Squaw Lake
Management Plan Update 2012

Squaw Lake Rehabilitation & Management District

St. Croix County Land & Water Conservation Department

Polk County Land & Water Resources

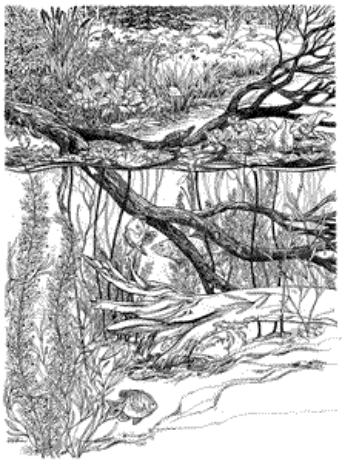
St. Croix County Sportsmen's Alliance

WI Department of Natural Resources

What I Can Do to Protect My Lake!

No cost/Low cost options

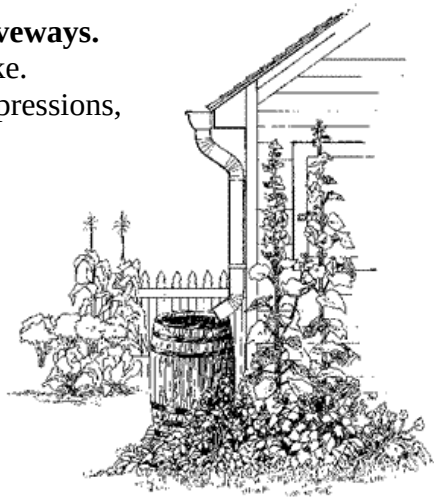
1. Leave plants near the shore.



2. Leave fallen trees in the water.

3. Slow stormwater from roofs and driveways.

a. Direct downspouts away from lake.
b. Capture stormwater in ground depressions, rain barrels, or raingardens.



4. Use Phosphorus-Free fertilizers and soaps.

5. Check for Invasive Species.

a. Remove aquatic plants from all watercraft.
b. Drain water from your boat, motor, bilge, live wells, and bait containers.

ACKNOWLEDGEMENTS

We would like to thank all of those who were involved in the creation of this document.

Squaw Lake Rehabilitation and Management District Commissioners: Craig Jameson, Roger Swanson, Connie Haupt, Jerry Van Dam

Squaw Lake Residents: Ken House, Duane Haupt

Squaw Lake Watershed Residents: Scott Carlson, Brad Johnson, Timm Johnson

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Acronym Definations

PLWR - Polk Land & Water Resources

SLWCD – St. Croix County Land & Water Conservation Department

SLRMD - Squaw Lake Rehabilitation & Management District

TMDL – Total Maximum Daily Load

TRM Grant – Target Runoff Management Grant

USUSFWS – United States Fish & Wildlife Service

WI DNR – Wisconsion Department of Natural Resources

SUMMARY

Squaw Lake is a 303(d) Impaired Water. The lake is nutrient (phosphorus) impaired as a result of agriculture, internal loading and local land use. In an effort to improve this resource, the Squaw Lake Rehabilitation & Management District (SLRMD) worked with the WI Department of Natural Resources, St. Croix County Land & Water Conservation Department (SLWCD) and Polk Land & Water Resources (PLWR) to update the Squaw Lake Management Plan. The writing of this plan included surveying lake residents, soils testing of shoreland and agricultural land, and research of past and on-going studies. These studies included information on water quality, groundwater levels, lake levels, lake groundwater field testing, spring runoff phosphorus sampling, Phosphorus modeling, shoreland habitat, aquatic habitat, and aquatic invasive species. The following goals and objectives are derived from the values and concerns of the members and residents of the Squaw Lake Rehabilitation and Management District and the science evaluating the health of Squaw Lake.

Goal I: Improve water quality, prevent the occurrence of nuisance algae blooms, reduce nutrient levels, improve water clarity and minimize nutrient inputs from the watershed and deep lake sediments.

Goal II: Protect and improve the diverse aquatic life in Squaw Lake; including a self sustaining fishery and diverse aquatic plant community.

Goal III: Protect and restore healthy, stable shoreland habitats.

Goal IV: Prevent the expansion and new infestations of invasive species.

Goal V: Provide safe and multifaceted recreational opportunities.

MANAGEMENT OBJECTIVES AND GOALS

Implementing the goals and objectives of the Squaw Lake Management Plan update will protect what we value most for the current and future generations of those that love and use Squaw Lake. The Squaw Lake goals will guide lake management activities by shore land property owners, the Squaw Lake Rehabilitation & Management District, the town of Star Prairie, St. Croix County, Polk County and the Wisconsin Department of Natural Resources who will work together as a community to preserve and protect Squaw Lake. This plan will be evaluated on an annual basis to review, update and document the successful implementation of these goals and objectives and implemented as funding is available.

Goal I: Improve water quality, prevent the occurrence of nuisance algae blooms, reduce nutrient levels, increase water clarity and minimize nutrient inputs from the watershed and deep lake sediments.

Squaw Lake water quality can be restored to conditions that are characterized by good water clarity and low algae levels. Families, community members and especially our children deserve to have clean lakes to use and enjoy. Reducing the phosphorus inputs from the watershed and lake sediments will decrease the phosphorus concentration in Squaw Lake. This will help prevent summer algae blooms and improve summer water clarity. Protecting water quality will be achieved by reducing summer surface total phosphorus concentrations from 100ug/l to 30ug/l. To reach this total phosphorus concentration goal, 300acft of spring runoff to the lake must be infiltrated in the upper watershed and an alum treatment will be needed to address in-lake phosphorus.

We will measure our success when the summer average surface total phosphorus concentration is 30 ug/l, summer average chlorophyll a concentration is 17ug/l and by modeling our total phosphorus load reductions.

- **Infiltrate the 400 acft of spring runoff that occurs during frozen ground conditions**

  Prairie Flats wetlands currently capture 95 acft of spring runoff. (Maintained by US USFWS)

  SLWCD & PLWR will work with agriculture producers whose soil tests were higher than 100ppm to discuss nutrient management. (In process: Polk County in contact, nutrient planning starting)

  SLRMD will work with shoreline owners whose soil tests were higher than 100ppm to ensure no phosphorus fertilizer is being used and shorelines are managed to prevent soil erosion.

  SLWCD will work with USFWS to create ephemeral ponding sites on USFWS property by damming small drainage ways identified on the potential storage area map (appendix A). These would capture 13.5 acft of spring runoff. (Summer 2014 and 2015, Funded by TRM grants)

  SLWCD will work with USFWS and St. Croix Highway Department to construct Wetland 2 of Prairie Flats. This would capture 12 acft of spring runoff. (Summer 2015-engineer, Fall 2015-construct, Funded by TRM grants/USFWS funding?)

  PLWR & SLWCD will work with agriculture landowners to conduct a spring runoff infiltration pilot project. These shallow ponding areas would only hold water on frozen ground conditions; draining once the ground thawed and allowing the water to infiltrate. The pilot would also include crop insurance for the agriculture producer, ensuring no loss of productivity. (Summer 2013 – find pilot site, Fall 2013 – construct, 2014– data gathering, Winter 2014 – analyze data, Funding sources: TRM grant, SLRMD)

  SLWCD and SLRMD will implement an infiltration pilot project throughout the direct drainage watershed; working from the upper watershed to the lower watershed. This will capture 275 acft of spring runoff. (2014, Funding Lakes Protection Grant – May 1 application due date.)

SLRMD is open to purchasing property or easement for the purpose of infiltrating spring runoff implementing management strategies. (TRM grant)

LIDAR needed for mapping potential infiltration areas. (Lakes Grant, St. Croix Bridge Mitigation Fund)

- **Trap phosphorus in lake sediments with Alum Treatment**

  SLRMD will apply for Lake Protection Grant to implement the Infiltration Pilot Project capturing 300 acft of spring runoff, followed by an alum treatment. (2016, Funding Lakes Protection Grant – May 1 application due date. Alum treatment could not occur until 300 acft of spring runoff is achieved. The approximate cost of the alum treatment is $207,100 (James).

- **Encourage shoreland owners to manage stormwater.**

  SLRMD and SLWCD will educate shoreland owners about the importance of capturing rain water from roofs and driveways with a goal of 5 homeowners implementing stormwater control each year.

  SLWCD will provide technical assistance for raingarden design and installation. A raingarden design class will be offered to lake residents in 2013.

  SLWCD will provide technical support to assist in implementing stormwater management practices and shoreland restorations.

- **Continue current water quality monitoring in Long Term Trends and Volunteer Monitoring programs.**

  WI DNR (water quality staff) will continue annual water quality monitoring to show trends or changes. Water quality samples will be taken five times during the year: spring turnover, summer (three times) and fall turnover.

  Encourage lake residents to participate in Citizen Lake Monitoring. (Spring 2013 newsletter article, SLWCD)

- **Update TMDL goal to 30ug/L**

  WINDR The current TMDL level of 130ug/l should be updated. The scientific work done for this management plan shows that an in-lake phosphorus goal of 30ug/l is possible.

- **Develop a tracking system of items that have been implemented from the plan**

Goal II: Protect and improve the diverse aquatic life of Squaw Lake; including a self sustaining fishery and diverse aquatic plant community

Leaving fallen trees in the water and protecting high quality aquatic plant beds will improve fishing for anglers and many generations of future anglers. Healthy lake ecosystems are valuable natural resources for all lake users and help prevent invasive species from becoming a nuisance. Fish and aquatic populations will be protected and improved by: providing good water quality conditions; protecting high quality aquatic plant populations; protecting, improving and restoring in-lake habitats; and managing angler harvest.

- **Objectives from Goal I will help accomplish this goal.**

  As water quality improves in Squaw Lake, light will infiltrate to the bottom of the lake and aquatic plants will return to areas that currently have little or no plants due to the high levels of algae.

- **Educating riparian land owners on the importance of protecting and restoring sensitive areas and riparian fish habitat.**

  SLRMD, SLWCD and WI DNR will provide educational information to lakeshore residents through a variety of outlets such as newsletters and brochures available at public meetings. Target date is the 2013 annual meeting and future annual meetings.

  SLWCD will work with riparian landowners to restore habitat by conversion of mowed areas.

