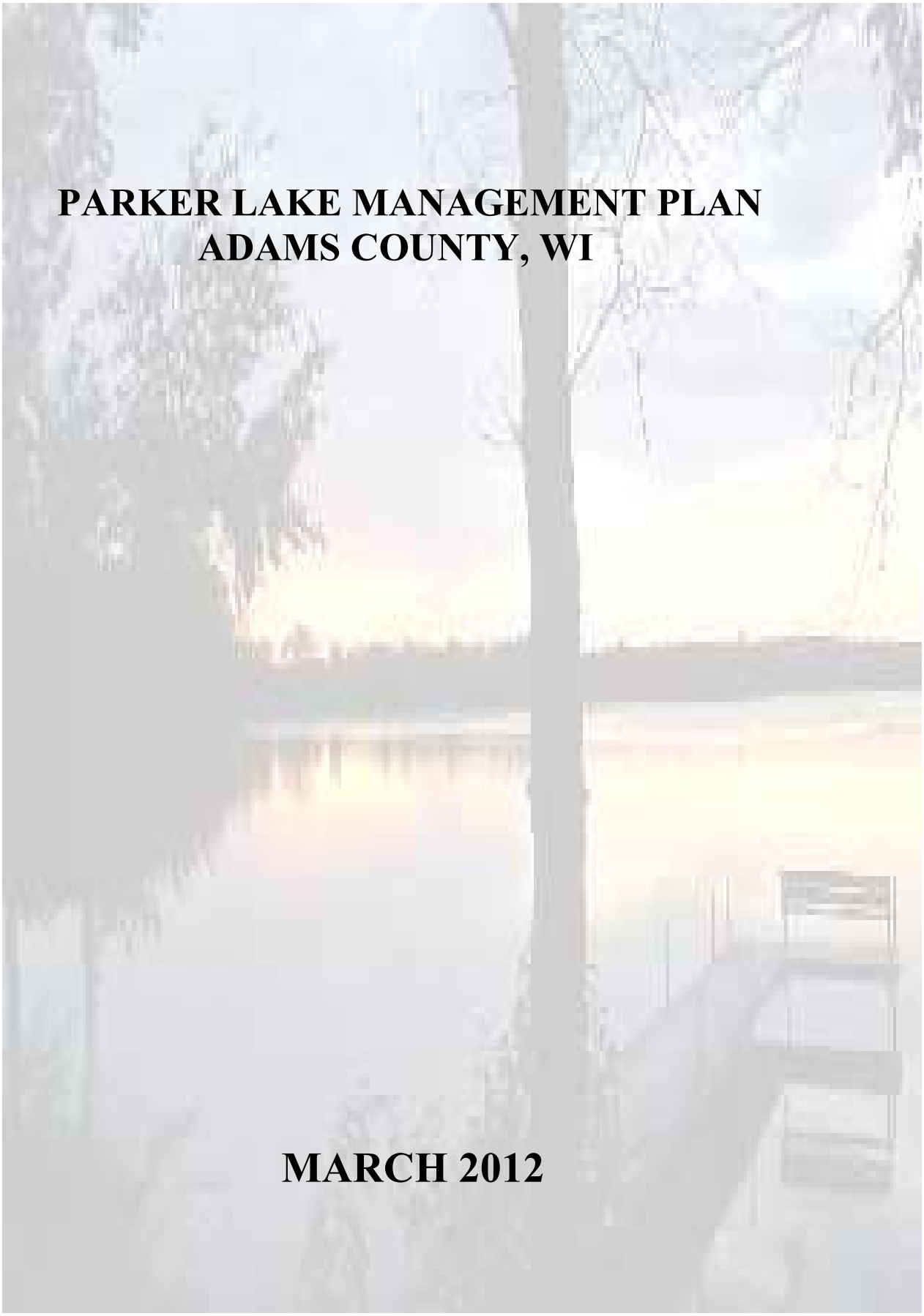

PARKER LAKE MANAGEMENT PLAN
ADAMS COUNTY, WI

MARCH 2012

PARKER LAKE WATERSHED MANAGEMENT PLAN

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PROCEDURE FOR MODIFYING LAKE MANAGEMENT PLAN

The Parker Lake Association will maintain an agenda item of "modifying lake management plan" on its meeting notices. Although suggested changes or additions can be presented at any time, they will only be acted upon at the annual meeting. The Lake Advisory Group will meld with the Lake Management Committee, which will function as a research and advisory group for the Lake Association.

