2009

Amherst Millpond Lake Management Plan

Amherst Lake Management Planning Committee

9/14/2009

Plan approved by the Amherst Millpond Lake Management Planning Committee on

A special thanks to all those who helped to create the Amherst Millpond Lake Management Plan and provided the necessary data in the Portage County Lake Study.

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Introduction

The Amherst Millpond is located in the Village of Amherst in Portage County, Wisconsin. The Amherst Millpond was created by a dam on the Tomorrow River to provide power to the local feed mill in 1858. The Amherst Millpond is valued by those who use and enjoy the millpond for its natural beauty, peace and tranquility, wildlife viewing, fishing, and recreational opportunities. When asked about the impact of the Amherst Millpond, 39% of respondents from within the Village of Amherst indicated that the millpond somewhat positively impacted their lives. When asked what the impact would be if the dam on the millpond were removed, 35% of respondents from within the Village of Amherst indicated that the removal of the dam would very negatively impact their lives.

The purpose of this plan is to provide guidance about addressing existing problems and preventing future problems in the Amherst Millpond and its watershed.

The Amherst Millpond Management Plan was written as part of the second phase of the Portage County Lakes Study. The first phase of the Portage County Lakes Study began in 2002, when 29 lakes throughout Portage County were surveyed and studied to gain valuable information on water quality, shoreline development, amphibian habitat, fisheries, aquatic plants and other parameters. These studies were completed in 2004 and lake reports were developed.

The second phase of the Portage County Lakes Study takes the information from phase one and works with the citizens, local organizations, local government, and professionals to create lake management plans for the lakes. In addition to the information from the lake study, a citizen survey was conducted to gather information on citizen's values, opinions, and perceived issues with the millpond. The survey was sent to 814 residences within the Amherst Millpond watershed and was available online where any interested member of the public could take the survey. One hundred and eighty six citizen surveys were returned for a response rate of approximately 23%. The members of the Amherst Millpond Management Planning Committee met over 5 months, learned about topics related the millpond and developed this lake management plan. The purpose of this management plan is to provide guidance about addressing existing problems and preventing future problems in the Amherst Millpond and its watershed.

Background Information

Information in this section was taken from the Portage County Lakes Study and from the citizen surveys. The complete lake study document and summarized survey results can be found at: http://www.co.portage.wi.us/planningzoning/PCL/Main%20Page/Main%20Page.shtml

The Amherst Millpond is an impoundment of the Tomorrow River which is located, owned, and managed by the Village of Amherst, WI. The Amherst Millpond covers 48 acres, has an estimated volume of 116 acre-feet, and a maximum depth of 5 feet (WDNR 2005). The Tomorrow River is navigable above and below the dam. There are two public access points on the east side of the millpond; the boat landing and Cates Park.

Watershed

The Amherst Millpond's surface watershed, an area of land where water from precipitation drains from higher elevations towards the millpond, is approximately 51,089 acres, starting from the headwaters of the Tomorrow River in northern Portage County.

There are various land uses throughout the watershed but they are dominated by non-irrigated agriculture (37%) and forested lands (37%). Shrub cover is the secondary land cover followed by irrigated agriculture, residential, and transportation, which all have similar acreages. Land use types and associated practices can have a significant impact on water quality. Though land uses may not easily be changed, land use management practices can be modified to improve water quality.

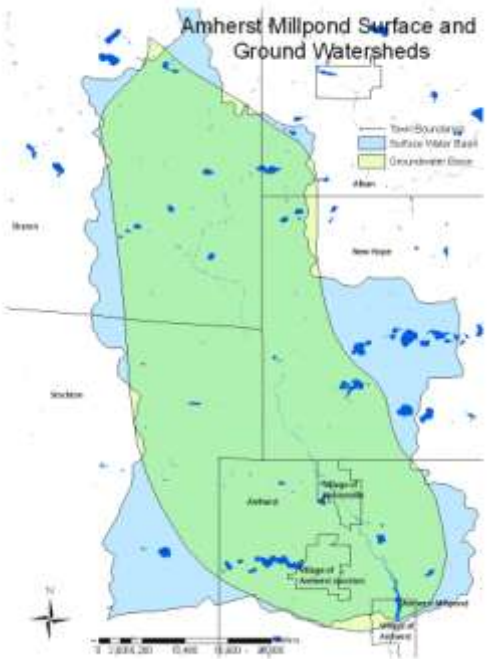

Figure 1. Amherst Millpond groundwater and surface watersheds.

A groundwater watershed is similar to a surface watershed, except that it is an area of land where the groundwater, instead of surface water, drains to the Amherst Millpond. Often surface water watersheds and groundwater watersheds do not match each other, which is the case in the millpond. The extent of the Amherst Millpond's groundwater watershed is shown in Figure 1.

Sensitive Areas

The sensitive areas associated with the Amherst Millpond are defined by lands immediately around the millpond that are particularly valuable or that would be significantly impacted by most disturbances or development. These areas include a county park and associated land that encompasses most of the northern half of the millpond and has large stretches of undisturbed shoreline; three wetlands, two to the northeast of the millpond and the other adjacent to part of the west shore; and a section of steep slopes that are found along the southeastern banks that would be prone to erosion (See Appendix A).

Reptile and Amphibian Habitat

The habitats of amphibians and reptiles are of importance because they utilize both aquatic and terrestrial habitats and the shoreline interface between the two. These areas of habitat are not only important for reptiles and amphibians but also other aquatic and terrestrial species.

The primary amphibian habitat is located along the north side of the pond. Key features of this habitat area include protected areas of marsh with large areas of submergent, emergent, and floating leaf vegetation. There are large areas of natural habitat that are present on the millpond. However, there are also high levels of shoreline alteration due to development (See Appendix B).