- **Work with riparian landowners to increase woody habitat using techniques such as tree drops or tree and stump insertion.**

- **Continue Trends Monitoring for the fish community**

  WI DNR (Fisheries staff) will monitor the sport fish community on a rotational basis. The current rotation is once every 10 years. Next survey scheduled for 2016.

  WI DNR (fisheries staff) completed the evaluation of a 10 bag limit on panfish. The 10 bag limit is considered successful on Squaw Lake. (Funding was cut and the evaluation is considered complete following the 2010 sampling season).

  WI DNR (fisheries staff) will evaluate the 14-18 inch slot size limit on largemouth bass. (Comprehensive Survey 2016.)

  WI DNR (fisheries staff) to determine effectiveness of northern pike stocking by 2016.

  WI DNR (fisheries staff) to pursue extended growth walleye fingerling for stocking beginning 2013.

- **Investigate groundwater level issues related to low water conditions.**

  SLWCD and SLRMD will continue to work together to monitor lake water levels and assess how those changes are affecting water quality and quality and quantity of aquatic vegetation. As these changes occur, we will support studies of protecting and improving the diverse aquatic life of Squaw Lake.

Goal III: Protect and restore healthy, stable shoreland habitats

Restoring and protecting shorelands will provide privacy and tranquility as well as a natural space for families to enjoy nature. The shorelands of Squaw Lake have changed over the years due to development. Restored and properly maintained shorelands are buffers that will provide water quality protection and critical habitat areas for water dependent aquatic and wildlife.

- **Objectives from the Goal I will help accomplish this goal.**
- **Work with riparian landowners to protect and improve shoreland habitat.**
- **Request the St. Croix County Planning and Zoning Department to update the Shoreland Zoning Ordinance to include shoreland buffer restorations and storm water management activities as requirements for riparian properties which are being developed or redeveloped.**

  SLRMD will survey membership on support of such a proposal, vote at an annual meeting and if passed, submit a request to the St. Croix County Planning and Zoning Department.

  SLWCD & Planning and Zoning Department will develop a lake and river classification system based on WI DNR and county labeling of waters for use in revised shoreland zoning ordinance. (2013)

Goal IV: Prevent the expansion and new infestations of invasive species

Many families and lake users enjoy recreating on Squaw Lake. Squaw Lake's close proximity to Bass Lake, the St. Croix and Mississippi Rivers put it at risk for invasive species introduction. Preventing infestations of invasive aquatic species are critical to maintaining the integrity of native plant and animal communities which will protect and maintain the ecosystem health of Squaw Lake.

- **Objectives from Goal I will help accomplish this goal.**

  As water quality improves in Squaw Lake, light will infiltrate to the bottom of the lake and aquatic plants will return to areas that currently have little or no plants due to the high levels of algae. Encouraging native aquatic plant growth will be important competition to keep invasive species out.

- **Objectives from the Goal III will help accomplish this goal.**

- **Encourage riparian landowners to leave aquatic vegetation which serves as competition for invasive species. (On-going, SLRMD)**

- **Continue to participate in the Clean Boats, Clean Water program for the prevention of infestations of invasive species through the Citizen Science Center out of Beaver Creek Reserve.**

- **Monitoring for all invasive species, including zebra mussels and purple loosestrife.** .

  WI DNR (water quality staff) will conduct aquatic plant survey. The survey will repeat past survey protocol to show trends or changes. Plant surveys will be completed every 3 years.

Goal V: Provide safe and multifaceted recreational opportunities

Boating and fishing are favorite family and social activities for many lake users. Recreational needs and uses of Squaw Lake will continue to grow as populations increase and development continues to occur in St. Croix County. It will be important to provide safe recreational opportunities for all lake users while protecting critical lake habitats and water quality.

- **Provide appropriate and safe public access**

  Town of Star Prairie, SLWCD and local clubs will maintain and repair the boat landing and service dock as needed.

  Town of Star Prairie, WI DNR, SLWCD and local clubs will work to maintain an access channel to the lake by funding repair or dredging projects as needed.

  SLRMD, SLWCD will apply for waterway or other lake management grants as necessary to maintain or repair access to the lake.

  SLRMD will maintain the donation box, using funds collected to support future Squaw Lake projects.

- **Address dissolved oxygen depletion and maintain a high quality sport fishery through aeration.**

  SLRMD, SLWCD and WI Sportsmen's Alliance will put together a plan to address the current aeration system. This will include discussion of maintenance, replacement costs, easements and location of easements and aerators. (ongoing)

  SLRMD will apply for fishery, county aids or other lake management grants as necessary to make major repairs or replacement of major components to the aeration systems. (ongoing, 2010 received County Aids funding to upgrade electrical systems and blower.)

  SLRMD will obtain, secure or resolve long term easement agreements. This may include seeking funds for purchasing permanent easement for the north aerator.

- **Improve the sport fishery through regulation of size and bag limits**

  SLRMD, WI DNR, local clubs continue to support the current 10 bag limit on panfish. Data indicates this rule is effective on Squaw Lake.

  SLRMD, WI DNR, local clubs continue to support the new 14-18" protected slot size limit on largemouth bass. (Passed at annual Spring Hearings in April, 2011 and become law April, 2012.)

- **Restore a recreational fishery for northern pike and walleye through stocking**

  SLRMD, Conservation Congress representatives and WI DNR to determine future options for a recreational fishery through stocking.

WI DNR to continue stocking large fingerling of northern pike on an alternate year basis and assess effectiveness as needed.

WI DNR to seek extended growth walleye fingerlings on an alternate year basis and assess effectiveness as needed.

BACKGROUND

Squaw Lake is located in St. Croix County in the township of Star Prairie, northwest of New Richmond, WI. It is a long, narrow 110 acre lake, with a maximum depth of 32 feet. (WI DNR Lake Information website). It has a 2,700 acre watershed (*the area of land that drains into Squaw Lake*).

The protection of social values, water quality, fisheries, aquatic life and natural beauty of Squaw Lake is dependent upon the continued stewardship of those living in the Squaw Lake Watershed, as well as those who visit and enjoy the lake.

The sediments of Squaw Lake store the water quality history of the lake. Each year the lake deposits a very thin layer of sediment on the bottom of the lake and within this sediment layer is stored the water quality history of that year. A sediment core was taken from Squaw Lake in the late 1980's. This sediment core was then analyzed in several thin layers to reconstruct the water quality history of the lake. The study of lake sediments in a historic time sequence is called paleolimnology. The reconstruction of the water quality history of Squaw Lake found that the Lake had very good water quality until the early 1800's when farming began in the watershed and water quality remained good until the 1940's. After the 1940's water quality continued to degrade to the conditions that are present in the lake today. The sediment core studies give a baseline indication of how much water quality in the lake can be improved if the phosphorus sources which have degraded water quality are significantly reduced. The sediment core study found that the presettlement phosphorus concentration in Squaw Lake was 20 – 25 micrograms per liter, indicating that at one time the lake had good water quality (Garrison).

Phosphorus is the nutrient responsible for stimulating algae growth in Wisconsin lakes. The major sources of phosphorus are agricultural spring runoff during frozen ground conditions, lawn fertilizers and increased runoff from roof tops, roadways and other impervious surfaces associated with developed lake lots.

Algae have the most significant impact on the use of Squaw Lake. Excessive algal growth degrades the aesthetic beauty of the lake, makes portions of the shoreline unsuitable for swimming and causes odor problems around the lake. Lake residents attempted to alleviate nuisance algal blooms by treating the lake with copper sulfate between 1969 and 1984. During the 15-year period, 1980 was the only year the lake was not treated with copper sulfate. Almost 7,000 pounds of copper sulfate were applied to the lake during this period. Lake residents decided to discontinue the use of copper sulfate for algae control in 1985 (Sorge, 1991).

High quality shore land habitats are critical to the protection and production of fisheries and aquatic life. Over 90% of the aquatic life that lives in Squaw Lake is dependent upon the near shore shallow water habitat for some or all life stages. This fact demonstrates why it is critical to protect shoreland and improve degraded habitats on Squaw Lake. Several studies of Wisconsin lakes (Christensen 1996, Schindler 2000, Jennings et al 2003, Woodford and Meyer 2003, Lindsay et al 2002, Garrison et al 2005, and Garrison and Wakeman 2000) have documented that current and historical development practices have been

detrimental to Wisconsin lake ecosystems. Water quality, fish populations, woodland bird populations, frog populations, aquatic insects and plants, and near shore habitat have all been significantly degraded in developed Wisconsin lakes. The protection and restoration of lake shorelines can restore many critical habitat features.

Several studies have been conducted on Squaw Lake to assess the health, condition and to assess protection and restoration potential of the lake. Since 1986, the Wisconsin Department of Natural Resources has conducted trends studies for: water quality, shorelands, fisheries, and aquatic plants to characterize changes. The water quality data collected is used by the statewide monitoring program to improve lake management.

The 1991 Squaw Lake Management Plan was "intended to serve as a blueprint for action to improve and protect water quality and aquatic life in Squaw Lake (Sorge, 1991)." The following recommendations were made to improve Squaw Lake.

Watershed Management

- ✓ 1. The St. Croix River Basin Area wide Water Quality Management Plan should classify Squaw Lake as a high priority for selection as a priority lakes project in the Wisconsin Nonpoint Source Pollution Abatement Program.
- ✓ 2. The SLRMD should work with the St. Croix and Polk County Land & Water Conservation Departments and Committees to develop local support for selection of Squaw Lake as a priority lakes project.

Sediment Phosphorus Management

- ☐ 1. Summer aeration should be used to control the release of phosphorus from the bottom sediments.
- ☐ 2. SLRMD should modify the aeration system prior to using the system for summer aeration.
- ☐ 3. WI DNR should assist SLRMD in developing a funding source to conduct the modifications to the aerations system.

  The use of the aeration system to manage phosphorus was calculated to be too costly and these recommendations were never implemented.

Shoreland Zoning

- ✓ 1. Any lake property owner proposing to conduct any construction or land use activities within the shoreland zone should first contact the County Zoning Office.
- ✓ 2. SLRMD should develop a working relationship with the St. Croix County Zoning office to facilitate having the lake management district review all shoreland zoning permits on Squaw Lake before they are issued by the zoning office.
- ✓ 3. The St. Croix County Zoning office should take actions to insure that documented shoreland zoning violations on Squaw Lake are in compliance with remedial measures required by the St. Croix Zoning Department.

