

# 2011

## Jordan and Bentley Ponds Management Plan



Jordan and Bentley Ponds Management Planning Committee

5/12/2011

Plan approved by the Jordan and Bentley Pond Committee on

Adopted by the town of Hull

Adopted by the town of Sharon

Adopted by Portage County on

DRAFT

***A special thanks to all those who helped to create the Jordan and Bentley Ponds Management Plan and provided the necessary data in the Portage County Lake Study.***

**Jordan and Bentley Ponds Management Planning Committee Members and Resources**

**Bentley and Jordan Management Planning Committee**

<u>Jordan Pond</u> Dave Bakken Dale Bembenek Scott Bembenek Cliff and Pauline Bembenek Jean Buckley Jim Czysen Randel Groshek Gregory Klug Melanie Patterson Nancy Sander Memba Sullivan John Thompson Gregory Wysocki	<u>Bentley Pond</u> Kim Beckham Michael and Marge Bigalke Adam and Pat Borys Mark Kirschling
---	--

**Wisconsin Department of Natural Resources**

Tom Meronek – Fisheries Biologist  
Scott Provost – Water Resources Management Specialist

**Portage County**

Randy Slagg – Conservation Technician

**Golden Sands RC&D**

Paul Skawinski – Regional Aquatic Invasive Species Coordinator

**University of Wisconsin –Stevens Point**

Dr. Robert Freckmann – Professor Emeritus of Botany  
Nancy Turyk, Jen McNelly– Center for Watershed Science and Education  
Linda Stoll– Center for Land Use Education

**Portage County Lake Study Researchers/Authors**

Becky Cook – Water Quality/Watersheds  
Dr. Paul McGinley – Water Quality/Watersheds  
Dr. Byron Shaw - Water Quality/Watersheds and Upland Sensitive Areas  
Dick Stephens – Water Quality/Watersheds and Upland Sensitive Areas  
Nancy Turyk – Water Quality/Watersheds/Final Report  
Dr. Glenn Bowles – Near Shore Summary  
Dr. Alan Haney – Upland Sensitive Areas  
Dr. Vince Heig – Upland Sensitive Areas  
Dr. Kent Hall – Upland Sensitive Areas

Dr. Bob Bell – Algae  
Dr. Robert Freckmann – Aquatic Plants and Upland Sensitive Areas  
Dr. Tim Ginnett – Birds  
Brad Bulin (Graduate Student) – Birds  
Dr. Ron Crunkilton – Fishery and In-lake Habitat  
Steve Bradley (Portage County Conservationist) – Land Use Coverages/Watersheds  
Lynn Markham – Planning Assistance  
Mike Hansen – Portage County Planning Assistance  
Dr. Erik Wild – Reptiles and Amphibians/Near Shore Habitat  
Rori Paloski (Graduate Student) – Reptiles and Amphibians/Near Shore Habitat

## Introduction

Jordan and Bentley Ponds are impoundments of the Plover River that are located in Portage County. They are valued by those who use and enjoy them for their natural beauty, peace and tranquility, wildlife viewing, and quiet recreational opportunities including walking, fishing, biking, and canoeing/kayaking.

The purpose of this management plan is to provide guidance to protect current good conditions, address existing problems and prevent future problems that may be detrimental to the Jordan and Bentley ecosystems. This management plan was written as part of the second phase of the Portage County Lakes Project. The first phase of the Portage County Lakes Study involved data collection from Jordan and Bentley Ponds and 27 other lakes throughout the county. The study provided information on water quality, shoreline development, amphibian habitat, fisheries, aquatic plants, and other parameters.

The development of this lake management plan utilized the information from the Plover River Study (UWSP, 2000). This management plan was developed by a committee of interested citizens and professionals from UWSP, Portage County, and the Wisconsin Department of Natural Resources. Prior to the current plan development a citizen survey was conducted to gather information on citizens' values, opinions, and perceived issues with Jordan and Bentley Ponds. The survey was sent to all residences within the watersheds and was available online where any interested person could take the survey. Four hundred and thirty seven

*The purpose of this plan is to provide guidance to protect current good conditions, address existing problems and prevent future problems that may be detrimental to the Jordan and Bentley ecosystems.*

surveys were sent out for Jordan Pond and 102 were sent out for Bentley Pond. Of those sent, 81 surveys were returned for Jordan Pond for a response rate of 18%. For Bentley Pond 14 surveys were returned for a response rate of 14%.

The members of the Jordan and Bentley planning committee met over four months to learn about topics related to the ponds and develop this lake management plan.

## Background Information

Information in this section was taken from the Portage County Lakes Study and the citizen survey responses. 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>

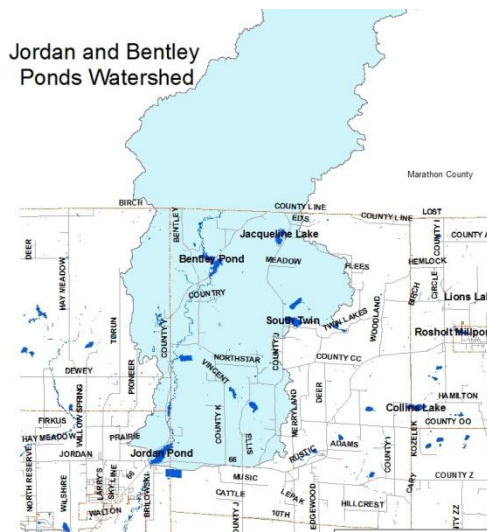
The background information provided from the Portage County Lakes Study helps to give us an understanding of Jordan and Bentley Ponds and their ecosystems. A healthy pond ecosystem is comprised of many components that include in-pond habitat and vegetated shorelands that support aquatic plants, fish, wildlife, good water quality and quantity, absence of aquatic invasive species and more. These components are not only found in Jordan and Bentley Ponds but also extend to where the water meets the land and beyond into the watersheds. Jordan and Bentley Pond are a reflection of the health and activities that occur in the ponds, near the shores, and in the watersheds.

Bentley Pond is as 86 acre impoundment of the Plover River northeast of Stevens Point, WI with a maximum depth of 10 feet (WDNR 2005). The dam was built to provide power to a woodworking mill. The Plover River is navigable above and below the dam, and the pond is very scenic; however, public access to the pond is limited to County Hwy Y.