Shoreline

Within the Village of Amherst, approximately 34% or 590 meters of the 1700 meters of shoreline around the millpond are considered healthy, undisturbed habitat comprised of a combination of flowers, native grasses, shrubs and trees. The remaining shoreline within the Village has various levels of disturbance. Outside the Village of Amherst, the shoreline around the millpond remains largely intact and undisturbed.

The lack of vegetated shoreline surrounding the Amherst Millpond is cause for concern due to the lack of habitat and the lack of runoff control. Runoff or excess water coming off hard surfaces such as roofs, driveways, roads, patios, and compacted soils that enter the millpond directly or via storm sewers can carry a variety of pollutants into the water. Negative impacts on the millpond due to runoff may include: excess nutrients (such as phosphorus) in the millpond, which can cause algae blooms and excessive plant growth and an increased amount of sediment in the millpond. This in turn can lead to cloudy or turbid water, sediment burying fish spawning areas and other critical habitat, and sediment transporting additional contaminants such as bacteria, debris, metals, and pesticides. During warm weather the warm runoff can also act as a thermal pollutant to the millpond and downstream river.

When citizens were asked about their own runoff management practices, 35 out of 186 survey respondents indicated that they use rain barrels as a means of retaining rain water on their property, 30 respondents said that they routed rain water to a depression to infiltrate, and 10 respondents indicated that they used rain gardens to infiltrate rain water.

The area near a pond where land meets water is the area most utilized by a large number of terrestrial and semi-aquatic animals. On the other hand, geese avoid tall plants so a healthy shoreline buffer also serves to reduce goose loitering.

According the citizen survey 19 of the 186 respondents owned shoreline property. Of those 19 respondents, nine resided within the village of Amherst, one resided within the village of Nelsonville, six resided within the town of Amherst, and one resided within the town of Alban. Twelve of the citizen survey respondents who owned shoreline property indicated that their shorelines were undeveloped or natural. The majority of shoreline owner respondents indicated that the depth of their buffer was between 10 and 25 feet, which does not meet the county/state shoreline zoning requirements for lakes outside of Villages.

Aquatic Plants

Aquatic plants play many important roles in an aquatic ecosystems including providing habitat for aquatic and semi-aquatic organisms; providing food for fish, waterfowl, and other animals; taking up nutrients that would otherwise be used by algae; and modifying water temperatures on hot days.

According to R. Freckmann (UWSP), there are **21** species of aquatic macrophytes, or aquatic plants that have been identified in the Amherst Millpond or wet areas of the adjacent shore. This does not include the wetland area along the north shore of the millpond. This is the lowest of all of the Portage County Lakes.

The UWSP herbarium has no collections or reports of botanical observations prior to 2003, which makes it difficult to discuss vegetation change over the years. The Amherst Millpond is also ringed with homes that have preserved little of the native vegetation and have sections of steep shores that provide little habitat for wetland plants along the shore. Submersed vegetation in the Amherst Millpond is sparse while the invasive species curly leaf pondweed is abundant. All of these factors have an effect on the amount of native vegetation present in and around the Millpond.

When asked about aquatic plants in the Amherst Millpond, the majority of citizen survey respondents felt that the aquatic plant growth in the millpond was dense. August and July had the most abundant growth.

Water Quality

When asked about the Amherst Millpond's water quality, the majority of survey respondents indicated that they felt the water quality was fair. The majority of respondents also indicated that they felt that the water quality had declined over time. Excess algae, fertilizer use, and excess aquatic plant growth were identified as the top contributors to the perceived decline in water quality. Survey respondents also indicated that the water quality in the Amherst Millpond had both economic impacts on their community and impacts on their personal life.

Water quality assessment of a lake involves a number of measures including temperature, dissolved oxygen, water chemistry, chlorophyll *a*, and algae. Each of these measures plays a part in the lakes overall water quality.

Chloride concentrations, and to a lesser degree sodium and potassium concentrations, are commonly used as an indicator of how strongly a lake is being impacted by human activity. In the Amherst Millpond both potassium and sodium concentrations were low, but chloride and sulfate concentrations were elevated. Although these constituents are not detrimental to the aquatic ecosystem, they indicate that sources of contaminants (road salt, fertilizer, animal waste and/or septic system effluent) are entering the millpond from either surface runoff or via groundwater.

Atrazine, an agricultural herbicide, was found in low concentrations in the Amherst Millpond (0.1 ppb). Some toxicity studies have indicated that even at these low levels reproductive system abnormalities can occur in frogs. The presence of Atrazine indicates that other agri-chemicals may also be entering the Amherst Millpond. The temperature in the Amherst Millpond was generally mixed from top to bottom. However, the dissolved oxygen profiles show that during the summer dissolved oxygen concentrations fall below the 5 mg/L needed for survival.

Water clarity is a measure of how deep light can penetrate the water. It is an aesthetic measure and is related to the depth that rooted aquatic plants can grow. Clarity measurements in the millpond ranged from 3-5 feet and occasionally the secchi disk used for measurements hit the bottom before a maximum depth was reached. The fluctuations in water clarity throughout the summer are normal as algae and aquatic plant populations and sedimentation increase and decrease. Disturbance of sediment by wind or boating activity also influence the water clarity in shallow lakes.

Chlorophyll a is a measure of algae in the Amherst Millpond. Chlorophyll a concentrations in the Amherst Millpond ranged from 0.7 to 17.6 mg/L. The mid-June measure of 17.6 mg/L was an unusual high that may have been related to an algae bloom resulting from the die-off of curly leaf pondweed. The corresponding water clarity reading taken at this time was approximately 3.5 feet.