BASELINE INFORMATION

The Parker Lake Surface Watershed, located Jackson Township, Adams County, Wisconsin, is a fairly small watershed. The ground watershed is also entirely in Jackson Township and slightly smaller than the surface watershed. The ground watershed lies west and north of the lake itself. There are no major streams in either watershed.

Parker Lake is a natural seepage lake. A seepage lake is a natural lake fed by precipitation, limited surface runoff and groundwater. The water level of a seepage lake is affected greatly by variations in the groundwater level.

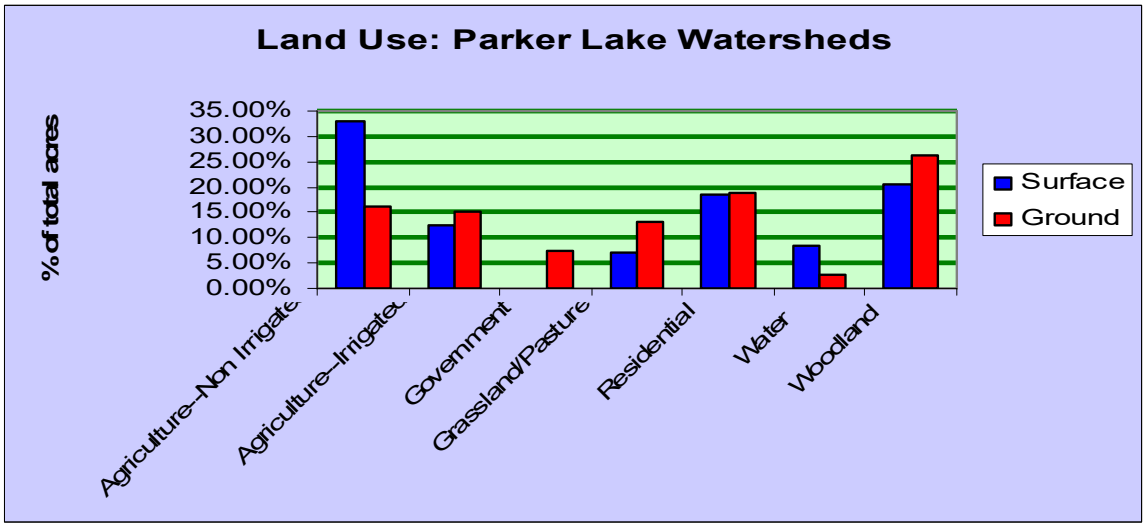
The lake has 61.7 surface acres and a recognized maximum depth of 36 feet. It is located just south of Highway 82. A wayside owned by Wisconsin Department of Transportation is located on Highway 82. It has picnic tables and a cement path to the water.

Watershed Land Use

Land Use is very important in looking at ways to maintain or improve water quality. Studies have shown that types of land use affect sedimentation rate, erosion rate and runoff rate (with included pollutants). Increased sedimentation can not only fill in shallow areas of water, but also causes excessive turbidity that harms aquatic life by destroying habitat and smothering oxygen. Increased runoff carries with it pollutants besides sediments, including pathogens, nutrients that affect algal & aquatic plant growth (nitrogen & phosphorus), pesticide residue, fertilizer chemicals, organic matter, metals, petroleum products and road salt. Increased runoff can also reduce ground water recharge and increase shore erosion. Addition of such substances can degrade water quality and habitat and also limit aesthetic and recreational enjoyment. Parker Lake is in a vulnerable spot, since both Highway 82, which is heavily traveled, and 3rd Avenue, a town road, are within a few feet of the lake's edge.