Jordan Pond is an 84.5 acre impoundment of the Plover River northeast of Stevens Point, WI with a maximum depth of 8 feet (WDNR 2005). The southern half of the lake, on both the east and west sides, is in the County Park System with shelters, bathroom facilities, a boat landing, and camp sites. The park totals 271 acres.

### Watershed

A surface watershed is an area of land where water from precipitation drains from higher elevations towards the pond. Bentley Pond's surface watershed is the Plover River watershed north of the impoundment, which encompasses approximately 74,175 acres in Portage, Marathon, and Langlade Counties (Figure 1). The surface watershed of Jordan Pond is the watershed for the Plover River north of the Jordan Pond dam. It encompasses approximately 97,280 acres in Portage, Marathon, and Langlade Counties (Figure 1).



As water moves across the landscape, the quality can either improve or degrade depending upon what it comes in contact with en route to the pond. Land use types and associated management practices can have a significant impact on water quality. Though land uses may not easily be changed, land management practices can be modified to improve water quality.

**Figure 1. Bentley and Jordan Ponds surface watersheds.**

In 1992 land uses within the surface watershed of Bentley and Jordan Pond were predominately forested areas and agriculture. The areas near shore tend to have the most direct impact on habitat and water quality. In both Bentley and Jordan Ponds these areas are comprised of primarily vegetated shorelines (Appendix A).

Survey respondents indicated a willingness to change how they manage their land to protect/improve the Bentley and Jordan Pond ecosystems. The top motivators included better fish/wildlife habitat, increasing natural beauty of the property, increasing property value, improving water quality, increasing privacy and saving money.

### Sensitive Areas

The sensitive areas associated with Bentley and Jordan Ponds are defined by lands adjacent to the ponds that are particularly valuable to the pond's ecosystems or that would be significantly impacted by most disturbances or development. On Bentley Pond these areas include a large contiguous wetland complex adjacent to the pond that extends in all directions (See Appendix B). In addition the shoreline and set back areas are valuable nesting sites for waterfowl.

On Jordan Pond the river corridor north of Jordan Pond is an extremely valuable wetland complex that provides excellent riparian zone habitat (See Appendix A). In addition, the wetland forest that parallels the river and pond along the east back is a valuable tract that provides an almost northern forest type habitat due to the shallow water table and cool temperatures. This is a large tract of land that has many unique tree species. The section of this wetland forest tract that is due east of Jordan Pond provides a breeding ground for wetland forest species the likes of which is known in very few other places in the county.

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 for Bentley Pond is found in numerous areas around the pond. Some of the key features of this habitat include protected areas of marsh with large amounts of submergent, emergent, and floating-leaf vegetation, as well as downed trees. The good news is that numerous, large areas of suitable habitat surround the pond (See Appendix C). Unfortunately, some areas of altered shoreline do also exist due to development.

Primary amphibian habitat on Jordan Pond is located on sections of the east and west sides of the pond. Some of the key features of this habitat include natural areas with large amounts of submergent, emergent, and floating leaf vegetation as well as downed trees. The good news is that there is a minimal level of shoreline development. The bad news is that there is some recreational use on portions of the lake which may affect amphibian populations.

## Shoreline

The majority of the shorelands around both Bentley and Jordan Ponds are vegetated. However, on Jordan Pond there are a few properties where the vegetation has been mowed to the water's edge.

Surfaces such as roofs, driveways, roads, patios, and compacted soils increase the amount of runoff moving across the landscape towards Bentley or Jordan Pond. Runoff that enters the ponds can carry a variety of pollutants into the water. Some of the negative impacts in the pond due to additional runoff may include: increased nutrients (such as phosphorus), which can cause algae blooms and excessive plant growth, and increased amounts or changes in the type of sediment. 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.

According to the citizen survey, six of the 14 respondents on Bentley Pond owned shoreline property. All of the respondents who owned shoreline property indicated their shorelines were undeveloped or natural.

On Jordan Pond six of the survey respondents indicated that they owned shoreline property. Five of the six respondents indicated their shorelines were undeveloped or natural. All of the respondents with vegetated shorelines indicated the depth of their shoreline buffers were more than 35 feet, which meets the county and state shoreland zoning ordinances. These special rules, the shoreland zoning ordinances, apply to the near shore area of the pond. These rules were developed to help protect water quality and habitat of pond/lakes while allowing for access to a waterbody.

## Aquatic Plants

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

According to R. Freckmann (UWSP) in 2003 there were **27** species of aquatic macrophytes or plants that had been identified in Bentley Pond or on the wet areas of shore. This was below average when compared to other Portage County lakes. Bentley Pond has dense submersed vegetation of relatively few species. The UWSP Herbarium has no collections or studies made on Bentley Pond before 2033, so historic references cannot be made.

According to R. Freckmann (UWSP) in 2003 there were **73** species of aquatic macrophytes or plants that had been identified in Jordan Pond or on the wet areas of shore. This places Jordan Pond as the fourth species richest lake in Portage County. Much of this species richness can be found in pockets of wetland, such as on the northwest shore and on the north end of Jordan Park.

Jordan Pond was infested by the aggressive invasive aquatic plants Eurasian water-milfoil and Curlyleaf pondweed. While these species are not currently abundant, they are likely to increase in the future and should be monitored.

During the survey, when asked about the abundance of aquatic plants in Bentley Pond, respondents indicated that the growth was dense, while respondents from Jordan Pond indicated that plant growth was just right. Respondents from both ponds indicated July and August were the months with the densest plant growth, which is typical for most Wisconsin lakes.

### **Water Quality and Land Use**

When asked about Bentley Pond's water quality, survey respondents were relatively evenly split between poor, fair, excellent and good. Respondents did indicate that they felt the water quality had declined during the time that they were familiar with the pond. Survey respondents also indicated the quality of water in the pond had some impact both economically and on their personal enjoyment of the pond.

When respondents asked about Jordan Pond's water quality, survey respondents felt that the water quality was good or fair and felt the water quality had stayed the same during the time that they were familiar with the pond. Survey respondents also indicated the quality of

water in the pond had a major impact both economically and on their personal enjoyment of the pond. A number of survey respondents and committee members expressed concern about siltation issues on Jordan Pond, especially in the northern end of the pond.

