*. The proposed study may establish groundwork to observe differences in zebra mussel success between the lakes and inform our understanding of lake susceptibility.

The lakes that comprise the Spread Eagle Chain of Lakes are healthy, diverse, and productive ecosystems. They provide countless hours of recreational value and represent significant monetary value to those who own property on the Chain. An important outcome of this proposed project is an adaptive management plan focused on maintaining the quality of this water resource. Zebra mussels are an insult to the ecological integrity of the Chain, but not a reason to "throw in the towel." In fact, the zebra mussel colonization of the Chain provides a wake-up call to address what is right with the Chain of Lake and devise actions that serve to perpetuate a state of health. This includes preventing other AIS from establishing in the Spread Eagle Chain of Lakes.

An important factor that contributes to the strength of this proposed project is the unique team of project partners prepared to contribute their experience and expertise. The project builds on past work accomplished by several of these partners with funds provided by the WDNR. This program seeks to limit the spread of zebra mussels to new water bodies, understand the impacts of zebra mussels on northern lake ecosystems, and address the entire Spread Eagle Chain of Lakes ecosystem with a comprehensive adaptive management plan. Funding this project would be a good investment by the WDNR.

4. PROJECT GOALS AND OBJECTIVES

The three facets of our approach to zebra mussels in the Spread Eagle Chain of Lakes are reflected by three specific actionable goals:

1. ***Education and Response*** – Deliver an education and response program that serves to increase lake users' knowledge of the biology and transport of AIS (with particular focus on zebra mussels) and reduces the opportunity for zebra mussel (and other AIS) to invade new bodies of water.
2. ***Research*** – Design and conduct a research program that endeavors to document the current conditions of the Spread Eagle Chain of Lakes ecosystem (including chemistry, physical attributes, and biota) and sets the stage for understanding the changes in the ecosystem that are coincident with zebra mussel colonization and population growth.
3. ***Planning*** – Develop an adaptive lake management plan for the Spread Eagle Chain of Lakes that integrates existing information about the lakes with new findings from the proposed research and addresses aquatic invasive species, including zebra mussels.

There are several objectives and associated tasks that support these goals and we outline these in the remainder of this section. The objectives are organized under four categories: (1) "project" including objectives that influence all three project components, (2) "education and response" including objectives that drive the education and outreach component and minimize the opportunities for AIS to invade new bodies of water, (3) "research" including objectives that cover the research element of the project, and (4) "planning" including those objectives that guide the Spread Eagle Chain of Lakes planning effort.

Project Objectives

Project Objective 1. Coordinate and integrate three project elements (education & response, research, and planning) and their respective teams through meetings and communication.

Task 1A: Articulate a general strategy and approach in the form of a WDNR Aquatic Invasive Species Control proposal (this proposal).

Task 1B: Meet yearly with project partners (2 meetings) to share progress and findings.

Task 1C: Augment meetings with correspondence and communication regarding project.

Project Objective 2. Produce final project report incorporating all three project components (education and response, research, and planning).

Task 2A: Gather written project products from project team members.

Task 2B: Integrate project products from education and response, research, and planning components into a single project draft report (draft adaptive management plan).

Task 2C: Provide draft report to project team, WDNR, and project sponsor for review.

Task 2D: Based on input from review, complete final adaptive management plan.

Project Objective 3. Administer the overall project.

Task 3A: Track and report project costs for all three project elements.

Task 3B: Administer project funds by reviewing and paying invoices submitted by project participants.

Task 3C: Track and report project volunteer/donated hours and other forms of "match."

Education and Response Objectives

Education and Response Objective 1. Increase knowledge of zebra mussels, other AIS, and lake ecology through education and training.

Task 1A: Host two annual project workshops (Year 1 will be project kick-off and lake ecology workshop; Year 2 will be project update and strategic planning workshop).

Task 1B: Host aquatic invasive species volunteer monitoring workshops (i.e. zebra mussels, Eurasian water milfoil, purple loosestrife, spiny water flea, etc.).

Task 1C: Prepare press releases and newspaper articles highlighting project.

Education and Response Objective 2. Conduct zebra mussel prevention and containment.

Task 2A: Conduct Boat Landing Blitz (July 4th weekend) at North Lake.

Task 2B: Conduct Clean Boats/Clean Waters at Spread Eagle Chain boat landing.

Education and Response Objective 3. Implement selected actions from the regional zebra mussel containment strategy.

Task 3A: Draw guidance from *A Strategic Plan to Address Zebra and Quagga Mussels in the Menominee River Watershed*.

Task 3B: Identify target lakes that are highly susceptible to zebra and quagga mussels, based on geography, recreational use, and water chemistry.

Task 3C: Organize zebra mussel monitoring program that enlists volunteers and focuses on the target lakes.

Task 3D: Implement zebra mussel monitoring program.

Research Objectives

Research Objective 1. Conduct research to document current conditions of the Spread Eagle Chain of Lakes ecosystem and establishes a baseline for understanding changes that are coincident with zebra mussel colonization and population growth.

Task 1A: Study phytoplankton community composition, distribution, and phenology.

Task 1B: Study periphyton community composition.

Task 1C: Conduct point-intercept surveys for rooted aquatic plants (macrophytes).

Task 1D: Study zooplankton community composition, distribution, and phenology.

Task 1E: Study benthic macroinvertebrate community composition.

Task 1F: Characterize the native mussel community in the Spread Eagle Chain.

Task 1G: Study the distribution, density, & demography of the zebra mussel population.

Task 1H: Study the fish community composition and demography.

Task 1I: Collect water quality measures (physical and chemical).

Research Objective 2. Conduct data management, analyses, interpretation, and reporting.

Task 2A: Report on phytoplankton community composition, distribution, and phenology.

Task 2B: Report on periphyton community composition.

Task 2C: Report on point-intercept survey aquatic plant data.

Task 2D: Report on zooplankton community composition, distribution, and phenology.

