2010

Adams, Bear, and Thomas Lake Management Plans

Adams, Bear, and Thomas Lake Management Planning Committee

9/14/2010

Plan approved by the Adams, Bear, and Thomas Lake Management Planning Committee on

Adopted by Town of Stockton

Adopted by Portage County on

A special thanks to all those who helped to create the Adams, Bear, and Thomas Lake Management Plan and provided the necessary data in the Portage County Lake Study.

Adams, Bear, and Thomas Lake Management Planning Committee Members and Resources

Adams, Bear, and Thomas Lake Management Planning Committee

Lloyd and Kelly Anseth
Eleanor Bembenek
James Borski
Ted and Mary Cayford
Jeanee Dodge
Jerome Glodowski
Justin Hodges
Jamie Jastromski
Mel Klish
Tom Kranig
Germaine and Ray Konkol
Jerry and Maryann Krupka
Tom Kumm
Art and Sandy Lepak
Donna Literski
Mary Maller
Randy and Carla Mayes
Dave and Sherry McHome
Dale Niggemann
Jerry Piesik
Conrad Shulfer
Boyd and Sharon Trachsel
Marc Wolding
Thomas Zielinski

Wisconsin Department of Natural Resources

Tom Meronek – Fisheries Biologist
Neil Trombly – Water Resources Management Specialist
Patrick "Buzz" Sorge – Programming and Planning Analyst

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, Lynn Markhem – Center for Land Use Education
Patrick Goggin, UWEX Lakes

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

Adams, Bear, and Thomas Lakes are located in the Town of Stockton in Portage County. These lakes are valued by those who use and enjoy them for their natural beauty, peace and tranquility, wildlife viewing, and many recreational opportunities including fishing, swimming, canoeing/kayaking and walking.

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 Adams, Bear, and Thomas Lake ecosystems.

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 Adams, Bear, and Thomas Lake 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 Adams, Bear, Thomas and 26 other lakes throughout the county. The study provided information on water quality, shoreline development, amphibian habitat, fisheries, aquatic plants, and other parameters.

This plan was developed by a committee of interested citizens, local organizations, and professionals. Prior to the lake plan development a citizen survey was conducted to gather information on citizens' values, opinions, and perceived issues with Adams, Bear, and Thomas Lakes. In 2010 a survey was sent to 54 residences within the Adams Lake watersheds, 19 residences in the Bear Lake watersheds, and 33 residences in the Thomas Lake watershed and was available online where any interested person could take the survey. Seventeen citizen surveys were returned for Adams Lake for a response rate of 31%. Eight surveys were returned for Bear Lake for a response rate of 50%, and 17 surveys were returned for Thomas Lake for a response rate of 52%. The members of the Adams, Bear, and Thomas Lake management planning committee met over five months to learn about topics related the lakes and develop this lake management plan.

The overall goal for the Adams, Bear, and Thomas Lake Management Plan is to **manage Adams, Bear, and Thomas Lakes to maintain the water quality and healthy eco-systems present.**

Background Information

Information in this section was taken from the Portage County Lakes Study and 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 background information provided from the Portage County Lakes Study helps to give us a good understanding of Adams, Bear, and Thomas Lakes and their ecosystems. A healthy lake ecosystem is comprised of many components that include in-lake 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 Adams, Bear, and Thomas Lakes but also extend to where the water meets the land and beyond into the watershed. Adams, Bear, and Thomas Lakes are a reflection of the health and activities that occur in the lakes, near the shores, and in the watersheds.

Adams Lake is a 29 acre hard water, spring-fed lake located in the Town of Stockton about five miles west of Amherst. The lake has a maximum depth of 44 feet (WDNR 2005). Adams Lake has an intermittent inlet and a small outlet known as Bear Creek.

Bear Lake is a 28.7 acre seepage lake located in the rolling hills near the glacial moraine six miles southwest of Amherst in the Town of Stockton. The lake has a maximum depth of 30 feet (WDNR 2005). Much of the shoreline around Bear Lake is undeveloped with steep slopes on the north and south shores that are protected by Standing Rocks County Park.

Lake Thomas is a 32 acre hard-water seepage lake located three miles west of Amherst Junction in the Town of Stockton. The lake has a maximum depth of 28 feet (WDNR 2005). In the past Lake Thomas has been intensively managed for fisheries with chemical treatments and restocking projects.

Watershed

A surface watershed is an area of land where water from precipitation drains from higher elevations towards the lake. Adams Lake surface watershed is approximately 291 acres, Bear Lake's surface water shed is 253 acres, and Thomas Lake's surface watershed is 151 acres(Figure 1).

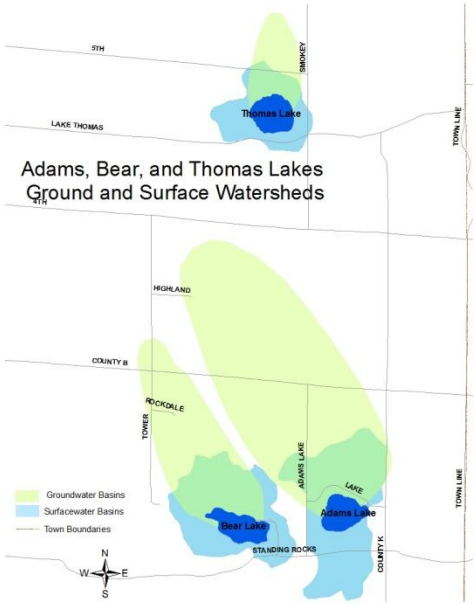


Figure 1. Adams, Bear, and Thomas Lake groundwater and surface watersheds.

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 lake. 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.**

Predominant land uses in all three surface watersheds are forests, non-irrigated agriculture, and shrub cover. The areas near shore have the most direct impact on habitat and water quality. These areas are currently comprised of forested, shrub/herbaceous covered, residential land uses (See Appendix A).

A groundwater watershed is similar to a surface watershed, except that it is an area of land where the groundwater drains to the Lake. Within the groundwater watershed, precipitation soaks into the ground and recharges the groundwater. The groundwater slowly moves towards the lake, and enters it via springs and seeps. During dry periods, this provides the majority of water in Adams, Bear, and Thomas Lakes. Often surface watersheds and groundwater watersheds do not match each other, which is the case with these lakes. Adams Lake groundwater watershed is approximately 858 acres, Bear Lake's groundwater watershed is 360 acres, and Thomas Lake's groundwater watershed is 128 acres (Figure 1). The major land uses/cover types in the Adams and Bear Lake groundwater watersheds are non-irrigated agriculture and forests. Thomas Lake's groundwater watershed has forested areas and shrub/wetland vegetation as its major land uses/cover types(See Appendix A).