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

Chloride concentrations, and to a lesser degree sodium and potassium concentrations, are commonly used as indicators of how strongly a water body is being impacted by human activity. In Bentley and Jordan Pond chloride and sodium levels measured in 2002/03 were elevated, and potassium concentrations were low. Although these constituents are not detrimental to the aquatic ecosystem, they indicate that source of contaminants (road salt, fertilizer, animal waste, and /or septic system effluent) are entering the lake from either surface runoff or via groundwater.

Atrazine, an agricultural herbicide, was detected in both Bentley and Jordan Ponds. Some toxicity studies have indicated that even at low levels reproductive system abnormalities can occur in frogs. The presence of atrazine indicates that other agri-chemicals may also be entering and present in the ponds.

The temperature in Bentley and Jordan Ponds was generally uniform throughout the water column through the year. This would be expected because of the constant influx of water from the Plover River and the relatively shallow depth of the impoundments.

In 2002/03 in Bentley Pond, dissolved oxygen was plentiful throughout the water column of the pond for most of the year. Dissolved oxygen

concentrations fell below the 5 mg/L needed support aquatic biota during July and September.

In 2002/03 in Jordan Pond, dissolved oxygen was always plentiful enough to support aquatic biota throughout the water column of the pond.

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. Water clarity can be affected by sediment, algae, and color in water. Clarity measurements in Bentley Pond ranged from three to eight feet. Clarity measurements in Jordan Pond ranged from three to seven feet. On both ponds May had the best water clarity and July had the poorest. Fluctuations in water clarity throughout the summer are normal as algae and aquatic plant populations and sedimentation increase and decrease. Changes in water quality are best determined with long-term records; these measurements could be made by trained citizens.

Chlorophyll *a* is a measure of algae in Bentley and Jordan Ponds. Chlorophyll *a* concentrations in Bentley Pond ranged from 2.03 to 7.32 mg/L. Chlorophyll *a* concentrations in Jordan Pond ranged from 1.0 to 9.5 mg/L. Readings over 5 mg/L are considered to be elevated.

In Bentley Pond the 29 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 relative to the chlorophyll *a*, phosphorus, and nitrogen values for Bentley Pond presents a picture of a fairly mesotrophic pond. The water quality in Bentley Pond should be monitored for changes, as shallow water bodies like Bentley Pond can have algal related problems with algal mats of blue-green algae and diatoms (B. Bell).

In Joran Pond the 36 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 relative to the chlorophyll *a*, phosphorus, and nitrogen values for Jordan Pond also presents a picture of a fairly mesotrophic pond. In Jordan Pond there is a late season surge of blue-green algae that could be the result of increasing cultural eutrophication in the watershed and should be considered a warning sign (B. Bell).

Nutrients (nitrogen and phosphorus) are important measures of water quality in water bodies because they are used for growth by algae and aquatic plants. In Bentley and Jordan Ponds both the phosphorus and nitrogen concentrations fluctuated throughout the year.

Phosphorus is an element that is essential to most living organisms including plants. Sources of phosphorus can include naturally occurring phosphorus in soils, wetlands, and small amounts in groundwater. Sources from human influence include soil erosion, agricultural and residential runoff, septic systems, and animal waste. They make their way to the pond by near shore runoff and the Plover River.

In Bentley Pond the aquatic plant and algae growth is most responsive to phosphorus due to its relative limited supply with respect to other elements necessary for growth. Increases of small amounts of phosphorus can result in increased abundance of aquatic plants and algae. Phosphorus concentrations in Bentley Pond are variable throughout the year. Average total phosphorus (TP) concentrations for 2002-2004 were 50.9 ug/L.

The Wisconsin DNR's phosphorus criteria value for impoundments is 40 ug/L. Average summer concentrations at or above this value would result in noticeably degraded water quality. The average summer total phosphorus concentrations in Bentley Pond was 67.1 ug/L in 2002-2004.

In Jordan Pond the aquatic plant and algae growth is also most responsive to phosphorus due to its relative limited supply with respect to other elements necessary for growth. Phosphorus concentrations in Jordan Pond also varied throughout the year. Average total phosphorus (TP) concentrations for 2002-2004 were 35.6 ug/L. Jordan Pond has the same phosphorus criteria of 40 ug/L for average summer concentrations.

The average summer total phosphorus concentrations in Jordan Pond was 35.6 ug/L in 2002-04. Total phosphorus should be monitored multiple times per year in Jordan Pond to be sure that it stays below the recommended value and that increases could be observed and addressed prior to noticeable changes in algal and aquatic plant communities.

Managing phosphorus in the Bentley and Jordan Pond watersheds is key to protecting the pond. Positive land management practices and land uses can result in good water quality in the ponds. Phosphorus inputs to the ponds can be controlled through the use of many different Best Management Practices (BMP's) that minimize the movement of runoff, nutrients, and pesticides to the pond. BMPs that should be used near shore and throughout the watershed include the development of water quality-based nutrient management plans for agricultural land, only applying phosphorus and nitrogen from fertilizer or manure based on soil tests for turf or specific crops, providing cover on the landscape and/or appropriate mitigation when open soils are necessary during construction or cropping, use of cover crops, properly storing manure, and manure application only when the ground is not frozen. Some of the near shore land use practices that can help to reduce the inputs of phosphorus to Bentley and Jordan Ponds include leaving native vegetation (trees, bushes, and grasses), eliminating the use of fertilizer, minimizing runoff/increasing infiltration, and minimizing and securing exposed soil. The Portage County Land Conservation Department is a

local organization that can provide assistance to landowners that want to reduce impacts to Bentley or Jordan Pond from their property.

Future degradation of water quality in Bentley and Jordan Ponds can be minimized with thoughtful land use planning throughout the watershed. This includes diverting runoff to areas where it can infiltrate rather than runoff to the pond, limiting withdrawal of groundwater, and controlling runoff, nutrient, and chemical inputs from new and existing developments and agriculture.

## Recreation

According to respondents of the citizen survey, the **most popular activities at Bentley and Jordan Ponds include fishing, enjoying scenery, enjoying wildlife, walking, picnicking, and solitude.**

The committee indicated that Jordan Pond received an unprecedented amount of fishing pressure while the water was drawn down in the Jordan Pond for dam repairs. There was a special request made that should a draw-down be required in the future an emergency closure is placed on fishing on the pond.