Task 2E: Report on benthic macroinvertebrate community composition.

Task 2F: Report on the native mussel community in the Spread Eagle Chain.

Task 2G: Report on the distribution, density, & demography of zebra mussel population.

Task 2H: Report on fish community composition and demography.

Task 2I: Report on water quality measures (physical and chemical).

Planning Objectives

Planning Objective 1. Gather, consolidate, assess, and manage existing information about the aquatic plants and plant habitats of the Spread Eagle Chain.

Task 1A: Collect and review historical information regarding plants and plant studies on the Spread Eagle Chain of Lakes. (Done in consultation with Jim Kreitlow, WDNR).

Task 1B: Summarize existing plant information for the Spread Eagle Chain of Lakes.

Planning Objective 2. Analyze point-intercept aquatic plant survey data collected on the Spread Eagle Chain.

Task 2A: Obtain completed APM spreadsheets from WDNR for the 2014 point-intercept.

Task 2B: Analyze plant data and summarize. Include maps of emergent and floating leaved communities and substrate.

Planning Objective 3. Gather, consolidate, assess, and manage information about water quality and potential risks to water quality for the Spread Eagle Chain of Lakes.

Task 3A: Collect and review existing limnological information. (Coordinate with Jim Kreitlow, WDNR, for completeness. Sources may include WDNR records, Florence County Land Conservation Dept, outside studies, and volunteer information.)

Task 3B: Analyze and summarize historical water quality data.

Task 3C: Analyze and summarize 2014 water quality data from Spread Eagle Chain.

Task 3D: Evaluate water quality conditions in relation to zebra mussel population.

Planning Objective 4. Gather and summarize information about Spread Eagle Chain fisheries.

Task 4A: Collect and review existing Spread Eagle Chain Lake fisheries information. (Coordinate with Jim Kreitlow and Greg Matzke, WDNR to ensure completeness.)

Task 4B: Summarize existing fisheries data in format appropriate for inclusion in the adaptive management plan.

Planning Objective 5. Gather and integrate information on zebra mussels as it pertains to the Spread Eagle Chain of Lakes.

Task 5A: Collect and review existing information on the Spread Eagle chain zebra mussel population. (Coordinate with Jim Kreitlow, WDNR, to ensure completeness.)

Task 5B: As they become available from the research component, gather new findings on zebra mussels of the Spread Eagle Chain. Integrate this with existing information.

Task 5C: Review scientific and resource management literature for information and techniques relevant to Spread Eagle Chain of Lakes zebra mussel management.

Planning Objective 6. Gather, consolidate, assess, and manage information about the Spread Eagle Chain of Lakes' watershed, especially those attributes relevant to lake health.

Task 6A: Delineate the watershed.

Task 6B: Map watershed land cover/use/soils & create nutrient budget with WILMS.

Task 6C: Map slopes to identify runoff and environmentally "risky" areas in terms of non-point source pollution. (In future phases, we plan to estimate potential pollutant loadings.)

Task 6D: Determine existing institutional programs that effect water quality. (e.g., soil and sediment control, GMU basin plan, county land and water management plan, and township zoning ordinances.)

Planning Objective 7. Prepare aquatic plant management plan for Spread Eagle Chain.

Task 7A: Summarize plant and water quality data in a format for inclusion in the APMP.

Task 7B: Write an APMP for the Spread Eagle Chain (including, goals, objectives, historical plant management, monitoring, plant community, potential impacts of zebra mussels, nuisance species or AIS, management alternatives, and recommendations).

Task 7C: Integrate the Aquatic Plant Management Plan into the Adaptive Management Plan for the Spread Eagle Chain of Lakes.

Planning Objective 8. Prepare the zebra mussel plan component for the Spread Eagle Chain of Lakes Adaptive Management Plan.

Task 8A: Summarize biological and pertinent water quality information in a format for inclusion in the zebra mussel plan.

Task 8B: Create a zebra mussel plan for the Spread Eagle Chain of Lakes (including goals and objectives, actions, and monitoring and evaluation.

Planning Objective 9. Create an initial adaptive management plan that integrates the APMP and zebra mussel plan with other information about the Spread Eagle Chain and its watershed.

Task 9A: Using information gathered in the current project as well as historical information, develop overarching adaptive management recommendations for the Spread Eagle Chain of Lakes. These recommendations should include topics such as water quality, fish habitat, special species habitat (rare plants and animals), sensitive areas, non-native species, and ecological threats.

Task 9B: Prepare a written adaptive management plan that follows standard scientific format and includes sections on implementation, monitoring, and adaptive management. In the initial version, the plan will lay the basis for its expansion in future phases. It will identify where more information is required.

Planning Objective 10. Integrate recommendations from the GMU/basin plan and/or County Land and Water Resources Management Plan into the Adaptive Management Plan.

Task 10A: Review existing GMU/basin plan and County Land and Water Resources Management Plan and draw from these as appropriate in the Spread Eagle Chain of Lakes Adaptive Management Plan.

Task 10B: Prepare section of adaptive management plan that documents this review.

Planning Objective 11. Prepare a catalog of Spread Eagle Chain Lake environmental, cultural, and aesthetic attributes with a qualitative evaluation of quality and potential threats.

Task 11A: Through collaboration with the SECOLA and other Spread Eagle Chain of Lakes stakeholders, list water-related environmental and aesthetic attributes.

Task 11B: Describe the quality of each of the attributes (high, medium, low).

Task 11C: Identify potential threats to the quality of each of the identified attributes. (**NOTE:** In future phases, we plan to use USEPA habitat assessment and the WDNR methodology to document shoreline and littoral zone quality. A future phase may also include photographic records of representative shorelines in the Spread Eagle Chain).

Planning Objective 12. Support the educational program efforts where related to the Spread Eagle Chain of Lakes zebra mussel and other management elements.

Task 12A: White Water Associates staff will be available for phone conference for SECOLA and other stakeholder consultations.