Survey respondents indicated a willingness to change how they manage their land to protect/improve the Adams, Bear, and Thomas Lake ecosystems. The top motivators included increasing natural beauty, improving water quality, improving water quantity, demonstrating a commitment to the environment, increasing property values, and better habitat for fish and wildlife.

Sensitive Areas

The sensitive areas associated with Adams, Bear, and Thomas Lakes are defined by lands adjacent to the lakes that are particularly valuable to the lake's ecosystem or that would be significantly impacted by most disturbances or development. These areas include steep shorelines on all three lakes and sensitive wetlands on Adams and Bear Lakes. The steep shore areas are particularly prone to erosion and could contribute to sedimentation and associated water quality problems in the lakes. Care should be taken if these areas are disturbed. The wetlands present on the north shore of Adams Lake and on the eastern shore of Bear Lake, can serve as primary habitat for amphibians and reptiles (See Appendix B).

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 on Adams Lake is located on the southwest corner and east side of the lake, the primary habitat on Bear Lake is found on the east and west sides of the lake, and on Thomas Lake the primary habitat is found on the west shore. Key features of this habitat in all of the lakes include protected areas of marsh with submergent, emergent, and floating-leaf vegetation. One Adams Lake the good news about the amphibian populations is that several frog species are present and development has been kept to a minimum by the low number of houses and protection of shoreline habitat is in place in many locations. However, there are stretches of highly altered shoreline that may prevent amphibian populations from establishing in some areas. On Bear Lake the good news about the amphibian populations is that there are large amounts of natural habitat available because shoreline development has been kept to a minimum. The bad news is that there is a small amount of recreational use on the lake which may negatively affect amphibian populations. On Thomas Lake the good news about the amphibian populations is that there are large sections of undisturbed natural shoreline but there are also small sections of altered shoreline which can negatively impact amphibian populations (See Appendix C).

Shoreline

Approximately 34% of the shoreline around Adams Lake was considered disturbed. Minimal disturbance of vegetation occurred on 8.3% of the shoreline, 1.3% was considered moderately disturbed, and 24.4% was highly disturbed. Areas of minimal disturbance of vegetation are areas that have unaltered shore except for pier access. Around Bear Lake only 8% of the shoreline is considered to be disturbed. Of that 3.8% is low level disturbance and 4.2% is highly disturbed. Around Thomas Lake 33% of the shoreline is considered disturbed, with 16.4% considered moderately disturbed and the other 16.4% highly disturbed. Areas of moderate disturbance may contain a mowed lawn with intact overstory vegetation. Areas of high disturbance of vegetation are defined as a beach, rip rap, lawn mowed to the water line, or a boat access. The Adams Lake shoreline is comprised of 61.2% dense vegetation such as tall grasses and shrubs, 3.3% alders, and 1.6% narrow wetlands that extend less than five meters onto shore. The Bear Lake shoreline is comprised of 50% narrow wetlands that extend less than five meters onto shore, vegetated shorelines, shrubs and grasses, and tag alders. The Thomas Lake shoreline is comprised of 68.6% dense vegetation such as tall grasses and shrubs and 1.5% narrow wetlands that extend less than five meters onto shore.

Protecting the existing shoreland and restoring the disturbed shoreland around Adams, Bear, and Thomas Lakes would improve near shore habitat along with the water quality in the lakes, growth of algae and

aquatic plants, and the fish and other species that currently comprise the lake's ecosystem. Surfaces such as roofs, driveways, roads, patios, and compacted soils increase the amount of runoff moving across the landscape towards the lakes, especially where steep shorelines occur. Runoff that enters the lakes can carry a variety of pollutants into the water. Some of the negative impacts in the lakes 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 surveys, 9 of the 17 respondents on Adams Lake, 4 of the 8 respondents on Bear Lake, and 12 of the 17 respondents on Thomas Lake owned shoreline property. All of the respondents on Bear Lake, 59% on Adams Lake, and 67% on Thomas Lake indicated their shorelines were undeveloped or natural. Respondents indicated the depth of their shoreline buffers around the lakes varied greatly. Two respondents on Adams Lake indicated their buffers were less than 35 feet, which is required by the county/state shoreline zoning ordinances. All of the respondents on Bear and Thomas Lakes indicated their buffers were greater than 35 feet. These special rules, the shoreland zoning ordinances, apply to the near shore area of the lake. These rules were developed to help protect water quality and habitat of lakes while allowing for access to a lake.

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), there are **37** species of aquatic macrophytes or plants that have been identified in Adams Lake, **85** species in Bear Lake, and **41** species in Thomas Lakes or on the wet areas of shore around the lakes.

When asked about the abundance of aquatic plants in the lakes, the majority of respondents on Adams Lake indicated that the growth was just right, Bear Lake respondents indicated that the plant growth was just the right amount or heavy, and the majority of Thomas Lake respondents indicated that the plant growth was heavy. Respondents also indicated July and August were the months with the densest plant growth on all three lakes, which is typical for most Wisconsin lakes.

Water Quality and Land Use

When asked about water quality in the lake, the majority of survey respondents for Adams Lake felt the water quality was good or excellent and felt the water quality hadn't changed during the period that they were familiar with it. Respondents on Bear Lake felt that water quality was good or fair but indicated that the water had declined over time. Thomas Lake respondents indicated that water quality was good or fair, but that water quality had declined over time. Survey respondents on all of the lakes also indicated the quality of lake water had major impact both economically and on their personal enjoyment of the lake.

The assessment of water quality in 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 indicators of how strongly a lake is being impacted by human activity. In Bear and Thomas Lakes chloride, sodium, and potassium levels measured in 2002/03 were all low. In Adams Lake chloride, sodium, and potassium levels measured in 2002/2003 were slightly elevated.

Atrazine, an agricultural herbicide, was detected in all three lakes. 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 Adams, Bear, and Thomas Lakes.