Studies also suggest that an increase in impervious surface around a waterbody of 20% may negatively impact water quality. Impervious surfaces include areas such as pavements, roofs, decks, sidewalks, compacted soil, cement patios, etc. Similarly, traditional closely-mowed lawns, as opposed to unmown lawns or native vegetation, tend to have high runoff rates and low infiltration rates. Soil types may also influence runoff amounts. Research in Indiana established the difference in average runoff amounts, based on land use. Runoff from general residential (i.e., not necessarily highly-developed) was twice as much as runoff from forested land. Runoff in highly-developed areas may be up to fourteen times more than forested lands and twice as much as from agricultural lands. With a highly-developed residential shore, residential runoff at Parker Lake will be one of the main negative impacts on its overall water quality in the future if steps are not taken to address this problem.

The Adams County Land & Water Conservation Department conducted a land use evaluation for both the ground and surface watersheds of Parker Lake in 2004. The (2004) surface watershed land use was 33.3% (311 acres) non-irrigated agriculture, 12.4% (117 acres) irrigated agriculture, 8.47% (79.7 acres) water (including Parker Lake), 20.6% (194 acres) forests, 18.48% (174 acres) residential and 6.97% (69.6 acres) open grassland/pasture. Currently, according to phosphorus-loading modeling done by the Adams County Land & Water Conservation Department, most of the phosphorus loading to the lake is currently coming from agriculture (72.6%). Some phosphorus loading, such as that from woodlands or other water surfaces, is not controllable by humans; however, some of the phosphorus loading from residential and agricultural inputs is controllable. Residential practices such as not using lawn fertilizers, installing native vegetation and/or unmowed buffers and controlling runoff from impervious surfaces can reduce phosphorus input. Agricultural practices such as conservation tillage, increased residue and field buffers can reduce agricultural phosphorus input.



Non-irrigated agriculture took up 16.32% (88.5 acres) of the ground watershed acreage, with an additional 15.17% (82.2 acres) in irrigated agriculture. 26.19% (140.7 acres) of the ground watershed is in forests, with the rest of the ground watershed being 18.78% (106.3 acres) residential, 2.8% (15.3 acres) water and 13.28% (40.7 acres) open grassland/pasture.

There are a few small businesses in the watershed, mostly located around the lake. These include a restaurant/bar and cabins. According to the Wisconsin State Historical Society, the only archeological site in the watersheds is a part of a burial mound group located above the north side of the lake, above Highway 82.

Public Use and Value

In 2007, the Adams County Land & Water Conservation Department conducted a mailed citizen survey about lake issues. 96% of those responding had lakefront property on Parker Lake. Only 12.5% of the respondents were full-time residents; 25% were year-around weekend residents; the remaining were summer or occasional residents. While only 4% of the respondents had owned their property less than 3 years, 54.5% had owned their land over 20 years. Most respondents owned some kind of boat, with rowboats dominating, then foot-paddle boats. Only 12.5% of the respondents used their boats on lakes other than Parker.

41.2% of the respondents felt the lake water quality had stayed substantially the same in the time they'd been coming to the lake, but 50% felt the water quality had declined. Declining water quality was attributed most strongly to the invasion of