Septic System Maintenance

- ✓ 1. SLRMD and the St. Croix County Zoning Department should work cooperatively to develop a septic system maintenance program to be

implemented by the lake district. *(The maintenance program is currently run by the county.)*

Because of the recommendations of the 1991 Squaw Lake Management Plan, Squaw Lake became part of the St. Croix County Lakes Cluster Priority Watershed Project from 1997-2008. Goals for Squaw Lake focused on moderately improving water quality, and moderate to substantial improvement in shoreland and shallow water habitat, aquatic plant beds, wetlands and fisheries. During this time 7 agriculture producers helped protect Squaw Lake's water quality by reaching and exceeding phosphorus and sediment reduction goals. By participating in agriculture best management practices (BMPs), barnyard phosphorus was reduced by 200 lbs/year (488% of the goal), upland sediment was reduced by 200 T/year (488% of the goal), and critical acres of manure winter spreading were reduced by 27 acres (100% of the goal). One shoreline restoration and six lawn soils test were also done through this project. (Voss)

High phosphorus levels prompted the WI DNR to list Squaw Lake on the 303(d) List of Impaired Waters in 1998. This listing allowed Squaw Lake to be given a TMDL (Total Maximum Daily Load.) The TMDL is the amount of a pollutant a waterbody can receive and still meet water quality standards. A TMDL establishes the amount of pollutant reduction needed from each source to meet water quality goals. The in-lake TMDL Phosphorus concentration has been identified as 130 *ug*/L. In 2000, in-lake phosphorus concentration mean was approximately 270 *ug*/L. (Squaw Lake TMDL, 2000). The 2011 in-lake phosphorus concentration mean was 143 *ug*/L.

Squaw Lake has an intermittent stream that only flows during spring runoff with frozen ground conditions. Agriculture has been named as the primary source of phosphorus to Squaw Lake. The agriculture runoff only reaches Squaw Lake during this spring runoff. All other times of the year, even high summer rainfall events, this intermittent stream is dry. In an effort to capture the 1st runoff event, which has the highest amount of suspended nutrients, a series of wetlands, the Prairie Flats, were recreated. This was a partnership between St. Croix County LWCD, the U.S. Fish & Wildlife Service and Ducks Unlimited.

Monitoring of the Prairie Flats was conducted 2006-2011. The monitoring determined that the wetlands were effective in capturing the first flush of spring runoff. Grab samples collected above and below the wetlands determined that the wetlands are also reducing the suspended solids that enter Squaw Lake. These grab samples also determined that the majority of phosphorus entering Squaw Lake is dissolved, not particulate (Wittmer).

Soil tests were taken from both agricultural fields and shoreline properties during the summer and fall of 2010 following UW-EX field and lawn sampling procedures and analyzed at the UW-Soil lab in Marshfield.

Shoreline phosphorus samples ranged from 20 ppm to 150 ppm. The optimum lawn phosphorus level is 18-24ppm. Of the 66 shoreline soil samples that were taken, only 7 fell within this range; all others were high. Agricultural field phosphorus samples ranged from 18ppm to 125ppm. The optimum crop phosphorus level is 30ppm. Of the 86 agriculture soil samples that were taken, 25 fell below this level; all others were high. The agricultural data was used to provide a P index. This is a planning and assessment tool to evaluate the potential for phosphorus in runoff from a specific field entering the closest receiving water. The P index takes into account soil type, field slope, soil test P, tillage, crop rotation, and distance to a waterway to calculate the index. State Law (WI 590 nutrient management standard) requires an average P index of 6 or less over a rotation (approximately 4 years), not over 12 in a single year. All fields within the Squaw Lake direct drainage watershed have P index's ranging from 0-3, well below this requirement.

SQUAW LAKE REHABILITATION & MANAGEMENT DISTRICT SURVEY 2010

Squaw Lake Rehabilitation & Management District residents were asked to complete a survey during the summer of 2010. Of the 73 lake property owners, 43 replied. The survey asked several questions regarding why people chose to own property on Squaw Lake, their perception of the quality of the lake and a variety of questions related to owning property and recreating on the lake. The majority of residents chose to live on Squaw Lake to appreciate the peace and tranquility (20%), enjoy the view (15%) and as their primary residence (12%) or investment (12%).

Responses were divided 2/3 year-round residents, 1/3 summer and weekend residents. Boating is an important recreation activity on Squaw Lake. All but one resident have at least one boat. The majority of boat owners have both a motorized and a non-motorized boat, such as canoe or paddle boat, showing the importance of motorized and non-motorized recreation activities to Squaw Lake residents. Fishing is also an important recreation activity to Squaw Lake residents. 75% of respondents commented on the quality of fishing in Squaw Lake.

Water quality is a great concern of Squaw Lake residents. Many have noticed reduced water clarity, excessive weeds and large fluctuations in water levels often. 82% list the lake a cloudy or fairly cloudy and 91% list the water quality as poor or fair. 67% say the water quality in Squaw Lake has slightly or greatly worsened since they have owned property on Squaw Lake.

Squaw Lake residents were asked what issues regarding owning waterfront property concern you the most.

1. Excessive aquatic plant growth (18%)
2. Paying property taxes (17%)
3. Lake level (16%)

Water clarity (mid-lake: 8% and end of dock: 13%), protecting the natural lake environment (8%) and aquatic invasive species (5%) will also be addressed as they are related to excessive aquatic plant growth.

LAND USE

There is a common phrase among lake managers – "Lakes are products of their watersheds." Most often the land use of the lands within a watershed will influence the water quality of the lake. Natural land uses such as forest, grasslands and wetlands deliver natural amounts of storm water runoff and nutrients to lakes. The development of land for agricultural or residential purposes significantly increases the amount of storm water runoff and nutrients delivered to lakes.

The Squaw Lake Watershed is largely agriculture. It is mostly cash grain with some acres of row crop for dairy operations. Most of the acres are no-till practices, with occasional strip tillage, chisel plowing and conventional moldboard tillage. Most of the acres are farmed with conservation tillage equipment.

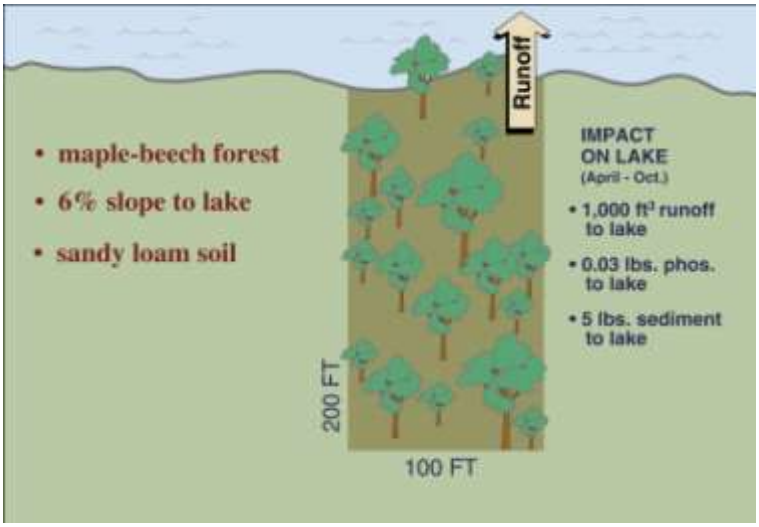
A very high level of watershed management has already been achieved by the farmers in the Squaw Lake watershed. Farmers have implemented land management practices that have minimized soil erosion and significantly reduced phosphorus losses from agricultural fields. The Squaw Lake Watershed P Index numbers range from 0-3, well below the state standard of 6. Also, tolerable soil loss, Soil T, for fields in this watershed are assigned a soil lose of 3-5 tons per acre per year. This is the maximum erosion that soil can have annually and still maintain productivity. Actual Soil T values for this watershed are much less, ½ to 1 ton per acre per year (Kivlin, 2011).

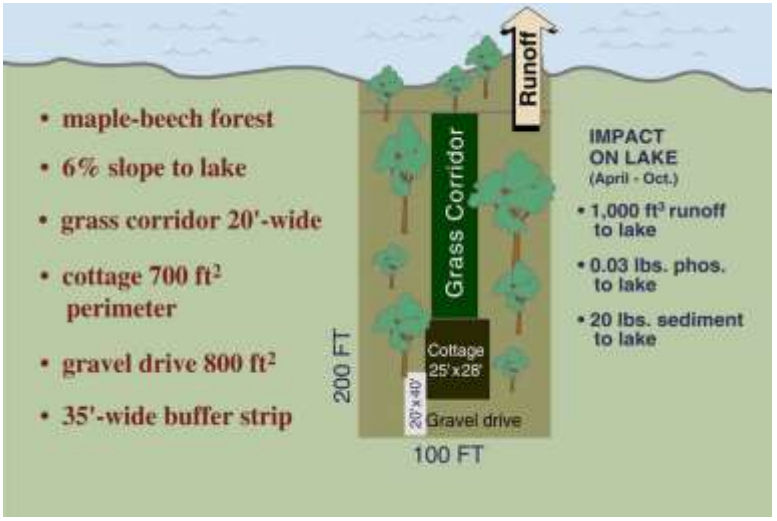
In addition, a phosphorus mass balance shows that more phosphorus is leaving the watershed as agriculture products (i.e. grain and milk) than is being applied to fields. (Casey, 2004).