The temperatures in Adams, Bear, and Thomas Lakes were generally mixed in the spring and fall and stratified in the winter and summer months, typical of Wisconsin Lakes. In Adams Lake dissolved oxygen was always plentiful in the upper 18 feet of the lake. Below that, during some times of the year water lacks enough oxygen to support many biota; however, this is considered normal and is due to the decomposition of organic materials. In Bear and Thomas Lakes, dissolved oxygen levels dipped below the5 mg/L needed for biota to survive in the upper 6 feet of water in Bear Lake upper 9 feet in Thomas Lake. Oxygen levels may become a problem in the future due to the large amount of decomposing aquatic vegetation in these lakes.

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 Adams Lake ranged from eight to 20 feet. May had the best water clarity and August had the poorest. Clarity measurements in Bear Lake ranged from nine to 11 feet. September had the best water clarity and June had the poorest. Clarity measurements in Thomas Lake ranged from 11 to 20 feet. June had the best water clarity and May had the poorest. Fluctuations in water clarity throughout the summer are normal as algae and aquatic plant populations and sedimentation increase and decrease however, 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 a lake. Chlorophyll *a* concentrations in Adams Lake ranged from 2.59 to 6.89 mg/L. Concentrations in Bear Lake ranged from 0.005 to 10.04 mg/L. Concentrations in Thomas Lake ranged from 0.005 to 6.46 mg/L. Any reading over 5 mg/L is considered to be high.

The algal genera identified during the sample periods in Adams, Bear, and Thomas Lakes 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 Adams and Thomas Lakes present a picture of an oligotrophic lake or a lake that has a balance between decaying vegetation and living organisms. In Bear Lake the algal community relative to the chlorophyll a, phosphorus, and nitrogen values present a picture of a mildly mesotrophic lake (B. Bell).

Nutrients (nitrogen and phosphorus) are important measures of water quality in lakes because they are used for growth by algae and aquatic plants. In Adams, Bear, and Thomas Lakes both the phosphorus and nitrogen concentrations fluctuated throughout the year.

Nitrogen concentrations in Adams and Thomas Lakes were low, including nitrate, which is easily used for growth by aquatic plants and algae (Figure 2). Concentrations were below the 0.3 mg/L needed to fuel algae growth (Figure 2). In Bear Lake nitrogen levels are occasionally above the 0.3 mg/L threshold.

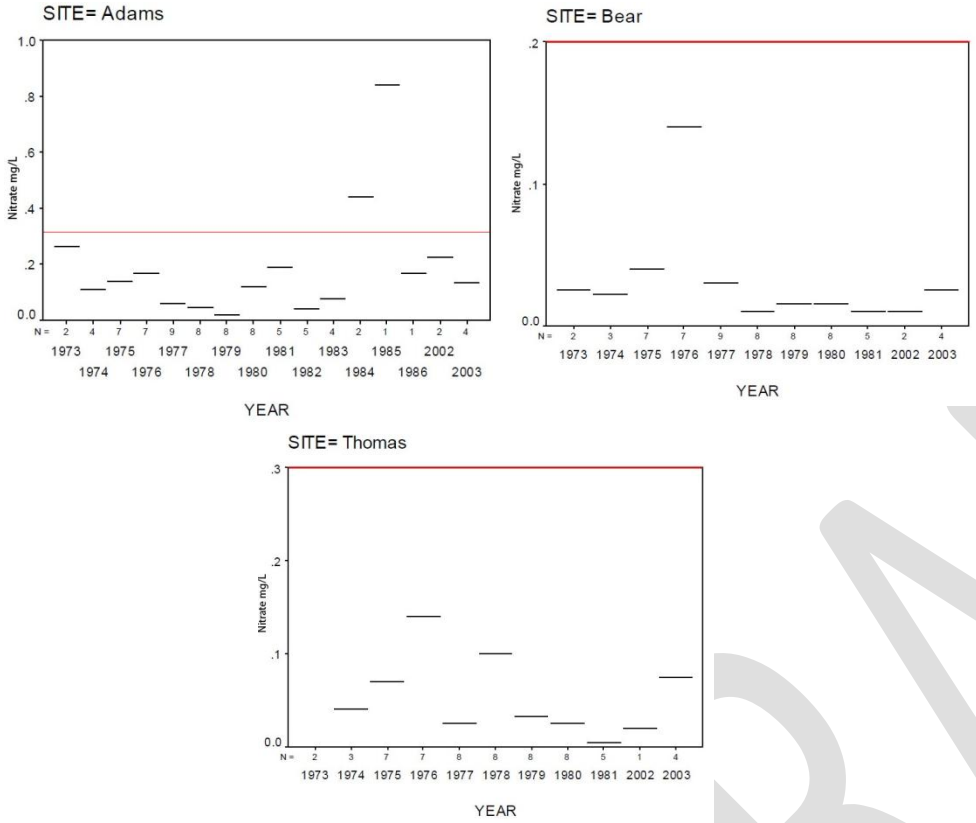


Figure 2. Median Nitrate-N concentrations (mg/L) in Adams, Bear, and Thomas Lakes, 1973-2003. Red line indicates nitrate level needed to fuel algae growth.

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.

In Adams, Bear, and Thomas Lakes 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 Adams, Bear, and Thomas Lakes are variable throughout the year. Adams Lake's median total phosphorus (TP) concentrations in spring/fall for 2002/2003 were 13.4 ug/L). Bear Lake's median total phosphorus (TP) concentrations in spring/fall for 2002/2003 were 20.4 ug/L). Thomas Lake's Median total phosphorus (TP) concentrations in spring/fall for 2002/2003 were 19.8 ug/L

The Wisconsin DNR's phosphorus criteria value for deep groundwater drainage lakes is 30 ug/L and for deep seepage lakes is 20 ug/L . Average summer concentrations at or above this value would result in noticeably degraded water quality. The average summer total phosphorus concentrations in Adams Lake was 13.6 ug/L in 2002/03 (Figure 3), which is below the recommended 30 ug/L. Average summer total phosphorus in Bear Lake was 19.7 ug/L (Figure 3) and in Thomas Lake was 19.1 ug/L (Figure 3), both just slightly below the recommended level of 20 ug/L. Total phosphorus should be monitored in these lakes to be sure that it stays below the recommended values and that increases could be observed and addressed prior to noticeable changes in algal and aquatic plant communities.