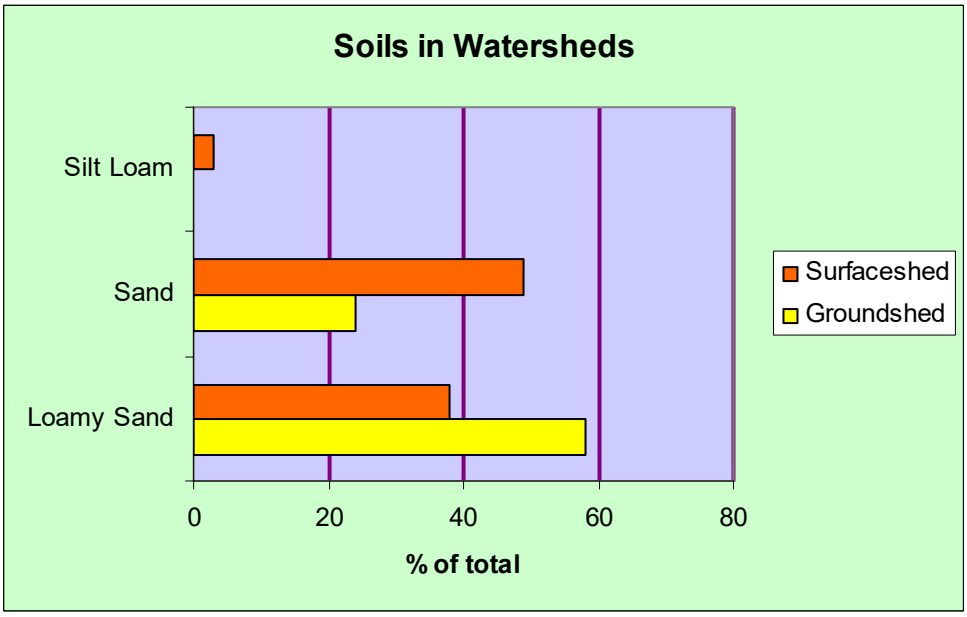
exotic species (58%), aging septic systems (33%), and agricultural contributions (17%).

96% of the respondents felt aquatic "weed" growth had increased. In fact, aquatic plant growth was identified as the most problematic water quality issue, with the presence of algae scum coming a far second.

The main reasons respondents chose to buy land at Parker Lake were its scenery, its good water quality, its distance from their primary residence and family history of using that lake. The four most popular uses of the lake by the respondents were motorized boating, non-motorized boating, fishing, and scenery-watching.

Soils in the Watershed

Soils in the both the ground water and surface watersheds range from silt loams to sands, with slopes from nearly flat to over 12%. In the surface watershed, the dominant soil type is Sand (48.8%), followed by Loamy Sand (42.8%). There is a small amount of silt loam in the surface watershed (3%). Loamy Sand dominates the ground watershed (58%), followed by Sand (24%).



Sands and Loamy Sands are generally well-drained to somewhat excessively drained, with moderate to rapid permeability in the surface layer and slow to rapid permeability in the subsurface layers. Land runoff is slow to rapid, mostly depending on slope. Available water capacity ranges from usually low, as is natural fertility organic matter content. There are wide ranges of suitability for cropping, tree-

production and engineering uses. Most of these soils have erosion, blowing and drought hazards as well. Depth to groundwater is mostly over 20', although there are some areas of perched water tables. Bedrock is mostly sandstone.

Silt Loams are well-drained with moderately slow to slow permeability. Runoff in cultivated areas tends to be rapid. Available water capacity, natural fertility and organic matter content are all medium. These soils can be subject to ponding in heavy rains. These soils are generally good for cultivated crops (if erosion control is used), hay, pasture and trees, but poor for most engineering purposes. Heavy use of these soils when they are wet may result in compaction and surface runoff.

Lake Basin Shape

Parker Lake has fairly regular shore. The lake shape is roughly round to slightly oval. The deepest spot is slightly to the south of the middle of the lake. It has a broad littoral zone around the edges of the lake. Most of the depths less than 20' are populated with aquatic plants.