Task 12B: Increase support, capacity, and involvement of the SECOLA and other stakeholders in long-term stewardship of the Spread Eagle Chain of Lakes through communication of project progress and findings.

Task 12C: White Water staff will attend public meetings that report and discuss the Spread Eagle Chain of Lakes planning process and other project-related issues.

By adopting the "adaptive management" model, we anticipate that the research, education, and planning/implementation process will be ongoing over several years and we will design the adaptive management plan to accommodate future findings and management modifications. Future phases will build on foundations established by the proposed project. Monitoring indicators will be developed. Other aspects of the ecosystem will be explored. For example, future phases will address water quality, AIS mapping, watershed wetlands, riparian vegetation assessment, littoral zone and nearshore riparian area assessment to inform restoration actions, current and anticipated land use and land cover, and education of lake users on topics such as the importance of the riparian zone to lake health. Spread Eagle Chain water quality data can be used for WDNR lake assessment purposes using WisCALM. Future phases will include revisions to the adaptive management plan. The six-year timeline presented as Table 2 outlines various anticipated project phases. In the next section, we discuss the methods and activities that will be undertaken to meet the current project objectives. We also outline anticipated task assignments.

Table 2. Six year time line for anticipated phases of proposed project.					
Year 1 (current proposal)	Year 2 (current proposal)	Year 3 (future proposal)	Year 4 (future proposal)	Year 5 (future proposal)	Year 6 (future proposal)
Existing information review; commence all research components; begin education and planning components.	Research data interpretation and reporting, zebra mussel plan, aquatic plant management plan, and adaptive plan. Continue educ. program	Implement adaptive management plan; continue educ. program; begin longterm research and monitoring program, CB/CW program.	Continue educ. program; continue longterm research and monitoring program; continue CB/CW program. Develop 2nd iteration of the Adapt. Mgt. Plan	Plan implementation; longterm research & monitoring. USEPA /WDNR habitat assessment; Photo documentation of shoreline. Educ. program; CB/CW.	Ongoing plan implementation; longterm research and monitoring. Educ. program; CB/CW. Develop 3rd iteration of the Adapt. Mgt. Plan

5. METHODS AND ACTIVITIES

There are eight partners (including the sponsoring agency) in this project: WDNR, Florence Co. Land Conservation Dept., SECOLA, FCLARA, WRISC, Northland College, White Water Associates, and Lumberjack RC&D (the sponsoring agency). These entities will carry out project tasks presented in Table 3. We provide a summary of methods in this section for each of the three project components: (1) education and response, (2) research, and (3) adaptive management plan.

Education and Response Methods

The effort involved with the zebra mussel education and response includes regional educational outreach and preventing the spread of zebra mussels and other aquatic invasive species. We plan to take guidance from the regional zebra mussel containment strategy that was a product of a previous WDNR AIS grant (***A Strategic Plan to Address Zebra and Quagga Mussels in the Menominee River Watershed***).

Education and outreach will be accomplished through an annual project meeting, workshops/trainings, and news articles. The initial project meeting will serve as a project kick-off. Other workshops summer will expand upon concepts introduced at the kick-off meeting and train citizen volunteers to monitor various biota including AIS. Water clarity workshops will also be conducted as water clarity is an indicator of zebra mussel induced changes a lake.

Project partners will promote prevention of the spread of zebra mussels and other AIS by focusing containment efforts on zebra mussel source waters. Containment efforts will include CB/CW watercraft inspections (Florence Co. anticipates 200 h at North Lake). Planned zebra mussel monitoring will assess extent of zebra mussel distribution in the region.

TABLE 3. TASKS AND RESPONSIBILITIES FOR 2011 AND 2012

1=Primary responsibility; 2=Secondary responsibility

Organizations: Lumberjack RC&D Council (LJ), Spread Eagle Chain of Lakes Association (LA), Florence County AIS Coordinator (FCAIS), Wisconsin Department of Natural Resources (DNR), Wild Rivers Invasive Species Coalition (ISC), Florence County Lakes and Rivers Association (FCLR), Northland College (NC), and White Water Associates (WWA)

Pr=Project Objective, E=Education and Response Objective, R=Research Objective, P=Planning Objective

TASKS	LJ	LA	FCAIS	DNR	ISC	FCLR	NC	WWA
Pr-Task 1A: Articulate general strategy in AIS proposal.	2		2	2			2	1
Pr-Task 1B: Meet once yearly with project partners.	1	1	1	1	1	1	1	1
Pr-Task 1C: Correspondence and communication.	1	1	1	1	1	1	1	1
Pr-Task 2A: Gather written project products team.								1
Pr-Task 2B: Integrate project products into draft report.								1
Pr-Task 2C: Provide draft report to project team for review.	2	2	2	2	2	2	2	1
Pr-Task 2D: Based on review, complete final project report.								1
Pr-Task 3A: Track/report costs for all project elements.	1	2	2	2	2	2	2	2
Pr-Task 3B: Administer project funds.	1							
Pr-Task 3C: Track and report project match.	1	2	2	2	2	2	2	2
E-Task 1A: Host annual project workshops.			1		1			
E-Task 1B: Host AIS volunteer monitoring workshops.			1		1*			
E-Task 1C: Prepare press releases and newspaper articles.		2	1		1*			
E-Task 2A: Boat Landing Blitz (July 4th weekend) at North L.			1			1		
E-Task 2B: Conduct CB/CW at Spread Eagle Chain			1			2		
E-Task 3A: Guidance from Menominee River Strategic Plan.			1		1	1		1
E-Task 3B: Identify target lakes susceptible to AIS mussels.								1
E-Task 3C: Organize zebra mussel monitoring program.			1		1			2
E-Task 3D: Implement zebra mussel monitoring program.			1					
R-Task 1A: Study phytoplankton community.							1	2
R-Task 1B: Study periphyton community.				1				2
R-Task 1C: Conduct PI aquatic plant surveys.				1				2
R-Task 1D: Study zooplankton community.							1	2
R-Task 1E: Study benthic macroinvertebrates.				1				2
R-Task 1F: Characterize native mussel community.				1				
R-Task 1G: Study zebra mussel population.								1
R-Task 1H: Study fish community.				1				
R-Task 1I: Collect water quality measures.								1
R-Task 2A: Report on phytoplankton.							1	
R-Task 2B: Report on periphyton.				1				2
R-Task 2C: Report on aquatic plants.								1
R-Task 2D: Report on zooplankton.							1	
R-Task 2E: Report on macroinvertebrates.				1				
R-Task 2F: Report on native mussels.				1				
R-Task 2G: Report on zebra mussels.								1
R-Task 2H: Report on fish community.				1				
R-Task 2I: Report on water quality.								1