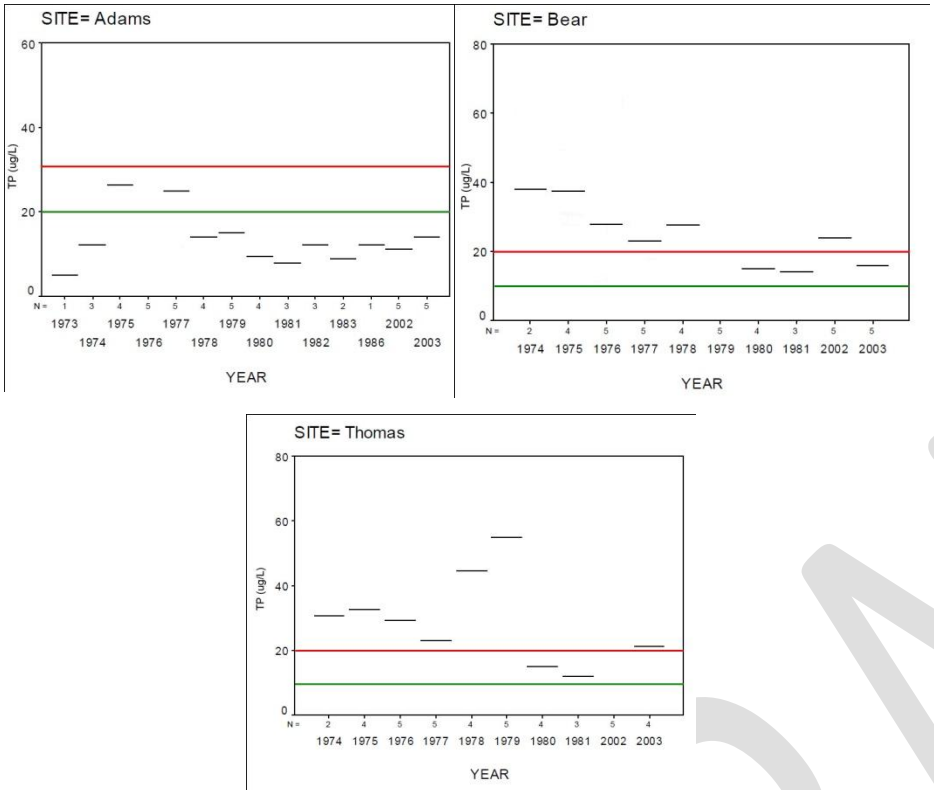


Figure 3. Median total phosphorus concentrations (mg/L) in Adams, Bear, and Thomas Lakes in samples collected in summer, 1974-2003. Green line is WDNR warning value and red line is WDNR criteria value for phosphorus.

Managing phosphorus in the Adams, Bear, and Thomas Lake watersheds are key to protecting the lakes themselves. Positive land management practices and land uses can result in good water quality in these lakes. Phosphorus inputs to a lake can be controlled through the use of many different Best Management Practices (BMP's) that minimize the movement of runoff , nutrients, and pesticides to a lake. 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 decrease the inputs of phosphorus to Adams, Bear, and Thomas Lakes include leaving native vegetation (trees, bushes, and grasses), eliminating the use of fertilizer, minimizing runoff/increasing infiltration, minimizing and securing exposed soil, and increasing the setback of septic drain fields. The Portage County Land Conservation Department is a local organization that can provide assistance to landowners that want to reduce impacts to Adams, Bear, and Thomas Lakes from their property.

Future degradation of water quality in Adams, Bear, and Thomas Lakes can be minimized with thoughtful land use planning throughout the watershed. This includes locating roads away from the lake, diverting runoff to areas where it can infiltrate rather than runoff to the lake, limiting withdrawal of groundwater, and controlling runoff, nutrient, and chemical inputs from new and existing developments and agriculture.

A "build out" of the current zoning in the surface and groundwater watersheds (Town of Stockton) were conducted as a predictive tool to estimate the phosphorus and algal response in Adams, Bear, and Thomas Lakes if complete allowable development occurs. Additional scenarios included connecting more of the landscape to the lake through water diversion such as culverts and roads (Figure 4). The development of a lake model allowed us to estimate phosphorus and algal changes within the lake based on various land use scenarios (figure 4). Points displayed include (in order from left to right) undeveloped, current land use with 25% of the landscape using BMPs, current land use, built out watershed, and built out with additional level of connectedness

The goal for this plan is to maintain the water quality in Adams, Bear, and Thomas Lakes at 2002/2003 concentrations.

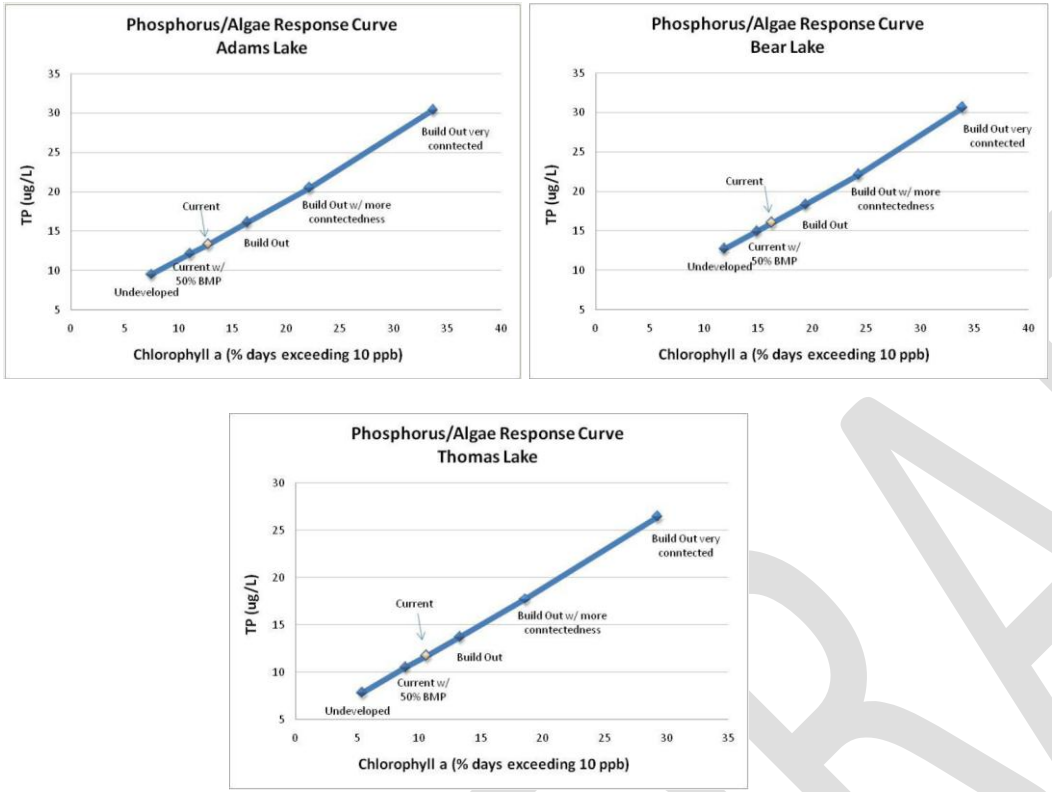


Figure 4. Phosphorus and related algae response to land use scenarios in the watershed for Adams, Bear and Thomas Lakes.