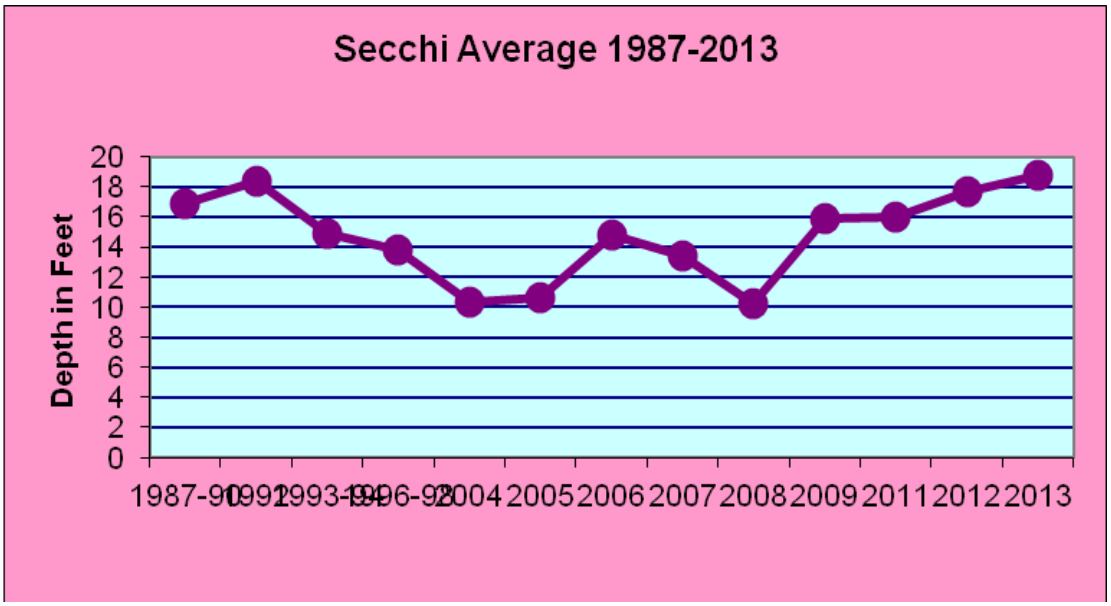
According to a 2005 aquatic plant survey, sand was found at 39.6% of the sample sites, with the percentage of sand growing larger as depth increased. By the 10'-20' depth zone, sand or marl constituted 91.7% of the lake bottom, with the remaining 8.3% as a mixture of sand and silt. In shallower depths, there were more mixtures of lake bottom types, including muck, silt, peat and mixtures thereof. In some instances, sediment type can be a limiting factor for aquatic plant growth, but this does not appear to be the case on Parker Lake, based on the 2005 survey information, which found 100% of the sample sites vegetated.

Lake Chemistry

One indicator of water quality is a lake's trophic status. Oligotrophic lakes have clear, often cold, water with low overall productivity and very desirable fisheries of large game fish. Eutrophic lakes have poor water clarity, with high production of plants and frequent algal blooms likely. Eutrophic lakes also may have fish kill histories due to oxygen depletion and often have rough fish, such as carp, that contribute to the "muddiness" of the lake water. Mesotrophic lakes are those in between oligotrophic and eutrophic lakes, with more production and accumulated organic matter than oligotrophic lakes, but only occasional algal blooms, and a good mixed fishery.

There are three lake chemistry readings that Wisconsin has traditionally used to determine a lake's trophic status. These are Secchi disk readings, which test water clarity; total phosphorus level, which indicates the amount of phosphorus available for aquatic plant and algae production; and cholorophyll a, which correlates to algal blooms. Three groups have been involved in taking these measurements: Self-Help Monitoring (1985-2004); the Wisconsin Department of Natural Resources (1992-2004), and the Adams County Land & Water Conservation Department (2002-2006). Citizen monitoring started again in 2008 and has continued through 2011.

Secchi Disk Readings: Secchi disk readings taken in Parker Lake over the years have generally been good. The average growing season readings for the period of 1990 through 2013 was 14.8 feet. The readings put Parker Lake in the oligotrophic class, based on water clarity, in the "very good" category.

