TRI-LAKES MANAGEMENT PLAN

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INTRODUCTION

Chapter 92 of the Wisconsin State Statutes established the Adams County Land and Water Conservation Committee (LWCC) and the Adams County Land and Water Conservation Department (LWCD). The LWCC and LWCD have the responsibility of conserving long-term soil productivity, protecting the quality of related natural resources, enhancing water quality and focusing on severe soil erosion problems.

The Tri-Lakes Management District was formed in 1978 to monitor lake water quality and implement best management practices to maintain and improve lake water quality and quantity on Arrowhead Lake, Sherwood Lake, and Camelot Lake (Tri-Lakes).

The Wisconsin Department of Natural Resources (WDNR) is dedicated to the preservation, protection, effective management, and maintenance of Wisconsin's natural resources. It is responsible for implementing the laws of the state and where applicable, the laws of the federal government that protect and enhance the natural resources of our state.

To achieve the purposes of the Tri-Lakes Management District, Adams LWCC/LWCD, WDNR and to address increased natural resources concerns due to increasing development within the Tri-Lakes area, a Tri-Lakes Management Plan was developed. The plan addresses natural resource issues on the lakes and also in their watersheds. The plan is dynamic and revisions will occur annually to reflect current events and priorities. The Tri-Lakes Management District will receive public input on plan revisions at the Tri-Lakes Management District Annual Fall Meeting. The Tri-Lakes Management District will notify all members of the district and will accept written comments from the members and the public who cannot attend. The plan will utilize best management practices, education, and regulations to improve the natural resources. The plan will incorporate human conveniences in a manner that does not compromise the quality and quantity of the natural resources. All ordinances, policies, and activities associated with the State, County, and Town must receive approval from proper authorities. The plan consists of goals and action items to address natural resource issues and activities for a five-year period. As one year passes, another year of the plan will be added so the plan will always reflect a five-year period. Scientific studies, community residents, and the general public were inventoried to determine the goals of the plan. A Lake Advisory Group (LAG) was formed to identify action items, write the rough draft of the Lake Management Plan, and in the future assist Tri-Lakes Management District with updates and revisions. The LAG consists of WDNR specialists, Tri-Lakes Management board, community businesses, community residents, and Adams LWCD. Once the rough draft was written, LAG members disseminated the plan and received feedback. There were also two public meetings held to receive feedback. LAG members met after receiving the feedback and incorporated the feedback as allowable and deemed necessary into the Tri-Lakes Management Plan. The Tri-Lakes Management Board is responsible for implementing and updating/revising the Tri-Lakes Management Plan. The Tri-Lakes Management Board consists of a representative from each Lake Association, the Town of Rome, and

the Adams County Board. Copies of the Tri-Lakes Management plan have been distributed and are available at the following locations: Tri-Lakes Management District; Arrowhead Lake Association; Sherwood Lake Association; Camelot Lake Association; Town of Rome; Rome Public Library; WDNR Service Center in Wisconsin Rapids; Adams Public Library; and Adams Land and Water Conservation Department.

Tri-Lakes Management Plan Advisory Group

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TRI-LAKES CHARACTERISTICS

There are 4 County owned dams in Northern Adams County located on 14 Mile Creek creating 3 separate lakes called Tri-Lakes. The Tri-Lakes are Sherwood Lake, established in 1967, Camelot Lake, established in 1969, and Arrowhead Lake established in 1978. The Tri-Lakes are part of the 14 Mile Creek Watershed. Waters from Tri-Lakes drain into the Petenwell Lake which WDNR has listed as an impaired water body 303(d)(1)(C), Clean Water Act. In 1993, the Tri-Lakes and Watershed Characterization report stated the following: North Camelot has a surface area of 191 acres with a maximum depth of 23 feet and an average depth of 10 feet; South Camelot has a surface area of 260 acres with a maximum depth of 23 feet and an average depth of 10 feet; Sherwood has a surface area of 250 acres with a maximum depth of 26 feet and an average depth of 10 feet; Arrowhead has a surface area of 295 acres with a maximum depth of 27 feet and an average depth of 12 feet. The Tri-Lakes Management District governs Lake activities. A public sanitary sewer does not service this area. Studies have been conducted on the lakes and the watershed to identify water quality issues.

The Adams County Land and Water Conservation Department oversees the operation, maintenance, and inspection of the dams. There is currently an Emergency Action Plan in place that dictates actions to be taken when an emergency event occurs.

The climate in this region is classified in the continental climate type. Fall and spring have variable weather conditions usually accompanied by winds. The summers are warm with occasional periods of high temperatures and humidity. Winters are usually cold, and snowy. In an average winter, snow cover on the ground and ice cover on the lakes lasts from December to April. The growing season generally extends from late May to early September, for an average frost-free growing season of 135 days. Mean annual precipitation is almost 30 inches of which 60% occurs during June to September. Winds come out of the northwest from late fall through spring, and from the South during the remainder of the year. The wind speed generally ranges from 4 to 15 miles per hour with periods of stronger winds occurring in spring and fall.

The major soils in the Tri-Lakes Watershed are sands and loamy sands on nearly level to gently sloping outwash plains and knolls. Water and air move rapidly through the soils and runoff is slow. The soils are suitable for wood production, irrigated crops, pastures, and building sites. The soils are suited for septic tank absorption fields but there is a danger polluting the groundwater due to the rapid permeability of the soils. Sand and loamy sand soils are subject to wind erosion when they are cultivated. The soils are unsuitable for onsite waste disposal because of seepage. Areas of muck and poorly drained loamy sands are found in depressions and drainage ways scattered throughout the area. Water and air move through these soils at a moderate rate and runoff is slow or ponded. These soils are best suited for wetlands, and pastures. Crops may be grown if drainage occurs. The muck and poorly drained sandy loams soils are poorly suited for building sites, septic tank adsorption fields and onsite waste disposal. (Soil Survey of Adams County, 1984)

The Tri-Lakes Watershed consists of 62, 035 acres (Tri-Lakes and Watershed Characteristics, 1993). Land use of the watershed in 1800's was 75% woodlands, 20% wetlands and 5% grasslands. Land use reported in 1993 was forest 31%, agriculture 50%, residential 8%, conservance 1%, and pasture 10% (Tri-Lakes and Watershed Characteristics, 1993). Current land use in the watershed is

approximately 30% woodlands, 20% cropland, 15% water, 20% grasslands, wetlands 10% and other 5%. (Enterprise Information, 1998).

The majority of the cropland is located in the east half of the watershed and is irrigated with center pivot or hand line sprinklers. The main crops grown include vegetables for processing, potatoes, and cranberries.

Wind erosion on cultivated fields is a major concern due to sandy soils. Cropland without adequate plant cover or crop residues erode during strong wind events.

The Central Sands Wind Erosion Control Pilot Project was initiated in 1988. The project was supported and advised by Golden Sands Resource Conservation and Development, the Land and Water Conservation Departments in Adams, Portage, Juneau, Wood and Waushara counties, The Wisconsin Potato and Vegetable Growers Association, area Townships, Department of Agriculture, Trade and Consumer Protection and University of Wisconsin – Extension. The goal of the project was to reduce wind erosion in the Central Sands Area by offering property tax credits for landowners who installed wind erosion control practices, conduct conservation tillage demonstrations, and inform and educate people on causes and solutions of wind erosion. (Central Sands Wind Erosion Control Project, 1991) The project transformed to become the Central Wisconsin Windshed Partnership(CWWP), supported by the same groups as mentioned before. The CWWP presently provides tree planting services, conducts conservation tillage demonstrations, and educates people about best management practices on sandy soils.

Between 1990 and 1992, a study to determine the impact of wind erosion on water quality was completed. The study determined wind eroded soils from croplands contain solids, phosphorus, nitrogen, and pesticides. The wind is depositing the soil in the streams, which significantly impacts water quality in the watershed. The study recommended the use of best management practices such as conservation tillage, cover crops, buffers, crop residues, nutrient management plans, irrigation management plans and pest management plans. Currently, Central Wisconsin Windshed Partnership, Golden Sands Resource Conservation and Development, Wisconsin Department of Natural Resources (DNR), USDA-Natural Resource Conservation Service, Adams Drainage Board, University of Wisconsin – Extension and Department of Agriculture, Trade, and Consumer Protection are providing education, plan and design assistance and financial programs to crop, livestock, fruit, and wood producers. (Wind Erosion Impacts on Water Quality in the Sand Plain of Central Wisconsin, 1993)

The Leola Drainage District and the Portage Drainage District are located in the upper watershed. The drainage has occurred since the early 1900's to allow crop production on normally wet soils. The Adams County Drainage Board currently maintains the ditches and is working with landowners to install best management practices. Chapter 48 of the Wisconsin Statutes provides rules and policy for drainage districts.

The predominant land use in the lower watershed is woodlands. A large majority of the woodland is owned by lumber companies and is managed to harvest the timber. Also existing in the lower watershed is residential land use concentrated in the Tri-Lakes area

and along Fourteen Mile Creek between Arrowhead Lake and Petenwell Lake. In 1978, the number of parcels located in the Tri-Lakes area was 3,828 with only 934 of the lots having a house. A survey conducted in 1978, estimated that approximately 280 of the houses contained permanent residents.

It was reported in 1999, that 387 out of 865 properties in the Sherwood Lake area were developed. Development has typically occurred within 75 to 100 feet of the water's edge and the lots are generally 75 foot in width. (Septic System Evaluation, 1999)

Currently, the Tri-Lakes Management District (area around the Tri-Lakes) has 4,892 lots and most of these lots have a house on them. It is estimated, 1,077 of these houses contain permanent residents.