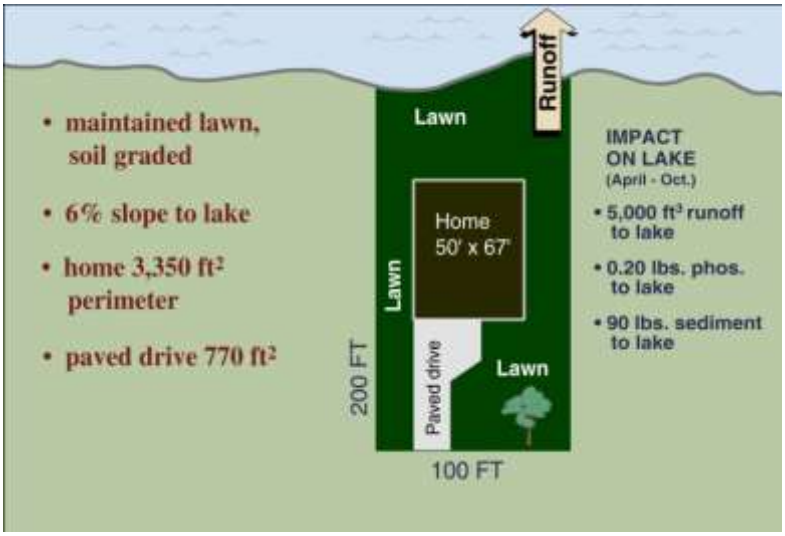
Agricultural land management through the Priority Watershed Program has reduced phosphorus levels by 30-40% (Sorge, 2011). Even with this high level of land management and the Prairie Flats restoration, Squaw Lake still has relatively high levels of phosphorus compared to the water quality goal. Reducing the phosphorus inputs from the watershed will require infiltrating spring runoff water in the watershed.

The development of a riparian property (*a dwelling adjacent to a body of water*) increases water runoff and nutrient inputs to Wisconsin's lakes (United States Geological Survey 2003). Runoff studies conducted on several northern Wisconsin lakes found that phosphorus inputs to lakes from developed lots where 8 times higher than phosphorus inputs from adjacent undeveloped forested lands.

Residential development increases the amount of storm water runoff by: adding impervious surfaces (rooftops, sidewalks, and roadways), decreasing the soils ability to infiltrate storm water due to compaction during construction and changing natural drainage patterns by grading. The concentration of nutrients in storm water runoff is increased by: excessive amounts of yard fertilizers, animal manure, atmospheric deposition and increased soil erosion.





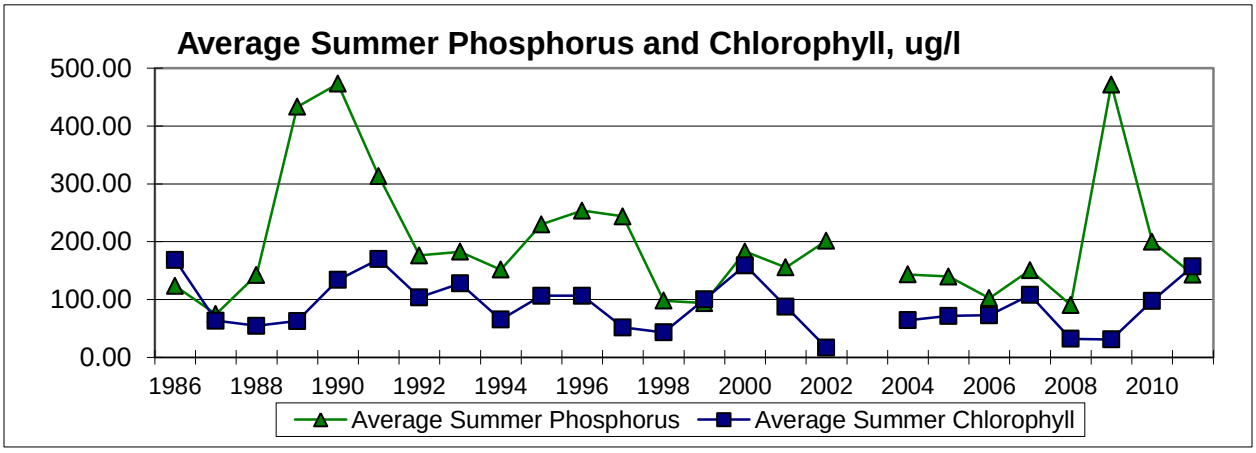


WATER QUALITY

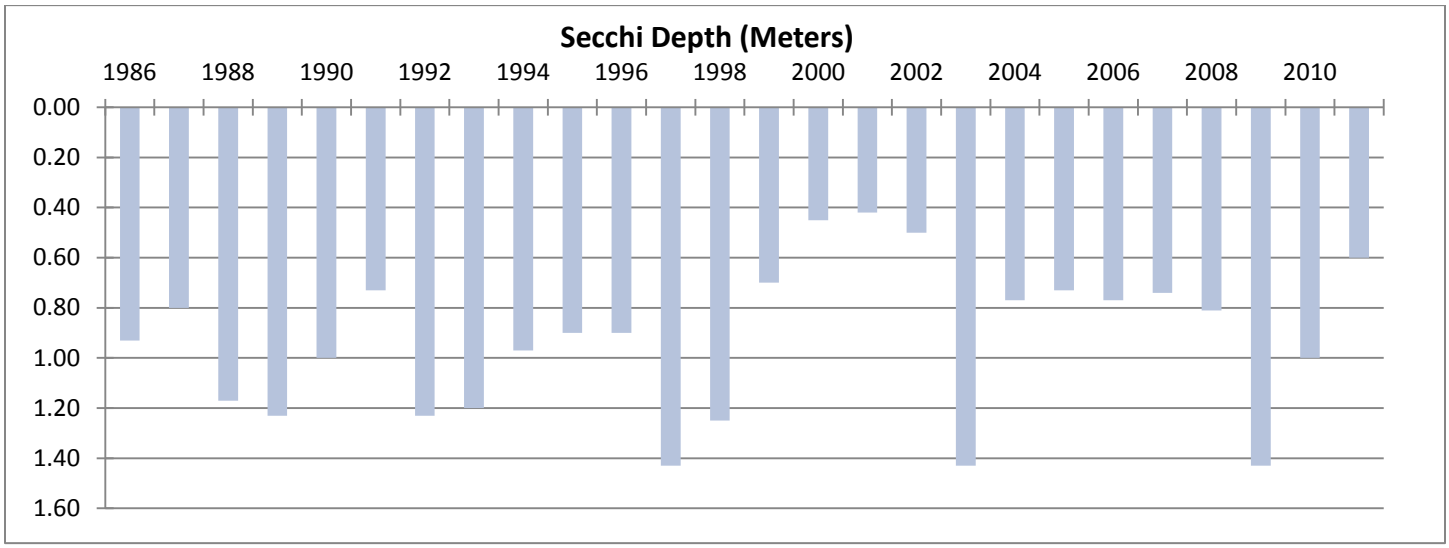
Water quality monitoring is a tool to assess the health of a lake. Measurements of water clarity (secchi depth), algae abundance (chlorophyll) and nutrient enhancement (phosphorus) are used to determine water quality of lakes. To monitor water clarity, a secchi disk is used to measure the depth to which you are able to see. A low secchi depth can indicate low water clarity. Visibility in water can be affected by algae blooms or by natural coloration of the water. (Think of water which has a high amount of iron – the water is dark.) To determine if algae abundance is causing the visibility problems chlorophyll a, a chemical found in plants, is also tested. High amounts of chlorophyll indicate high levels of algae in the water. Phosphorus is the nutrient plants need to grow and that causes algae blooms. High total phosphorus leads to low water quality.

Water quality has been monitored annually in Squaw Lake since 1986 as part of the WI DNR Long Term Trends Monitoring Program. Volunteers have also monitored water quality off and on through the WI DNR Self Help Monitoring Program. Since this monitoring began, Total phosphorus levels have ranged from 75 – 471 micrograms per liter and chlorophyll a levels have ranged from 30 to 170 micrograms per liter.

Phosphorus and Chlorophyll Graph



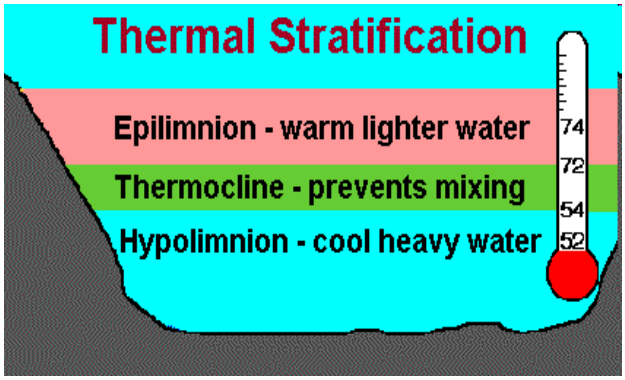
Secchi Depth Graph



Currently, the phosphorus level in Squaw Lake is 146 ug/l (a five year rolling average.) When lake phosphorus levels reach 20 ug/l lakes have more frequent algae blooms and water clarity decreases.