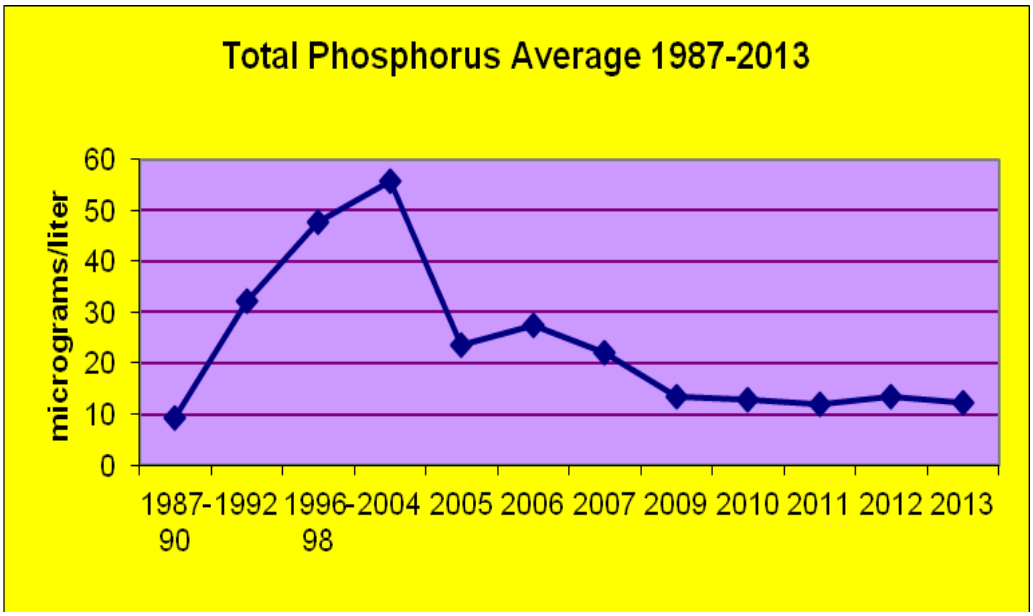


Total Phosphorus Readings: From 1992 through 2004, the WDNR occasionally took water samples from Parker Lake and tested them for total phosphorus. From 1992-1995, the WDNR average surface phosphorus reading was 34 micrograms/liter; from 1995-1998, the WDNR surface average decreased to 15 micrograms/liter. For 1999-2002, the surface phosphorus average for WDNR testing was 12 micrograms/liter.

WDNR phosphorus results from water from Parker Lake's bottom tended to be higher than that at the surface. From 1992-1998, the average bottom phosphorus reading was 22.7 micrograms/liter. The Self-Help Lake Monitoring citizens took occasional total phosphorus readings in 1988-1990, with average total phosphorus of

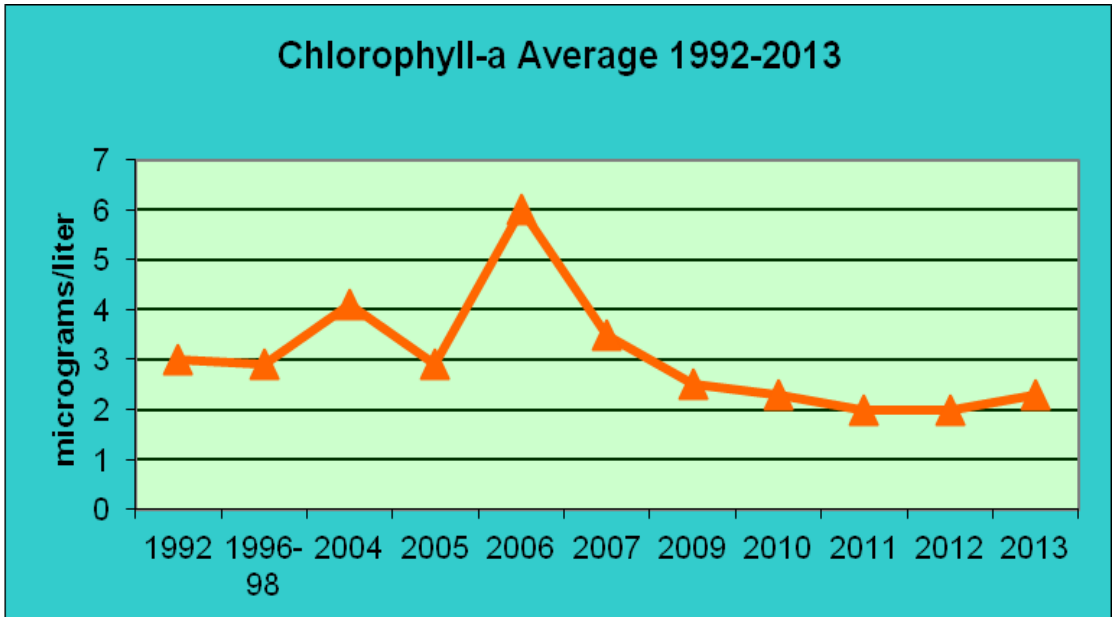
9.3 micrograms/liter. Citizen monitoring resumed in 2009 and continued through 2013.