There are 5 named streams and ditches and 27 unnamed ditches totaling 349 miles in the 14 Mile Creek watershed. Chester Creek has been designated by the Wisconsin Department of Natural Resources (WDNR) as a Class I trout stream and Exceptional Resource Water. Ditch No. 7 is a tributary of 14 Mile Creek. WDNR has reported Ditch No. 7 as a cold-water fishery that needs further surveys to determine the streams potential use. Channel ditching, nutrient and sediment loading, shallow channel depth and lack of fish cover impact the stream. The 14 Mile Creek is classified by WDNR as a warm water game fishery with limited in-stream fish habitat. Factors limiting fish habitat are streambank erosion, shallow channel depth, sedimentation, and lack of pools, riffles, and fish cover. WDNR has classified Leola Ditch as a warm water fishery with the potential to be a cold water fishery in the upper reaches. Dredging, sedimentation, lack of pools, and lack of fish habitat impact the stream. Stream surveys show organic loading to the stream and 1999 water quality sampling found nitrate levels above 5 ppm. Unnamed Ditch 13-13 is a tributary to Leola Ditch and WDNR has classified it as a warm water fishery. Cranberry operations may discharge waters to the stream. Stream impacts are channel ditching, sedimentation, nutrification, flow fluctuations, lack of pools, riffles, and habitat, and organic loading. Unnamed Ditch 12-1 is a tributary to 14 Mile Creek and WDNR has classified it as a warm water forage fishery. Cranberry operations may discharge waters to the stream. Stream impacts are channel ditching, sedimentation, flow fluctuations, lack of pools, riffles, and habitat. Spring Branch is a tributary to Camelot Lake and WDNR has classified it as a warm water forage fishery. (The State of the Central Wisconsin River Basin – DNR, 2003).

Groundwater generally flows east to west towards the Wisconsin River. In 1971, it was reported that groundwater supplies are sufficient enough as to supply adequate amounts of water for both the public and private domestic users as well as upper watershed irrigation users (Effects of Irrigation on Streamflow in the Central Sand Plain of Wisconsin, 1971). The groundwater is moderately hard and has localized problems of high dissolved iron content. Regional water table elevations vary between 940 – 970 sea level datum (Water Management Plan Fourteen Mile Creek Watershed, 1979)

Rome Water Utility is the only municipal water supply system in the watershed. Two wells are operated to serve the residents of the Lake Camelot Property Owners Association. The wells are productive and operated below their yield potential because one of the wells has nitrate concentration exceeding 15 ppm which exceeds the maximum contaminant level of 10 ppm. The other well has 4 ppm nitrate so the utility blends the water from each well to reach an acceptable level. The utility has attempted to reduce the nitrates by working with area agricultural producers and by purchasing land up gradient from the wells and taking it out of production. This action did not reduce the nitrates so the utility has drilled a new well in a protective area of woodlands. A wellhead protection program is

required for the new well. WDNR suggests a well head protection program be developed for the existing wells (The State of the Central Wisconsin River Basin–DNR, 2003).

HISTORY AND RESULTS OF TRI-LAKES STUDIES

Lake Management Plan, 2004

In March 2004, the Adams County Land and Water Conservation Department conducted an inventory of Tri-Lakes Property Owners to identify issues important to them and rank the issues in order of importance. The Tri-Lakes Management District provided assistance and guidance during the inventory process. The information was used to develop goals and action items for the Tri-Lakes Management Plan. Invitations were sent to every member of the Tri-Lakes Management District, which totaled over 4,000 mailings. On the front of the invitations, was information regarding meeting times, places, and Land and Water Conservation mailing and e-mail addresses. On the back of the invitations, the question "What are the most important issues regarding the lakes and watershed and list them in order of importance. By providing this information on the invitations, it gave residents who could not attend the meeting an opportunity to respond. Approximately 200 property owners responded by e-mail or mail and their input was combined with those who attended the meetings. To gather issues and rank them in order of importance for the property owners who attended the meetings, the nominal group process was used. Approximately 130 property owners attended the meetings. The following issues were identified and ranked as the most important: 1. improve water quality; 2. aquatic plant control; 3. eliminate algae blooms; 4. septic system regulation.

In May 2004, the Tri-Lakes Management District conducted a survey of public users of the lakes. The survey identified issues important to the users. The information was used to develop goals and action items for the Tri-Lakes Management Plan.

Limnological Analysis of Tri-Lakes, Wisconsin, 2002

In 2000, the U.S. Army Corps of Engineer-EauGalle Aquatic Ecology Laboratory, UW-Stevens Point and Department of Natural Resources conducted a study to determine what impacted the water quality of the Tri-Lakes. The study determined 55% of the total phosphorus load came from 14 Mile Creek Watershed while the remainder came from the shoreline area and from the lake bed. Fourteen Mile Creek provided 44% of the total phosphorus load from the watershed, while Leola Ditch contributed 33% from the watershed and Unnamed Ditch 13-13 contributed 23%. Lower Lake Camelot retains 60% of the total phosphorus load received from the watershed. Tri-Lakes bottom sediments do not release large amounts of phosphorus. The study measured toxicity, which occurred at a greater frequency at stream and ditch locations and was associated with high flows. The Trophic State Index was used to determine the water quality of the Tri-Lakes is moderate to poor or mesotrophic to eutrophic. Phosphorus and "chlorophyll a" concentrations increased in downstream lakes due likely to phosphorus loading from groundwater or sediment release. The back bays have slightly poorer water quality than the lake main stems. Using a prediction model, it was estimated the Tri-Lakes water quality would improve if upper watershed external phosphorus loading were reduced 50%. Camelot would show most improvement while Sherwood and Arrowhead would be lower in magnitude due to groundwater or sediment phosphorus loading. The study recommended

developing a lake management plan to improve water quality, inventory phosphorus sources and assess how they are reduced, and increase buffers between surface water and agricultural land.

The study conducted in 2000 to 2002 stated aquatic plants improve water quality, provide habitat and food for fish and wildlife, and resist invasion of non-native species. The study stated the plant communities are below average for Wisconsin Lakes and the plant community is dominated by disturbance tolerant species. The plant community can be improved by machine harvesting in a pattern that provides edges of vegetation, reduce chemical use for aquatic plant control, reduce winter draw downs and use them for noxious and invasive plant control only, and restore natural buffer zones of native vegetation along the shoreline.

A study of the groundwater conducted in 2000 to 2002 concluded a substantial source of groundwater phosphorus loading comes from decomposition of wetland soils buried during lake development. The study also concluded septic systems were contributing nitrates and chlorides and less significant amounts of phosphorus. The amounts of these nutrients added to the groundwater, increased during the draw down period. The study recommended reducing nutrient inputs to groundwater. The sources of nutrients are septic systems located in groundwater shoreline areas that flow to the lake, application of homeowner fertilizers in the shoreline area, and the use of phosphorus sources in the home. Forty-five percent of the nutrient loading is coming from the shoreline area and the lakebed.

Soil Retention of Phosphorus From Septic Systems, 1999

A study involving 5 septic system drainfields in the Arrowhead Lake area was conducted to measure the phosphorus concentrations in the subsoils beneath the drainfields. The results showed: the average total phosphorus concentrations below the drainfields were significantly higher than those collected in areas outside of the drainfield; at depths greater than 3 feet below the drainfield, elevated total phosphorus concentrations were found; and total concentrations of phosphorus varied significantly between sites aged between 10 to 30 years old. Conclusions of the study were: total phosphorus retention by soils under the drainfields is nonuniform due to differences in septic tank effluent discharge and/or reactivity of soils to phosphorus; on-site waste systems in compliance with code distance to groundwater still releases phosphorus to groundwater due to soils low ability to retain phosphorus; models estimate the phosphorus retention range of 6 feet of soil beneath a drainfield is 30% to 50% which confirms that movement of phosphorus through the soil profile is occurring in septic drainfields in the Tri-Lakes area.

Lake Camelot and Lake Sherwood Septic System Evaluations, 1999

In 1997 and 1998, Camelot and Sherwood Lakes residents were asked to participate in a septic system evaluation survey. 174 out of 1,204 septic systems on Camelot and Sherwood Lakes were inspected. Nineteen of the systems were classified as failing and the average age of the failing systems was 24 to 27 years. Hydraulic failure can be identified by excessive ponding of a drainfield vent. Hydraulic failure occurs when effluent is prevented from discharging from the septic tank into the ground. Factors that cause hydraulic failure are time, excessive household water use, over-use of garbage disposals, putting harmful agents like bleach in septic tanks, and failure to remove septic tank solids at regular intervals. The consequence of hydraulic failure is wastewater is discharged to the ground surface, providing nutrients a pathway to surface waters. The septic systems in the Tri-Lakes are located in sandy soils. These soils allow water to move through the soil profile rapidly not providing much time for nutrient removal. Phosphorus is the nutrient of concern from septic effluent. Phosphorus contacts and attaches with iron and aluminum as it travels downward through the soil and becomes immobile. Over time, the soils ability to immobilize the phosphorus decreases allowing the phosphorus to pass into the ground water. It was estimated that 5% of the phosphorus loading to the Tri-Lakes comes from septic systems and this is projected to rise to 30% by the year 2039. It was concluded that alternative waste management practices and strategies could be considered. It was also concluded the sandy soils in the Tri-Lakes area do not provide much phosphorus removal before septic effluent reaches the groundwater and the lakes and as septic systems grow older and more residents become permanent, more phosphorus will reach the Tri-Lakes.

Tri-Lakes and Watershed Characterization, 1993

The objectives of this study were to study the flow of dam toe drains and to develop a lake management water quality plan.