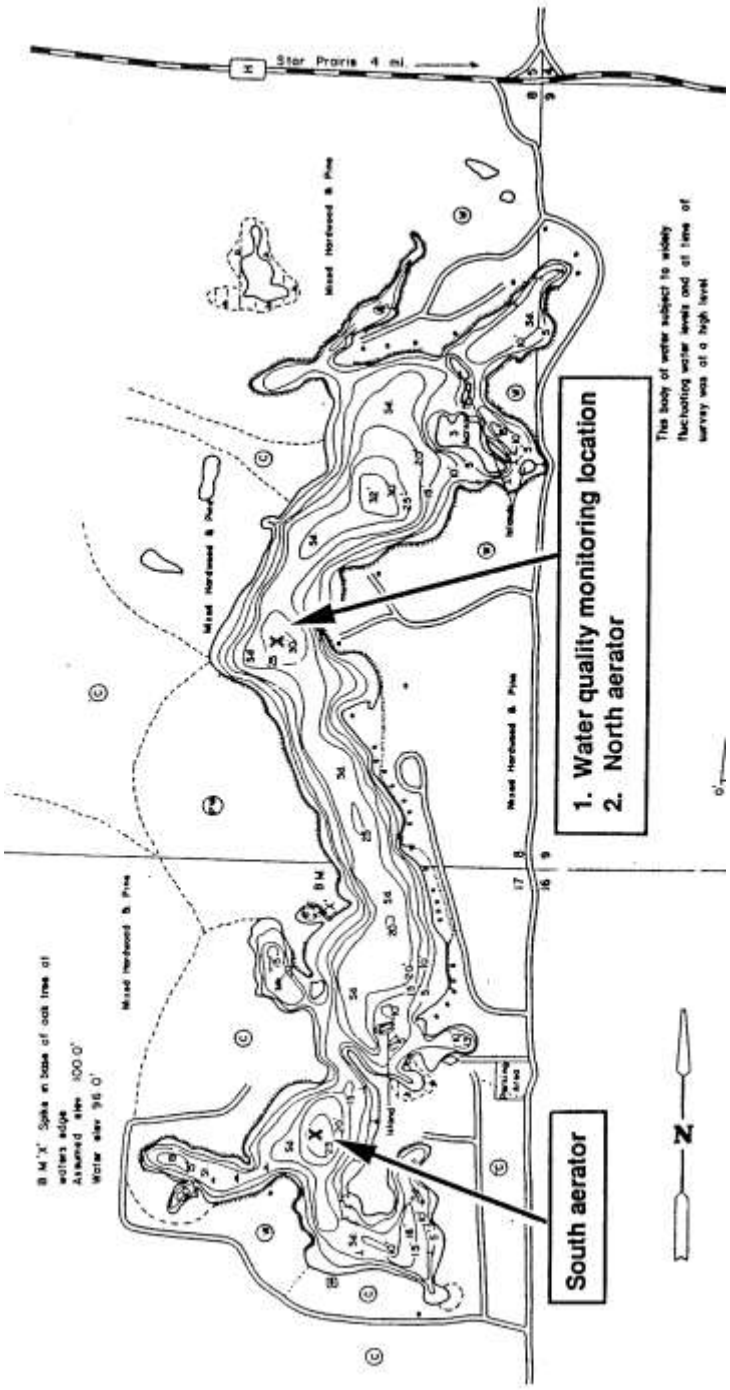
> By late-April there is no oxygen below a depth of 6 feet in Squaw Lake.

Each year as the waters of Squaw Lake warm in late spring and in early summer the lake stratifies into 3 distinct layers by water density. The colder bottom layer (hypolimnion) of the lake is separated by a mid layer (thermocline) from the warmer surface layer (epilimnion). These layers remain stratified into three distinct layers until late fall when the lake mixes top to bottom called turnover. The stratification occurs again during the winter months until spring turnover. Only during these mixing periods is oxygen returned to the lowest layer of the lake. During stratified periods, oxygen is used by aquatic life. In lakes such as Squaw with high algal concentrations, oxygen is completely used up by bacteria as it decomposes lake sediments. This loss of oxygen is called hypoxia and is an indication of declining water quality. By late-April there is no oxygen on average below a depth of 6 feet in Squaw Lake. This means no fish can survive below 6 feet. Hypoxic conditions also lead to a release of phosphorus from the sediments back into Squaw Lake. The released phosphorus can then be used by algae, leading to an algae bloom and exacerbating the algae problem. Before aerators were installed in Squaw Lake, oxygen levels in the lake often were depleted over the winter to such low levels that the fish often died. This condition is known as winterkill.



Winterkill conditions develop in the lake when the consumption of oxygen by bacteria decomposing the bottom sediments exceeds the amount of oxygen stored in the lake during fall mixing and the oxygen produced under the ice by algae and aquatic plants. Algae and aquatic plants continue to produce oxygen under the ice until snow and ice decreases the sunlight entering the lake to levels where the algae and plants can't produce oxygen. A winterkill of the fish will occur if the oxygen levels in the lake are depleted before the ice melts from the lake in the spring.

Winterkill occurred on the average every 7.5 years between 1954 and 1986. Winterkills are now prevented from occurring by an aeration system which was installed in the lake during the winter of 1988-1989. This system provides sufficient mixing of lake water with the atmosphere to increase dissolved oxygen levels high enough to insure the winter survival of the fishery (Sorge).



WATER QUALITY MODELING

Water quality models are computer based mathematical models which simulate lake water quality and watershed runoff conditions. The models are based on the mathematical representation of lake functions which determine lake water quality and a paleolimnological reconstruction of water quality conditions from the 1700's to present. The model is a tool which assists in predicting changes in water quality when watershed management activities are simulated. The model can answer the question: "what is the estimated water quality improvement when watershed sources of phosphorus are reduced?" It must be acknowledged that models predict a relative and not an exact environmental response.

Water quality in Squaw Lake is determined by the quality of spring runoff that enters the lake each year and the amount of phosphorus that is released from the bottom sediments into the overlying water. A hydrologic analysis predicts 420 acft of spring melt runoff in the Squaw Lake Watershed, assuming a two inch spring melt (Donavon, 1998). Of that 100 acft are captured in the Prairie Flats restoration, 20 acft are captured in existing infiltration, and the remaining 300 acft will need to be infiltrated in order to meet the water quality goal. A laboratory study determined the rate of internal phosphorus loading from bottom sediments. Alum is a source of aluminum that ties up phosphorus in the lake sediments and makes it unavailable for algae growth. An alum treatment to a 10-cm sediment depth is needed to meet the water quality goal (James, 2003).

The water quality model predicts that if spring runoff melt water can be stored in the watershed and allowed to infiltrate and enter the lake through groundwater, water quality will be drastically improved. To achieve the water quality goals the water quality model also predicts that phosphorus released from the deep sediments must also be controlled (McGinly & Nitka, 2011). By controlling spring runoff waters and eliminating the release of phosphorus from the deep lake sediments lake water quality can be restored to a time when Squaw Lake had very good water quality. Achieving this goal will require a very high level of spring runoff management and treating the deep sediments with alum to prevent the release of phosphorus into the lake.

FISHERIES

Historically, Squaw Lake was a bass/panfish fishery and is managed that way today with the addition of northern pike. WI DNR data beginning in the 1950's shows poor water quality in Squaw Lake and the fishery shifting towards bullheads. In 1956, WI DNR used "Toxafine" to kill off the Bullheads and restocked the lake with desirable species (walleye, bass and panfish).

Largemouth bass

Due to high nutrient levels and excessive algal growth, Squaw Lake suffered from low dissolved oxygen levels. The result of the low oxygen levels was seven fish winter kills between 1955-1990. These winter kills would affect mostly the desirable species, and cause the fishery to again shift towards bullheads. In 1989, two aeration units were installed (one in the southern bay and one in the north) to

prevent oxygen levels from dropping during the winter. No winter kills have occurred since.

After the aeration units were installed, walleye, largemouth bass and panfish were again stocked. Walleye stocking success was initially excellent following aeration, however walleye stock survival declined and became ineffective once self-sustaining bass/panfish populations were established. Walleye stocking was officially discontinued in 2001.

Bluegill

Fishing pressure on Squaw Lake is higher than other lakes in the region. 1996 saw the highest fishing pressure at ~ 400 hours/acre. In comparison, most lakes average 15 hrs/acre. This high fishing pressure led to the collapse of the panfish fishery on Squaw Lake. Bluegill dropped from 70 quality fish/mile in 1996 to 19 quality fish/mile in 2001. (Quality bluegill are larger than 7 inches.) In 2004 a 10 bag limit was enforced for Squaw Lake. (Previous bag limit was 25.) WI DNR Fisheries is in the midst of an 8 year study (ending in 2012) on the affects of this bag limit. Current data shows a great improvement over the past 5 years in the bluegill fishery; in 2010 there were 158 quality fish/mile. Largemouth bass are common and appear to have good reproduction. However, the number of legal size fish have declined substantially. The current bag limit is 5 fish over 14". A protected slot size limit of 14-18" fish with a three bag limit may help improve the quality of bass populations. The northern pike fishery is dependent on stocking to support a recreational fishery. Currently populations are low, but the quality of fish are high.

Northern Pike

The amount of littoral zone habitat influences fish populations. Currently, excessive algal growth provides fish cover and hiders the growth of submergent and emergent aquatic plants. The improvement of Squaw Lake water quality will have an effect on its fishery. The replacement of near shore habitat (submergent and emergent aquatic plants) and large woody habitat will be important for panfish and bass spawning success.

AQUATIC PLANTS

Aquatic plants form the foundation of healthy and flourishing lake ecosystems - both within lakes and rivers and on the shores around them. They not only protect water quality, but they also produce life-giving oxygen. Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus and nitrogen that could stimulate algal blooms. Plant beds stabilize soft lake and river bottoms and reduce shoreline erosion by reducing the effect of waves and current. Healthy native aquatic plant communities help prevent the establishment of invasive non-native plants like Eurasian Watermilfoil.

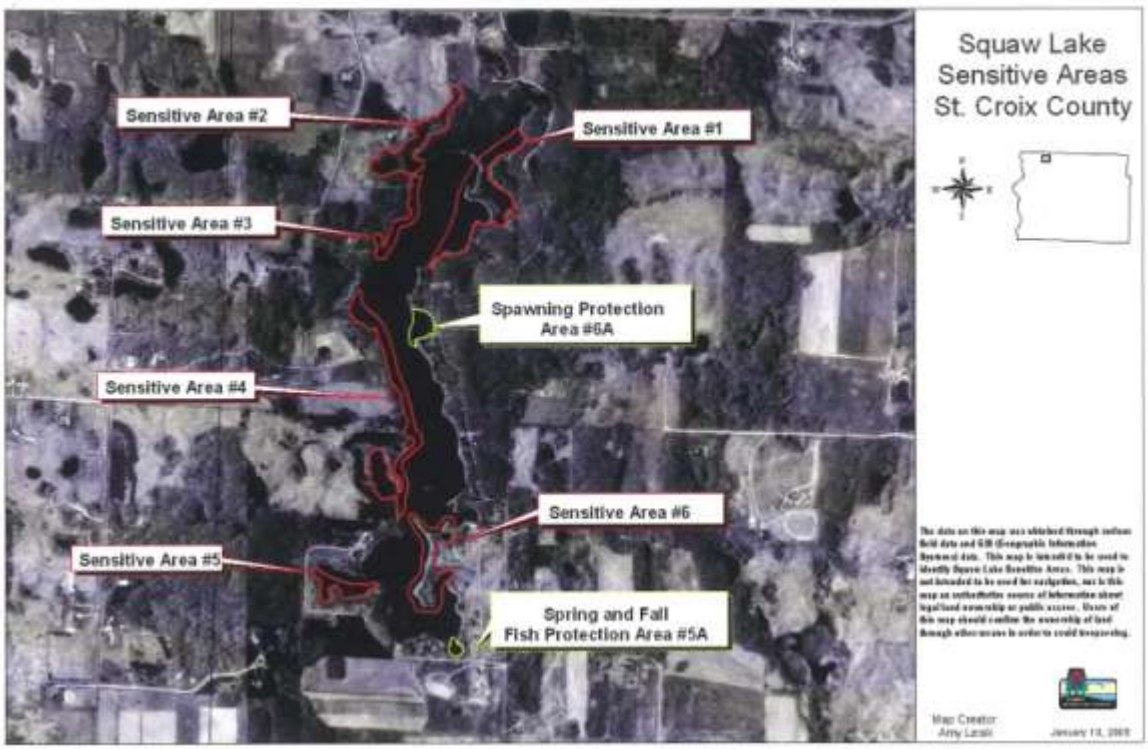
Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus.