The overall total phosphorus average from 1988 through 2011 was 23.5 micrograms/liter. Using the upper level phosphorus, Parker Lake scores as a "mesotrophic" lake in the "good" category.



Chlorophyll-a: Chlorophyll-a is the third factor often used in evaluating water quality, since studies have shown it is correlated with algal bloom frequency. The Self-Help Monitoring citizens didn't take any chlorophyll-a readings, but the WDNR took some between 1991 and 2004. The average reading between 1992 and 1998 was 2.8 micrograms/liter. The average from 2004 through 2006 was 3.5 micrograms/liter. Sampling also occurred in 2007 and 2009.

The overall chlorophyll-a average level for 1996 through 2013 was 3.0 micrograms/liter. The ongoing low levels of chlorophyll-a are indicative of an oligotrophic, fairly clear lake with good water quality. These readings place Parker Lake in the "very good" level for chlorophyll-a and place the lake in the "very good" category for chlorophyll-a, in the "oligotrophic" class.



The waters of Parker Lake tend to be around neutral, with pH readings between 5.38 and 8.95. The lake has hard water with sufficient alkalinity to protect its fishery from the effects of acid rain or other acidic deposits. Since regular testing started in 2004, all hardness testing results have been "hard" or "moderately hard" for Parker Lake. Hard water lakes tend to have clearer water and more diverse fishery than soft water lakes. The lake, with its varying depths, maintains sufficient oxygen levels in the lake so that fish kill from low oxygen are not likely to be a problem.

Readings for sodium, chloride, magnesium, sulfate and potassium in Parker's waters have all been low, below any caution levels.

A problem that may need to be dealt with is aging septic systems. Of the 2007 survey respondents, 75% had septic systems over 10 years old, with most of them being in the 500 to 1000 gallon size.

The three "trophic" parameters suggest that Parker Lake is maintaining good overall status. Phosphorus is especially important related to density & frequency of aquatic plants and of algal blooms. One pound of phosphorus (2.2 kilograms) in the water can produce 500 pounds of algae. Nutrient loading is the most common cause of elevated phosphorus levels, so the Parker Lake Management Plan should investigate if phosphorus levels will be lowered.

Parker Lake thus scores 41 TSI on Secchi Disk readings; 45 on Chlorophyll a readings; and 48 TSI on Phosphorus Levels, for an average TSI reading of 45, placing it in the "mesotrophic" class overall.

Parker Lake is 45

Score	TSI Level Description
30-40	**Oligotrophic:** clear, deep water; possible oxygen depletion in lower depths; few aquatic plants or algal blooms; low in nutrients; large game fish usual fishery
40-50	**Mesotrophic:** moderately clear water; mixed fishery, esp. panfish; moderate aquatic plant growth and occasional algal blooms; may have low oxygen levels near bottom in summer
50-60	**Mildly Eutrophic:** decreased water clarity; anoxic near bottom; may have heavy algal bloom and plant grrowth; high in nutrients; shallow eutrophic lakes may have winterkill of fish; rough fish common
60-70	**Eutrophic:** dominated by blue-green algae; algae scums common; prolific aquatic plant growth; high nutrient levels; rough fish common; susceptible to oxygen depletion and winter fishkill
70-80	**Hypereutrophic:** heavy algal blooms through most of summer; dense aquatic plant growth; poor water clarity; high nutrient levels

Aquatic Plants

An aquatic plant survey was performed in Parker Lake during the summer of 2005 by staff from Adams County Land & Water Conservation Department. 21 species were found in the lake. Two of the 21 species were the exotics Eurasian watermilfoil and curly-leaf pondweed. These exotics tended to be found mostly in the littoral area, although there were some large patches of Eurasian water-milfoil found in deeper waters. A hybrid of the native milfoil and the invasive milfoil was verified by DNA in 2009.