The study reported water flows throughout the watershed were monitored between 1964 and 1979 and an average watershed runoff was determined to be 6.3 inches or 42.3 cfs or 30,594.3 acre feet/ year.

The study reported phosphorus loading in the Tri-Lakes increased between 1978 and 1991. In North Camelot, the comparison shows an increase in phosphorus loading of 83 kilograms (kg) in 1978 to 256 kg in 1991, with notable sources of increase being: septic tanks – 0 kg in 1978 to 99 kg in 1991; and streams – 58 kg in 1978 to 126 kg in 1991. In South Camelot, the comparison shows an increase in phosphorus loading of 726 kg in 1978 to 1,227 kg in 1991, with notable sources of increase being: septic tanks – 0 kg in 1978 to 66 kg in 1991; and streams – 686 kg in 1978 to 1,119 kg in 1991. In Sherwood, the comparison shows an increase in phosphorus loading of 266 kg in 1978 to 953 kg in 1991, with notable sources of increase being: septic tanks – 0 kg in 1978 to 48 kg in 1991; and streams – 166 kg in 1978 to 864 kg in 1991. In Arrowhead, the comparison shows an increase in phosphorus loading of 1,079 kg in 1978 to 1,433 kg in 1991, with notable sources of increase being: septic tanks – 0 kg in 1978 to 100 kg in 1991; and streams –1,0241 kg in 1978 to 1,433 kg in 1991. Lake phosphorus concentrations show the Tri-Lakes are approaching threshold

phosphorus concentration, which is where a lake passes from clear water and plants to turbid water and algae.

The study conducted in 1991 to 1992 recommended the following to maintain good water quality in the Tri-Lakes: implement best management practices to reduce soil erosion in the Tri-Lakes Watershed; continue to monitor water quality of incoming streams and lakes; educate residents in ways to prevent excessive nutrient inputs; conduct regular aquatic plant surveys to monitor the results of harvesting; continue to harvest aquatic plants and test the plant tissue to determine how much phosphorus has been removed; develop test plots to demonstrate various aquatic plant control methods; create natural landscaping along the shorelines; and conduct a septic leachate survey of the Tri-Lakes shoreline area.

Water Management Plan 14 Mile Creek Watershed, 1979

Numerous individuals from local, state, and federal governments, private industry, and the public cooperated to investigate the natural resources to develop a water management plan for the 14 Mile Creek Watershed.

The plan referenced the following statements: In aquatic systems, aquatic plants play an important role providing food, shelter, and oxygen to aquatic organisms (Biology of Aquatic Vascular Plants, 1967); Aquatic plants act as a nutrient sink for aquatic ecosystems by accumulating large quantities of inorganic nutrients in the growing season, thus making nutrients unavailable for algae growth (The Limnological Role of Aquatic Macrophytes and Their Relationship to Reservoir Management, 1971); Aquatic plants provide spawning and foraging areas for fish common to northern temperate lakes. The optimum proportion of plant area to water area for fish production is unknown (Northern Fishes, 1974).

Analysis of 1978 lake water quality data indicated the Tri-Lakes were in a mesotrophic to eutrophic status. To improve the status of the lakes, it was recommended to install measures to reduce inlake phosphorus concentrations. The data suggested the most significant source of phosphorus and nitrogen was in the stream flow from upper 14 Mile Creek Watershed. Due to high flushing rates and high nutrient concentrations in the lakes, practices to reduce phosphorus concentrations in the lakes are too costly. Recommendations also suggested septic tanks should be inspected periodically to determine the need for pumping to prevent the release of sludge and scum. The sludge and scum degrades the performance of the septic system. Recommendations also stated the need for a central sewage system was not needed at this time. However, when the community becomes fully developed and groundwater monitoring shows pollution from onsite waste disposal systems, wastes should be treated by a central sewage system. Recommendations also stated shoreline erosion and storm water runoff need to be managed. Alum treatments to control algae are not recommended due to the Tri-Lakes having a non-stable summer thermocline with a short residence time for the water and high external nutrient loading. Selective discharge is not recommended due to the Tri-Lakes not forming stable thermoclines. Bottom sealing and dredging are not recommended due to high expense and the sediments of Camelot and Sherwood do not release enough substantial nutrient loading to the lake. Dewatering of sediments will not be effective because of the sandy substrates and over winter lake drawdowns may not allow for complete refilling of the lakes. Dilution and

flushing require high capacity wells containing low nutrients. There is not enough data at this time to determine if this is a viable option. Aeration is not required in the Tri-Lakes at this time. Dissolved oxygen levels are not critically low at any time of the year and bottom sediments are not anoxic.

The water management plan stated that historically, aquatic plant growth was found at the east ends of Sherwood and Camelot Lakes due to shallow waters and ports of entry for nutrients. Water depths in these areas allow light penetration to the lakebed therefore, encouraging plant growth. Maximum depth of aquatic plant growth was determined to be 7 feet for Southern Camelot, Arrowhead and Sherwood, and 9 to 10 feet for Northern Camelot. Aquatic plant growth will occur in narrow bands along the shorelines and inlet areas. Sedimentation will increase the areas available for aquatic plant growth. Acres of water treated with chemicals to control algae and aquatic plants on Camelot and Sherwood Lakes has increased 83% from 1970 to 1977. Chemical treatment of aquatic plants produces a competitive advantage for algal growths because the plants are not there to uptake nutrients. Records indicate chemical treatment for planktonic algae occurred two to four weeks following chemical treatment for aquatic plant control. This is explained by the release of phosphorus from the decomposing plants killed during chemical treatment, which the alga uses for growth. Decaying chemically treated plants in Sherwood Lake provided 25% of the total phosporus loading, while in Camelot Lake, decaying plants provided 39% of the total phosporus loading. Raking was utilized by the Lake Camelot Property Owners Association to control Aquatic Plant Growth during the summer of 1978. Two persons, working 20 hours per week raked beach club beaches. This method proved to be futile due to low harvesting efficiency and rapid plant regrowth. Mechanical harvesting has advantages such as: in contrast to chemical treatments, there is no waiting period to use the lake; decomposing aquatic plants are removed from the lake; it is site specific. Disadvantages of mechanical harvesting include: high initial investment; shallow areas cannot be harvested; aquatic plant community will be altered due to species with rapid regrowth will dominate; cuttings that escape collection may propagate vegetatively throughout the lake. Generally, overwinter drawdowns will control some aquatic plants while other plants will benefit and become the dominant species. The shallow eastern ends of Sherwood and Camelot Lakes have the greatest aquatic plant growth with species that benefit or are not affected by overwinter drawdowns. Therefore, winter drawdowns will not solve aquatic plant problems in Sherwood and Camelot Lakes. Substrate management is not recommended for Camelot and Sherwood Lakes due to low predicted success and high costs. Dredging is recommended only when shoreline erosion and slumping of the lake bottom create shallow water areas.

In 1979, the Water Management Plan for 14 Mile Creek Watershed reported stocking of game and pan fish in Camelot and Sherwood Lakes beginning in 1968 and continued to 1972, while walleye were stocked on an alternate year basis from 1972 to 1979. The plan also stated no northern pike reproduction was observed while there was only slight walleye reproduction noticed. Optimum type of habitat for walleyes, shallow washed gravel bars, is severely limited in Camelot and Sherwood Lakes. Northern pike spawning habitat is severely limited in both lakes due to lake drawdown during the spawning period, early April and the lack of dense beds of emergent aquatic plants.

Stable populations of bass and pan fish were reported with the first observation of bass reproduction in 1972. Stunting of pan fish was suggested in 1977. (Zimmerman, 1978, personal communication) Stunting is a decline in the average size of pan fish harvested and a decrease in the total abundance of game fish because of competition between young game fish and the pan fish

(Disturbance of Predator-Prey Balance as a Management Technique, 1958). The Water Management Plan for 14 Mile Creek Watershed in 1979, reported the most common reason for stunting is a combination of excess aquatic plants providing refuge for small pan fish and lack of predators for balancing the pan fish populations. In 1979, the plan reported fish populations are adequate for a quality bass and walleye fishery, while a balanced pan fish population is the bulk of the fish caught.

A 1978 inventory of Sherwood and Camelot Lakes showed erosion from wave action on steep, vertical banks to areas of low relief. All arms of both lakes are subject to shoreline erosion due to wave action against predominately steep, sandy soil banks. Inlets and channels show less erosion. It was determined boats generate larger waves at low frequency while the wind generated smaller waves at a high frequency. The relationship of wave characteristics could not be defined therefore it was concluded that both wave types play a comparable role in shoreline erosion. Ice flows against the shoreline do not cause much erosion on Sherwood and Camelot Lakes due to the winter drawdown. Recommendations to reduce shoreline erosion include: encourage vegetation growth on shoreline and aquatic plant growth off shore; regulate boat speeds close to shore; and “no wake” rules in critical erosion areas.

The plan reported research conducted in 1978 concluded the groundwater flow in and out of Sherwood and Camelot Lakes was similar throughout the year. Sherwood Lake had greater inflows and Camelot Lakes had greater outflows during the winter drawdown period.

During low surface flows, 1978 research indicated Lake Camelot may be well below normal during late summer and early winter, while Sherwood and Arrowhead Lakes would have normal levels. The annual average downstream release during low flows is 31 cubic feet per second (cfs) and during an average year the average downstream release is 52 cfs. It was determined that pumping groundwater into the lakes to supplement flows was not economically feasible.

