

Abstract

Bass Lake has been studied for many years by the Wisconsin Department of Natural Resources (WDNR). Water quality monitoring on Bass Lake started in 1986 as a part of the WDNR Long Term Trends Monitoring program. This summer the Bass Lake Rehabilitation District (BLRD) wanted to do some of their own testing and hired an intern from the University of Wisconsin – River Falls. The intern was supervised by the St. Croix County Land & Water Conservation Department (LWCD). The lake was tested for nitrate, phosphate, pH, dissolved oxygen, temperature, clarity, and macroinvertebrates. The BLRD also asked that an individual shoreline inventory be taken for every land parcel. The tests and shoreline inventory helped to determine the water quality of Bass Lake. Everything that was tested confirmed that Bass Lake is an Outstanding Water Resource, but the phosphate level is too high and needs some attention. Some serious action needs to be taken in trying to keep phosphate levels down in the lake. This is something that can be done with home and land owner participation and something that will benefit the lake for years to come.

Purpose

The purpose of the summer internship was to work with the BLRD and the LWCD to determine the water quality of Bass Lake by testing for nitrate, phosphate, pH, clarity, and dissolved oxygen, to survey individual shorelines, and to survey for stormwater runoff. All of these things relate to the quality of Bass Lake. Along with the results of this study, Bass Lake volunteers were trained to monitor the lake for years to come. Keeping a record of readings for many years will allow the BLRD to know about problems or improvements to the lake and what, if anything needs to be done.

Introduction

Bass Lake is located in northwestern Wisconsin, in St. Croix County. It is a thermally stratified, groundwater seepage lake that is 416 acres and has a maximum depth of 45 feet, according to the WDNR in 2006. The Bass Lake watershed is 1,398 acres, which is relatively small compared to the lake size. This is a three to one ratio and is a contributing factor that leads to the quality of the lake.

Currently, Bass Lake is named an Outstanding Water Resource by the WDNR. An Outstanding Resource Water is a surface water which provides valuable fisheries, hydrologically or geologically unique features, outstanding recreational

opportunities, unique environmental settings, and is not significantly impacted by human activities (Wisconsin Administrative Code NR 102.11). The one thing that threatens that is the phosphate concentrations. They have been on an increase for many years now and some serious considerations need to be taken. The rapid development on and close to the lake is causing problems with the quality of the water. The increase in recreational traffic also contributes to the rising problem.

There have been many studies done on Bass Lake, all of which give different numbers for acreage, depth, and water level. In 1992 there was a study done by the WDNR and the West Central Wisconsin Regional Planning Commission that stated the lake was 441 acres and had a maximum depth of 38 feet. According to a 2006 WDNR study the lake was 416 acres with a maximum depth of 45 feet, and the WDNR website has Bass Lake as a 293 acre lake with a maximum depth of 37 feet. The water level has fluctuated a lot in the past several years. The lowest recorded level was in 1963 at 876.37 feet and the highest level was 888.25 feet in 1995. This is a difference of 11.91 feet in 32 years.

Water Quality Results

Eleven weeks of water quality data were taken at Bass Lake this summer (Figure 15). Appendix E has a list of all the graphs associated with those results. These results are what determine the lake to be Oligotrophic, Mesotrophic, or Eutrophic (Figure 14). The Merriam Webster Dictionary defines these three terms as:

- Oligotrophic- having a deficiency of plant nutrients that is usually accompanied by an abundance of dissolved oxygen
- Mesotrophic- having a moderate amount of dissolved nutrients
- Eutrophic- a body of water that becomes enriched in dissolved nutrients (as phosphates) that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen

The phosphate readings that were found are the ones that show some concern. Just about every time that ortho phosphate was tested, the readings were over the DNR recommended levels. Past studies have shown that phosphorus has been on the rise since 1998. The highest ortho phosphate concentration was over the HACH scale, which is 10.0 mg/L, the lowest was 0.05 mg/L, and the mean was 0.54 mg/L. These levels show Bass Lake to be in the Eutrophic status.