TABLE 3. TASKS AND RESPONSIBILITIES FOR 2011 AND 2012

1=Primary responsibility; 2=Secondary responsibility

Organizations: Lumberjack RC&D Council (LJ), Spread Eagle Chain of Lakes Association (LA), Florence County AIS Coordinator (FCAIS), Wisconsin Department of Natural Resources (DNR), Wild Rivers Invasive Species Coalition (ISC), Florence County Lakes and Rivers Association (FCLR), Northland College (NC), and White Water Associates (WWA)

Pr=Project Objective, E=Education and Response Objective, R=Research Objective, P=Planning Objective

TASKS	LJ	LA	FCAIS	DNR	ISC	FCLR	NC	WWA
P-Task 1A: Collect/review historical plant info.				2				1
P-Task 1B: Summarize existing plant info.								1
P-Task 2A: Obtain APM data from WDNR.				2				1
P-Task 2B: Analyze P-I plant data and summarize.								1
P-Task 3A: Review existing limnological info.								1
P-Task 3B: Analyze/summarize historical water quality data.								1
P-Task 3C: Analyze/summarize 2014 water quality data.				2				1
P-Task 3D: Evaluate water quality relative to zebra mussels.				2				1
P-Task 4A: Collect/review existing fisheries information.				1				1
P-Task 4B: Summarize existing fisheries info.				1				1
P-Task 5A: Collect/review info on SEC zebra mussels.			2	2				1
P-Task 5B: Gather new findings on SEC zebra mussels.			2					1
P-Task 5C: Review zebra mussel literature.								1
P-Task 6A: Delineate the watershed.								1
P-Task 6B: Map land cover/use and soils; WILMS model.				2				1
P-Task 6C: Map slopes to identify runoff patterns.								1
P-Task 6D: Determine existing institutional programs.								1
P-Task 7A: Summarize plant and water quality data.								1
P-Task 7B: Write Aquatic Plant Management Plan (APMP).								1
P-Task 7C: Integrate APMP into Adaptive Management Plan.								1
P-Task 8A: Summarize info for zebra mussel plan.								1
P-Task 8B: Create zebra mussel plan.								1
P-Task 9A: Develop adaptive mgt recommendations.		2				2	2	1
P-Task 9B: Prepare adaptive management plan.								1
P-Task 10A: Review existing plans.								1
P-Task 10B: Document review in adaptive management plan.								1
P-Task 11A: List environmental and aesthetic attributes.		2	2	2		2		1
P-Task 11B: Describe quality of each of the attributes.		2	2			2		1
P-Task 11C: Identify and describe threats to attributes.		2	2			2		1
P-Task 12A: Stakeholder consultations.								1
P-Task 12B: Communication of project progress/findings.								1
P-Task 12C: Public meetings.	2	2	2	2	2	2	2	1

**Current activity under existing Wisconsin DNR AEPP grants for Florence and Marinette Counties.*

Research Methods

Scientifically defensible and documented methods will be adopted for carrying out the various research components outlined in this proposed project. These methods will be appropriate to the biotic taxa or other ecosystem parameter being studied. All methods selected will be done so in consultation with the WDNR. Table 4 summarizes the methods proposed for this project.

TABLE 4. PROPOSED METHODS FOR SPREAD EAGLE CHAIN OF LAKES PROJECT

ECOSYSTEM COMPONENT	PROPOSED METHODOLOGY	INVESTIGATORS
Phytoplankton community	Plankton tows or to be determined with WDNR	Northland College
Periphyton community	Identification of taxa on artificial substrates and associated chlorophyll a samples	Northland College
Aquatic plant surveys	WDNR point-intercept aquatic plant surveys	WDNR
Zooplankton community	Plankton tows	Northland College
Benthic macroinvertebrates	Identification of taxa on artificial substrates	UW-Stevens Point
Native mussel community	Qualitative or quantitative survey methodology	WDNR
Zebra mussel population	Quadrat counts of randomly determined points	White Water
Fish community	Standard WDNR Fisheries assessment of fish	WDNR
Water quality measures	Field collection using standard tools and techniques carried out by White Water Associates staff; laboratory analysis conducted by Wisconsin State Laboratory of Hygiene.	White Water/WDNR

Adaptive Management Plan Methods

The effort involved with creating an adaptive management plan for the Spread Eagle Chain of Lakes will first include gathering, reviewing, and summarizing existing information about the Spread Eagle Chain of Lakes biota and water quality. It will also include integrating the new research results that will emanate from this proposed project. It will also include reviewing and integrating information on zebra mussels (both from the Spread Eagle Chain and other literature sources) to be used in creating the plan. Watershed analysis will include delineating the Spread Eagle Chain watershed area, mapping land cover/use and soils of the watershed; and characterizing slopes through topographic maps and digital elevation models. We will use existing layers of geographic information available from the WDNR and other sources and

manipulate these data using geographical information system technology. Plant data will be used in the creation of the aquatic plant management plan component of the Spread Eagle Chain Adaptive Management Plan. Likewise, the information gathered regarding zebra mussels will be used to create a zebra mussel management plan component of the adaptive management plan. The Adaptive Management Plan will include objectives and actions that enable implementation of the plan over time.