2011 Update: Key Actions Implemented through the Lake Management Plan

The primary sources of phosphorus input to the Tri-Lakes have been identified as 1) stream flow from the upper 14 Mile Creek Watershed, 2) septic system drainfields and 3) stormwater runoff carrying lawn fertilizers into surface waters. To address these issues, Tri-Lakes Management District has implemented the following:

- A Citizen Lake Monitoring program in 2007. This program established baseline data that identifies possible source points for high phosphorus inputs. Initially, Camelot volunteers began expanded monthly water testing from 1 site per lake to 8 sites plus 6 additional sites in the upper watershed. Tests include phosphorus, chlorophyll-a, secchi dish readings and temperatures at different depths. The program was expanded to Arrowhead and Sherwood the following year.
- The water testing data confirmed higher levels of phosphorus coming in to the Tri-Lakes from the upper 14 Mile Creek Watershed. As a result, the County Conservationist is increasing efforts to identify and correct phosphorus contributing sources in the upper watershed.

- In 2004, at a Special Meeting of the Tri-Lakes property owners, the formation of a Sanitary District was authorized. Later that year, the Adams County Board granted Tri-Lakes the authority to implement a Septic Inspection and Maintenance program for septic systems located in the district that were installed prior to July 1, 1992. State Law requires inspection and/or pumping at least once every 3 years. Since implementation of the Septic Inspection and Maintenance program in 2006, 49 failed septic systems have been identified and replaced.
- In 2007, Tri-Lakes Management District worked with the Rome Town Board to develop an ordinance to eliminate the use of phosphorus in lawn fertilizers. This was 3 years prior to the Wisconsin Legislature passing it as a State Law.

Additionally, Tri-Lakes has been active since 2009 with implementing a Clean Boats, Clean Waters program with Aquatic Invasive Species grant assistance by WDNR. Each summer, two interns are hired to monitor the public boat landings throughout the summer recreation season and to educate boaters on the importance of not transporting invasive species from one lake to another.

RESULTS OF TRI-LAKES PROPERTY OWNERS INVENTORY

In March 2004, the Adams County Land and Water Conservation Department conducted an inventory of Tri-Lakes Property Owners to identify issues important to them and rank the issues in order of importance. The Tri-Lakes Management District provided assistance and guidance during the inventory process.

It was decided to conduct meetings at Arrowhead Lodge, Sherwood Lodge, Camelot Lodge, and Town of Rome Hall. Invitations were sent to every member of the Tri-Lakes Management District, which totaled over 4,000 mailings. On the front of the invitations, was information regarding meeting times, places, and Land and Water Conservation mailing and e-mail addresses. On the back of the invitations, the question "What are the most important issues regarding the lakes and watershed and list them in order of importance. By providing this information on the invitations, it gave residents who could not attend the meeting an opportunity to respond. Approximately 200 property owners responded by e-mail or mail and their input was combined with those who attended the meetings.

To gather important issues and rank them in order of importance for the property owners who attended the meetings, the nominal group process was used. Approximately 130 property owners attended the meetings. A brief education on Tri-Lakes scientific studies was presented to the audience followed by the opportunity for each audience member to identify an important issue to them. The identified issues were written on large paper and then hung on the wall for all to view. When all issues important to the property owners were identified, audience members were given three stickers that represented three votes. They were instructed to place the stickers on issues they felt were most important to them.

Votes from the meetings and mailings were tallied. The following issues were identified and are ranked in order of importance. These issues were developed into goals for the Tri-Lakes Management Plan.

1. IMPROVE WATER QUALITY – 99
2. AQUATIC PLANT CONTROL – 75
3. ELIMINATE ALGAE BLOOM S-51
4. SEPTIC SYSTEM REGULATION – 46
5. REGULATE BOAT TRAFFIC FOR SAFETY AND TO IMPROVE WATER QUALITY – 27
6. MANAGE LAKES FOR MULTIPLE RECREATION USES – 24
7. EDUCATION ABOUT WAYS TO IMPROVE WATER QUALITY – 23
7. MAINTAIN STABLE LAKE LEVELS AND FLOWS – 23
8. MAINTAIN DRAWDOWNS OF LAKES-15
9. MAINTAIN QUALITY NATURAL FISHERIES-14
10. REDUCE SHORELINE EROSION - 11
11. ELIMINATE DRAWDOWN OF LAKES - 10
11. RIPARIAN BUFFER WILDLIFE HABITAT - 10
12. ELIMINATE THE USE OF FERTILIZERS CONTAINING PHOSPHORUS - 9
12. ELIMINATE LAWN FERTILIZER USE - 9
13. WATERSHED FLOOD CONTROL PLAN - 8
14. MANAGE LAKES AT MINIMAL EXPENSE - 7
15. FISH STOCKING PROGRAM - 6
16. GOOD WILL ENFORCEMENT GROUP - 5
16. MAINTAIN AESTHETICS - 5

RESULTS OF TRI-LAKES PUBLIC USER SURVEY

In May 2004, the Tri-Lakes Management District conducted an inventory to identify issues important to public users of the Tri-Lakes.

It was decided to conduct the survey on Memorial Day weekend at Arrowhead, Sherwood, and Camelot public boat launches and parks. The following questions were asked and the response results are listed:

1. **WHAT STATE ARE YOU FROM?** 100% FROM WISCONSIN

2. **WHAT COUNTY ARE YOU FROM?**

   45% ADAMS; 36% WOOD; 10% MILWAUKEE; 3% OZAUKEE; 3% JUNEAU; 3% PORTAGE

3. **ORIGIN IN MILES FROM THE TRI-LAKES?**

   52%, 0–10; 36%, 11-50; 3%, 51-100; 10%, 101-150; 0% >200

4. **AVERAGE NUMBER OF TIMES IN A YEAR YOU WILL USE THE TRI-LAKES?**

   36%, 1-5; 6%, 6-10; 29%, 11-15; 3%, 16-20; 26%, >20

5. **PRIMARY REASON FOR VISITING TRI-LAKES?**

   43% FISHING; 20% BOATING; 15% SWIMMING; 10% WATER SKIING;

   6% NATURAL BEAUTY; 3% PARKS; 3% WILDLIFE

6. **MOST SERIOUS PROBLEM RELATING TO TRI-LAKES?**

   35% INVASIVE WEEDS; 17% ALGAE; 15% AQUATIC PLANTS;

   10% CROWDS; 10% BOATING SAFETY; 5% PERSONAL WATERCRAFT;

   2% BATHROOMS; 2% BOATLANDINGS;

   2% TOO MUCH HARVESTING; 2% INCONSISTENT LAKE LEVELS

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Aquatic Species Management	**Machine harvest aquatic plants to improve water quality, to provide safe boating areas and to improve aquatic habitat.**			
	1. Harvest maps (Appendix A-D) will be followed by harvesting crew. Areas in the lakes 6 foot deep or greater will be harvested as needed to a depth of 5 feet. Areas shallower than 6 feet can have a harvested path of 60 feet wide with a harvest depth 4 feet or less. The path will get no closer to the shoreline than the docks. No machine harvesting in the areas between the shoreline and the ends of the boat docks. Harvesters are allowed to go beyond docks to pick up weeds. Cutters will be turned off while backflushing in this area. A 30 foot path may be hand-harvested in these areas by the property owner. Harvest period will be between mid-May and end of September.	Tri-Lakes Mgmt District	Annually	C
	2. Conservancy areas will be marked on the harvest maps.	Tri-Lakes Mgmt District	Annually	C
	Monitor the harvesting of aquatic plants			
	1. WDNR representative and a Tri-Lakes Management representative will together annually inspect harvesting operations.	WDNR Tri-Lakes Mgmt District	Annually	C
	2. Record the pounds of aquatic plants removed by taking an average weight of a trailer full of plants harvested and multiplying this by the number of trailer loads. This will be documented and reported to WDNR Aquatic Plant Specialist by 12/31. (***Refer to Appendix L***).	Tri-Lakes Mgmt District	Annually	C
	3. Composite samples will be randomly taken from harvested plants (per protocol provided by WDNR) and sent to a certified lab to measure the phosphorus content. This is done once per summer to determine the amount of phosphorus being removed from the lakes by harvesting plants.	Tri-Lakes Mgmt District WDNR	Annually	C
	4. Add GPS system to harvester to improve efficiency. Explore alternative product for marine application for better efficiency.	Tri-Lakes Mgmt District	Ongoing	

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Aquatic Species Management continued …	1. Educate individuals on aquatic plant control methods by placing article developed by Adams LWCD in Lake Association communications.	Lake Associations Adams LWCD	Annually	C
	Update 2006 Aquatic Plant Community Survey 1. WDNR Lake Classification grant specifies aquatic plant survey to be conducted. Aquatic plants will be identified and quantified. Completed in 2006; Camelot completed 2009; Arrowhead completed 2010; Sherwood completed 2011. All reports to be posted on Adams LWCD website. Both Camelots were completed in 2013 and Sherwood/Arrowhead was completed in 2014.	Adams LWCD WDNR	Ongoing	C
	Prevent the spread of & try to eliminate invasive & noxious species 1. Invasive plants and noxious weeds will be mapped during aquatic plant surveys.	Adams LWCD WDNR	2013-14	C
	2. Develop and implement plan to: control existing exotic, invasive and noxious species; and prevent the introduction of exotic, invasive and noxious species. This plan will include an educational component and a boat inspection component. In 2010, a Clean Boats, Clean Waters Program was initiated and has been continued and expanded every summer since then.	WDNR Private consultants Adams LWCD Tri-Lakes Mgmt District	Ongoing	
	3. Make annual contact with boat dealers, boat patrol and water ski team and landscapers regarding methods to prevent spread of invasive species.	Tri-Lakes Mgmt District	Annually	C
	4. Pursue financial assistance for implementation of prevention and control plan.	WDNR, Private consultants, Adams LWCD & Tri-Lakes Mgmt Dist	December 1 each year	C
	5. Recontact Adams County Parks Committee to pursue installing boat washing equipment at public boat landings; work with Town of Rome if they assume responsibility for the parks.	Adams LWCD Adams Parks/Recreation Tri-Lakes Mgmt District	2014	
	6. Control Purple Loosestrife using pulling, chemical spot-treatments and bio-controls.	Tri-Lakes Mgmt District	Ongoing	C