Recreation

According to respondents of the citizen survey, the **most popular activities at Adams, Bear, and Thomas Lakes include walking, solitude, hunting, fishing, canoeing/kayaking, enjoying scenery, and enjoying wildlife.**

Conflicts between users do not appear to be of concern on Adams, Bear, and Thomas Lakes as the majority respondents on all of the lakes indicated that while they saw others, they were not bothered by them.

Goals, Objectives, and Actions

The overall goal for the Adams, Bear, and Thomas Lake Management Plan is to **manage Adams, Bear, and Thomas Lakes to maintain the water quality and healthy eco-systems present.**

The following goals, objectives, and actions were derived from the values and concerns of the members of the Adams, Bear, and Thomas Lake Planning Committee including local citizens and are based on the science used to assess Adams, Bear, and Thomas Lakes and their ecosystems. Implementing the goals, objectives, and actions of the Adams, Bear, and Thomas Lake Management Plan should protect 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.

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 and updated with any necessary changes by the Adams, Bear, and Thomas Lake planning committee, interested citizens, and representatives from municipalities and.**

Water Quality and Land Use

Adams, Bear, and Thomas Lakes 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 lake. Survey respondents indicated that water quality influenced their enjoyment of the lake and impacted their perceived aesthetic and economic value of Adams, Bear, and Thomas Lakes. Survey respondents felt that the water quality in Adams, Bear, and Thomas Lakes was good. However, citizens who were familiar with these lakes felt that water quality had stayed the same or declined over time. Data shows that water quality in Adams, Bear, and Thomas Lakes could use improvement. Currently, Adams, Bear, and Thomas Lakes all have high concentrations of nitrogen that could fuel excess plant and algae growth in the lakes. The majority of the water entering these lakes originates in their watersheds; therefore, water quality in the lake is directly related to the land uses in the watershed and especially near shore.

Goal 1: Maintain the water quality in Adams, Bear, and Thomas Lakes at 2002/03 concentrations (In Adams Lake average summer TP concentrations of 13 ug/L with algae blooms (10 ug/L) occurring 13% of the days, in Bear Lake average summer TP concentrations of 16 ug/L with algae blooms (10 ug/L) occurring 15% of the days and in Thomas Lake average summer TP concentrations of 12 ug/L with algae blooms (10 ug/L) occurring 11% of the days). We will know that we are achieving this when monitoring indicates that median summer (5 samples/summer) total phosphorus remain at 2002/2003 levels.

Objectives 1.1: Monitor the water quality in Adams, Bear, and Thomas Lakes to evaluate if we are meeting our goals.

Action	Lead person/group	Start/end dates	Resources
Establish a citizen water quality monitoring program on Adams, Bear, and Thomas Lakes			UWSP

Objectives 1.2: Riparian and watershed landowners will minimize their impacts to Adams, Bear, and Thomas Lakes through land management practices.

Action	Lead person/group	Start/end dates	Resources
Look at areas in the Adams Lake watershed that may be restored to provide water quality to Adams Lake			Portage County Land Cons. Dept.
Provide landowners with information about testing soil before applying fertilizers			WDNR UW Extension Agent

Action	Lead person/group	Start/end dates	Resources
Provide landowners with information about the benefits of leaving and/or restoring buffers along the lakeshore			UWEX Lakes
Work with Portage County to encourage water quality based best management practices within the watersheds			Portage County Land Cons. Dept.

Water Levels

Fluctuating water levels in lakes are natural responses to changes in climate and weather patterns. In Portage County some of the lakes have historically experienced fluctuations in water levels and the plant and animal life in these lakes have adapted and sometimes depend on these fluctuations for survival. The area surrounding Adams, Bear, and Thomas Lakes began experiencing drought like conditions in 2002/2003, that contributed to low lake levels. However, excess withdrawal of groundwater can potentially add to these natural fluctuations, effecting the extent and duration of low water levels. Survey respondents identified low water levels as a concern for Bear and Thomas Lakes.

Goals 2: Understand water fluctuations in and near Adams, Bear, and Thomas Lakes.

Objectives 2.1: Evaluate water quantity related to natural and human induced reductions in and near Adams, Bear, and Thomas Lakes and provide information on how to manage the land in relation to fluctuating water levels.

Action	Lead person/group	Start/end dates	Resources
Provide information to landowners on how to manage for fluctuating water levels on a lake. (Ex. Keep lake beds natural, watch for invasive species, keep woody material on shore, etc)			UWEX Lakes WDNR
Install groundwater monitoring wells near Adams, Bear, and Thomas Lakes to evaluate fluctuating lake levels and collect information on a routine basis			UWSP

Aquatic Plants 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 the water cool in the summer. Healthy aquatic plant communities, along with a vigilant watch, help to limit any new aquatic invasive species from becoming established in Adams, Bear, and Thomas Lakes. Thomas and Bear Lakes currently have infestations of Eurasian Water Milfoil present in them. Bear Lake was has chemically treated their EWM. Thomas Lake is part of an ongoing study using weevils to help control EWM present in the lake.

Goal 3: Maintain the diversity and quality of native aquatic plants in Adams, Bear, and Thomas Lakes.

Objective 3.1: Foster a healthy native aquatic plant community in Adams, Bear, and Thomas Lakes.

Actions	Lead person/group	Start/end dates	Resources
Learn about native and invasive aquatic plants in Adams, Bear, and Thomas Lakes through plant identification workshops.			UWSP UWEX Lakes Portage County AIS Specialist
Share information about the importance and maintenance of native aquatic plants in Adams, Bear, and Thomas Lakes through informational welcome packets			UWEX Lakes WDNR Lakes Specialist UWSP

Goal 4: Prevent new aquatic invasive species from becoming established in Adams, Bear, and Thomas Lakes

Objective 4.1: Monitor Adams, Bear, and Thomas Lakes for aquatic invasive species (AIS).