A variety of water chemistry measurements were used to characterize the water quality in the Amherst Millpond. Nutrients (phosphorus and nitrogen) are important measures of water quality in lakes because they are used for growth by algae and aquatic plants.

Phosphorus concentrations fluctuated dramatically throughout the year, but were often high enough to fuel excessive algae blooms and aquatic plant growth (See Phosphorus section).

Nitrogen concentrations in the Amherst Millpond are very high, especially in the form on nitrate, which is easily used for growth by aquatic plants and algae.

The shallow nature of the Amherst Millpond allows for light to penetrate all the way to the bottom. This creates problems as algal mats of blue-green algae and diatoms can carpet the bottom. As the mats trap oxygen in the interwoven material they will lift off the bottom and float to the surface. At the surface they get too much sunlight, bleach to yellow/white and then decay. The decay can be aesthetically displeasing and in some cases the bacterial decomposition of this material leads to oxygen depletion and perhaps even to fish kills. The 35 algal genera identified during the sample periods were relatively common and none of those that reached numerical dominance in the sample counts were associated with toxins or health issues. The algal community when considered relative to the chlorophyll a, phosphorus, and nitrogen values for the Amherst Millpond presents a picture of a mesotrophic lake. (B. Bell).

Phosphorus is an element that is essential to most living organisms in trace amounts, including plants. Sources of phosphorus can include naturally occurring phosphorus in soils, wetlands, small amounts in groundwater, agricultural runoff, urban runoff, domestic and industrial sewage, septic systems, and animal waste.

Phosphorus is a "limiting nutrient" in the Amherst Millpond. Aquatic Plant growth is most responsive to phosphorus due to its relative short supply with respect to other substances necessary for growth. However, increases of just a small amount of phosphorus results in increases in growth rates and abundance of aquatic plants and algae.

Phosphorus concentrations in the Amherst Millpond are variable throughout the year. Average total phosphorus (TP) for 2002-2004 was 38.8 ug/L, spring averages were 33.0 ug/L, summer averages were 32.1 ug/L, fall averages were 22.0 ug/L, and winter averages were 68.0 ug/L. Concentrations this high can contribute to or cause algae blooms in the lake.

Currently the Wisconsin DNR has proposed phosphorus criteria values for different lake types in Wisconsin. If a lake exceeds the phosphorus criteria value, steps should be taken to reduce internal and external phosphorus loading to the lake. The proposed criteria value for shallow impoundments like Amherst Millpond is 40 ppb. The Amherst Millpond had average total phosphorus concentrations of 35 ug/L in 2002 and 30.1 ug/L in 2003. One reading of 124 ug/L was taken in March of 2004.

The importance of managing phosphorus in the Amherst Millpond watershed is key to protecting the millpond itself. Major areas of focus throughout the watershed should include the reduction of runoff to the Tomorrow Waupaca River and its tributaries, applying phosphorus from manure/fertilizer based on soil tests for specific crops or turf, and providing cover on the landscape and/or appropriate mitigation when open soils are necessary during construction or cropping. Some of the near shore land use practices that increase the input of phosphorus to the millpond include removing native vegetation (trees, bushes, and grasses), applying fertilizer, increasing runoff, exposing soil , and increasing the amount of impervious surfaces without controlling the stormwater runoff. Phosphorus inputs to the millpond can be controlled through the use of many different Best Management Practices (BMP's) that minimize the movement of runoff and phosphorus to the lake.

The Portage County Land Conservation Department can provide assistance to landowners that want to reduce impacts to the millpond from their land.

Recreation

According to respondents of the citizen survey, the most popular activities at the Amherst Millpond include walking, enjoying the scenery, fishing, enjoying wildlife, and solitude.

When survey respondents were asked to rank their fishing experiences in the Amherst Millpond, 41% of survey respondents indicated that fishing was average, 28% indicated that it was fair, 22% indicated that it was poor, and 9% indicated that it was very good. The majority of survey respondents felt that the quality of fishing had declined over time and indicated that algae, aquatic plants and fertilizer use were the leading causes of the decline.

The majority of respondents described their recreational/boating experience on the millpond as seeing others but not being bothered by them. Respondents to the citizen survey expressed an interest in exploring other recreational opportunities around the millpond, such as biking or hiking paths.

Goals, Objectives and Actions

The following goals, objectives and actions are derived from the values and concerns of the members of the Amherst Millpond Planning Committee and local citizens and are based on the science used to assess the Amherst Millpond and its ecosystem. Implementing the goals, objectives and actions of the Amherst Millpond Management Plan will protect what residents value most for current and future generations. These goals are intended to be met through implementation, education, encouragement, and incentives.

Resources that are listed within the plan include primary organizations or individuals that would be able to provide information, suggestions, or services to accomplish the goals and objectives.

A management plan is a living document that changes over time to meet the current needs, challenges, and desires. **The goals, objectives, and actions listed in this plan will be reviewed by the Amherst Millpond planning committee, interested citizens, and representatives from municipalities and agencies annually in the fall and updated with any necessary changes.**

***Please Note: There are additional comments and recommendations in the plan. These are for your review and comments. Comments in blue are from Nancy Turyk and comments in Orange are from Rebecca Roberts. ***

Comments and recommendations from Nancy Turyk, Center for Watershed Science and Education
Comments and recommendations from Rebecca Roberts, local Amherst Citizen and Center for Land Use Education

Aquatic Plants, Algae, and Aquatic Invasive Species

Fish and other aquatic biota and water dependent terrestrial life depend on aquatic plants for habitat, food, and spawning areas. Aquatic plants also help to baffle waves thus reducing shoreline erosion and some species of plants (water lilies) help to keep water cooler in the summer. Healthy aquatic plant communities, along with a vigilant watch, limit any new aquatic invasive species from becoming established in the Amherst Millpond. Many survey respondents perceived the aquatic plant growth in the Millpond as dense, described as more than optimum for fish and wildlife and the plants limiting their use of the pond. Currently one aquatic invasive plant species, Curly leaf pondweed (Potomogetan crispus) has been observed in the millpond. The Amherst Millpond Planning Committee envisions a future of aquatic plant and algae control that meet the needs of the public as well as the needs of aquatic and terrestrial life.