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Aquatic Species Management continued …	**Manage impacts to lakes resulting from the Zebra Mussel invasion.**			
	1. Arrange for a series of articles and provide material to the Wisconsin Rapids newspaper, Adams-Friendship newspaper, fishing clubs and lake associations.	Tri-Lakes Mgmt District	Annually	C
	2. Use volunteer group to provide education.	Tri-Lakes, Associations	Ongoing	
	3. Develop an advertisement to be placed in lake association newsletters and local newspapers to notify public that there are zebra mussels in Lake Arrowhead, Lake Camelot and Lake Sherwood.	Tri-Lakes Mgmt District Adams LWCD, WDNR	Ongoing	C
	4. Seek funding from AIS grant for boat launch attendant through the Clean Boats, Clean Waters program.	Tri-Lakes Mgmt District Adams LWCD, WDNR	Ongoing	C
	Monitor the impact of Zebra Mussels			
	1. Monitor zebra mussel research on control methods	Tri-Lakes, WDNR, Adams LWCD	Annually	C
	2. Maintain coordination and communications with WDNR Specialist & Adams LWCD	Tri-Lakes, WDNR, Adams LWCD	Ongoing	C

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Dams	**Maintain and operate Arrowhead, Sherwood and Camelot Dams to insure public safety, proper dam function and a stable lake level.**			
	1. Conduct inspections and record findings as specified in WDNR standards.	Engineer certified by Nat'l Assn. of Prof. Eng.	Per WDNR schedule	C
	2. Operate, inspect and repair dams to meet Wisconsin laws in Chapter 31 and NR Chapter 330.	Adams LWCD	Min. 3 times/week	C
	3. Review and update the County Emergency Action Plan.	Adams LWCD Town of Rome	Annually	C
	4. Implement the Emergency Action Plan in times of emergency. Evacuation Route signs were added in 2014 by Adams County.	County Board Chair, Adams LWCD & Emergency Mgt and Town of Rome	As needed	C
	5. Maintain water level gauges that are placed on the sides of the water flow control structures. These gauges will be the official tool used to determine lake levels. Lake level information may be obtained online starting in June, 2010.	Adams LWCD	Ongoing	C
	6. Maintain history of levels; data can be obtained from Adams County LWCD at 608-339-4268.	Adams LWCD	Annually	C

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Recreational Uses	**Manage lakes for boating and skiing.**			
	1. Provide areas for boating/skiing as part of the harvest plan.	Tri-Lakes Mgmt District	Ongoing	C
	2. Regulate lake traffic to increase safety. This will be accomplished by implementing and enforcing state laws, and town ordinances. Pursue 2nd boat and increase awareness with Town of Rome.	Town of Rome WDNR	Ongoing	C
	3. Implement methods of enforcing state laws, county and town ordinances. Methods may include anonymous tips hotline, goodwill ambassador groups and education. Once methods have been identified, develop strategy to implement.	Town of Rome Tri-Lakes Mgmt District	Ongoing	C
	4. Install no-wake buoys 100' off the face of the dams shortly after ice-out.	Adams LWCD	Ongoing	C
	Manage lakes for fishing.			
	1. Work with WDNR Fisheries expert to stock game fish, panfish and forage fish in lakes as funding allows.	Lake Associations Tri-Lakes Mgmt District	Ongoing	C
	2. Educate lake users about VHS rules and bait rules. Contact bait shops also.	Tri-Lakes Mgmt District Adams LWCD	Ongoing	C
	3. Educate lake users re good of improving littoral and riparian zones to improve fish habitat as long as navigation is not impeded; permit may be required.	Tri-Lakes Mgmt District	Ongoing	
	Manage lakes for swimming.			
	1. Maintain safety of public swim area on all three lakes by marking with buoys	Town of Rome Adams Park & Rec	Ongoing	C
	2. Report any illnesses from blue-green algae to www.dhs.wi.gov/eh/bluegreenalgae	Tri-Lakes Mgmt District	Ongoing	
	Improve and develop parks associated with the Tri-Lakes.			
	1. Coordinate efforts to develop plan to improve and develop Tri-Lakes parks. Improvements include adding boat washing stations and containers to dispose of unused bait and aquatic plants at the boat landings.	Town of Rome, Adams Park & Rec, Lake Assns	Ongoing	

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Shorelands – area within 1000 feet of the lake	**Reduce phosphorus and nitrogen entering groundwater that then enters into Tri-Lakes.**			
	1. Inventory and map septic systems within the Tri-Lakes Management District. Manage system to notify owners (pre-7/1/1992) to pump septic systems.	Tri-Lakes Mgmt District	Ongoing	C
	2. Verify county and state-approved method of sanitary disposal on camping lots in the District.	Town of Rome	Ongoing	C
	Reduce nutrients entering the Tri-Lakes by surface water.			
	1. Educate lake shoreline owners on the benefits of riparian buffers and storm water runoff management utilizing meetings, newsletters and individual visits.	Tri-Lakes Mgmt District Adams LWCD and P&Z Lake Associations	Ongoing	
	2. Plan/design and offer cost share to install shoreline protection, riparian buffers and storm water runoff management to areas identified in inventory. Utilize Adams Soil & Water Resource Mgmt Program & WDNR financial assistance programs (***will expire 7/1/2015***). Cost-sharing grants may be available to help.	Adams LWCD, WDNR, landowners, Lake Assns	Ongoing	
	3. Assist lakeshore property owners with Shoreland Protection Ordinance riparian buffer conformance. Cost-sharing grants may be available to help. The deadline for compliance with the Ordinance is July 1, 2015.	Lake Associations Adams P&Z	2012 to 2015	
	4. Monitor methods for sanitary disposal for year-round campers. Review Town ordinance.	Adams County Town of Rome	Ongoing	
	5. Develop compliance plan for Shoreland Protection Ordinance riparian buffer conformance after July 1, 2015. A site is considered compliant if all required documents are submitted and approved. Develop plan for dealing with Beach Club properties.	Adams P&Z	2015	

TRI-LAKES MANAGEMENT PLAN

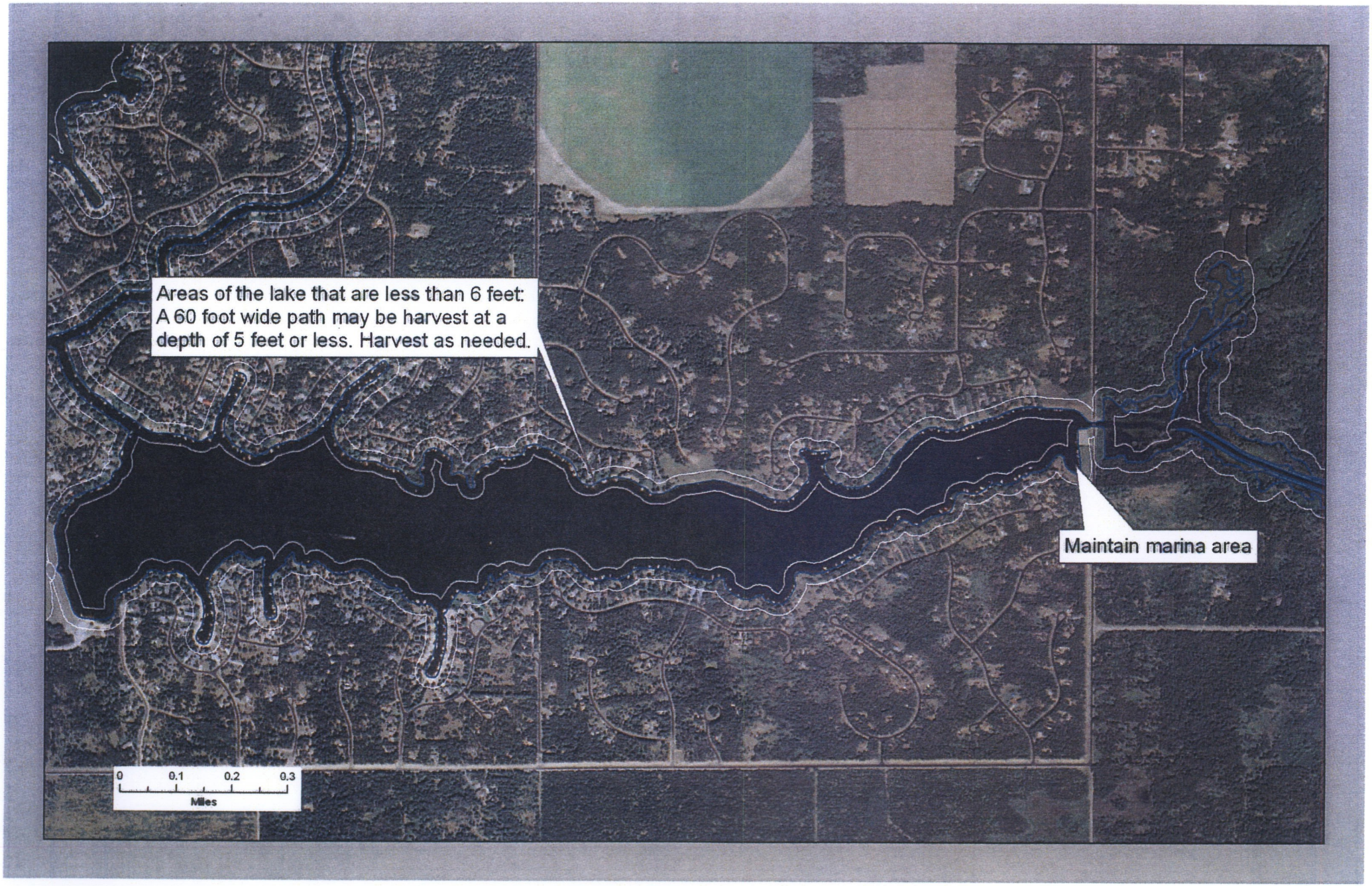
ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Water Quality	**Reduce algae blooms and nutrient levels.**			
	1. Utilize the Citizen Monitoring Program to monitor water quality to measure clarity, temperatures, secchi dish readings, chlorophyll A and total phosphorus.	Adams LWCD Tri-Lakes Mgmt District Lake Associations	Ongoing	C
	2. Monitor water quality at six sites in the upper watershed. Monitor flow rates at three sites.	Adams LWCD Tri-Lakes Mgmt District	Ongoing	C
	3. Monitor additional 16 sites (Arrowhead-4, Camelot-8 and Sherwood-4) in the lakes and 2 toe drains at each dam.	Adams LWCD Tri-Lakes Mgmt District Lake Associations	Ongoing	C
	4. Work with WDNR to learn new solutions as they become available. Utilize the DNR website as well as the Lake Specialist at Adams LWCD.	Tri-Lakes Mgmt District	Ongoing	C
	5. Evaluate water quality report produced by UW-SP and identify action plan.	Tri-Lakes Mgmt District	2014-15	