Actions	Lead person/group	Start/end dates	Resources
Learn to identify native and invasive species in Adams, Bear, and Thomas Lakes through workshops annually.			Portage County AIS Specialist
Form a group of citizens to routinely monitor for new aquatic invasive species.			UWEX Lakes Portage County AIS Specialist
Utilize the Aquatic Invasive Species Rapid Response Plan if new invasive species are found in Adams, Bear, and Thomas Lakes (see Appendix).			UWSP
Maintain and annually update the Aquatic Invasive Species Rapid Response Plan.			UWSP

Objective 4.2: Provide information about aquatic invasive species (AIS) to riparian landowners and lake users.

Actions	Lead person/group	Start/end dates	Resources
Provide information on invasive species at local polling stations			UWSP UWEX Lakes Portage County AIS Specialist
Have informational invasive species signs and signs listing fines for transporting invasive species posted at all boat landings			UWSP UWEX Lakes Portage County AIS Specialist

Goal 5: Control/eradicate the species that are already in the lakes Bear and Thomas Lakes.

Objective 5.1: Control and/or eradicate Eurasian watermilfoil in Bear Lake

Actions	Lead person/group	Start/end dates	Resources
Continue to work to eradicate EWM in Bear Lake			Portage County AIS Specialist WDNR Lakes Specialist
Citizens annually monitor EWM infestation on Bear Lake in late fall and early spring			Portage County AIS Specialist
Annually evaluate and decide the methods of control of EWM to be used in the upcoming year			Portage County AIS Specialist UWSP WDNR Lakes Specialist
If after 5 years EWM has not been eradicated create an aquatic plant management plan to outline methods of controlling EWM			Portage County AIS Specialist UWSP

Objective 5.2: Control Eurasian watermilfoil in Thomas Lake

Actions	Lead person/group	Start/end dates	Resources
Continue to work to control EWM in Thomas Lake			Portage County AIS Specialist WDNR Lakes Specialist
Annually monitor EWM infestation in Thomas Lake using a point intercept method			Portage County AIS Specialist UWSP WDNR Lakes Specialist
Continue to use weevils a control method for EWM in Thomas Lake. Look into possibly stocking additional weevils in Thomas Lake.			Portage County AIS Specialist UWSP WDNR Lakes Specialist
Monitor populations of weevils in Thomas Lake			UWSP
Ensure that UWSP will be completing monitoring for the year. If not, have a citizen committee that is able to monitor.			UWSP
Explore mechanical harvesting as a method to control EWM in Thomas Lake			Portage County AIS Specialist UWSP WDNR Lakes Specialist
If mechanical harvesting is a control method that is chosen develop an aquatic plant management plan that outlines the control methods used for EWM in Thomas Lake			Portage County AIS Specialist UWSP WDNR Lakes Specialist
Develop an aquatic plant management plan for Lake Thomas			Portage County AIS Specialist UWSP WDNR Lakes Specialist

Shorelands

Shorelands are some of the most important habitat for terrestrial and aquatic wildlife, including birds, near lakes. Intact vegetative shorelines also help to slow runoff moving to the lake and filter runoff before it enters the lake. Protecting and restoring shorelines help to provide scenery, solitude, and privacy, as well as natural space for lake residents to enjoy nature. Currently, approximately 61% of the Adams Lake shoreline is considered healthy, undisturbed habitat comprised of a combination of native flowers, grasses, shrubs and trees. Alder shoreline comprises another 3.3% of the shoreline. The remaining 34% of the shoreline has various levels of disturbance including a public boat landing. The majority of Bear Lakes shoreline is considered healthy, undisturbed habitat com. Only 8% of the shoreline has various levels of disturbance including a public boat landing. The majority of Lake Thomas's shoreland is also considered healthy. However, 33% of the shore does have some type of disturbance present. Shorelands also include any fallen trees and branches that rest in the water. This woody material provides habitat for young fish, frogs, turtles, birds, and other creatures.

Goal 6: Protect and restore healthy stable shoreland habitats near and around Adams, Bear, and Thomas Lakes

Objective 6.1: Shore landowners around Adams, Bear, and Thomas Lakes will understand their roles in protecting this important land and will make informed shoreland management decisions.

Actions	Lead person/group	Start/end dates	Resources
Share information with landowners about the importance of native shorelands and shoreland restoration. Relate this information to weevil survivability on Lake Thomas			Portage County Land Cons Dept UWEX Lakes UWSP
Share information with landowners about who can assist with shoreland restoration			Portage County Land Cons Dept UWSP
In steeper sloped areas around Adams, Bear, and Thomas Lakes, encourage the design of access points to the water that minimize erosion and slow water runoff.			Portage County Land Cons Dept UWEX Lakes
Explore conservation easements for willing shoreland owners around Adams, Bear, and Thomas Lakes.			North East Conservancy Trust North Central Conservancy Trust NRCS
Encourage shoreland restoration outside of critical habitat areas.			Portage County Land Cons Dept UWSP

Objective 6.2: Shorelands around Adams, Bear, and Thomas Lakes will all meet state/county shoreland zoning ordinances

Actions	Lead person/group	Start/end dates	Resources
Provide information about the benefits of native shoreline buffers to shoreline owners through informational welcome packets			Portage County Land Cons Dept UWEX Lakes
Become familiar with Portage County shoreland zoning ordinances and their purposes for protecting water quality, habitat, etc.			UWSP Center for Land Use Education Portage County Planning and Zoning
Work to restore all shorelands to meet the County/State shoreland zoning ordinance (or better).			Portage County Land Cons. Dept Portage County Planning and Zoning WDNR

Fisheries and Recreation

Adams, Bear, and Thomas Lake residents enjoy many different recreational opportunities on the lakes. Based on survey results, the most popular recreational activities on Adams, Bear, and Thomas Lakes included solitude, fishing, hunting, walking, enjoying scenery, canoeing/kayaking, and enjoying wildlife. Recreational needs and uses on the lakes will likely continue to increase as populations and development in the area increases.

Healthy lake ecosystems are valuable natural resources for all. . It is important to maintain a good fishery so that anglers and families are able enjoy the fishery on Adams, Bear, or Thomas Lake, as fishing is one of the top recreational activities on each of these lakes and is valued by lake users. Survey respondents felt that the quality of fishing in Adams, bear, and Thomas Lakes were average and perceived that fishing had stayed the same in recent years on Bear and Adams Lake but had declined on Thomas Lake. Survey respondents also indicated that a large portion of the fish caught in Adams Lake were too small to keep.