It makes sense that the best fishing spots are typically near aquatic plant beds. Aquatic plants provide important reproductive, food, and cover habitat for fish, invertebrates, and wildlife. It is aquatic plants that fashion a nursery for all sorts of creatures ranging from birds to beaver to bass to bugs. In order to maintain healthy lakes and rivers, we must maintain healthy native aquatic plant communities.

Aquatic plant populations have been monitored in Squaw Lake from 1986-present. Aquatic plant studies have been conducted every three years by the WI Department of Natural Resources as part of the *Long Term Trends Lakes Monitoring Program*. The most recent study was conducted in 2005. The aquatic plant community has undergone significant change during 1986-2005. Over all, there were increases in the number of species, the percentage of vegetated sites, the coverage of emergents, free-floating and submergents, the quality of the plant community and species diversity (Konkel 2007).

SENSITIVE AREAS

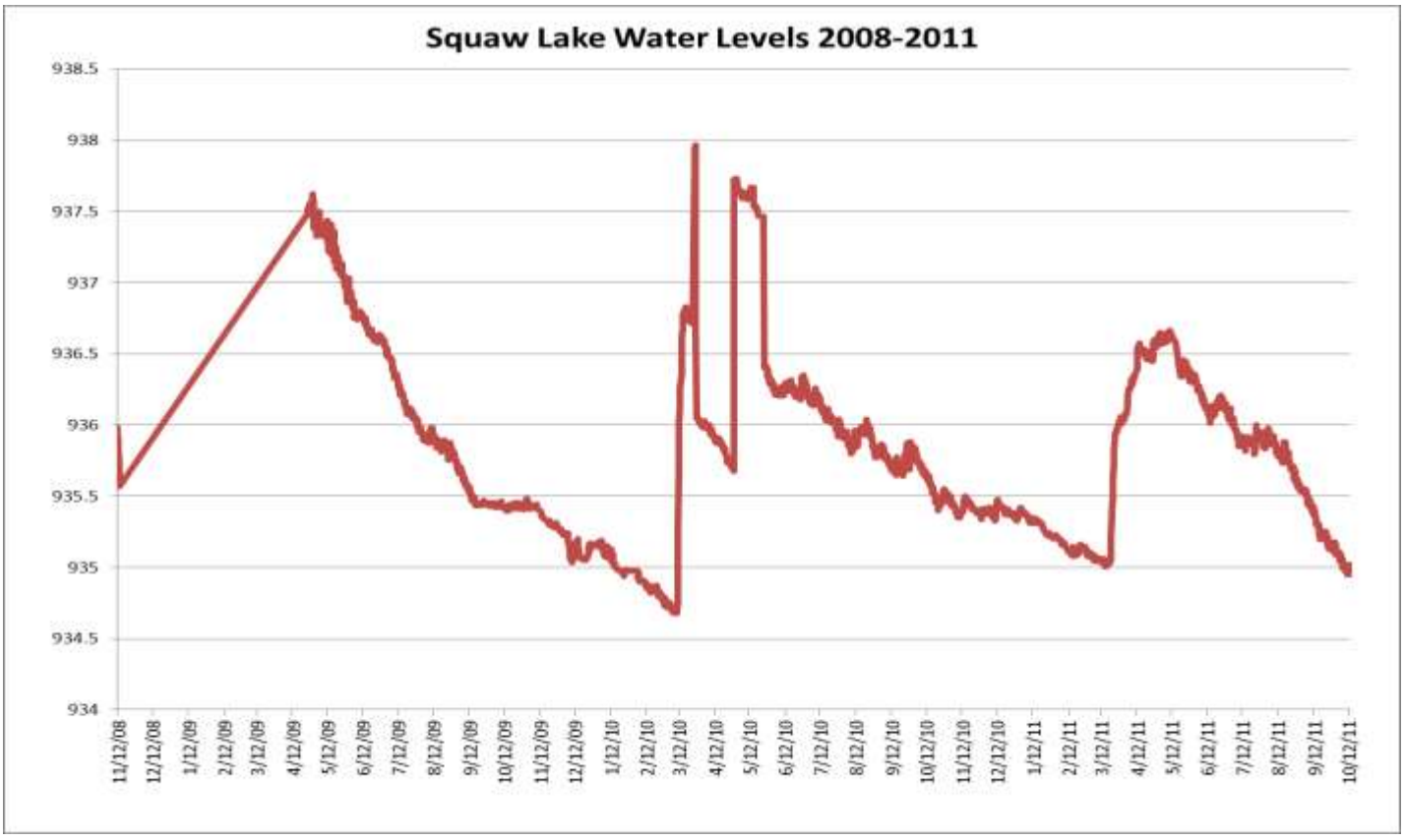
A *Sensitive Area Designation* was conducted by the WI Department of Natural Resources in 2004. Six sensitive areas were identified in Squaw Lake, with an additional two protection areas for fish. Designation of sensitive areas within a lake provides a holistic approach to the protection of those sites within a lake that are most important for preserving the very character and qualities of the lake that initially attracted developments on the lake. These sites are those sensitive and fragile areas that support the wildlife and fish habitat, provide the mechanisms that protect the water quality in the lake, harbor quality plant communities and preserve the places of serenity and aesthetic beauty for the enjoyment of lake residents and visitors (WI DNR, Designation of Sensitive Areas, p. 1). By identifying and mapping these sensitive areas we are able to preserve and protect the most critical habitats within Squaw Lake. http://DNR.wi.gov/lakes/criticalhabitat.



LAKE LEVELS

Squaw Lake is a seepage lake. It has an intermittent stream that only flows during spring runoff. As landlocked waterbodies, the main source of water is groundwater and precipitation or runoff. Since seepage lakes commonly reflect groundwater levels and rainfall patterns, water levels may fluctuate seasonally, rising with high precipitation and dropping during long droughts. Seepage lakes are the most common lake type in Wisconsin. The following Lake level photos show this change in different years.

A groundwater field investigation in 2011 confirmed this is affecting Squaw Lake. Under current groundwater conditions (drought) there is no groundwater movement into the lake and a slight movement out of the lake (McGinley & Nitka). Though spring runoff causes the lake level to rise, this runoff slowly seeps out of the lake all summer until the lake is again at the level of the surrounding groundwater (Wittmer). This can be seen in the lake level graph.