## Goals, Objectives, and Actions

The following goals, objectives, and actions were derived from the values and concerns of the members of the Bentley and Jordan Ponds Planning Committee including local citizens and are based on the science used to assess Bentley and Jordan Ponds and their ecosystems. Implementing the goals, objectives, and actions of the Bentley and Jordan Ponds Management Plan should protect many of the values that have been identified including the scenic beauty, peacefulness, recreational opportunities, and water quality for current and future generations. These goals are intended to be met through education, encouragement, actions, and incentives.

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

This lake management plan outlines management strategies that reflect the status of Bentley and Jordan Ponds in 2011. We recognize that these river impoundment systems are constantly in flux and are ever

changing. This lake management plan is a “living” document that should be reviewed annually to be updated and revised to reflect current needs, challenges, and desires in Bentley and Jordan Ponds and their watersheds. Updates will be provided to the Towns of Sharon and Hull, Portage County, the Wisconsin DNR, Bentley and Jordan Ponds Committee, and any other entity adopting the plan.

DRAFT

## Water Quality and Land Use

The water quality in the Plover River and Bentley and Jordan Ponds is strongly influenced by the land use practices in their respective watersheds. They are host to a variety of plants, insects, fish, amphibians, and a variety of other animals that all depend on good water quality in the ponds. Survey respondents indicated that water quality influenced their enjoyment of the ponds and impacted their perceived aesthetic and economic value of Bentley and Jordan Ponds. In Bentley Pond, respondents felt that the water quality in the pond was fair/poor and the water quality had declined over time. In Jordan Pond, respondents felt that the water quality in the pond was good/fair and the water quality had stayed the same over time. Data shows that water quality in Bentley and Jordan Ponds could use improvement. Currently, both Bentley and Jordan Ponds have elevated concentrations of nitrogen, and Bentley Pond has elevated concentrations of phosphorus that can fuel excess plant and algae growth in the pond. Atrazine and other agricultural chemicals are also entering the ponds.

***Vision: The planning committee of Bentley and Jordan Ponds envisions on having improved water quality in the ponds that exceed state standards and support a healthy ecosystem.***

**Goal 1:** Improve water quality in Bentley Pond so that phosphorus concentrations are below the WDNR phosphorus criteria of 40 ug/L. Maintain water quality in Jordan Pond so that phosphorus concentrations do not exceed 2002-04 annual average concentrations of 35 ug/L. We will know that we have achieved this goal when monitoring indicates that median summer (5 samples/summer) total phosphorus remain at or below these levels.

**Objectives 1.1:** Monitor the water quality in Bentley and Jordan Ponds to evaluate if goals are being met.

Action	Lead person/group	Start/end dates	Resources
Develop strategies for an annual nutrient related water quality monitoring program on Bentley and Jordan Ponds that include year round monitoring for phosphorus, nitrogen, surface temperature, and other water quality measures.			UWSP WDNR
Identify volunteer monitors to take water quality measures and collect samples for lab analysis.			UWSP WDNR

**Objectives 1.2:** Reduce nutrient and sediment inputs to Bentley and Jordan Ponds.

Action	Lead person/group	Start/end dates	Resources
Encourage soil tests on lawns and land where fertilizer is applied – provide information to landowners on how and where to sample.			Portage County UW-Extension
Provide information to watershed landowners about when to fertilize or not based on soil test results.			Portage County UW-Extension UWEX Lakes
Work with the counties to encourage development of water quality based nutrient management plans within the Bentley and Jordan Pond watersheds.			Portage County Land Cons. Dept. Marathon County Land Cons. Dept.

**Objectives 1.3:** Riparian and watershed landowners will minimize their impacts to Bentley and Jordan Ponds through understanding impacts and improved land management practices.

Action	Lead person/group	Start/end dates	Resources
Support the use of conservation easements and/or land purchases for willing landowners who wish to protect their land.			UWEX Lakes North Central Conservancy Land Trust
Encourage the use of natural vegetation, rain gardens, and/or landscaping throughout the residential areas adjacent to Bentley and Jordan Ponds to reduce runoff that reaches the ponds by providing information through newspapers, informational packets, and other community resources.			Portage County Land Cons. Dept. UWEX Lakes
Encourage and support the implementation of runoff reduction practices during new construction and replacement of infrastructure throughout the watersheds.			UWEX Lakes Portage County Land Cons. Dept.

## **Sedimentation**

Sedimentation, or the tendency for particles in the water to settle out, is currently an issue of concern in Bentley and Jordan Ponds. Both ponds are impoundments of the Plover River and therefore receive sediment routinely. Some of the survey respondents indicated that sedimentation in Jordan Pond was of concern or was something that could be improved, especially towards the north end of the pond. Dr. Clancy informed the group that due to the extreme variability of sediment movement through a river system, estimating sedimentation in an impoundment is a difficult to impossible task.

*Vision: The Bentley and Jordan Pond Planning Committee envision Jordan Pond remaining easily navigable for various forms of recreation.*

### **Goal 2: Understand how to slow and manage sedimentation in Jordan Pond.**

**Objective 2.1: Utilize professionals and other resources to understand how to slow and manage sedimentation in Jordan Pond.**

<b>Action</b>	<b>Lead person/group</b>	<b>Start/end dates</b>	<b>Resources</b>
Explore obtaining additional information regarding sediment transport and contribution to Jordan Pond, especially from stretches between Bentley and Jordan Ponds.			UWSP
Hire a consultant and work with WDNR to explore management options for sediment in Jordan Pond, including dredging.			WDNR
Monitor the volume of water and rate of sedimentation in Jordan Pond to try and determine how fast sedimentation is occurring.			Consultant WDNR
Encourage land management practices that reduce erosion to the Plover River and its tributaries (property owners, municipalities, highway departments)			Portage County Land Cons. UWEX Lakes

## **Shorelands**

Shorelands are some of the most important habitat near water bodies for aquatic and terrestrial wildlife, including birds. Shoreline vegetation helps to slow runoff moving to the ponds and filter runoff before it enters the ponds. Restoring and protecting shorelines not only improves water quality and protects habitat but will also help to provide scenery and solitude, as well as natural space for residents to enjoy nature, which were some of the most popular recreational activities identified in the citizen survey. A healthy shoreland buffer should be comprised of native flowers/forbs, shrubs, and trees. In 2010, nearly all of the shoreland of Bentley and Jordan Ponds meet the county/state shoreland zoning ordinance. Many of the steeper sloped shorelands along the Plover River are comprised of sand which easily erodes when disturbed by use and/or removal of vegetation. Extra care and consideration of land management should be given in these situations to prevent significant sediment movement to the Plover River.