Goal 7: Maintain a healthy fishery in Adams, Bear, and Thomas Lakes

Objective 7.1: Work with the WDNR to maintain a healthy fishery in Adams, Bear, and Thomas Lakes

Actions	Lead person/group	Start/end dates	Resources
Inform individuals about the importance of woody habitat in shallow water near shore areas of Adams, Bear, and Thomas Lakes and encourage its' placement in appropriate areas.			WDNR/UWSP Portage County Land Cons Dept
Participate in the listening sessions regarding the new fishery regulations recommended by the WDNR and Consider supporting the new Northern Pike regulations recommended by the WDNR.			WDNR
Ask the WDNR to sample Lake Thomas so that more recent information is available on the fishery			WDNR

Goal 8: Preserve the quiet nature and safety of Adams, Bear, and Thomas Lake users while allowing for recreational opportunities.

Objectives 8.1: Provide recreational opportunities to enjoy Adams, Bear, and Thomas Lakes while minimizing conflicts between users and protecting lake water quality and habitat.

Action	Lead person/group	Start/end dates	Resources
Post slow-no-wake signs at the boat landings on each lake that also list the state statute			Town of Stockton

Communication/Organization

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

Goal 9: Provide information to lake residents and lake users on Adams, Bear, and Thomas Lakes

Objective 9.1: Provide information to all riparian residents and available lake users on Adams, Bear, and Thomas Lakes.

Action	Lead person/group	Start/end dates	Resources
Share information on lake topics with riparian landowners through informational welcome packets			UWSP UWEX Lakes
Share information with landowners when they come in seeking town permits			Town of Stockton
If association forms, share association information with landowners when they come in seeking town permits.			Town of Stockton
Explore forming a Town of Stockton Lake Association			UWEX Lakes UWSP Town of Stockton

Admas, Bear, and Thomas Lake Aquatic Invasive Species Rapid Response Plan 2010

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**

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 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 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).

Admas, Bear, and Thomas Lake Aquatic Invasive Species Rapid Response Plan 2010

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, 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 town in which the waterbody is situated
Town of: New Hope
Contact: Chairperson – Daniel Zaborowski
Address: 9596 County Rd. Z Amherst Junction, WI 54407
Phone: 715-677-3878
Who will contact them: Portage County AIS Coordinator

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

Who will contact them: Portage County AIS Coordinator

Newspapers
Who will contact them: Portage County AIS Coordinator
Amherst Our Community Spirit
Portage County Gazette
Stevens Point Journal

Post notice at the access points to the waterbody

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_2) 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/l) as calcium carbonate ($CaCO_3$), 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/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++) 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 clear water lakes and ponds with beds of submerged aquatic plants and medium 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 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.

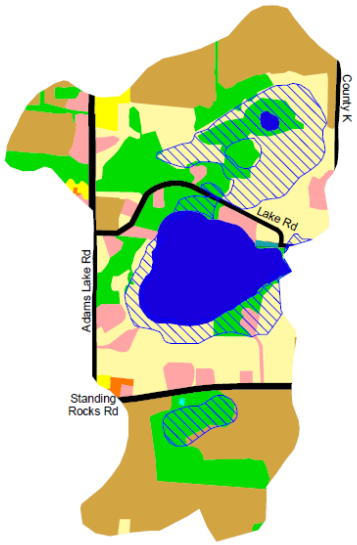
Stratification:

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.

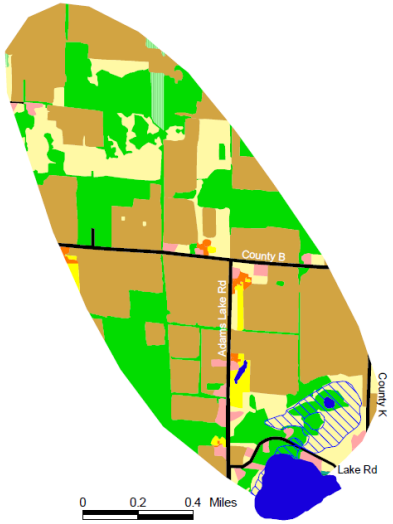
Watershed: See “drainage basin”.

Appendix A

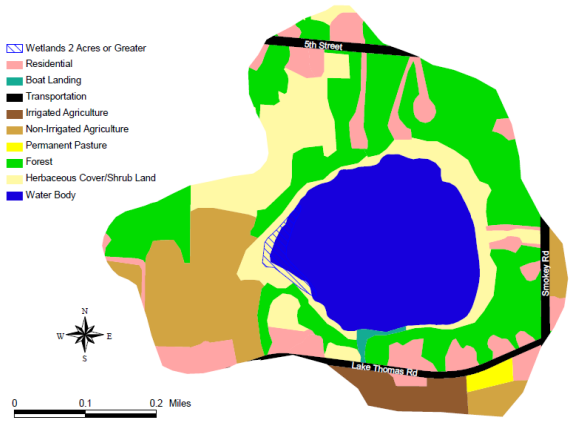
Adams, Bear, and Thomas Lake Watershed Land Uses



