Survey of Rice Lake

Dane County, Wisconsin

Small-scale Lakes Planning Grant Project

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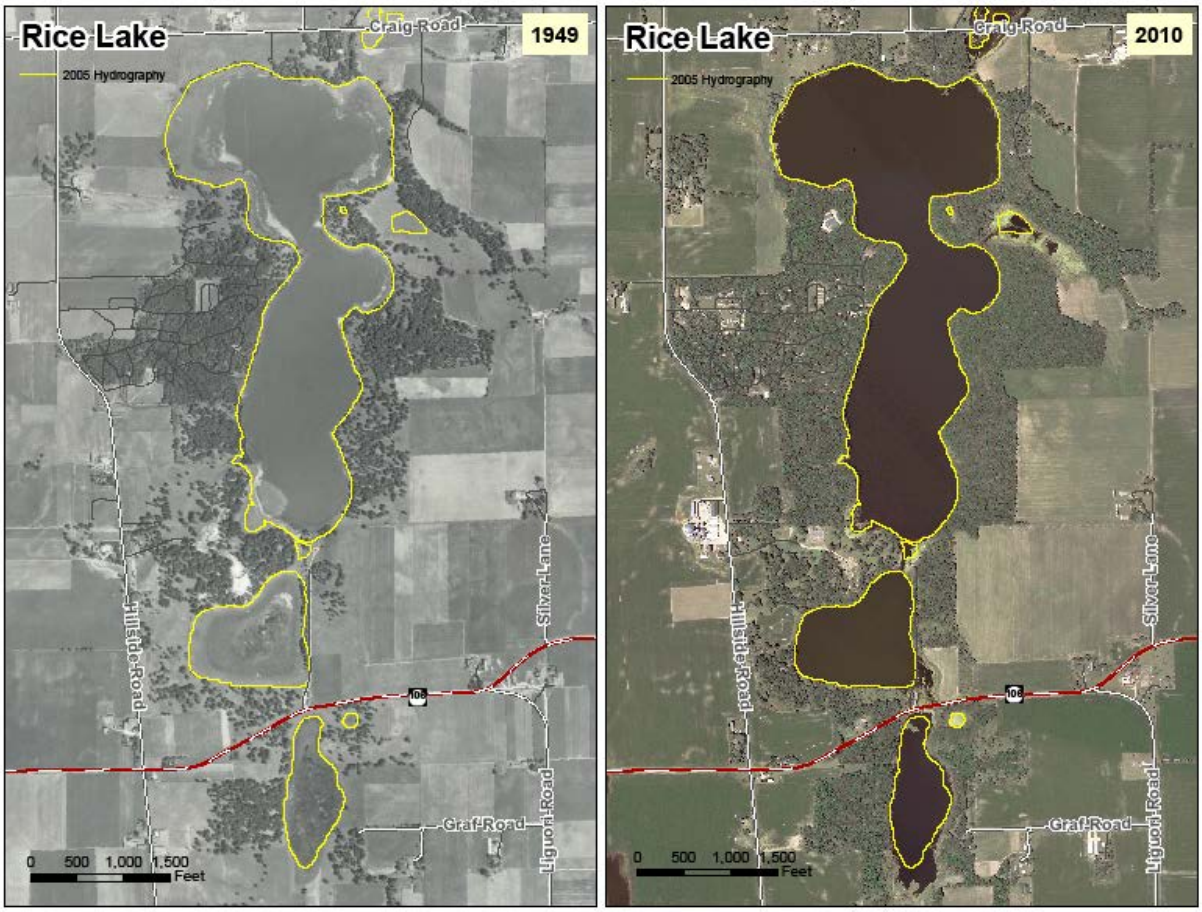
Findings

Rice Lake (WBIC 0779500) is shallow seepage lake that lies within the Southeast Wisconsin Glacial Plains Landscape. Located in the Town of Albion, the lake is about 154.5 acres with a maximum depth of 8 feet. Lake depth does vary seasonally and is greater in periods of higher precipitation. Like other seepage lakes in south central Wisconsin, the water level has increased significantly in recent decades and at least one residence had been abandoned due to water damage. See Figure 1.