***Vision: The Bentley and Jordan Ponds Planning Committee having natural shorelines along the Plover River corridor, Bentley, and Jordan Ponds that will help protect and improve the water quality and habitat in the ponds.***

**Goal 3:** Waterfront property owners along the Plover River will understand the importance of shorelands for a sustainable aquatic ecosystem and how their actions affect the aquatic ecosystem.

**Objective 3.1:** Provide a variety of informational/education opportunities for waterfront property owners to learn about the importance of shorelands for a sustainable aquatic ecosystem.

<b>Actions</b>	<b>Lead person/group</b>	<b>Start/end dates</b>	<b>Resources</b>
Provide information about the benefits of natural vegetation and natural shorelands through the welcome packets.			Portage County Land Cons Dept UWSP UWEX WDNR Grants
Share Portage County Land Conservation contact information with local landowners through the welcome packets.			Portage County Land Cons Dept UWSP

**Goal 4:** Plover River, Bentley and Jordan Pond shorelands will be healthy and stable habitat. Shorelands will be restored and/or protected.

**Objective 4.1:** Waterfront property owners around Bentley and Jordan Ponds, along the Plover River and its tributaries will understand their roles in protecting this important land and will make informed land management decisions that minimize impacts to water quality and habitat.

Actions	Lead person/group	Start/end dates	Resources
In steeper sloped areas around Bentley and Jordan Ponds, encourage the design of access points to the water that minimize erosion and slow water runoff through informational workshops and the welcome packets.			Portage County Land Cons. Dept.
Explore different methods of shoreline restoration (restoration on steep banks, sharp curves, and re-vegetation techniques) on Jordan Pond and along the Plover River above the Pond.			Portage County Land Cons. Dept. UWEX Lakes UWSP
Explain limitations of current state shoreline ordinance (NR115) and encourage participation in county interpretation of ordinance.			Portage County Planning and Zoning Dept. UWSP Center for Land Use Education
Explore the use of conservation easements with willing landowners to protect shoreland habitats along the Plover River and Jordan and Bentley Ponds.			North Central Conservancy Trust UWEX Lakes WDNR
Explore possible funding sources to aid interested landowners that want conservation easements.			WDNR North Central Conservancy Trust
Have a presentation by land local land trust on possible programs/benefits of conservation easements.			North Central Conservancy Trust UWSP
Shoreland property owners and municipal board members will understand and comply with the state/county shoreland zoning ordinance.			Portage County Planning and Zoning

## **Aquatic Plants and Aquatic Invasive Species**

Fish and other aquatic and water dependent terrestrial life use aquatic plants for habitat, food, and spawning areas. The presence of fish, wildlife, and wildlife viewing are valued by the Bentley and Jordan Pond survey respondents and committee members. Thirty-six percent of Bentley Pond survey respondents felt that the plant growth in Bentley Pond was dense, while 21% felt that plant growth was just right and 14% felt that the pond was choked with aquatic plant growth. In Jordan Pond, 20% of respondents felt that the plant growth in the pond was just right, while 11% that the plant growth was dense, 4% said there was very little growth, and 1% indicated that the pond was choked with plant growth. Most of those that were impacted indicated that they live on the east end of the pond.

Bentley Pond is currently free of any invasive aquatic species. Eurasian watermilfoil, curly leaf pondweed, and reed canary grass have all been found in or on the shores of Jordan Pond. In 2010, none of these species seemed to dominate the aquatic plant communities in Jordan Pond. The majority of survey respondents indicated that they were not aware of the presence of Eurasian water milfoil in nearby waterbodies and there were an equal number of survey respondents who were and those who were not aware of the presence of Eurasian watermilfoil present in Jordan Pond. The responses from both ponds indicate that there might be a need for information regarding the presence of invasive species in and around local waterbodies.

Healthy aquatic plant communities, along with a vigilant watch will help to limit any new aquatic invasive species from becoming established in the either Bentley or Jordan Ponds. Management may be needed for the Eurasian watermilfoil or curly leaf pondweed at some time. The population of these species should be closely monitored to identify any indication that they are spreading to larger areas. Pond users should be discouraged from using parts of the pond with these species.

**Vision:** The Bentley and Jordan Ponds planning committee envision having a healthy native aquatic plant community that does not have any new aquatic invasive species.

**Goal 5:** Control existing invasive aquatic plant species in Jordan Pond and prevent any new invasive aquatic species from becoming established in Bentley and Jordan Ponds.

**Objective 5.1:** Monitor the amount of Eurasian watermilfoil and curly leaf pondweed (*Potamogeton crispus*) in Jordan Pond and contact authorities if population appears to be increasing.

<b>Actions</b>	<b>Lead person/group</b>	<b>Start/end dates</b>	<b>Resources</b>
Establish a citizen monitoring program to track the extent and density of Eurasian watermilfoil and curly leaf pondweed in Jordan Pond.			WDNR Portage Co AIS Coordinator
Use Rapid Response Plan (appendix) to notify experts if population appears to be increasing.			UWSP Portage Co AIS Coordinator

**Objective 5.2:** Prevent new aquatic invasive species from entering Bentley and Jordan Ponds. If new species do get into the pond, quickly identify their presence and remove using proper procedures and techniques.

<b>Actions</b>	<b>Lead person/group</b>	<b>Start/end dates</b>	<b>Resources</b>
Routinely monitor for new aquatic invasive species.			Portage Co AIS Coordinator UWSP
Volunteers will attend/host training sessions and provide educational materials for individuals to identify native and invasive aquatic species.			Portage Co AIS Coordinator WDNR
Provide information to shoreland property owners on invasive aquatic species and how to prevent introduction in welcome packets.			Portage Co AIS Coordinator UWEX Lakes
Utilize aquatic invasive species rapid response plan if new invasive plants are found (see appendix).			UWSP Center for Watershed Science and Education
Annually update the Bentley and Jordan Ponds invasive species rapid response plan (appendix).			UWSP Center for Watershed Science and Education
Work with County Park and NatureTreks to ensure that pond users have adequate information (handouts, identification cards, brochures, signage, etc) about cleaning their boats/equipment before launching them in the ponds/Plover River.			UWEX Lakes Portage Co AIS Coordinator

**Goal 6:** Bentley and Jordan Ponds will have healthy and balanced native aquatic plant communities and ecosystems.

**Objective 6.1:** Shoreland property owners will be knowledgeable about how to maintain healthy native aquatic plant communities and ecosystems in Bentley and Jordan Ponds.