6. PROJECT PRODUCTS

There are several principal products that will result from the project we propose: (1) a comprehensive education and response program, (2) reports on various research aspects of the proposed project, and (3) the Spread Eagle Chain of Lakes Adaptive Management Plan (to include APMP and zebra mussel plan. Each of these is described in this section.

Education and Response

The principle products of the education and response component are actions such as building partnerships, coordinating efforts, hosting workshops, preparing educational articles, monitoring lakes, inspecting watercraft, conducting Clean Boats/Clean Waters, entering watercraft inspection data into the WDNR Surface Water Integrated Monitoring System, and operating boat washes at zebra mussel source waters to prevent transport of zebra mussels and other AIS.

Research

The various research components will be documented in separate reports and integrated into the Spread Eagle Chain of Lakes Adaptive Management Plan.

Adaptive Management Plan

A principal product of the proposed project is the integrated adaptive management plan for the Spread Eagle Chain of Lakes. This plan will incorporate and interpret information about the Chain and the watershed. It will include an aquatic plant report and management plan and a zebra mussel plan based on Spread Eagle Chain data and information from published literature.

7. DATA TO BE COLLECTED

Both existing and new data will be gathered over the course of this project. Existing relevant information will be identified for the Spread Eagle Chain of Lakes. It is important to gather what is available as part of the scientific and historical record. Some of this data will be available from WDNR sources, some from independent lake studies, and some from individual lake user observations. Large data sets will result from the several research components of the proposed project. The education and response portion of the project will glean information from a variety of sources to be used as part of the education program and in the regional response to stemming the spread of zebra mussels and other AIS.

8. EXISTING AND PROPOSED PARTNERSHIPS

The proposed project is quite unusual in that it knits together a large group of project partners from both private and public sectors and from two states and several counties. It views the detection of an aquatic invasive species as a problem that transcends jurisdictional and political boundaries. This cross jurisdictional approach has already been established in a previous WDNR AIS Grant (Keyes Lake) and this continues that approach. Northland College brings an enormous resource of scientific expertise to the issue. White Water scientists bring special landscape and aquatic ecology expertise and experience to this project. Various WDNR staff is directly involved with the proposed project and brings specific expertise to research and management questions. UW-Stevens Point scientists have partnered with these organizations I the past as well. SECOLA, FCLARA, WRISC, and Florence County Land Conservation Department have long worked together to successfully address water resource issues. There is a synergy that exists among these partners that will ensure a strong approach and high quality products.

9. ROLE OF PROJECT IN PLANNING AND/OR MANAGEMENT

The proposed project has a role in planning and management at several geographic scales. At the smallest scale, the stewardship and management of the Spread Eagle Chain of Lakes is a main value and purpose. At an intermediate regional scale, the integrated stewardship of an entire

watershed is made possible because of area-wide education and information sharing. Research conducted under the proposed project will add scientific insight to understanding zebra mussel infestations in the north country. Finally, we anticipate that this integrative approach to a region wide water resource issue will be a model that influences other organizations and their stewardship of regional water resources, thus expanding the value of the project beyond the the Spread Eagle Chain of Lakes. We plan on presenting this model to the Wisconsin Association of Lakes Annual Convention(s).

The adaptive management plan for the Spread Eagle Chain of Lakes is crucial to responsible stewardship. Integrating water quality, aquatic botany, and information about the lake's animals allows for a better understanding of lake ecology. The systematic point-intercept surveys allow accurate monitoring of change over time in the plant communities and early recognition of developing problems or initial establishment of AIS. These plans will allow the quickest possible response to new establishment of AIS in the Spread Eagle Chain.

The adaptive management paradigm sets the stage for continual learning about the Spread Eagle Chain of Lakes and its watershed. It provides a system to manage diverse sorts of data, recreational uses, and management challenges. The management plan will introduce the concept of "adaptive management" and set the stage for future phases that add valuable new information, monitor plan implementation, and refine the comprehensive plan. It will educate project participants and users of the Spread Eagle Chain and promote interest and involvement in the ongoing program. It will lay the ground work for the engagement of future generations in stewardship of the Spread Eagle Chain of Lakes.

10. TIMETABLE FOR IMPLEMENTATION OF KEY ACTIVITIES

We anticipate that work outlined in this proposal will take place from April 2014 through June 2016. Table 5 provides an estimate of the timing of major project tasks. Adjustments to this schedule will be made as required. Oversight of scheduling and progress on tasks and objectives will be accomplished by the project team. The WDNR will be consulted on all major project milestones and other aspects of project timing.