Figure 1. Rice Lake 1949 and 2010

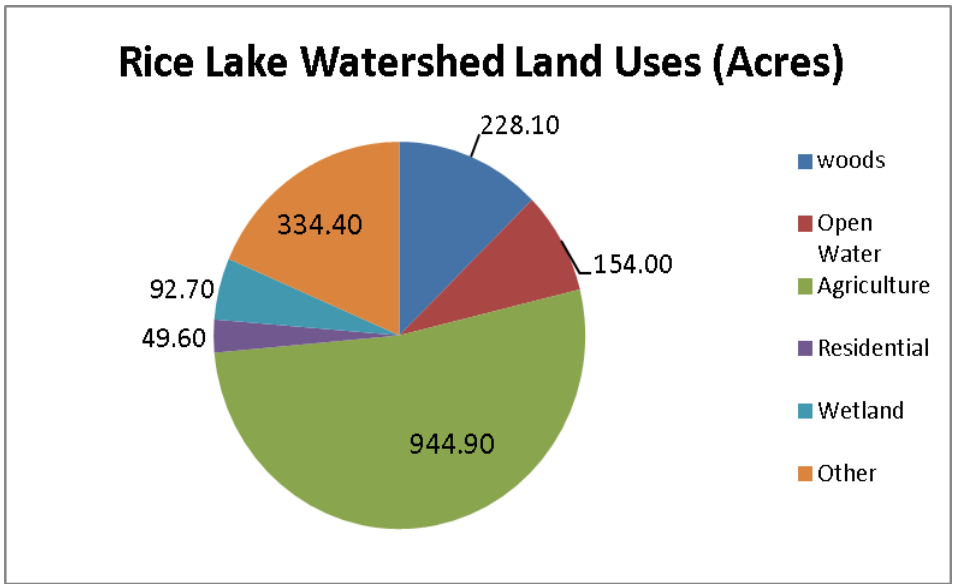


Rice Lake does have recreational use although there is no public access. Personal communication with local residents identified fishing, waterfowl hunting, and paddling as predominant activities. Access to the lake is made via the campground (resident campers/users only) and from riparian landowners. Recent years have shown an increase in ice fishing with the presence of permanent shacks being placed on the lake. More than likely a response to higher water levels and improved fishery. The Town of

Albion prohibits motorized watercraft so the lake does offer a sense of solitude for those that gain access.

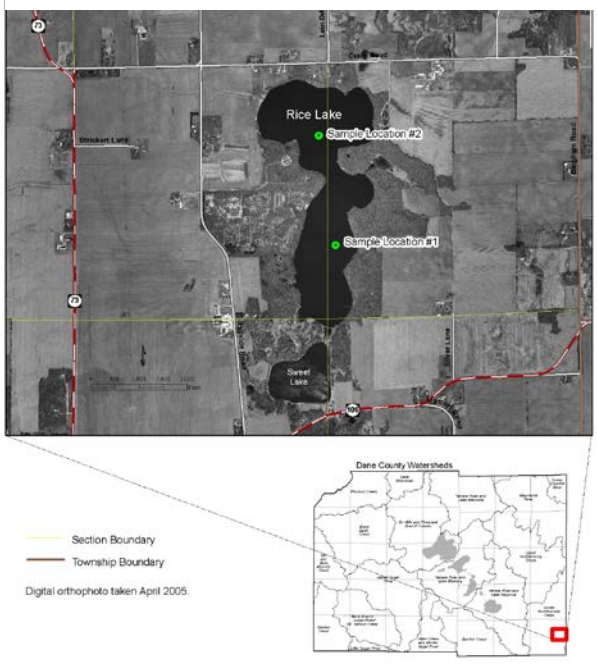
Part of the Lower Rock River Basin, the watershed draining to Rice Lake is 1,854 acres and comprised of predominantly agricultural land use. See Figure 2.

Figure 2. Watershed Land Use



Lake profile and biological sampling surveys were performed on June 30th and August 1, 2011. Lake profile sampling was conducted at Site 1 in the south basin (42 degrees, 53.719 min. – 89 degrees, 01.935 min.) and Site 2 in the north bay (42 degrees, 54.098 min. – 89 degrees, 02.01 min.). See Figure: 3

Figure 3. Sampling locations on Rice Lake



Survey results indicated that the lake is hypereutrophic with water clouding Cyanobacteria blooms. See Figure 4. Secchi measurements ranged from 2-3'. Very high pH was measured in the lake and likely reflected photosynthesis of algal blooms with chlorophyll-a concentrations up to 55 ug/l. Even though the lake is shallow and subject to mixing, anoxia was measured just below 1 meter below the surface.

Despite the poor water clarity, rooted aquatic plants were observed in modest densities including curly-leaf pondweed, small pondweed, Sago pondweed an Elodea. A substantive American lotus bed was observed in the north bay. See Figure 5.

Figure 4: Algal Bloom

Figure 5: American lotus

Fish populations were relatively scarce nearshore but may have reflected unusual distribution due to shallow anoxia as mentioned above. Seining and electroshocking revealed modest numbers largemouth bass, crappies, bluegill and immature golden shiners. An angler at the campground reported catching yellow perch, crappies, largemouth bass, bluegill, black bullhead, northern pike and rock bass. She also commented her concern over frequent algal blooms. In 2006, a WDNR boom shocking survey revealed 2 northern pike, 164 bluegill, 6 yellow perch, 14 crappies, 15 black bullhead, 4 golden shiners and 1 green sunfish. No endangered or threatened species were observed but numerous snags around the lake offer favorable turtle basking habitat. See Figure 6.