Water Quality Continued . . .	**Educate community and public about ways to improve water quality.**			
	1. Write and publish informational articles in lake association newsletters and in Wisconsin Rapids Tribune. Also post to websites and distribute materials at Environmental Day and Tri-Lakes Annual Meeting. Combine family activity days to reach a wider and younger audience.	Adams LWCD Lake Associations Tri-Lakes Mgmt District	Ongoing	C
	2. Distribute Waterfront Property Owners Packet of information prepared by Adams County Lake Specialist to waterfront owners.	Tri-Lakes Mgmt District	Ongoing	C
	3. Educate public about proper disposal of prescription drugs	Tri-Lakes Mgmt District	Ongoing	C
	4. Establish website to serve as portal of information to the property owners.	Tri-Lakes Mgmt District	2014	C
	Practice proper land use utilizing Comprehensive Plans and Zoning			
	1. Within the Tri-Lakes watershed, continue to implement existing town comprehensive plan. Planning Commission will be reviewing in 2015.	Town of Rome Tri-Lakes Mgmt District	Annually	
	2. Encourage smart growth plan development by attending town meetings in those towns within the Tri-Lakes watershed that do not have comprehensive plans.	Adams County Planning and Zoning	Annually	

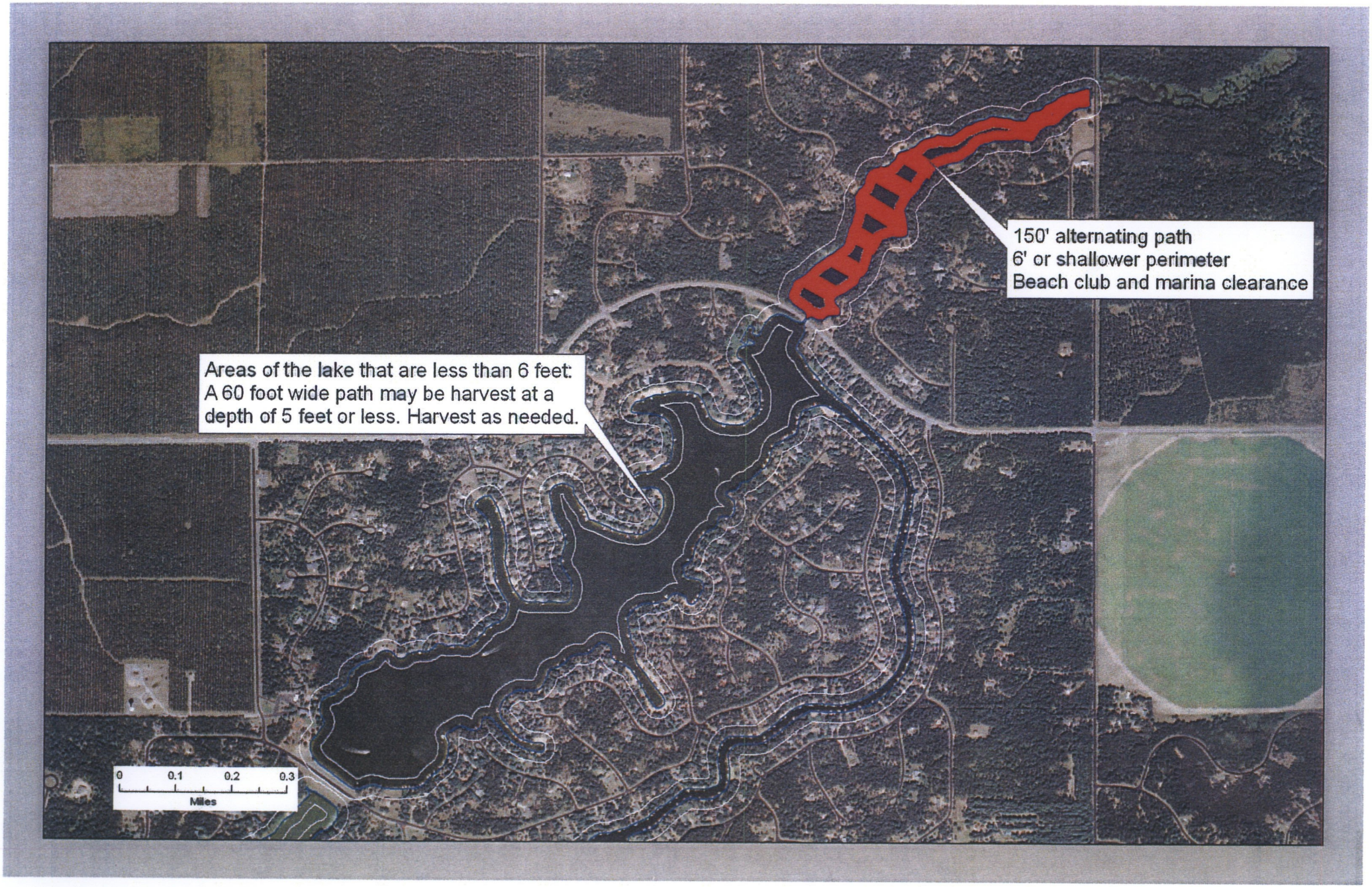
TRI-LAKES MANAGEMENT PLAN

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Water Quantity	**Maintain lake levels that enhance water quality and meet the requirements of Wisconsin Statute Chapter 31.**			
	1. Operate dams to maintain lake levels and outflows as stated by WDNR. These operating levels are listed in Adams County IOM (Inspection, Operation, Maintenance) Plan (Appendix G)	Adams LWCD	Annually	C
	2. Investigate groundwater net flow around and through dams and determine what phosphorus content the flow contains. Take water samples from toe drains for phosphorus content. Present findings to WDNR.	Adams LWCD Tri-Lakes Mgmt District State Lab of Hygiene	Ongoing	
	Maintain stable stream flows into and out of the Tri-Lakes.			
	1. Operate dams in proactive manner so large quantities of water are not released, causing downstream flooding and stream bank erosion. Lake levels will be lowered in a slow manner to accommodate anticipated heavy flows from the upper watershed.	Adams LWCD	Annually	C
	2. Develop plan to monitor flows.	Tri-Lakes Mgmt District UW-SP WDNR Adams LWCD	Ongoing	C
	3. Work with Central Sands water resource group.	Tri-Lakes Mgmt District	Ongoing	

ITEM	GOALS AND ACTION ITEMS	WHO	WHEN	STS
Watershed – land outside of shoreland area	**Reduce 50% of the total phosphorus, total nitrogen and total solid sediments entering Leola Ditch, 14 Mile Creek and Unnamed Ditch 13-13 by 2020.**			
	1. Develop strategy to implement buffer corridor compliance. Maintain and monitor the buffer corridors.	Adams LWCD Adams P&Z	Completed	C
	2. Invite Leola Drainage District governing body to attend a joint meeting and/or request a tour of the ditches.	Tri-Lakes Mgmt District	Ongoing	C
	3. Investigate and discuss methods to purchase land in the watershed in order to broker land use change.	Tri-Lakes Mgmt District	2014	
	4. Sample and test water at the headwaters region of the drainage district and as it enters Lake Camelot to determine clarity, pH, temperature, biological conditions, total phosphorus, total nitrogen and total sediments.	Tri-Lakes Mgmt District	Ongoing	C
	5. Implement the Adams County Stormwater Runoff Ordinance to prevent and/or reduce nutrients and sediments from entering State's waters.	Adams LWCD	Ongoing	
	6. Monitor and advocate change in Drainage District legislation.	Tri-Lakes Mgmt District	Ongoing	
	7. Implement State Agricultural Performance Standards by contacting agricultural producers to offer cost share for compliance with preventing: runoff from livestock confinement operations and uncontained livestock manure; sedimentation due to soil erosion from cropland; livestock access stream sites.	Adams LWCD	Ongoing	
	Create community awareness and improve community knowledge about watershed activities.			
	1. Educate landowners, agricultural producers and community about State Agricultural Performance Standards and best management practices utilizing newsletters, meetings and individual visits.	Adams LWCD, NRCS, WDNR, Waushara LWCD CREP	Ongoing	