TABLE 5. PROJECT CALENDAR (2014, 2015, and 2016)	
Note: The tasks outlined in this table fall under four objectives, designated by initials: Pr=Project Objective, E=Education and Response Objective, R=Research Objective, P=Planning Objective	
TASKS	CALENDAR
Pr-Task 1A: Articulate general strategy in AIS proposal.	Jan-Feb 2014
Pr-Task 1B: Meet once yearly with project partners.	June 2014, 2015
Pr-Task 1C: Correspondence and communication.	Ongoing
Pr-Task 2A: Gather written project products team.	Jan 2016
Pr-Task 2B: Integrate project products into draft report.	Feb 2016
Pr-Task 2C: Provide draft report to project team for review.	March 2016
Pr-Task 2D: Based on review, complete final project report.	April 2016
Pr-Task 3A: Track/report costs for all project elements.	Ongoing
Pr-Task 3B: Administer project funds.	Ongoing
Pr-Task 3C: Track and report project match.	Ongoing
E-Task 1A: Host annual project workshops.	Spring/Summer 2014, 2015
E-Task 1B: Host AIS volunteer monitoring workshops.	Spring/Summer 2014, 2015
E-Task 1C: Prepare press releases and newspaper articles.	Ongoing
E-Task 2A: Boat Landing Blitz (July 4th weekend) at North L.	2014, 2015
E-Task 2B: Conduct CB/CW at Spread Eagle Chain.	2014
E-Task 3A: Guidance from Menominee River Strategic Plan.	Ongoing
E-Task 3B: Identify target lakes susceptible to AIS mussels.	June 2014
E-Task 3C: Organize zebra mussel monitoring program.	July 2014
E-Task 3D: Implement zebra mussel monitoring program.	Aug 2014
R-Task 1A: Study phytoplankton community.	Spring - Fall 2014
R-Task 1B: Study periphyton community.	Summer 2014
R-Task 1C: Conduct PI aquatic plant surveys.	Summer 2014
R-Task 1D: Study zooplankton community.	Spring - Fall 2014
R-Task 1E: Study benthic macroinvertebrates.	Summer 2014
R-Task 1F: Characterize native mussel community.	Summer 2014
R-Task 1G: Study zebra mussel population.	Summer 2014, 2015
R-Task 1H: Study fish community.	Spring - Summer 2015
R-Task 1I: Collect water quality measures.	Spring - Fall 2014
R-Task 2A: Report on phytoplankton.	Winter 2015
R-Task 2B: Report on periphyton.	Winter 2015
R-Task 2C: Report on aquatic plants.	Winter 2015
R-Task 2D: Report on zooplankton.	Winter 2015
R-Task 2E: Report on macroinvertebrates.	Winter 2015
R-Task 2F: Report on native mussels.	Winter 2015

TABLE 5. PROJECT CALENDAR (2014, 2015, and 2016)	
Note: The tasks outlined in this table fall under four objectives, designated by initials: Pr=Project Objective, E=Education and Response Objective, R=Research Objective, P=Planning Objective	
TASKS	CALENDAR
R-Task 2G: Report on zebra mussels.	Winter 2015, 2016
R-Task 2H: Report on fish community.	Winter 2016
R-Task 2I: Report on water quality.	Winter 2015
P-Task 1A: Collect/review historical plant info.	Jan – Feb 2015
P-Task 1B: Summarize existing plant info.	Jan – Feb 2015
P-Task 2A: Obtain APM data from WDNR.	Fall 2014
P-Task 2B: Analyze P-I plant data and summarize.	Jan – Feb 2015
P-Task 3A: Review existing limnological info.	Jan – Feb 2015
P-Task 3B: Analyze/summarize historical water quality data.	Jan – Feb 2015
P-Task 3C: Analyze/summarize 2014 water quality data.	Jan – Feb 2015
P-Task 3D: Evaluate water quality relative to zebra mussels.	Jan – Feb 2015
P-Task 4A: Collect/review existing fisheries information.	Mar – April 2015
P-Task 4B: Summarize existing fisheries info.	Mar – April 2015
P-Task 5A: Collect/review info on SEC zebra mussels.	Nov – Dec 2014
P-Task 5B: Gather new findings on SEC zebra mussels.	Nov – Dec 2015
P-Task 5C: Review zebra mussel literature.	Nov – Dec 2015
P-Task 6A: Delineate the watershed.	Oct 2014
P-Task 6B: Map land cover/use and soils; WILMS model.	Oct 2014
P-Task 6C: Map slopes to identify runoff patterns.	Oct 2014
P-Task 6D: Determine existing institutional programs.	Oct 2014
P-Task 7A: Summarize plant and water quality data.	Dec 2015
P-Task 7B: Write Aquatic Plant Management Plan (APMP).	Jan – Feb 2016
P-Task 7C: Integrate APMP into Adaptive Management Plan.	Mar 2016
P-Task 8A: Summarize info for zebra mussel plan.	Jan – Feb 2016
P-Task 8B: Create zebra mussel plan.	Jan – Feb 2016
P-Task 9A: Develop adaptive mgt recommendations.	Mar 2016
P-Task 9B: Prepare adaptive management plan.	Jan – Apr 2016
P-Task 10A: Review existing plans.	Jan 2015
P-Task 10B: Document review in adaptive management plan.	Jan – Apr 2016
P-Task 11A: List environmental and aesthetic attributes.	Oct – Dec 2015
P-Task 11B: Describe quality of each of the attributes.	Oct – Dec 2015
P-Task 11C: Identify and describe threats to attributes.	Oct – Dec 2015
P-Task 12A: Stakeholder consultations.	Ongoing
P-Task 12B: Communication of project progress/findings.	Ongoing
P-Task 12C: Public meetings.	Ongoing

11. PLAN FOR SHARING PROJECT RESULTS

Our proposed education and response program will be a major avenue for sharing project results with the large variety of stakeholders and beyond. Press releases will result in on-line and printed particles. The adaptive management plan document will be written in form and format as an educational document. The research conducted by project partners will be presented in report format, summarized in the adaptive management plan, and in some cases presented at scientific and/or lakes conventions.

The WDNR will be provided with electronic versions of the report materials. If requested, additional electronic copies will be provided to local libraries, the Florence County Land Conservation Department, and others.

12. PROJECT BUDGET

We will investigate opportunities to use WDNR funds allocated for the proposed project as leverage for other financial assistance. There is significant value in terms of in-kind contribution to this project. Project partners will contribute in-kind value (in the form of donated services, volunteer hours, and cash). SECOLA has committed $5,000 cash to the project. Table 6 presents a budget summary. Table 7 presents the budget in the format of Section V, page 2 of Form 8700-283 (Lake Management Grant Application).