Goal 1: To have balanced healthy aquatic plant communities to provide habitat for fish and wildlife.

Objective 1.1: Protect native aquatic vegetation communities in the Amherst Millpond.

Actions	Lead person/group	Start/end dates	Resources
Identify wetland areas and plants around the Amherst Millpond and watershed areas for future protection			UWSP Herbarium
Develop and disseminate information about the importance and maintenance of wetland plants			UWEX Lakes WI DNR Lakes Specialist UWSP
Complete an aquatic plant survey on the Amherst Millpond to develop and implement management strategies to protect wetlands			UWSP WDNR Consultants

Objective 1.2: Monitor and/or Control existing aquatic invasive species in the Millpond

Actions	Lead person/group	Start/end dates	Resources
Map Curly Leaf Pondweed present in the Amherst Millpond annually in early June	Option 1: The Village of Amherst will ask Portage County AIS Specialist to train volunteers to annually map Curly Leaf Pondweed. Option 2: A consultant will be hired to map the Curly Leaf Pondweed	Completed for 2009 Annually in early-mid June	Portage County AIS Specialist WDNR UWSP Consultants

Goal 2: Prevent any new invasive species from becoming established in the Amherst Millpond.

Objective 2.1: Prevent any newly established invasive species in the Amherst Millpond.

Action	Lead person/group	Start/end dates	Resources
Develop & implement a system to routinely monitor new aquatic invasive species		Ongoing	Portage County AIS Coordinator
Hold training sessions and provide educational material for individuals to identify native and invasive species in the Amherst Millpond	Village of Amherst will set dates with Portage County AIS Coordinator		Portage County AIS Coordinator WDNR
Post signs & posters in public areas along the Amherst Millpond to teach people about invasive species and how to combat them			Portage County AIS Coordinator UWEX Lakes Clean Boats Clean Waters
Utilize aquatic invasive species rapid response plan if new invasive plants are found (see appendix)	Amherst Millpond planning committee	Update annually	

Fisheries

Healthy lake ecosystems are valuable natural resources for all lake users. It is important to maintain a good fishery so that anglers and families are able to enjoy the fishery on the Amherst Millpond, as fishing is one of the top three recreational activities on the lake and is valued by lake users. Survey respondents felt that the quality of fishing in the Amherst Millpond was average, but that fishing had declined in recent years. The planning committee for the Amherst Millpond supports a sustainable coolwater fishery in the Millpond by providing habitat and sufficient spawning areas including aquatic plants, woody habitat, and shoreland vegetation.

Goal 3: To have balanced healthy coolwater fish communities maintained through sustainable management practices in the Amherst Millpond.

Objective 3.1: Protect and enhance fishery habitat

Actions	Lead person/group	Start/end dates	Resources
Inform individuals about the importance of woody habitat in shallow water areas of the millpond & encourage their development in appropriate areas			WDNR/UWSP Portage County Land Cons Dept
Identify & implement Millpond improvements to target coolwater fish populations (Is this action the same as above or are there other improvements that you are thinking of?)			WDNR Fishery and Lake Specialists UWSP Fisheries Scientists

Objective 3.2: Understand the role of the rough fish population in the millpond

Actions	Lead person/group	Start/end dates	Resources
Determine the impact of the carp & rough fish populations on phosphorus levels in the Millpond			WDNR Fishery and Lake Specialists UWSP Fisheries Scientists

Land Use and Water Quality

Land use and land management practices in the watershed of a small millpond play a large role in the amount of sediment, nutrients, and other pollutants in a millpond. Although it may not be reasonable to change land uses, management practices on the landscape can result in water quality improvements. Thoughtful decisions that are made when land is developed may actually improve water quality or at least minimize disturbances.

Sensitive Areas

Sensitive areas support wildlife habitat, provide mechanisms that protect water quality, harbor plant communities, and are especially susceptible to disruptions or development. Protection of these areas near the Amherst Millpond is important because they exemplify the character and qualities of the millpond as well as ensuring the long-term health of the millpond.

Goal 4: Protect the sensitive areas on the Amherst Millpond or in the Tomorrow River Watershed

Objective 4.1: Protect the sensitive areas on the Amherst Millpond or in the Tomorrow River Watershed that were identified in the Portage County Lakes Study.

Actions	Lead person/group	Start/end dates	Resources
Support the use of conservation easements or land purchases that will protect sensitive areas identified in the Portage County Lakes Study or that will result in better water quality for the Amherst Millpond			
In steep slope areas around the Amherst Millpond encourage the design of access points to the water that minimize erosion			

Shorelines

Shorelines are some of the most important habitat near lakes for terrestrial and aquatic wildlife, including birds. They also help to slow runoff moving to the lake and provide some filtration of runoff before it enters the lake. Restoring and protecting shorelines helps to provide scenery and solitude, as well as natural space for lake residents to enjoy nature. GIS evaluation of air photos indicated that approximately 34% or 590 meters of the shorelines around the Amherst Millpond within the Village of Amherst appear intact. The remaining shorelines show some signs of disturbance. Twelve survey respondents that owned shoreline property indicated that they currently have an undeveloped natural shoreline. A healthy shoreland vegetative buffer is comprised of native flowers/forbs, shrubs, and trees.