Adams Lake Surface Water Watershed

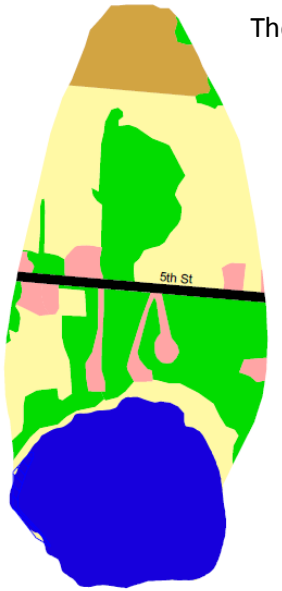


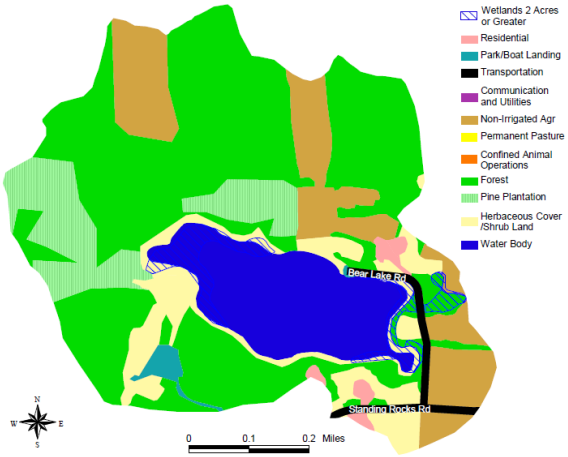
Adams Lake Groundwater Watershed



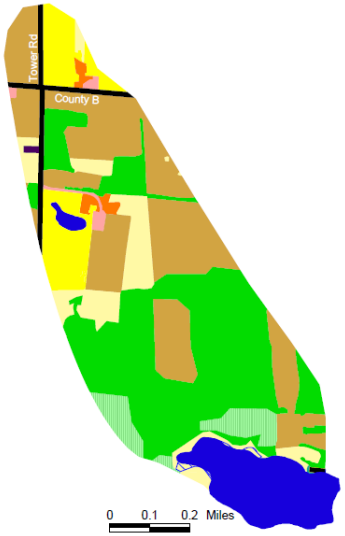
Thomas Lake Surface Water Watershed

Thomas Lake Groundwater Watershed





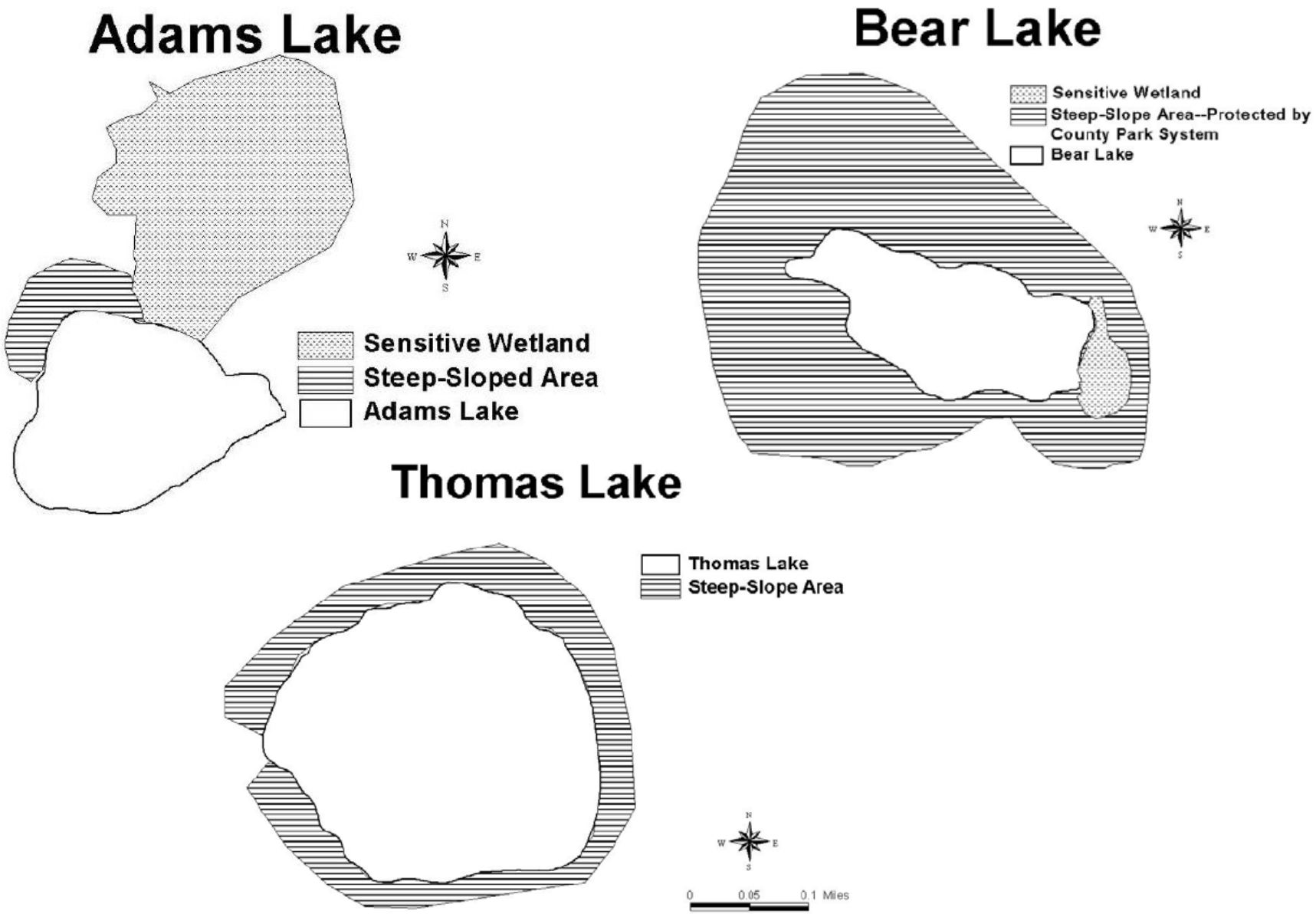
Bear Lake Surface Water Watershed



Bear Lake Groundwater Watershed

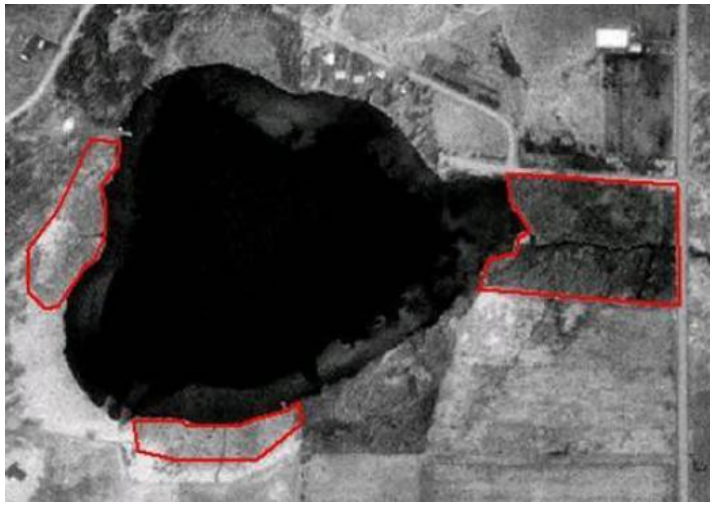
Appendix B

Adams, Bear, and Thomas Lake Sensitive Areas.



Appendix C

Adams, Bear, and Thomas Lake Amphibian Habitat (highlighted in red and yellow).



Adams Lake

Bear Lake

Thomas Lake