Figure 6: Favorable woody debris is scattered along the shoreline of Rice Lake. Areas provide critical cover for juvenile fish and habitat for nongame species.

Similar with most seepage lakes, the watershed to lake area ratio is a modest 12:1. However, most of the watershed (52%) is planted in row crops and intensive agriculture. As a result, the estimated annual phosphorus loading to the lake is 1001 lbs/yr (455 kg/yr). Buffers are limited around some areas of the lake. But comparing aerial photos from 1949 and 2005, woodland buffers have expanded and phosphorus/soil inputs likely declined. While estimated nutrient inputs remain fairly high, internal loading may also be a factor given the mid-summer anoxia and propensity for mixing.

Methods

Water chemistry sampling was conducted twice in 2011 and laboratory samples included total phosphorus, ammonia nitrogen, alkalinity and chlorophyll at the deepest location of the lake. Samples were collected at the surface and near the bottom of the lake. A Garmin 76 was used to log all sampling locations. A YSI Model 52 meter was used to measure dissolved oxygen and temperature profiles vertically. A Yellow Springs Instrument Model 63 meter was used to measure pH and specific conductivity profiles vertically. Calibration of the instruments followed manufacturer recommendations including the 2 point calibration for pH. Water samples were analyzed at the Dane County Public Health Lab.

Qualitative habitat surveys on the lake. As part of the habitat surveys, photographs captured aquatic plant and shoreline habitat conditions. General observations were recorded. Fish population sampling included small mesh seining and electroshocking. An angler was interviewed as well.

Watershed land uses were identified using GIS. Estimated phosphorus loading and Tropic State Indices were determined using WILMS.