Areas of the lake that are less than 6 feet:
A 60 foot wide path may be harvest at a
depth of 5 feet or less. Harvest as needed.
Maintain marina area
0
0.1
0.2
0.3
Miles

S 002/9


150' alternating path
6' or shallower perimeter
Beach club and marina clearance
Areas of the lake that are less than 6 feet:
A 60 foot wide path may be harvest at a
depth of 5 feet or less. Harvest as needed.
0
0.1
0.2
0.3
Miles

5002/9


Areas of the lake that are less than 6 feet:
A 60 foot wide path may be harvest at a depth of 5 feet or less. Harvest as needed.
Remove floating vegetation and algae
Surface skim only
30' - yellow
60' - red
27' (three passes) to each pier
0
0.1
0.2
0.3
Miles

6002/9

APPENDIX G – Revised 9/30/2010

TRI-LAKES CRITICAL WATER ELEVATIONS IN FEET ABOVE SEA LEVEL

LAKE CAMELOT

Maximum Operating Lake Level Elevation …..……..1011.59

Minimum Operating Lake Level Elevation ……1010.59

Assumed Dam Failure Elevation ……1014.86

100 Year Flood Elevation ……1014.86

Top of Dam Elevation ……..1017.95

LAKE SHERWOOD

Maximum Operating Lake Level Elevation ……. 992.73

Minimum Operating Lake Level Elevation ...…… 991.73

Elevation of Sherwood if Camelot would fail during 100 year flood …..... 999.46

Top of Dam Elevation ……...……..999.95

Highway 13 elevation ……...….. 980.55

Dam Failure Elevation at Highway 13 …… 988.77

LAKE ARROWHEAD

Maximum Operating Lake Level Elevation ..…….. 963.39

Minimum Operating Lake Level Elevation ……...…….. 962.84

Elevation of Arrowhead if Sherwood would fail during 100 year flood….. 972.91

100 Year Flood Elevation ……... 966.96

Top of Dam Elevation ……..… 971.25

Highway Z Elevation …….……. 931.17

Dam Failure Elevation at Highway Z …….…… 933.58

APPENDIX H

Comments & questions from public meeting regarding Tri-Lakes Management Plan

Water quality hasn't changed in 25 years why change management practices?

Arrowhead Lake has no drawdown yet water quality has decreased. Arrowhead Lake theoretically has ideal conditions to prevent nutrients but has worst water quality.

Camelot Lake serves as nutrient sink. Nutrients coming from upper watershed and settle on lake bottom. Nutrients flow through the groundwater of Camelot Lake to the other lakes. Higher the lake levels the more ground water flows. Primary path of groundwater is under the dams. Drawdowns reduce pressure which will reduce groundwater flow.
Need to determine the amount of nutrients coming from the dam.
Need to sample lakebed sediments.

Would like further studies on groundwater flows into the lakes so more detailed data can be obtained. It should take 189 years for Phosphorus to reach lake through the groundwater.

2000-2002 study did not state to eliminate drawdowns.

Let weeds utilize nutrients and then harvest weeds thus removing nutrients. This is supported by science. Compromise for harvesting weeds was not actually a compromise because science shows removing harvested plants is good.

Why the need to address a small source of nutrient loading? Let's concentrate on larger sources. Historically, the shoreline areas have practices installed to address nutrient loading-it is as good as it will get. Need to address watershed. 14 Mile Creek Watershed Study states streams are largest contributors of nutrients-specifically 14 mile creek.

Lake drawdowns provide cleansing effect.

Original drawdown designed for weed control along shoreline.

Dredging drainage ditches and eliminating drainage ditch dams (used to control peat fires) have increased nutrient loading in the lakes.

Impede the flow of water to the Tri-Lakes by building wing dams. Between 8th Ave and County highway D. Original area east of Camelot Lake designed as a sediment basin.

Has there been any lakes in the state where drawdowns have been reversed.

Need a cost analysis of winter drawdown?

Can drawdowns be taken away legally? Is adverse possession in effect?

Comments & questions from public meeting regarding Tri-Lakes Management Plan continued…

More information needed about surface runoff.

Planning process needs to be more democratic. Feel Tri-Lakes Mgmt District members should vote on the plan. Too much emphasis on Lake Advisory Group.

Who would be responsible if accidents occur due do to weed growth. Favor aquatic plant harvesting to increase recreational safety.

Residents need to consider wildlife and biodiversity. Should not sacrifice downstream water quality. Need to consider whole package.

Need benchmarking for data and practices implemented (i.e. if drawdown occurs, what will the decrease in nutrient loading be?)

Plan has too many quick fixes. Plan needs more long-term solutions.

$ 1 million worth of docks will be destroyed if drawdowns are eliminated.

Need to harvest channels like they have in the past.

Lake advisory group is a sham and DNR will dictate the outcome of the plan.

Need to listen to wishes of property owners and use common sense.

Plan would not allow use of lakes as stated in the Public Trust Doctrine.

Running harvesting machines too fast – not getting all the weeds.

A show of hands saw a majority of the people attending the meeting would like to keep a major drawdown on Camelot and Sherwood Lakes and be able harvest as they have in the past.

Nutrient loaded water is not polluted water.

Despite advisory group, DNR will regulate what is going to happen.
Perception is gov't is going to tell us what to do.
If local residents do not get a choice or vote, contact legislators and suggest budget cuts.

TABLE OF ACCOMPLISHMENTS – APPENDIX J

YEAR	ACTION ITEMS	WHO
Annual	Harvest lakes 6 foot deep or greater as needed to a depth of 5 feet. Areas shallower than 6 feet can have a harvested path of 60 feet wide with a harvest depth 4 feet or less	Tri-Lakes Mgmt District
Annual	Conservancy areas will be marked on the harvest maps. Sixty foot wide paths will be harvested in a criss-cross pattern. Harvesting depth shall be 4 feet or less	Tri-Lakes Mgmt District
Annual	WDNR representative and a Tri-Lakes Management representative annually inspect harvesting operations	WDNR and Tri-Lakes Mgmt District
Annual	Record the pounds of aquatic plants removed and report to WDNR	Tri-Lakes Mgmt District
Annual	Measure the phosphorus content of harvested aquatic plants	Tri-Lakes Mgmt District UWSP
Annual	Deny aquatic plant spraying permits for shoreline aquatic plant control	WDNR
Annual	Educate individuals on alternative control methods for aquatic plants	Tri-Lakes Mgmt District
Annual	Conduct annual inspections of dams and record findings	Adams LWCD
Annual	Operate, inspect & repair dams to meet Chapter 31 and NR chapter 330 operation done in proactive manner to prevent large water releases	Adams LWCD
Annual	Review and update the Emergency Action Plan	Adams LWCD
Annual	Maintain water level gauges on dam	Adams LWCD
Annual	Designate areas for boating/skiing as part of the harvest plan	Tri-Lakes Mgmt District
Annual	Regulate lake traffic to increase lake safety	Town of Rome
Annual	Implement NR151 Ag Performance standards in lake's watershed	Adams LWCD
2005	Formed Sanitary District to regulate pre-1992 septic systems	Tri-Lakes Mgmt District
2005	Inventoried shorelines to map erosion, no buffers & no storm water management	Adams LWCD
2006	Performed Aquatic Plant Survey and published findings along with Management Recommendations.	Adams LWCD WDNR
2007 – 2008	Obtained funding from AIS grant for signs warning about zebra mussels. Signs were placed on all boat launches.	Tri-Lakes Mgmt District WDNR
2007	Developed ordinance to eliminate the use of phosphorus in lawn fertilizers.	Tri-Lakes Mgmt District Town of Rome
2007	Investigated fish tourney permit process for zebra mussel monitoring practices and made recommendation via WAL.	Tri-Lakes Mgmt District
2007	Investigated to gather scientific information on advantages versus disadvantages of major drawdowns. Presented findings to WDNR.	Lake Associations
2007	Implemented Citizen Monitoring Program on Lake	Tri-Lakes Mgmt District

2008	Camelot to monitor water quality, chlorophyll A, total phosphorus, secchi dish depths and temperatures. Six sites in the Upper Watershed were added to gauge the impact of upstream inputs. Expanded Citizen Monitoring Program to include Lake Sherwood and Lake Arrowhead.	Adams LWCD
2008 – 2014	Obtained funding from AIS grant for two summer interns to implement a Clean Boats, Clean Waters program to monitor the District's boat landings.	Tri-Lakes Mgmt District WDNR
2008-2009	Developed an educational plan to assist with enforcement of no-phosphorus fertilizer ordinance of Town of Rome. Statewide ban went into effect in April, 2010.	Tri-Lakes Mgmt District
2009	Requested investigation of Arrowhead dam regarding excessive flow through toe drains.	Tri-Lakes Mgmt District Adams LWCD
2009-2010	Performed Aquatic Plant Surveys on Lake Camelot and Lake Arrowhead.	Adams LWCD Tri-Lakes Mgmt District
2010	Inventoried drainage district ditches for buffer corridor compliance as stated in State Statute Chapter 48.	Adams LWCD
2009-2010	Conducted tours of cranberry production operations to demonstrate best management practices.	Adams LWCD Tri-Lakes Mgmt District Wis. Cranberry Growers
2010-15	A Clean Boats, Clean Waters Program was initiated. Public boat landings are monitored by UW-SP student interns with a goal of educating the public on the importance of controlling the spread of Aquatic Invasive Species. The program has been continued each summer and expanded from 2 to 3 interns.	Tri-Lakes Mgmt District
2011	Performed Aquatic Plant Survey on Lake Sherwood	Adams LWCD Tri-Lakes Mgmt District
2011	Monitored and documented drainage district ditches for buffer corridor compliance as stated in State Statute Chapter 48. Developed strategy to implement buffer corridor compliance.	Adams LWCD
2012-2015	Assumed responsibility for raising Cella Beetles for release on Walden to aid in control of Purple Loosestrife.	Tri-Lakes Mgmt District
2012	Installed no-wake buoys 100 feet off the face of the dams.	Adams LWCD
2012	Performed Aquatic Plant Survey on Lake Arrowhead.	Adams LWCD Tri-Lakes Mgmt District
2012	Coordinated efforts to trap muskrats on the lakes to bring populations down to acceptable levels. In the fall trapping season, over 266 were trapped.	Tri-Lakes Mgmt District
2012-13	Worked with Adams County to secure additional funding for fish stocking in 2013. Tri-Lakes matched the funding grant dollars. Walleyes (large fingerlings) were stocked in each of the lakes.	Tri-Lakes Mgmt District Adams LWCD
2013	Performed Aquatic Plant Survey on Upper and Lower	Adams LWCD