Goal 5: Create, restore and protect healthy, stable shoreline habitats near and around the Amherst Millpond

Objective 5.1: Sixty-four percent of the shoreland around the Amherst Millpond will have a vegetative shoreland buffer within the next ten years. This will be accomplished by the creation and restoration of 30% of currently disturbed shoreline and the protection of all of the currently undisturbed.

Actions	Lead person/group	Start/end dates	Resources
Encourage the restoration of natural shorelines around the Millpond with native vegetation through education. Efforts will include information in newsletters, hosting workshops, dissemination of informational brochures and incentives.			Portage County Land Cons. Dept. UWSP UWEX Lakes WDNR Grants
Monitor extent of shoreline buffers around Amherst Millpond annually			UWSP
Pursue shoreline improvements and funds for improvements to prevent and/or repair shoreline erosion along the Amherst Millpond and its tributaries			
Utilize village land near dam for a shoreline restoration demonstration site. Improvements might consist of native plantings, walking path, and educational signage.	Village of Amherst	Concurrent with development of village hall landscaping.	Portage County Land Conservation Dept. WDNR Grants

Review and develop municipal shoreline ordinances to ensure residential, commercial and agricultural development has sufficient vegetative buffers around the Amherst Millpond (This action was re-worded because we were unsure of the meaning. Is this what you were looking try to achieve or not?)	Village of Amherst		Portage County WI DNR Lake Protection Grant UWSP Center for Land Use Education
Develop & review municipal shoreline ordinances to address the needs of aquatic and non-aquatic species (We are unsure of the purpose behind this action)	Village of Amherst		Portage County WI DNR Lake Protection Grant UWSP Center for Land Use Education

Water Quality

Amherst Millpond is host to a variety of plants, insects, fish, amphibians, and a variety of other animals that all depend on good water quality in the millpond. Survey respondents indicated that water quality influenced their enjoyment of the lake and impacted their perceived aesthetic and economic value of the Amherst Millpond. The majority of survey respondents felt that the water quality in the Millpond was fair. Citizens who were familiar with the lakes felt that overall the water quality in the Millpond had declined over time. Data shows that water quality in the Amherst Millpond could use improvement. The Amherst Millpond currently has high levels of both phosphorus and nitrogen that can fuel excess plant and algae growth in the lake. The majority of the water entering the Amherst Millpond originates in its watershed; therefore, water quality in the millpond is directly related to the land uses in the watershed and especially near shore. The water quality goals for the Amherst Millpond are…

Goal 6: Reduce nutrient and sediment inputs to the Amherst Millpond

Objective 6.1: Reduce and direct stormwater runoff away from the Millpond

Action	Lead person/group	Start/end dates	Resources
Agencies that provide assistance with nutrient best management practices will hold informational meetings with landowners			Portage County Land Cons. Dept. NRCS UW Agriculture UW Extension Co. Agent
Discourage placement of snow piles, grass clippings, brush, and other materials that may contain road salts, fertilizers, sediment and other contaminants, in areas that would drain into the millpond.	Village of Amherst		
Encourage the use of natural vegetation, rain gardens, or landscaping throughout the Village of Amherst to reduce runoff that reaches the Millpond by providing information through newsletters, newspapers, and other community resources.			Portage County Land Cons. Dept. UWEX Consultants

Stencil stormdrains that drain to the Millpond		Annually Completed for 2009	
Sponsor soil testing programs for Village of Amherst residents.			
Consider implementing runoff reduction practices during new construction and replacement of infrastructure in the Village of Amherst and throughout the Tomorrow River Watershed. One example is including curb cuts to redirect stormwater runoff from the street back onto private property, ideally into a rain garden. It would be helpful to include other examples and photos, perhaps in an appendix.			UWEX Lakes Portage County Land Cons. Dept.

Objective 6.2: Reduce nutrients that are applied to the landscape

Action	**Lead person/group**	**Start/end dates**	**Resources**
Encourage nutrient management plans, that include strategies for fertilizer applications and phosphorus management, in the watershed by discussing strategies with affiliated agencies	Portage County		Portage County Land Cons. Dept. NRCS UW Agriculture UW Extension Co. Agent
Provide information about current restrictions on livestock grazing or manure spreading within 300 feet of the streams in the Tomorrow Waupaca River watershed	Portage County Land Cons. Dept.		Portage County Land Cons. Dept.
Provide materials to the public regarding the impact of phosphorus from household sources, such as fertilizers and septic systems, on the Millpond & its watershed			UWEX Lakes UWSP

Objective 6.3: Refine our understanding of sediment and nutrient movement into and within the millpond.

Identify & implement methods to address siltation issues and concerns	Village of Amherst		
Explore with the community the pros and cons of dredging/ silt removal in the Amherst Millpond to increase depth and if desirable seek assistance with funding.	Village of Amherst		WI DNR Community Groups
Develop strategies for an annual nutrient related water quality monitoring program on the Millpond, should include all seasons			
Meet with other municipalities along the Tomorrow River to determine interest in developing a nutrient reduction strategy in the Tomorrow River watershed.			

Recreation

Amherst Millpond residents and users enjoy many different recreational opportunities on the Millpond. Based on survey results, the most popular recreational activities on the Amherst Millpond included walking, enjoying scenery, fishing, enjoying wildlife and solitude. Recreational needs and uses on the Millpond will likely continue to increase as populations and development in the area increases.