Actions	Lead person/group	Start/end dates	Resources
Share information about the importance and maintenance of native aquatic plants in Bentley and Jordan Ponds. Information will be provided in welcome packets.			UWEX Lakes WDNR Aquatic Plant Specialist UWSP Center for Watershed Science and Education

### **Fisheries and Recreation**

Bentley and Jordan Pond residents and users enjoy many different recreational opportunities on the Ponds. Based on survey results, the most popular recreational activities on Bentley Pond included fishing, enjoying scenery, canoeing/kayaking, and enjoying wildlife. On Jordan Pond, the most popular recreational activities include fishing, enjoying scenery, enjoying wildlife, walking, and picnicking. Recreational needs and uses on the ponds will likely continue to increase as populations and development in the area increases. Jordan Pond receives a fair amount of use because of its proximity to larger population and the amenities of a County Park and campground on its shores. It is ideal for family-friendly water recreation and enjoyment.

Healthy pond ecosystems are valuable natural resources for all pond users. Fishing is one of the top recreational activities on both ponds and is valued by pond users. The majority of survey respondents felt that the quality of fishing in Bentley Pond was average, but that fishing had declined in recent years. The majority of survey respondents for Jordan Pond felt that the quality of fishing was fair, but that fishing had also declined in recent years.

***Vision: The Bentley and Jordan Ponds planning committee envision recreational opportunities on the ponds that protect the quiet scenic nature of the ponds.***

## Goal 7: Provide recreational opportunities that preserve the quiet nature of Bentley and Jordan ponds

**Objective 7.1:** Provide recreational opportunities to enjoy Bentley and Jordan Ponds while minimizing conflicts between users and protecting lake water quality and habitat.

Action	Lead person/group	Start/end dates	Resources
Explain the impacts on water quality from disturbing the bottom sediment on shallow waters			
Share information about Bentley and Jordan Pond at the Park and at the Nature Center			
Share the information with lake residents and lake users about the slow no wake zone 100 ft from shore			
Share lake information through the park naturalist programs at the Jordan County Park			

**Vision:** *The Bentley and Jordan Ponds planning committee envisions a fishery with healthy fish of a catchable/keepable size.*

**Goal 8:** Study and understand the fishery of Jordan Pond so that a sustainable management plan can be created and followed.

**Objective 8.1:** Understand the needs of the fishery in Jordan Pond to create a sustainable management plan.

<b>Actions</b>	<b>Lead person/group</b>	<b>Start/end dates</b>	<b>Resources</b>
Inform individuals about the importance of woody habitat in shallow water near shore areas of the pond and encourage its placement on the east end of Jordan pond.			WDNR/UWSP Portage County Land Cons Dept
Support a survey of fish species by WDNR in Jordan Pond.	WDNR		WDNR Fishery Biologist UWSP Fishery Society
Work with the WDNR to determine fisheries management strategies based on the outcomes of the fish survey.			WDNR Fishery Biologist
Work with the WDNR to place an emergency closure on fishing if Jordan Pond experiences a drawdown or significant reduction in water level – work to ensure that a protocol is developed and in place			WDNR Fishery Biologist
Review and participate in hearings regarding any new northern pike regulations in Portage County, especially regarding Jordan Pond.			WDNR Fishery Biologist UWSP

## **Communication/Organization**

Many of the goals outlined in this plan are focused on disseminating information to pond and watershed residents and pond users, ultimately to help them make informed decisions that will result in a healthy ecosystem in Bentley and Jordan Ponds that are enjoyed by many people. There is no single best way to distribute information to those that enjoy and/or affect Bentley and/or Jordan Pond so the planning committee has identified a variety of options to communicate with one another and the community. Working together on common values will help to achieve the goals that have been outlined in this plan.

### **Goal 9: Every riparian or watershed resident is able to access/obtain information regarding Bentley and Jordan Ponds and the actions outlined in the management plan**

**Objective 9.1:** Reach out to Bentley and/or Jordan Pond landowners and the community using a variety of communication methods.

<b>Action</b>	<b>Lead person/group</b>	<b>Start/end dates</b>	<b>Resources</b>
Encourage partnerships along the entire river watershed. Share the Jordan/Bentley plan with the Marathon County Lakes. Meet with the Marathon County Lakes to discuss management actions.			UWEX Lakes Marathon County Lakes UWSP
Use informational packets that will be mailed to current riparian landowners on Bentley and Jordan Ponds and will be given to new landowners by the town (triggered when a permit is issued).			Towns of Hull, Sharon, Dewey UWSP
Explore having realtors share informational packets with clients that purchase properties along the river or the ponds.			UWSP
Share information on river and pond issues/concerns through town newsletters (Hull, Sharon, and Dewey).			Towns of Hull, Sharon, Dewey
Share information through articles in the Portage County Gazette. Share information about the plan creation and what it entails with George Rogers.			Portage County Gazette
Host a social get together for Plover River residents and lake tours. Can tour the power plant at Jordan Park.			McDill P&R Lake District UWEX Lakes
Support and encourage the formation of a group for the Plover River (similar to the Plover River Alliance, possibly in conjunction with the Isaac Walton League)			McDill P&R Lake District UWEX Lakes Issac Walton League
Support the formation of a county wide lake group in Portage County			UWSP

# **Bentley and Jordan Ponds Aquatic Invasive Species Rapid Response Plan 2011**

Or--

## **Survey/Monitor**

### **1. Learn to survey/monitor the pond 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 pond monthly/seasonally/annually**

## **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.

- 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 e-mail.

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](http://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).