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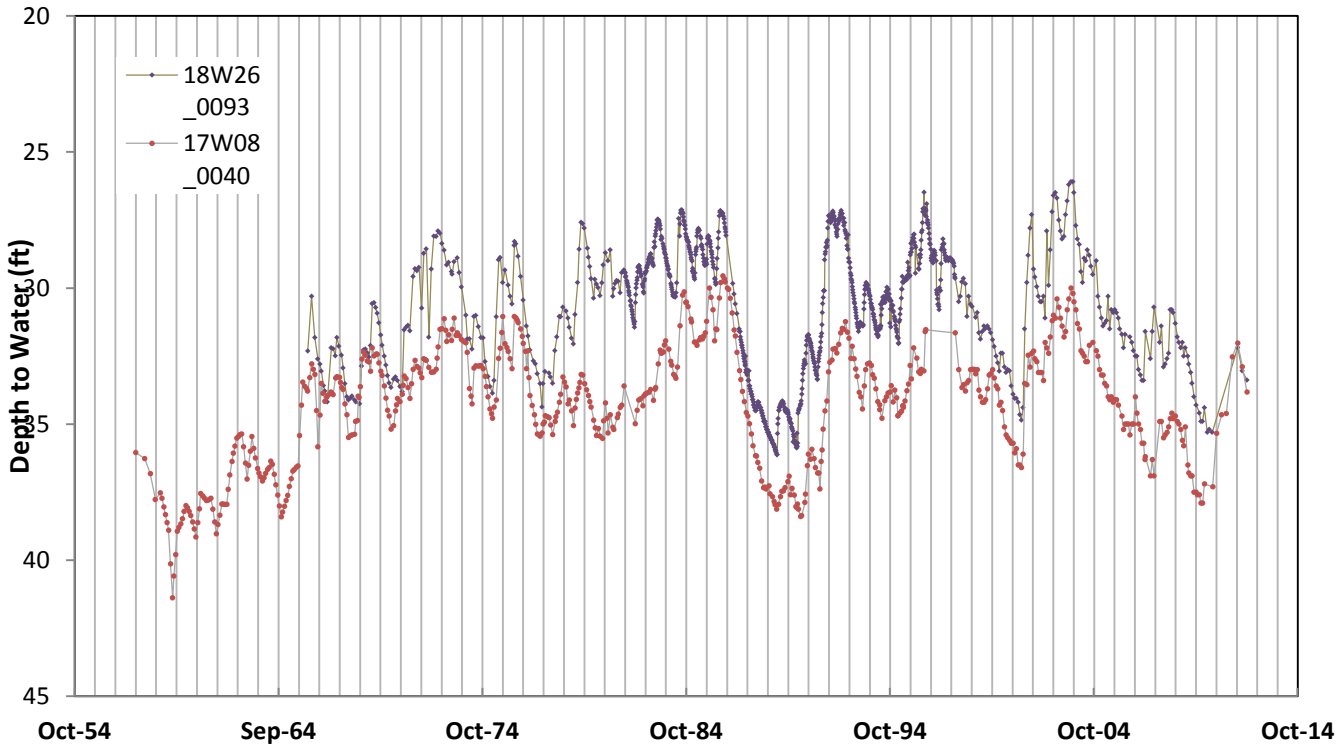
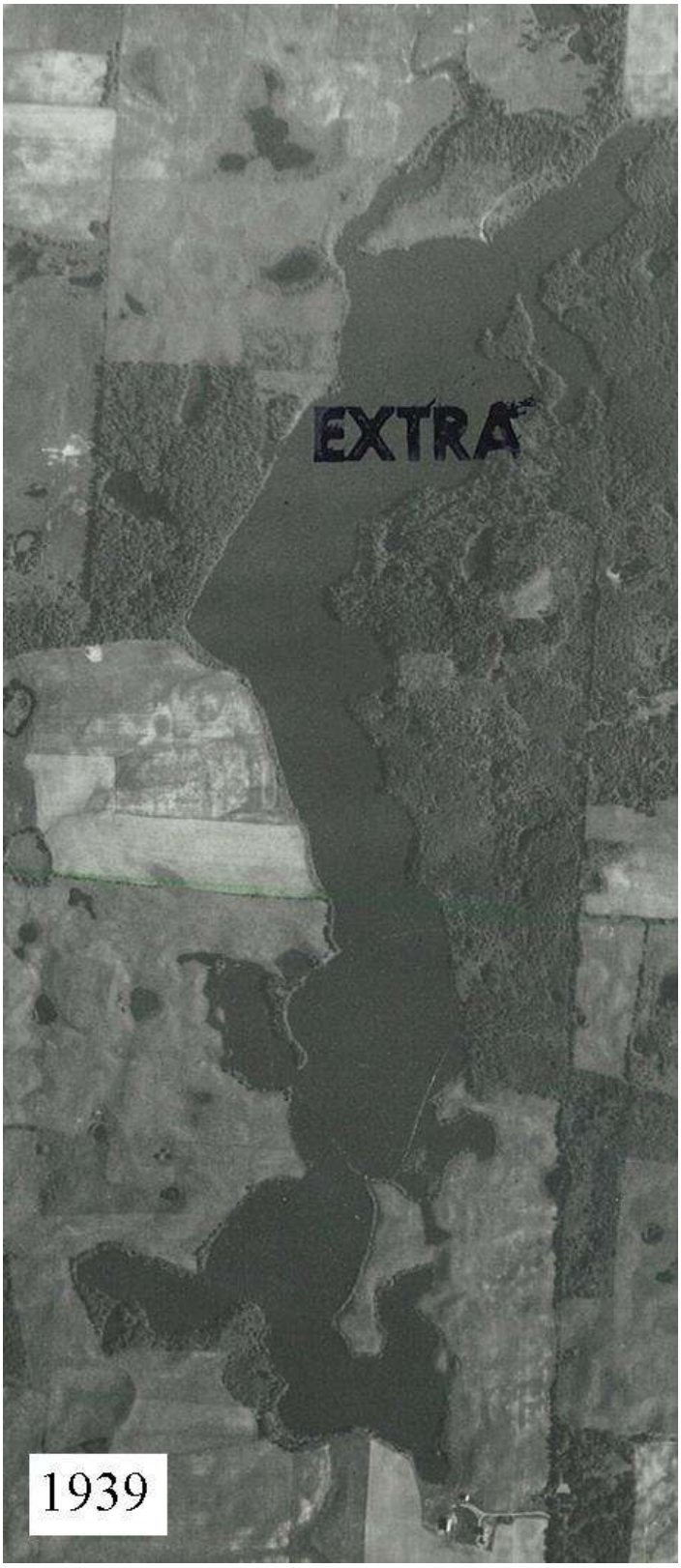
Long Term Monitoring Well Level Graph



Groundwater levels throughout the area are low. Surrounding lakes such as Perch and Bass are low; area long term monitoring wells show groundwater levels are very low, as seen in the graph above. Squaw Lake level will always reflect the surrounding groundwater and until local groundwater levels return, Squaw Lake will remain low.

Lake Level Photos




1958


1965


1973


1992


2004


2005


2006


2008


2010

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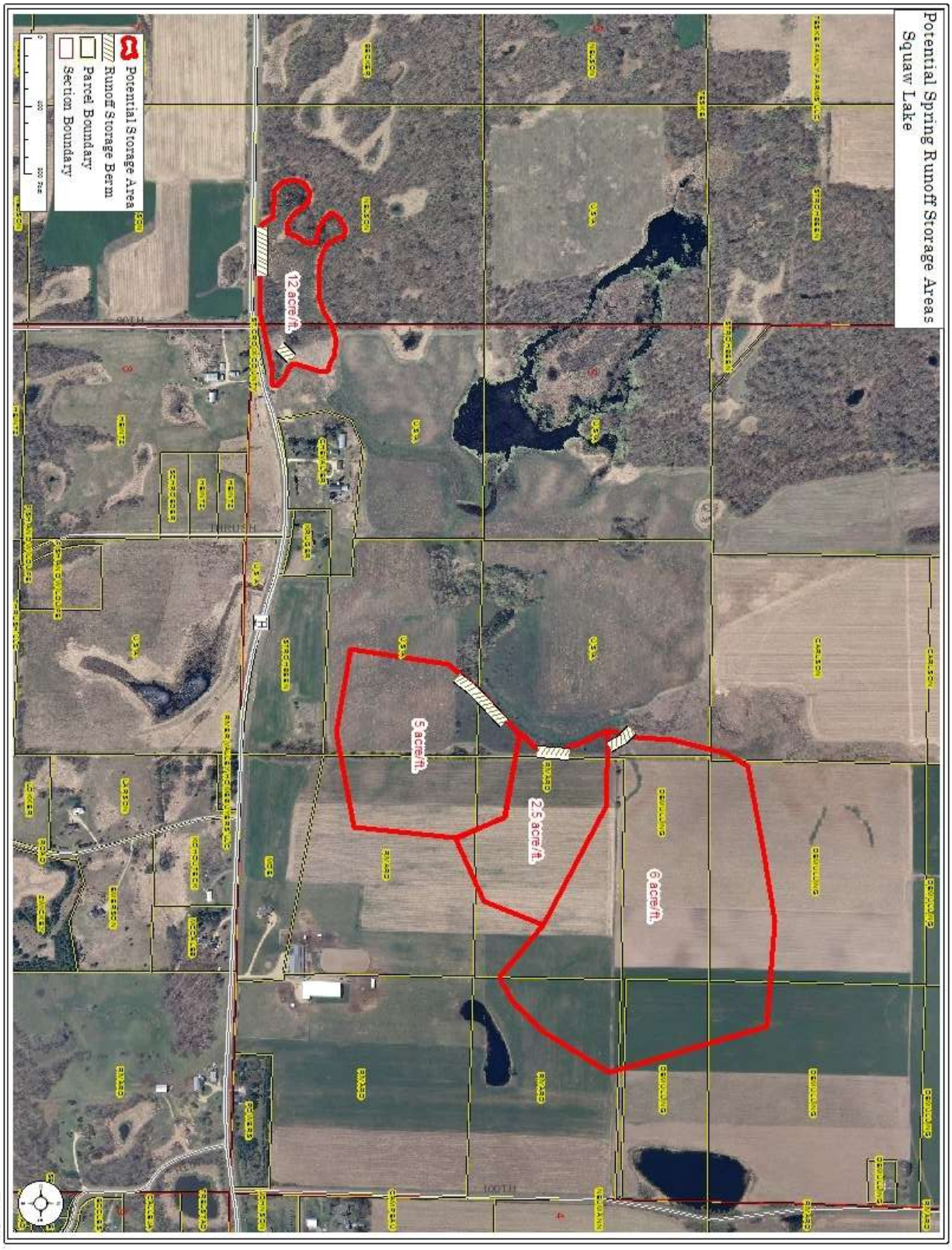
APPENDIX A: Potential Storage Area Map



APPENDIX B: Squaw Lake Survey Results

1. In what year did you purchase your lake property?

Average: 1988 Blank: 6

50's - 2	70's - 3	90's - 15
60's - 4	80's - 5	00's - 10

2. Why did you buy property on a lake?

Order of importance based on %

D.	Appreciating peace and tranquility	20%
E.	Enjoying the view	15%
C.	Investment	12%
O.	Primary residence	12%
A.	Spending time with family	11%
I.	Fishing/ice fishing	10%
P.	Secondary residence	4%
H.	Observing wildlife	3%
L.	Motorized boating	3%
B.	Entertaining friends	2%
J.	Swimming/SCUBA/snorkeling	2%
G.	Water quality	1.5%
M.	Water skiing/tubing	1.5%
Q.	Other:	1.5%
F.	Water clarity	1%
K.	Non-motorized boating	0%
N.	Jet skiing	0%

Order of Importance based on weighted score

D.	Appreciating peace and tranquility	48
O.	Primary residence	43
A.	Spending time with family	33
E.	Enjoying the view	32
C.	Investment	28
I.	Fishing/ice fishing	26
P.	Secondary residence	11
H.	Observing wildlife	6
J.	Swimming/SCUBA/snorkeling	6
L.	Motorized boating	5
Q.	Other:	5
M.	Water skiing/tubing	4
B.	Entertaining friends	3
F.	Water clarity	3
G.	Water quality	3
K.	Non-motorized boating	0
N.	Jet skiing	0

10 Blank

Q:

*snowmobiling

* if lake was cleaner swimming & fishing

*price

*plant trees and preserve nature

3. Why did you choose property on Squaw Lake?

Order of importance based on %		Order of Importance based on weighted score	
C. Cost of property	27%	F. Met your needs from Question 2	68
F. Met your needs from Question 2	25%	C. Cost of property	57
A. Distance from primary residence	19%	A. Distance from primary residence	51
D. Low number of people using the lake	18%	D. Low number of people using the lake	38
G. Other:	7%	G. Other:	17
E. Because of the neighborhood	3%	B. Family tradition	6
B. Family tradition	2%	E. Because of the neighborhood	5

9 Blank

G:
* Snowmobile trails
*Smaller lake - less boating activity
*Plan on building house in the future
*Good Investment
*Wanted a lake home and it was closest to one of two jobs
*Distance from work