Goal 7: Identify and promote compatible recreational uses on and around the Amherst Millpond and watershed resources

Objective 7.1: Provide a variety of recreational opportunities that provide opportunities to enjoy the millpond while minimizing conflicts between users and protecting lake water quality and habitat.

Action	Lead person/group	Start/end dates	Resources
Maintain public access points to the Millpond (The boat access point on the east side of the millpond is a great resource, but it is difficult for non-motorized watercraft to access downstream resources from here. Consider minor improvements on village property near dam to encourage/enable portage)	Village of Amherst		Portage Co. Parks
Explore hiking/biking path opportunities around the millpond (Ideally, it would be nice to create a connection to the Tomorrow River State Trail through signage and on-street bike lane designations. This could connect with a village owned hiking/biking path near the dam)	Village of Amherst		
Identify and promote non-motorized watercraft uses and tourism on the Millpond			UWEX Portage County Agent Stevens Point Area Convention and Visitors Bureau

Objective 7.2: Develop tourism in Amherst which is focused on quiet sports associated with the Amherst Millpond.

Action	Lead person/group	Start/end dates	Resources
Develop a program that will promote non-motorized watercraft tourism on the Amherst Millpond. Explore the concept of "water trails". See concern raised above about access between millpond and downstream.			UWEX Portage County Agent Stevens Point Area Convention and Visitors Bureau

Communication

Many of the goals in this plan involve the distribution and dissemination of information to local citizens and between municipalities. Outlined communication strategies will help achieve the goals and objectives listed throughout this document.

Goals 8: Create communication strategies for citizens and officials who are interested in the Amherst Millpond.

Objective 8.1: Identify partners that are interested in protection and improvement in the quality of the Amherst Millpond

Action	Lead person/group	Start/end dates	Resources
Work to incorporate citizen input and leadership in implementation of education and other actions identified in the plan.	Village of Amherst		Chautauqua UWEX Lakes
Define & coordinate the efforts of municipal plan commissions and committees to protect & improve the Millpond and its watershed	Village of Amherst		Portage County UWSP Center for Land Use Education

Objective 8.2: Enhance the public's understanding of the Amherst Millpond to effect behavioral changes that will result in improvements of water quality, habitat in the millpond, and economic benefits of the millpond.

Action	Lead person/group	Start/end dates	Resources
Co-host a Portage County Lakesfest			UWSP
Information on topics within the plan will be disseminated through multiple means including Chautauqua, newsletters, informational brochures, informational meetings, workshops, newspapers, signs, and posters.			Related educational efforts or demonstrations could be conducted during local events such as the Portage County Fair, Feel Good Festival, Jensen Center/High School plant sale, Chautauqua events, etc.

Survey/Monitor

1. **Learn to survey/monitor the lake** from:

   Water Resources Management Specialist
   Wisconsin Dept. of Natural Resources
   Scott Provost
   473 Griffith Ave.
   Wisconsin Rapids, WI, 54494
   Phone: 715-421-7881
   E-Mail: Scott.provost@wisconsin.gov

   Portage County Aquatic Invasive Species (AIS) Coordinator
   Golden Sands RC& D
   1462 Strongs Ave.
   Stevens Point, WI 54481
   Phone: 715-343-6278
   E-Mail: skawinsp@co.portage.wi.us

2. **Survey the Lake monthly/seasonally/annually**

Here Is What to Do When You Find a Suspected Invasive Species

1. **Collect Specimens or Take Pictures**

   - Collect, press and dry a complete sample. This method is best because a plant expert can then examine the specimen

Or --

- Collect a fresh sample. Enclose in a plastic bag with a moist paper towel and refrigerate.

Or --

- Take detailed photos (digital or film) and send them by mail or email.

Regardless of method used, provide as much information as possible. Try to include flowers, seeds or fruit, buds, full leaves, stems roots and other distinctive features. In photos, place a coin, pencil or ruler for scale. Deliver or send specimen ASAP.

Note Location
(Provide one or more of the following)

- Latitude & Longitude
- UTM (Universal Transverse Mercator) coordinates
- County, Township, Range, Section, Part-section
- Precise written site description, noting nearest city & road names, landmarks, local topography

If possible, give the exact geographic location using a GPS (global positioning system) unit, topographic map, or the Wisconsin Gazetteer map book. If using a map, include a photocopy with a dot showing the plant's location. You can use TopoZone.com to find the precise location on a digital topographic map. Click the cursor on the exact collection site and note the coordinates (choose UTM or Latitude/Longitude).

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2. **To Positively I.D. the species send or bring specimen and additional information**
    - Collection date & county
    - Your name, address, phone, email
    - Exact location (Latitude/Longitude or UTM preferred, or Township/Range/Section)
    - Plant name (common or scientific)
    - Land ownership (if known)
    - Population description (estimate number of plants, area covered)
    - Habitat type(s) where found (forest, field, prairie, wetland, open water)

Send or bring specimen to:

Portage County AIS Coordinator
Golden Sands RC& D
1462 Strongs Ave.
Stevens Point, WI 54481
Phone: 715-343-6214
E-Mail : skawinsp@co.portage.wi.us

UW-Stevens Point Herbarium
301 Daniel O. Trainer Natural Resources Building
Stevens Point, WI 54481
Phone: 715-346-4248
E-Mail: ejudziew@uwsp.edu

Wisconsin Dept. Natural Resources
Invasive Plant Education, Early Detection, and Mapping Specialist
Brendon Panke
WI Dept. of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921
Phone: (608) 267-7438
E-Mail: invasiveplants@mailplus.wisc.edu