# **Bentley and Jordan Ponds Aquatic Invasive Species Rapid Response Plan 2011**

## **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

### **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

### **UW-Stevens Point Herbarium**

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

## **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, Portage County AIS Coordinator 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 Town of Sharon**

Contact: Pat Wanserski - Chairperson  
Address: 7315 State Hwy 66  
Phone: 715-592-5085  
E-Mail:  
Who will contact them: Portage County AIS Coordinator

### **The Town of Hull**

Contact: John Holdridge –Chairperson  
Address: 4550 Wojcik Memorial Dr.  
Phone: 715-341-3144 or 715-344-8280  
E-Mail:  
Who will contact them: Portage County AIS Coordinator

# **Bentley and Jordan Ponds Aquatic Invasive Species Rapid Response Plan 2011**

**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: [pclakes@uwsp.edu](mailto:pclakes@uwsp.edu)  
Who will contact them: Portage County AIS Coordinator

**Newspapers**

Who will contact them: Portage County AIS Coordinator  
Portage County Gazette  
Stevens Point Journal

**Citizens**

Name (First & Last)	Address	Phone	E-mail
Adam & Pat Borys	4175 Cty. Rd Y Custer, WI 54423	715-345-1977	adamborys@sbcglobal.net
Michael and Marge Bigalke	1459 Cty Rd. K Custer, WI 54423	715-592-4942	
Mark Kirschling	W4123 Kiekhaefer Prkwy Fon du Lac, WI	920-948-0252	Mark.kirschling@milwpc.com
Jean Buckley	2029 Cty Rd Y Stevens Point, WI 54482	715-342-1586	triopticalthaijean@yahoo.com
Melba Sulliva	5535 Hwy 66 Stevens Point, WI 54482	715-344-9753	
Gregory Wysocki	6018 Hwy 66 Stevens Point, WI 54482	715-498-1062	Gwyso45@wildblue.net
Melanie Becker Patterson			melaniedave@chater.net

## 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 multi-cellular 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 provide 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 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 (N<sub>2</sub>) from the air to provide their own nutrient.

### Calcium (Ca<sup>++</sup>):

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/l) as calcium carbonate (CaCO<sub>3</sub>), or milligrams per liter as calcium ion (Ca<sup>++</sup>).

### Chloride (Cl<sup>-</sup>):

Chlorine in the chloride ion (Cl<sup>-</sup>) form has very different properties from chlorine gas (Cl<sub>2</sub>), which is used for disinfecting. The chloride ion (Cl<sup>-</sup>) 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/l). 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 that has most of its vegetative growth above water.

**Eutrophication:**

The process by which lakes and streams are enriched by nutrients, and the resulting increase in plants 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 as a spring-fed lake, has large amounts of groundwater as its source, and a surface outlet. Areas of high groundwater in-flow 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<sup>++</sup>) and magnesium (Mg<sup>++</sup>), in the water expressed as milligrams per liter of CaCO<sub>3</sub>. 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 (CaCO<sub>3</sub>) 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 clear water lakes and ponds with beds of submerged aquatic plants and medium levels of nutrients. See also "eutrophication".

**Nitrate (NO<sub>3</sub>-):**

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 (NO<sub>3</sub>-N) plus ammonium-nitrogen (NH<sub>4</sub>-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 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 that are deposited after settling out of the water.

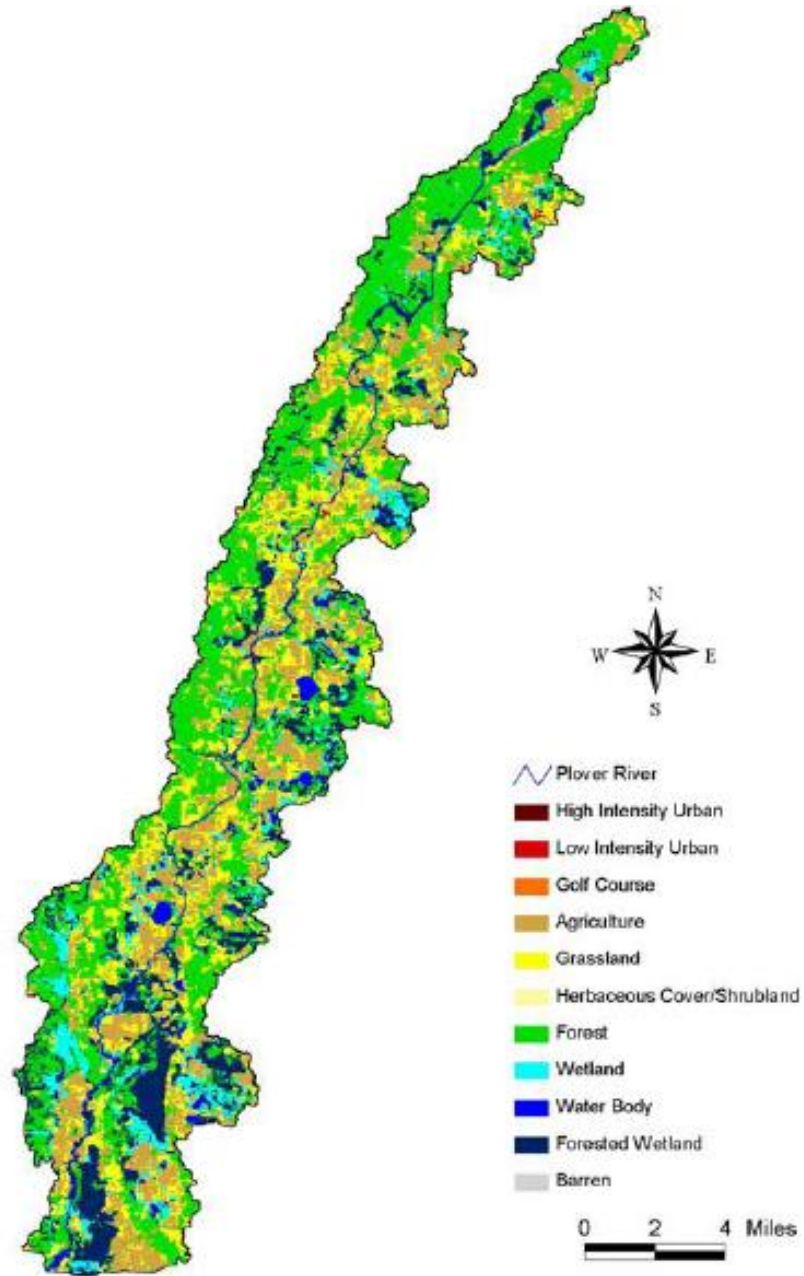
**Stratification:**

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”.