4. Which of the following best describes when you use your lake property?

10 Weekends
1 Vacations/Holidays
0 Summertime resident
6 Spring/Summer/Fall
24 Year round resident
5 Other:

Other:
*occasional use *weekdays

*rarely *do not use at this time

5. What structures exist on your property?

26 Winterized house
12 Summer cottage
0 Boathouse
29 Garage/storage shed
23 Dock/pier
7 Other:

Other:

*trailer home *none
*mobile trailer *none
*pole barn *gazebo
*none

6. How many of the following watercraft are kept at your property?

19 Canoe/Kayak
10 Rowboat
0 Sailboat
3 Jet ski
11 Motor boats under 25 HP
23 Motor boats 25 HP and over
15 Other:
1 Blank

Min watercraft: none
Max watercraft:

Other:

*paddle boat
*pontoon 35 HP
*pontoon
*2 canoes and 1 pontoon
*fishing boat is electric
*2 motor boats under 25 HP
*none
*pontoon boat
*2 motor boats 25 HP & over
*pontoon
*paddle boat
*none
*none
*2 canoes
*pontoon & paddle boat
*pontoon & paddle boat

7. How many feet of lake frontage do you own?

Average: 264 ft Max: 1000 Min: 50 9 Blank

8. Which of the following best describes your shoreline?

44 Natural vegetation
12 Lawn
1 Planted trees or shrubs
0 Masonry retain wall
0 Wood retaining wall
1 Rocks added for stabilization
1 Other:
0 Blank

Other:
*not developed

9. Do you maintain a lawn on your property?

41 Yes
5 No: skip to question 11
Blank

10. If you have a lawn, do you ever apply fertilizer containing phosphorus?

11 Yes
23 No
4 Unsure
1 Blank
skipped to question 11

Notes:
*one person has Tru Green Chem Lawn service
*fertilizes part of yard away from lake
*no phosphorus
*home-yes, access-
no

11. During the time you have owned property on Squaw Lake to what extent have you noticed the following occur on this lake?

	Never	Occasionally	Often	Blank	Don't Know	Occasionally + Often
Reduced water clarity	1	8	36	1	0	44
Excessive weeds	1	1	42	2	0	43
Sedimentation	14	13	5	10	3	18
Large fluctuations in water levels	3	8	32	2	0	40
Erosion	20	11	4	9	**2**	15
Unusual water smell or coloration	6	10	21	7	2	31
Failing septic systems	25	4	0	12	5	4

12. How would you define the water clarity of Squaw Lake?

32 Cloudy
5 Fairly cloudy
6 Unsure
2 Fairly clear
0 Clear
1 Blank

13. How would you define the water quality of Squaw Lake?

33 Poor
8 Fair
4 Unsure
0 Good
0 Excellent
1 Blank

Notes:
*bad since the WI DNR built the holding pond on the North end of the lake!

14. Since you have owned your property on Squaw Lake, would you say the water quality has:

18 Greatly worsened

11 Slightly worsened
7 Remained the same
7 Slightly improved
0 Greatly improved
2 Blank

15. Do you believe that establishing or maintaining native vegetation, such as a buffer zone, along your shoreline…

a. Improves the water quality of Squaw Lake?

3 Definitely no
6 Probably no
11 Unsure
15 Probably yes
11 Definitely

b. Enhances the beauty of your property?

8 Definitely no
9 Probably no
13 Unsure
10 Probably yes
6 Definitely yes

c. Increases the economic value of your property?

8 Definitely no
11 Probably no
17 Unsure
7 Probably yes
3 Definitely yes
___ Blank

Notes:

*15a: too much phosphorus coming in creek and already in lake

16. Which, if any, are contributing to water quality problems in Squaw Lake?

Major problem	Moderate problem	Not a problem	Don't know	Blank	Major/Moderate Problem

Fertilizers & pesticides from residential development	6	8	8	16	8	14
Soil erosion from:						
1. Residential areas	2	6	18	15	5	8
2. Construction areas	0	8	17	16	5	8
3. Agricultural areas	8	12	8	14	4	20
4. Natural shorelines	1	5	22	14	4	6
5. Developed shorelines	2	9	15	15	5	11
Stormwater running off:						
1. Streets, highways, parking lots	0	4	25	11	6	4
2. House roofs, driveways, and residential lands	2	11	18	11	4	13
3. Agricultural land	18	7	5	12	4	25
Accidental spills of gas/oil from boats in the lake	1	8	17	16	4	9
Loss of natural shoreline to lawns and development	2	12	14	13	5	14
Yard or grass clippings or leaves disposed of in lake	3	4	17	17	5	7
Improper disposal of household chemicals	2	3	15	21	5	5
Introduction of non-native plants and animals	5	4	12	21	4	9
Animal waste (pets, geese, etc.)	3	9	15	15	4	12
Septic systems	2	6	12	22	4	8
Other: please list					1	0

Notes:

*WI DNR actions have reduced the lake level by more than 6ft!
*other watershed runoff-accumulated phosphates at bottom of lake
*geese
*you're supposed to be the experts, not me!
*other: litter = moderate problem
*low water levels since dike system put in a while ago - no fresh water coming in

17. Do you think the water that runs off your property negatively impacts Squaw Lake?

20 Definitely no
17 Probably no
7 Unsure
2 Probably yes
0 Definitely yes

18. How would you rate the fishing in Squaw Lake?

3 Poor
16 Fair
4 Unsure
8 Good
4 Excellent
11 N/A: I don't fish → *Skip to question 21*
0 Blank

19. How has the quality of fishing changed since you started?

10 Greatly declined
15 Somewhat declined
8 Stayed the same
1 Somewhat improved
0 Greatly improved
11 Skipped to question 21
1 Blank

20. If you indicated that fishing quality has declined, what do you think has contributed to the decline?

Order of importance based on %		Order of Importance based on weighted score	
C. Over fishing	29%	C. Over fishing	48
L. Other	16%	L. Other	20
J. Agriculture	13%	J. Agriculture	15
K. Weeds	11%	A. Loss of habitat	12

A. Loss of habitat	10%
D. Fertilizer use	5%
F. Development	5%
G. Heavy recreation	3%
I. Herbicides	3%
B. Shoreline damage	2%
E. Soil erosion	2%
H. Septic systems	2%

K. Weeds	11
F. Development	6
D. Fertilizer use	4
I. Herbicides	4
B. Shoreline damage	2
E. Soil erosion	2
G. Heavy recreation	2
H. Septic systems	2

11 Skipped to question 21

11 Blank

L:

*winter kill

* low water

*WI DNR holding pond causing water level to drop

*low water

*low water

*water is bad

*algae

21. How would you describe the overall shoreline of Squaw Lake?

1 Overdeveloped
26 Moderately developed
3 Unsure
14 Lightly developed
2 Natural

22. What is the level of aquatic plant growth in Squaw Lake?

Dense growth	1	18
	2	16
	3	5
Unsure	4	5
	5	0
	6	0
Very light growth	7	0

23. How would you rate the peace and tranquility on Squaw Lake?

Many disturbances	1	1
	2	1

	3	3
Unsure	4	5
	5	14
	6	14
No disturbance	7	8

24. What is the level of boat traffic on Squaw Lake?

Overused	1	0
	2	3
	3	8
Unsure	4	16
	5	10
	6	7
Underused	7	2

25. How have your experiences been with other boaters?

Major conflict with boats	1	0
	2	0
	3	2
	4	4
Unsure	5	7
	6	6
No conflict with boats	7	25

26. What is the level of public access to the lake?

Overwhelming access	1	1
	2	5
	3	15
Unsure	4	12
	5	5
	6	3
Not enough access	7	2

27. What issues regarding owning waterfront property on Squaw Lake concern you the most?

Order of importance based on %		Order of Importance based on weighted score	
F. Excessive aquatic plant growth	18%	A. Paying property taxes	58

A. Paying property taxes	17%	F. Excessive aquatic plant growth	45
H. Lake level	16%	H. Lake level	44
D. Water clarity at the end of my dock	13%	D. Water clarity at the end of my dock	40
B. Maintaining the investment value of my property	12%	B. Maintaining the investment value of my property	37
C. Protecting the natural lake environment	8%	C. Protecting the natural lake environment	19
E. Water clarity in the middle of the lake	8%	E. Water clarity in the middle of the lake	12
K. Fishing opportunities	3%	K. Fishing opportunities	6
I. Aquatic invasive species	2%	I. Aquatic invasive species	5
J. Loss of natural scenery	1.5%	J. Loss of natural scenery	4
L. Other:	1.5%	L. Other:	2
G. Boat Traffic	0%	G. Boat Traffic	0

L:
* motors over 75 HP

Notes
*27A - taxes too high

28. What water quality practices do you already have/do on your property?

23 35' Buffer zone or greater
12 Downspouts directed away from the lake
37 Natural shoreline
30 Don't fertilize
5 Rain gardens
2 Rain barrels
2 Rain infiltration areas
28 Leave aquatic vegetation
3 Other:
__ Blank

Other:
*fertilize only with nitrogen
*added native plants to shoreline
*collect grass clippings
*leave grass

29. What would motivate you to install a water quality practice, such as a shoreline buffer or rain garden, on your property?

Order of importance based on %		Order of Importance based on weighted score	
A. Improving lake water quality	30%	A. Improving lake water quality	76
C. Providing better habitat for fish and wildlife	15%	F. Available financial and technical assistance	27
B. Improving water quality around my dock	12%	B. Improving water quality around my dock	24

F. Available financial and technical assistance	12%	C. Providing better habitat for fish and wildlife	23
J. Increasing my property value	12%	J. Increasing my property value	21
D. Increasing the natural beauty of my property	6%	D. Increasing the natural beauty of my property	11
E. Displaying a commitment to the environment	5%	I. Increasing my privacy	10
I. Increasing my privacy	5%	E. Displaying a commitment to the environment	9
K. Other:	2%	K. Other:	5
G. Setting an example for other lake residents	1%	G. Setting an example for other lake residents	3
H. Savings on landscaping/maintenance costs	1%	H. Savings on landscaping/maintenance costs	2

9 Blank

K:
*already have a shoreline buffer
*trying to sell
property
*someone would have to prove it would help
*I need to see results of good research that these practices improve water quality