Draf

3. **Once the specimen is dropped off or sent for confirmation, make sure to contact:**
Portage County AIS Coordinator
Golden Sands RC& D
Contact: Paul Skawinski
Address: 1462 Strongs Ave. Stevens Point, WI 54481
Phone: 715-343-6214
E-Mail : skawinsp@co.portage.wi.us

4. **If an invasive species is confirmed, Paul Skawinski will contact the following people along with the contact list of citizens.**

Wisconsin Department of Natural Resources
Water Resources Management Specialist
Scott Provost
473 Griffith Ave.
Wisconsin Rapids, WI, 54494
Phone: 715-421-7881
E-Mail: Scott.provost@wisconsin.gov
Who will contact them: Portage County AIS Coordinator

The Amherst Village Clerk
Village of: Amherst
Contact: Marcy Peterson
Phone: 715-824-5613
E-mail: vilamher@wi-net.com

University of Wisconsin-Stevens Point – Water Resource Scientist
Contact: Nancy Turyk
Address: 216 TNR 800 Reserve St. Stevens point, WI 54481
Telephone: 715-346-4155
E-mail: nturyk@uwsp.edu
Who will contact them: Portage County AIS Coordinator

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5. **The Amherst Village Clerk will then make the following contacts:**

Public notice will be posted at the Village Hall

Newspapers
Who will contact them: Amherst Village Clerk
Community Spirit
Gazette
Journal

Literature Cited

Fassbender, R.L., and L.M. Nelson. 1971. Surface Water Resources of Portage County. Wisconsin Department of Natural Resources, Madison, Wisconsin.

Turyk, N; R. Bell; R. Cook; T. Ginnett; R. Crunkilton; L. Markham; P. McGinle; B. Shaw; and E. Wild; 2006. Final report to Portage County and Wisconsin DNR. http://www.co.portage.wi.us/plzo/lakes.html

Glossary

Algae:

One-celled (phytoplankton) or multicellular plants either suspended in water (Plankton) or attached to rocks and other substrates (periphyton). Their abundance, as measured by the amount of chlorophyll a (green pigment) in an open water sample, is commonly used to classify the trophic status of a lake. Numerous species occur. Algae are an essential part of the lake ecosystem and provides the food base for most lake organisms, including fish. Phytoplankton populations vary widely from day to day, as life cycles are short.

Atrazine:

A widely used herbicide.

Blue-Green Algae:

Algae that are often associated with problem blooms in lakes. Some produce chemicals toxic to other organisms, including humans. They often form floating scum as they die. Many can fix nitrogen (N2) from the air to provide their own nutrient.

Calcium (Ca++):

The most abundant cation found in Wisconsin lakes. Its abundance is related to the presence of calcium-bearing minerals in the lake watershed. Reported as milligrams per liter (mg/1) as calcium carbonate (CaCO3), or milligrams per liter as calcium ion (Ca++).

Chloride (Cl-):

Chlorine in the chloride ion (Cl-) form has very different properties from chlorine gas (Cl2), which is used for disinfecting. The chloride ion (Cl-) in lake water is commonly considered an indicator of human activity. Agricultural chemicals, human and animal wastes, and road salt are the major sources of chloride in lake water.

Chlorophyll a:

Green pigment present in all plant life and necessary for photosynthesis. The amount present in lake water depends on the amount of algae and is therefore used as a common indicator of algae and water quality.

Clarity:

see "Secchi disc."

Color:

Measured in color units that relate to a standard. A yellow-brown natural color is associated with lakes or rivers receiving wetland drainage. The average color value for Wisconsin lakes is 39 units, with the color of state lakes ranging from zero to 320 units. Color also affects light penetration and therefore the depth at which plants can grow.

Concentration units:

express the amount of a chemical dissolved in water. The most common ways chemical data is expressed is in milligrams per liter (mg/l) and micrograms per liter (ug/l). One milligram per liter is equal to one part per million (ppm). To convert micrograms per liter (ug/l) to milligrams per liter (mg/l), divide by 1000 (e.g. 30 ug/l = 0.03 mg/1). To convert milligrams per liter (mg/l) to micrograms per liter (ug/l), multiply by 1000 (e.g. 0.5 mg/l = 500 ug/l). Microequivalents per liter (ueq/l) is also sometimes used, especially for alkalinity; it is calculated by dividing the weight of the compound by 1000 and then dividing that number into the milligrams per liter.

Cyanobacteria:

See “Blue-Green Algae”

Dissolved Oxygen:

The amount of oxygen dissolved or carried in the water.

Drainage Basin:

The total land area that drains towards a lake.

Drainage lakes:

Lakes fed primarily by streams and with outlets into streams or rivers. They are more subject to surface runoff problems but generally have shorter residence times than seepage lakes. Watershed protection is usually needed to manage lake water quality.

Emergent:

A plant rooted in shallow water and having most of its vegetative growth above water.

Eutrophication:

The process by which lakes and streams are enriched by nutrients, and the resulting increase in plant and algae. The extent to which this process has occurred is reflected in a lake's trophic classification: oligotrophic (nutrient poor), mesotrophic (moderately productive), and eutrophic (very productive and fertile).

Groundwater drainage lake:

Often referred to a spring-fed lake, has large amounts of groundwater as its source, and a surface outlet. Areas of high groundwater inflow may be visible as springs or sand boils. Groundwater drainage lakes often have intermediate retention times with water quality dependent on groundwater quality.

Hardness:

The quantity of multivalent cations (cations with more than one +), primarily calcium (Ca++) and magnesium (Mg++) in the water expressed as milligrams per liter of CaCO3. Amount of hardness relates to the presence of soluble minerals, especially limestone, in the lake watershed.