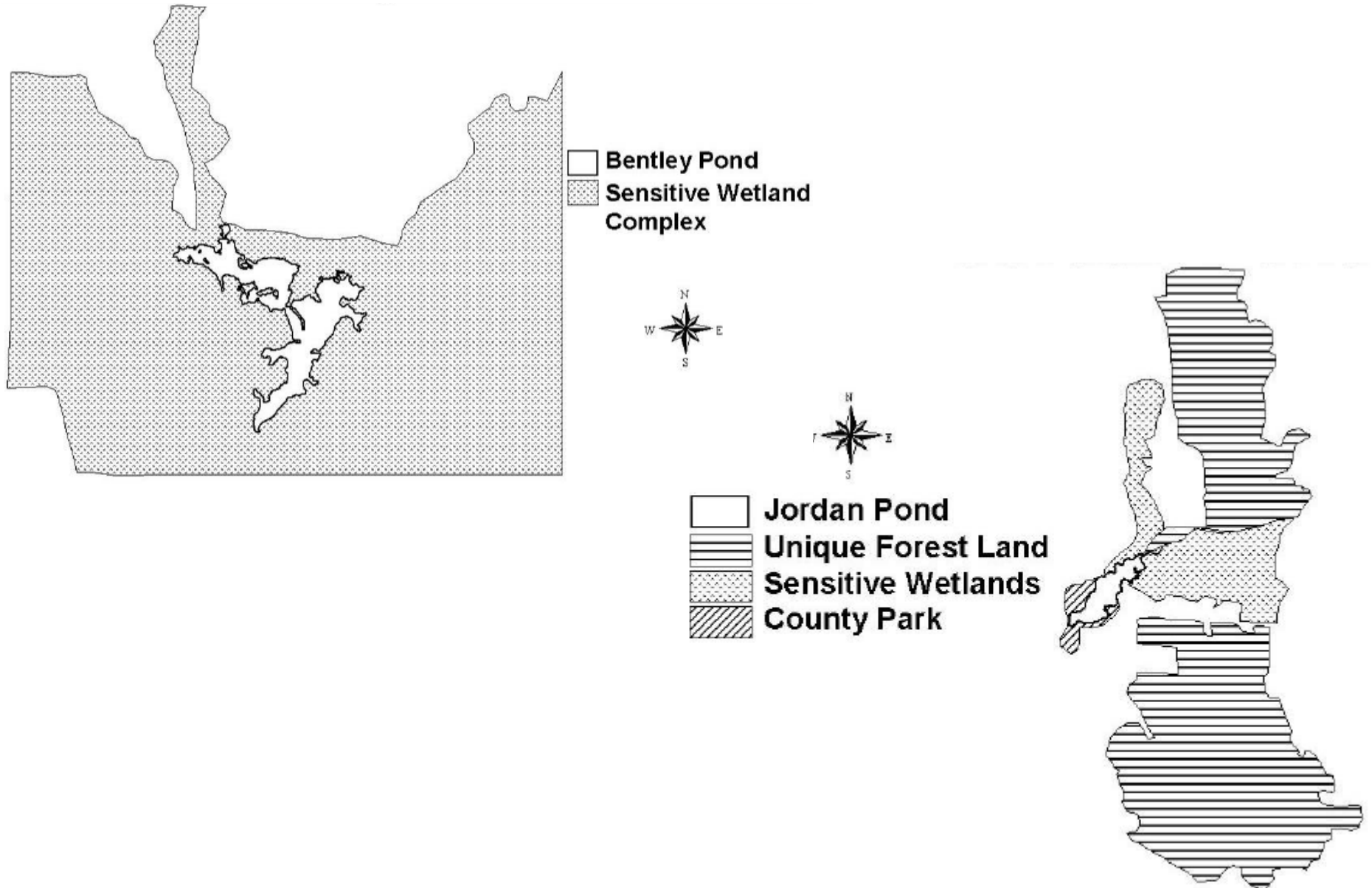
## Appendix A

### Bentley and Jordan Pond Surface Watersheds.



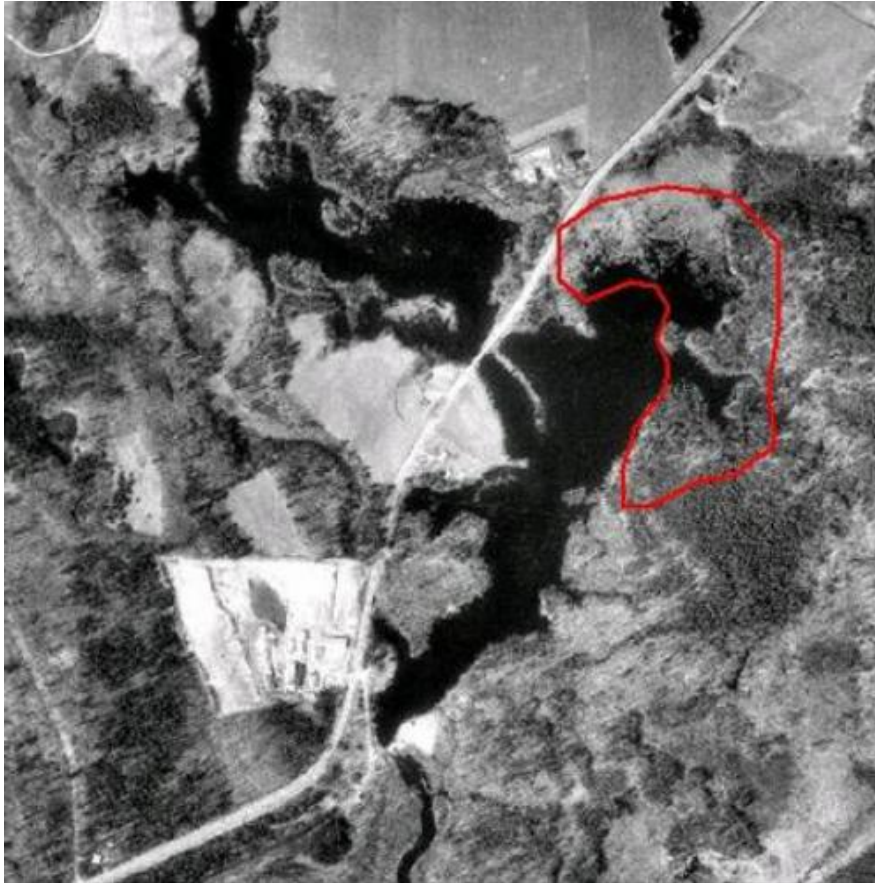
## Appendix B

### Bentley and Jordan Pond Sensitive Areas.



## Appendix C

Belntley and Jordan Pond primary amphibian habitat (highlighted in red).



**Bentley Pond**



**Jordan Pond**