Table 6. Budget for the Spread Eagle Chain of Lakes Project

MAIN CATEGORIES	BUDGET	MATCH
ADMINISTRATION	$13,300	0
COORDINATION & PROJECT MANAGEMENT	$12,500	$8,752
FIELDWORK	$21,200	$11,164
FIELD DATA ANALYSES & SPECIFIC REPORTS	$50,940	$11,200
MANAGEMENT PLANS & DOCUMENTATION	$28,500	$8,172
EDUCATION ACTIVITY	$6,600	$4,976
COLUMN TOTALS	$133,040	$44,264
TOTAL PROJECT COST ESTIMATE (BUDGET + MATCH)	$177,304	
STATE SHARE REQUESTED	$132,978	

Table 7. Budget for Spread Eagle Chain of Lakes Project in the format of Sect. V, Form 8700-283, Lake Mgt Grant Application

	Col 1 - Cash Costs	Col 2 - Donated Value	Notes
1. Salaries, wages & employee benefits	$13,300	$2,784	1
2. Consulting services	$114,900	$37,200	2, 3
3. Purchased services-printing & mailing			
4. Other purchased services (specify)			
5. Plant material			
6. Supplies (specify)	$1,000		4
7. Depreciation on equipment			
8. Hourly equipment use charges			
9. State Lab of Hygiene	$3,840		
10. Non-SLOH costs			
11. Land or easement acquisition value			
12. Associated acquistions costs			
13. Other (specify)		$4,280	5
14. Subtotals (sum each column)	$133,040	$44,264	
15. Total Proj. Cost Est. (col 1+col 2)	$177,304		
16. State Share Requested	$132,978		

Note 1 - Col.1 is Lumberjack's overhead cost; Col. 2 is volunteer time @$12/h
Note 2 - Col. 1 is professional services costs (Northland College, Stevens Point, & White Water Associates)
Note 3 - Col. 2 is value of professional services donated by Northland & White Water Associates
Note 4 - Purchase of sampling supplies for periphyton, phytoplankton, zooplankton, and macroinvertebrates
Note 5 - Includes donated mileage and equipment rental cost

13. SUPPLEMENTAL INFORMATION IN SUPPORT OF PROJECT

Many Menominee River watershed residents are members of lake and/or river associations, lake recreation organizations, and other stakeholders. Still others act as individual stewards by volunteering in lake conservation efforts such as citizen lake monitors or clean boats/clean waters monitors. The collective support of these many people in the proposed project is enormous. Local conservation and sportsperson groups support projects that maintain or improve ecological health of water resources. The many people who visit and vacation in the Spread Eagle Chain of Lakes area do so because of the high water quality and water-based recreational opportunities that they find in the area. In the remainder of this section, we provide additional information on the project's principal participants.

Lumberjack Resource, Conservation, & Development Council, Inc.

The Resource Conservation & Development (RC&D) is a USDA program administered by the Natural Resources Conservation Service. The mission of the RC&D program is to provide leadership to improve Wisconsin's economy while conserving the resources. The Wisconsin Association of RC&D Councils, formed by the seven Wisconsin RC&D Councils, promotes and coordinates statewide RC&D projects. Lumberjack Resource Conservation and Development Council, Inc services Forest, Florence, Langlade, Lincoln, Marinette, Menominee, Oconto, Oneida, Shawano, and Vilas Counties. Lumberjack Resource Conservation and Development Council, Inc strives to: enhance area natural resources, promote a higher standard of living and improve the quality of life; and foster partnerships between public and private sectors for the benefit of area citizens.

Spread Eagle Chain of Lakes Association

The Spread Eagle Chain of Lakes Association (SECOLA) is a non-profit incorporated organization of people who own dwellings and properties on or near the Spread Eagle Chain O' Lakes, located in the eastern portion of Florence County, Wisconsin. The SECOLA exists to provide a forum in which property owners, as members of the SECOLA, can come together to discuss and act upon matters pertaining to the preservation and upkeep of their properties and of the surrounding area. Major interests include water quality, water safety, property improvement, relations with the Town of Florence, and use of Spread Eagle waters by the general public. The SECOLA officers include president, vice-president, secretary, and treasurer. Standing committees include: Natural Resources, Boat Parade, Water Safety, Publications, Building-Zoning & Tax Relations, Lake Grants, Membership, Nominations, Public Relations, and Social Events.

Wild Rivers Invasive Species Coalition

The Wild Rivers Invasive Species Coalition (WRISC) is a partnership of federal, state and local government agencies, land managers, utility companies, civic organizations, and individuals interested in implementing a comprehensive plan to manage the invasive species found in

northeastern Wisconsin and Upper Michigan. The local cooperative is led by a Board of Directors focused on reducing the spread of invasive plants and animals that can have devastating ecological and economical impacts to communities. Healthy forestry and agricultural production, native fish and wildlife habitat, and water recreational activities are all at risk to these growing invasive populations. Because some of these species are widely dispersed across the landscape and jurisdictional boundaries, this cooperative partnership is combining multi-agency resources and expertise to coordinate public education, work-group activities, control methods and promote best management practices to help slow the spread of these invaders. Mari Dallapiazza is WRISC Project Manager and Coordinator.

Northland College

Northland College combines a strong liberal arts curriculum with a focus on the environment. Randy Lehr is Bro Professor of Sustainable Regional Development. He received a Ph.D. and M.S. in Water Resources Science from University of Minnesota and a B.S. in Biology from Winona State University. At Northland, Professor Lehr's position focuses on integrating student learning (mostly through applied projects) with research and outreach that supports sustainable development and ecosystem management throughout the upper Midwest. He splits his time between the natural resources program and Sigurd Olson Environmental Institute teaching courses in ecological restoration, integrated ecosystem management, and stream and watershed ecology and directing our Integrated Ecosystem Science program.

Randy Lehr's research is broadly related to the assessment and restoration of aquatic ecosystems, currently focusing on: (1) assessing the ecological exposure and effect of emerging chemical contaminants (particularly endocrine disrupting chemicals); and (2) the development and implementation of long-term water quality monitoring and ecological modeling programs to support the restoration of lakes, streams and wetlands.