Intermittent:

Coming and going at intervals, not continuous.

Macrophytes:

see "Rooted aquatic plants."

Marl:

White to gray accumulation on lake bottoms caused by precipitation of calcium carbonate (CaCO3) in hard water lakes. Marl may contain many snail and clam shells, which are also calcium carbonate. While it gradually fills in lakes, marl also precipitates phosphorus, resulting in low algae populations and good water clarity. In the past, marl was recovered and used to lime agricultural fields.

Mesotrophic:

A lake with an intermediate level of productivity. Commonly a clear water lakes and ponds with beds of submerged aquatic plants and mediums levels of nutrients. See also “eutrophication”.

Nitrate (NO3-):

An inorganic form of nitrogen important for plant growth. Nitrate often contaminates groundwater when water originates from manure, fertilized fields, lawns or septic systems. High levels of nitrate-nitrogen (over 10 mg/L) are dangerous to infants and expectant mothers. A concentration of nitrate-nitrogen (NO3-N) plus ammonium-nitrogen (NH4-N) of 0.3 mg/L in spring will support summer algae blooms if enough phosphorus is present.

Oligotrophic:

Lakes with low productivity, the result of low nutrients. Often these lakes have very clear waters with lots of oxygen and little vegetative growth. See also “eutrophication”.

Overturn:

Fall cooling and spring warming of surface water increases density, and gradually makes temperature and density uniform from top to bottom. This allows wind and wave action to mix the entire lake. Mixing allows bottom waters to contact the atmosphere, raising the water's oxygen content. However, warming may occur too rapidly in the spring for mixing to be effective, especially in small sheltered kettle lakes.

Phosphorus:

Key nutrient influencing plant growth in more than 80% of Wisconsin lakes. Soluble reactive phosphorus is the amount of phosphorus in solution that is available to plants. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particulate form.

Rooted Aquatic Plants: (macrophytes)

Refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects. Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels.

Secchi Disc (Secchi Disk):

An 8-inch diameter plate with alternating quadrants painted black and white that is used to measure water clarity (light penetration). The disc is lowered into water until it disappears from view. It is then raised until just visible. An average of the two depths, taken from the shaded side of the boat, is recorded as the Secchi disc reading. For best results, the readings should be taken on sunny, calm days.

Sedimentation:

Materials are deposited after settling out of the water.

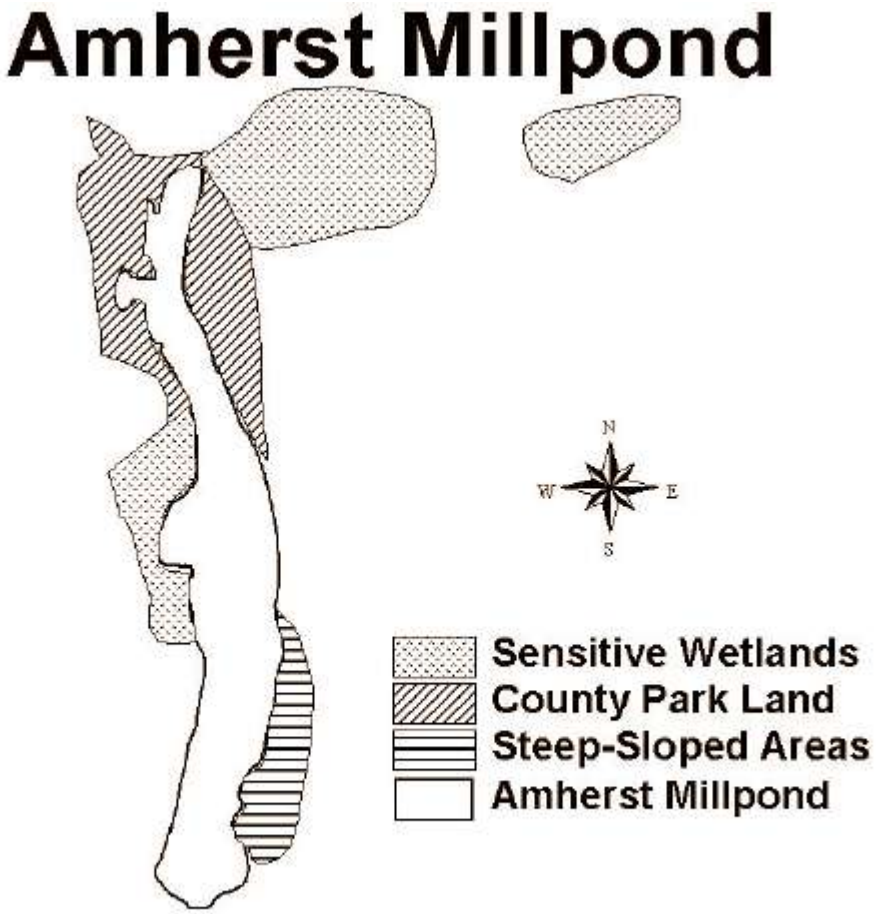
Stratification:

The layering of water due to differences in density. Water's greatest density occurs at 39 Deg.F (4 Deg.C). As water warms during the summer, it remains near the surface while colder water remains near the bottom. Wind mixing determines the thickness of the warm surface water layer (epilimnion), which usually extends to a depth of about 20 ft. The narrow transition zone between the epilimnion and cold bottom water (hypolimnion) is called the metalimnion or thermocline.

Watershed: See “drainage basin”

Appendix A

Amherst Millpond Sensitive Areas



Appendix B

Amherst Millpond Reptile and Amphibian Habitat