The concentrations of nitrate are all under DNR recommendations, 5 mg/L, and don't show to be a threat to the lake. The highest concentration was 4.91 mg/L, the lowest was 0.78 mg/L, and the mean was 3.09 mg/L.

Dissolved Oxygen levels are higher than the needed amount for living organisms to survive. The highest reading was 9.63 mg/L, the lowest was 7.38 mg/L, and the mean was 8.52 mg/L. There isn't 11 weeks worth of dissolved oxygen readings due to a problem with equipment. The last sampling day, 8/22/07, the DO meter was used to find the hypolimnion. It was found it to be around 26-30 feet.

The secchi depth results are in the good range according to the Trophic Status table. All of the secchi disc depths fall in the Oligotrophic or Mesotrophic status. The majority of these readings fall into the Mesotrophic category. The highest reading was 13.25 feet, the lowest was 4.5 feet, and the mean was 7.4 feet.

pH stayed around the same almost all summer. These results also match previous studies that have been done and they show Bass Lake to be on the alkaline side. This puts Bass Lake in the hard water category and these lakes tend to have more abundant aquatic plant growth.

Conclusion

Bass Lake is a thermally stratified groundwater seepage lake that has had fluctuating lake levels for many, many years. With the watershed to lake ratio, residents need to be careful of their daily activities. Encouraging conservation and best management practices will educate the public on what they can do to help. The BLRD would like to keep the lake as an Outstanding Water Resource, so they looked into what they could do as a community. They have purchased their own testing equipment and they will be using it to test the water quality for summers to come. They are also going to be working with the WDNR, through the Self-Help Monitoring Program, to have water chemistry samples tested and secchi disc readings recorded. The work that was done this summer will give the BLRD a step in the right direction to maintaining the water quality. The residents of Bass Lake have shown an interest in protecting the water and this will help for future generations.

Recommendations

Bass Lake already has good water quality and the thing to do now is to keep it that way and work on reducing phosphate levels. In order for Bass Lake to stay an Outstanding Water Resource, I recommend:

1. Continue monitoring and chemical testing of the water. This can be done through the WDNR Self-Help Lake Monitoring Program.
<http://dnr.wi.gov/org/water/fhp/lakes/selfhelp/>

2. Plant some vegetation in the road ditch at the south end of the lake. This will help with stormwater runoff. Some guidelines to follow are:
 - a. Seed in Spring (4/15-6/1) or Fall (8/1-8/21)
 - b. Seed mix for that area:
 - i. Smooth Bromegrass (*Bromus inermis*), 0.5lbs
 - ii. Creeping Red Fescue (*Cestuca rubra*), 0.14lbs
 - iii. Alfalfa (*Medicago sativa*), 0.14lbs
 - iv. Red Clover (*Trifolium pretense*), 0.14lbs
 - c. Install one erosion logs
3. Properly maintain all private roads around Bass Lake to ensure no gravel runoff.
4. Participate in St. Croix County's program for soil testing. Encourage all lake residents to have their soil nutrient levels tested.
5. Keep in contact with the parks department to make sure the boat landing is being maintained so that stormwater runoff filters into the detention pond.
6. Encourage residents to join WAL (Wisconsin Association of Lakes) and sign up for their e-mail newsletter. www.wisconsinlakes.org
7. Remind residents and boaters to participate in Clean Boats, Clean Waters Program. <http://www.uwsp.edu/cnr/uwexplakes/CBCW/>
8. Encourage residents to maintain a natural shoreline.
9. Encourage residents to attend meetings and picnics to keep themselves informed on what is happening around the lake.
10. Impact on lake quality occurs when the watershed has 7% impervious surface. Contact Town and County representatives about keeping impervious surface low within Bass Lake's Watershed. Encourage conservation development.
11. Update the signs that are posted at the boat launch. The better people can read them, the better they will be at obeying the rules and regulations.
12. Contact the Bureau of Water Resources Management Groundwater Section and try to have a study conducted to determine the nutrient contribution of septic systems.