The dominant species in the 2010 surveys was *Chara*, a plant-like algae. The next most frequently-found plants were *Najas guadelupensis* (Southern naiad), *Potamogeton illinoensis* (Illinois pondweed), and *Stuckenia pectinata* (Sago pondweed). The aquatic plant community had fair diversity and was in the average range for overall aquatic plant community. However, it tended to have many plants tolerant of frequent disturbance.

In 2007, Parker Lake Association treated contracted for chemical treatment of the Eurasian watermilfoil. Based upon a visual survey of the lake in July 2007, the initial treatment appears to have been successful. The Lake Association has continued to treat chemically as necessary. During the 2010 surveys, little Eurasian watermilfoil or the hybrid milfoil were found. There were signs that Curly-Leaf Pondweed and Reed Canarygrass continued to be present in Parker Lake.

Further details of the aquatic plant surveys are available on the Adams County Land & Water Conservation Department website.

Fishery

Parker Lake has a diverse fishery, with largemouth bass and bluegill being historically the most abundant fish. Pumpkinseeds tend to be common, but northern pike, bullheads and perch tend to be scarce. The lake does not have a history of fish kills from low oxygen.

WDNR stocking records for Parker Lake date back to 1967, when walleyes, rainbow trout, brown trout and bluegills were stocked. In 1981, it was determined that walleyes and rainbow trout stocking had not succeeded in establishing a reproducing population, so stocking of those two fish species were abandoned. Brown trout and brook trout continued to be stocked. There doesn't appear to have been any stocking since 1992 by the WDNR, and there are no recent surveys recorded.

Shoreline Use

Parker Lake has a shoreline of 1.16 miles (6125 feet). Most of the shore is in residential properties, including some older cabins that are quite close to the water line. Part of the north shore is a wayside owned by the Wisconsin Department of Transportation. On the east shore is a small resort and beach.

Some of the shores are quite steep. In two places, the shore runs close to a road, leaving the potential for stormwater and road runoff to the lake. The Parker Lake Association and the Adams County Land & Water Conservation Department are working with the Wisconsin Department of Transportation (runoff from State Highway 82) and the Town of Jackson (runoff from 3rd Ave) to address these issues.

A 2004 survey of the shore showed that 41.7% of the shore was covered with native vegetation. However, it appeared that most of the shoreline did not have a

buffer of native vegetation going 35' landward from the shore. 22.9% of the shore sites had mowed lawns to near the shore, with another 23.33% having hard structures such as decks or rock riprap. Bare sand covered 12.5% of the shore.

The plant survey completed in 2005 revealed that 58.75% of the Parker Lake shoreline was covered with disturbance. Mowed cultivated lawn had the highest individual coverage, covering 22.82% of the shore. These types of disturbed shorelines have been found to contribute negatively to water quality. They do not provide food or shelter for wildlife and fish and may degrade spawning beds. They tend to increase runoff and excess nutrients. The lack of plant cover tends to warm the water by disturbed areas, encouraging the growth of algae and nuisance aquatic plants. Also, cover like hard surface retaining walls deflect waves off the walls, stirring up sediments and destroying vegetation. In addition, the Parker Lake water level rose in the mid-1980s, changing the shore parameters.

Shorelands are critical habitat necessary for the protection and enhancement of lake water quality, fisheries, wildlife and aquatic life. They provide shelter and food for wildlife and fish. They support spawning beds, cover and feeding areas for fish and invertebrates. Native vegetation filters and traps pollutants and excess nutrients, preventing them from entering the lake water, thus protecting water quality. They provide significant aesthetic beauty and can also serve as a visual and audio buffer between the shoreland residents and lake traffic or noise. It is essential to protect existing natural shorelands and restore shoreland habitats that have been eliminated or degraded by nearshore development. Natural shorelands contain a mixture of native plants including trees, shrubs, grasses and forbs (wildflowers) that provide critical habitat for water-dependent wildlife and help filter stormwater runoff by removing excessive nutrients and sediments before they reach the lake.

Wildlife and Endangered/Threatened Resources

No endangered or threatened resources have been reported in either of the Parker Lake watersheds.