	Camelot.	Tri-Lakes Mgmt District
2013	Added GPS to one harvester to evaluate effectiveness.	Tri-Lakes Mgmt District
2014	Established a new and more comprehensive website at www.trilakesmanagement.com Property owners can sign up for E-Alerts to receive important and time-sensitive information via email.	Tri-Lakes Mgmt District
2014	Performed Aquatic Plant Survey on Sherwood and Arrowhead	Adams LWCD Tri-Lakes Mgmt District
2014	Begin monitoring flows in Upper Watershed	Adams LWCD Tri-Lakes Mgmt District

TRI-LAKES MANAGEMENT DISTRICT

HISTORY OF MILESTONES – APPENDIX K

DATE	MARKER
May 15, 1984	Tri-Lakes Management District formed following official approval by Adams County Board – County Board Order #34
Sept 1, 1984	By-Laws were adopted at first Annual Meeting held September 1, 1984; budget of $68,000 for 1985 was approved
1986 – 1987	Land purchased and maintenance building/office was constructed at 1555 Apache Avenue.
1986	An Aquamarine Harvester was purchased from Lake Weed Cutting Service in Hartland, WI
1993	Jointly funded with WDNR a Watershed Characterization study conducted by Blue Water Science.
1994	Purchased weed harvester #2 from Aquarius with financial assistance through a WDNR grant.
1994	Tri-Lakes and Adams County jointly funded restoration dredging around the islands on Lake Sherwood.
1995	Purchased 2 weed harvesters (#3 and #4) from Inland with financial assistance through a WDNR grant.
1997	Purchased weed harvester #1 from Inland with financial assistance through a WDNR grant.
1997 – 2003	By permit of WDNR, conducted weed spraying program on selected properties on Lakes Arrowhead, Camelot and Sherwood.
1997 - 1998	Tri-Lakes and Town of Rome secured grant to evaluate existing septic systems on Lakes Camelot and Sherwood. Of the sample septic systems that were evaluated, 95% of Camelot's and 82% of Sherwood's were found to meet code requirements.
1998	Requested and received authorization from WDNR to begin using bales of barley straw fastened to underside of piers to help control of algae. There is something unique to barley straw (unlike other forms of straw) that helps to control the amount of algae in the water. As the straw decomposes in the lake, it releases a natural chemical which inhibits algal growth and provides an environmentally safe alternative to chemicals.
1999	Conducted study of septic systems on Lake Arrowhead to evaluate the retention of phosphorus in soils beneath the drainfield. Results showed significantly elevated levels of phosphorus beneath the drainfields and suggested that it can migrate through the soils, eventually affecting groundwater.
1999	Tri-Lakes obtained permit to maintenance dredge 2 properties along the Camelot channel as well as several properties on bays on Upper and Lower Camelot and several properties on Lake Sherwood. Permit was for 10 years and subsequent projects were completed in 2001 and 2003
2000	UW-SP conducted study of groundwater flow for WDNR and found that the annual drawdowns on Camelot and Sherwood in the fall actually caused nutrients to reverse flow from land back into the lake and affected water quality.
Jun – Nov, 2000	UW-SP conducted study of water and sediment samples to determine amount of acute toxicity.
2000-2002	Limnological Analysis of the Tri-Lakes was conducted jointly by the US Army Corps of Engineers and UW-Stevens Point Dept. of Natural Resources. The study identified what impacted water quality and recommended developing a lake management plan to improve water quality, inventory phosphorus sources and

	increase buffers between surface water and agricultural land.
2001	Aquatic Plant Communities study prepared for each lake by WDNR, Deb Konkel.
2003	Began working with local group Wildflowers, etc. to control Purple Loosestrife on Walden.
2004	Through the joint efforts of Adams County Land and Water Conservation Department, WDNR and our Tri-Lakes Advisory Group, a five-year Lake Management Plan was developed to identify goals and action items to improve our lakes. We were the first in our county to accomplish this. The Plan is reviewed and updated annually.
July 3, 2004	Formation of a Sanitary District was authorized at Special Meeting of the property owners
2004	Existence of Zebra Mussels in Lake Arrowhead confirmed by WDNR.
Nov 16, 2004	Adams County Board granted authority to implement Septic Inspection and Maintenance program for septic systems located in the district that were installed prior to July 1, 1992
2005	Purchased weed harvester #5 from Aquarius with financial assistance through a WDNR grant.
2005	Began collecting weed samples from each lake and had UW-SP lab determine the amount of phosphorus contained in the plant tissue. This was then used to extrapolate the amount of phosphorus removed from each lake as a result of our mechanical weed harvesting.
2005-2010	Working with WDNR, we began to implement Zebra Mussel monitoring protocol including 3 substrate sampler platforms installed in each lake.
2006	Joined the Adams County Lake Alliance
2006	Aquatic Plant Survey prepared for each lake by Adams County Land and Water Conservation Department.
2007	With financial assistance through a WDNR grant, contracted with Inland to rebuild harvester #4.
2007	Camelot volunteers began monthly water testing program to expand sites tested from 1 per lake to 8 sites plus 6 additional sites in the upper watershed. Tests include phosphorus, dissolved oxygen, chlorophyll-A, secchi dish readings and temperatures at different depths. Program was expanded to Sherwood and Arrowhead in 2008.
2007	Worked with Rome Town Board to develop an ordinance to eliminate the use of phosphorus in lawn fertilizers. This was 3 years prior to the Wisconsin Legislature passing it as a State Law.
2007	Lake Classification Short Reports prepared for each lake by Adams County Land and Water Conservation Department.
2008	AIS signs warning about Zebra Mussels and other invasive species were installed at all 7 of the boat landings – both public and private
2009 - 2014	Implemented Clean Boats, Clean Waters program with AIS grant assistance by WDNR; two summer interns were hired to monitor the boat landings throughout the summer and educate boaters on the importance of not transporting invasive species from one lake to another. A third intern was added in 2012.
2009	Existence of Zebra Mussels in Lake Camelot confirmed by WDNR.
2010	Purchased weed harvester #6 from Inland with no financial assistance.
2010	Existence of Zebra Mussels in Lake Sherwood confirmed by WDNR.
2011	Sold 17-year-old weed harvester #2 to a French company.
2012	Purchased new weed harvester #2 from Aquarius with financial assistance through a WDNR grant.
2012	Organized a Muskrat Control program with the Wisconsin Trappers Association.

2012 – 2014	Began project to raise Cella Beetles at Tri-Lakes as a biocontrol method for decreasing Purple Loosestrife on the Tri-Lakes, especially in the Walden area.
2013	Supported and participated in the formation of RAWRA (Rome Area Water Resources Alliance) to address issues concerning quantity and quality of water. The group met at the Tri-Lakes office.
2013	Rebuilt Harvester #1 and trailer in-house with the aid of grant from WDNR.
2013	Installed GPS on Harvester #5 to evaluate effectiveness in the harvesting operation.
2013	Worked with each lake association to combine funds for stocking fish in each lake. Walleyes were released in the fall. A portion of the Tri-Lakes funding was covered by a DNR grant obtained by Adams County Land and Water.
2014	Established a new and more comprehensive website at www.trilakesmanagement.com Property owners can sign up for E-Alerts to receive important and time-sensitive information via email.
2014	Worked with US Geological Survey to put out platforms in Walden and the conservatory area of Arrowhead to encourage nesting by loons in central Wisconsin.

Phosphorus Removed from Tri-Lakes
By Mechanical Harvesting

Pounds of Phosphorus Removed (Revised):

Lake	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Arrowhead	28.2	126.1	109.3	154.4	118.1	153.3	132.7	105.1	59.4	40.8
Upper Camelot	53.3	21.1	118.0	21.8	57.5	29.5	91.9	73.4	45.1	67.8
Lower Camelot	241.3	87.2	125.3	78.5	107.7	143.6	138.8	176.0	125.5	79.2
Walden	23.0	61.3	Included in Upper Camelot #'s	51.8	54.2	49.6	42.8	68.1	35.1	15.0
Sherwood	214.8	11.8	32.3							
Sherwood-North fork				41.0	72.2	68.8	42.2	227.1	61.0	79.6
South fork				47.7	115.8	69.3	46.2	62.2	102.1	78.5
TOTAL	**560.6**	**307.5**	**384.9**	**395.2**	**525.5**	**514.1**	**494.6**	**711.9**	**428.1**	**360.8**

One pound of phosphorus can support 500 pounds of algae