Florence County Land Conservation Department

The Florence County Land Conservation Department focuses on conserving long-term soil productivity, protecting the quality of related natural resources, enhancing water quality, and

addressing severe soil erosion problems. A Land and Water Resource Management Plan was developed for Florence County by the Land Conservation Department through the cooperation of additional departments, agencies, organizations and individuals. The Administrator of the Department is Margie Yadro. Since 2005, the Florence County Land Conservation Department has partnered with the Florence County Lakes and Rivers Association to develop and implement the Florence County Aquatic Invasive Species program.

Florence County Lakes and Rivers Association

The Florence County Lakes and Rivers Association (FCLARA) was founded in 2000 as the Florence County Lake Association. In 2002 the organization was expanded to include rivers due to concerns about proposed modifications to the county's Wild River restrictions. FCLARA and concerned community members were successful in protecting the rivers and preserving this important county asset. Currently, FCLARA members work with local officials to protect area lakes and rivers by sponsoring educational programming and volunteering to participate in monitoring and other efforts. Water quality and invasive aquatic species are among FCLARA priorities.

White Water Associates, Inc. - Biographical Summaries for Selected Staff

Established in 1985, White Water Associates, Inc. comprises a seasoned team of science professionals that approaches environmental problem-solving systematically and objectively. White Water teams well with other professionals and excels in clear, accurate communication. White Water carries necessary insurances to ensure protection for its clients, including Workers Compensation and Employers Liability; Commercial General Liability; Professional Liability, Errors and Omissions; and Automobile Liability insurance. White Water Associates' website is http://www.white-water-associates.com.

Dean Premo, Ph.D., is President and co-founder of White Water Associates, Inc., an ecological consulting firm and analytical laboratory in northern Michigan. His academic training is in zoology and ecology (with a specialty in herpetology, the study of reptiles and amphibians).

His undergraduate degree included certification for secondary science education. His graduate studies research emphasized ecology of salamanders and frogs. Dr. Premo serves as a consultant to the U.S. Environmental Protection Agency Science Advisory Board (Ecological Processes and Effects Committee, and Research Strategies Advisory Committee). He is a member of the National Research Council (research arm of the National Academy of Sciences) Committee on Inland Aquatic Ecosystems. He has served on the Dean's Board of Advisors for the College of Natural Science at Michigan State University. During 1994-95, Dr. Premo was the principal project scientist for the Ecosystem Stewardship Program: Great Lakes Tribal Lands, a comparative risk analysis project with Native American communities in Michigan and Wisconsin. Dr. Premo's work regarding biodiversity and ecosystem health with forest managers has received regional and national recognition and has been featured in The New York Times. Dr. Premo served as a member of the Science Committee of Michigan's Relative Risk Assessment Project as an expert in biodiversity and landscape ecology. He served on the Project Advisory Committee for National Wildlife Federation's Lake Superior Biodiversity Project and later as a project scientist for the same endeavor. Dean Premo is a Certified Senior Ecologist (Ecological Society of America). He has been the principal scientist on several WDNR Lake Grants.

Kent Premo, M.S. is the systems support scientist, publications specialist, and technical editor for White Water Associates. His degrees bachelor's and master's degrees are in botany and plant pathology. Mr. Premo is a project scientist for a White Water study of car-deer accidents in a Michigan county that includes Grand Rapids, Michigan's second largest city. This study involves an innovative geographical information system (GIS) approach to evaluating many layers of information including land cover/use, deer accident records (precise location, time of day, age of driver, and more), stream locations, traffic density, and housing development trends. Mr. Premo assisted Oneida County, Wisconsin develop a GIS database for classification of its 1,200 lakes. In 1998, he attended a training workshop on lake classification and shoreland zoning sponsored by the North American Lake Management Society and Wisconsin Association of Lakes. In many water quality projects, Mr. Premo is responsible for deployment and maintenance of remote sensing devices for continuous monitoring of dissolved oxygen, temperature, and other water quality measures. This work includes data management and interpretation. Mr. Premo has considerable experience with scientific writing, education, and publication. From 1992 through 1997, he edited and published Strategies, a periodical that provided unique, practical information to resource managers. Mr. Premo has edited two scientific

review texts; one dealt with biomarkers for toxicological exposure and effects, the other with a modeling initiative involving the effects of such exposures to birds. His publishing skills also include production of camera-ready graphics (illustrations, maps, and photographs).

Bette Premo, Ph.D., is White Water Associates Chief Executive Officer, with graduate training in limnology (freshwater ecosystem science) and 26 years of professional experience. Her doctoral research involved watershed management as related to nonpoint source phosphorus inputs in agricultural landscapes. For her M.S. degree, Dr. Premo studied aquatic invertebrate communities. She spent 16 months as a research scientist in Java, Indonesia studying water quality problems as related to agriculture and other land management practices. Dr. Premo is a member of Michigan Governor John Engler's Environmental Science Board and as such reviews environmental issues and translates them for general public presentation, in formats that include white papers, handbooks and public hearings. For White Water Associates, Dr. Premo consults on hydrological studies of groundwater movement, lake and stream bathymetry, flow studies, water quality monitoring, baseline inventories and sediment contamination and transport. She has served as principal scientist for water quality studies and aquatic ecosystem habitat assessments related to FERC relicensing projects for major hydroelectric companies. She assisted Oneida County, Wisconsin in designation and classification of 1,200 lakes for purposes of establishing shoreland ecosystem management and zoning regulations. Dr. Premo has written and procured grants for environmental, cultural, education, and recreation projects for municipalities, intermediate school districts, universities, and corporations. She procured nearly $200,000 for a municipality to establish a river walk and interpretive trail. Bette Premo is the president of the Iron River Watershed Council, a grassroots organization that coordinates and funds watershed restoration and education. She is on the board of directors of Operation Action U.P. (a northern Michigan Chamber of Commerce). Dr. Premo has been involved with many water quality and ecosystem health assessment projects at White Water Associates. In addition to her duties as White Water's CEO and project scientist, Bette manages White Water's laboratory staff and consults on data quality control issues.