Lake Monitoring Results

Figure 7: Chlorophyll a

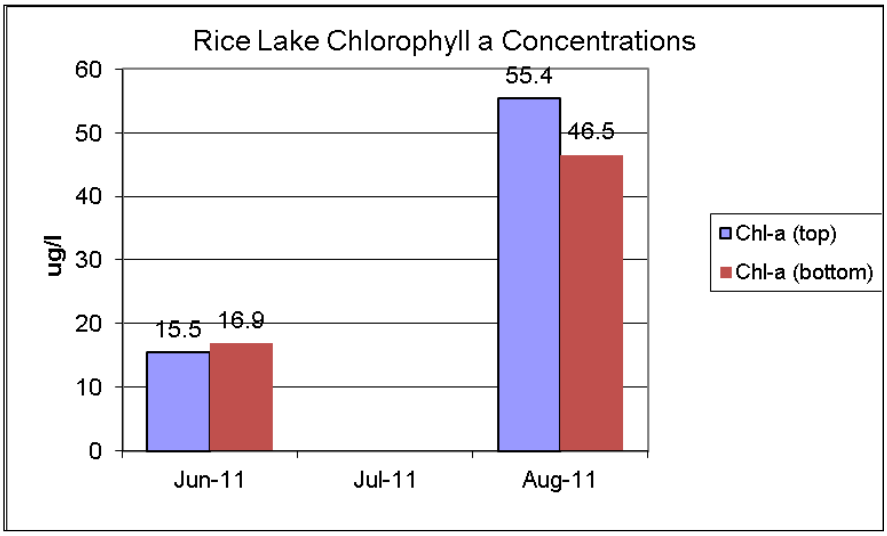


Figure 8: Total Phosphorus

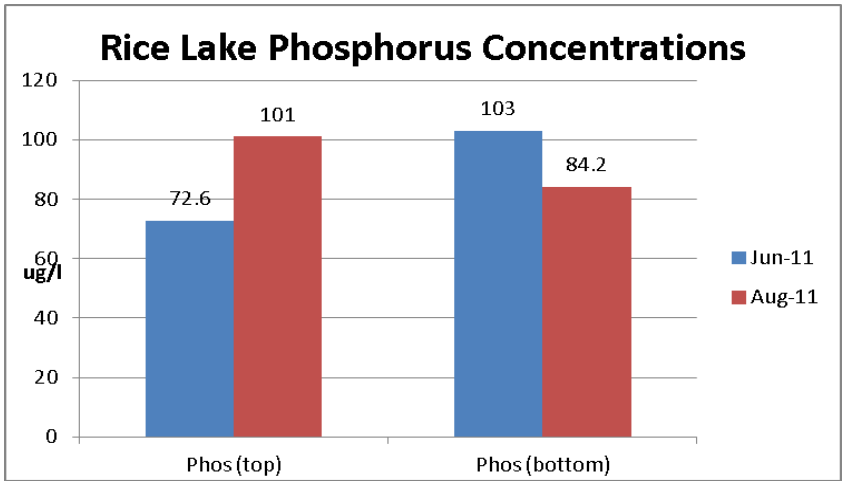


Figure 9: Secchi Measurements

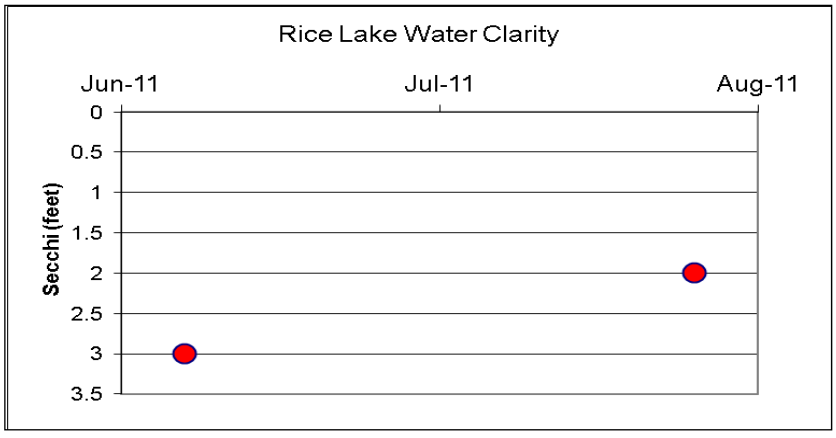


Figure 10: TSI

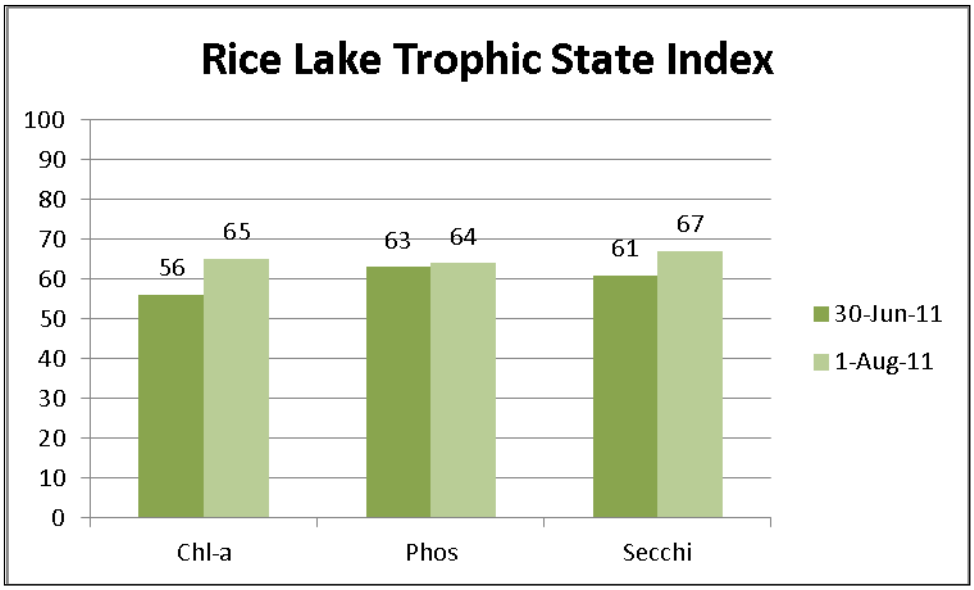


Figure 11: Specific Conductance

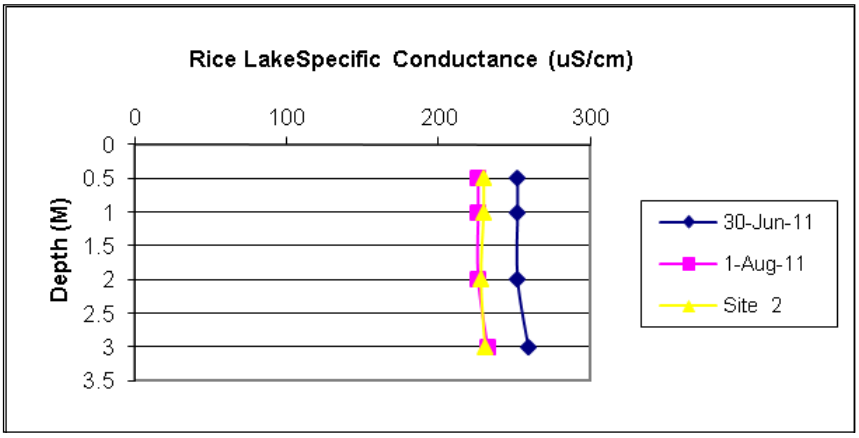


Figure 12: pH

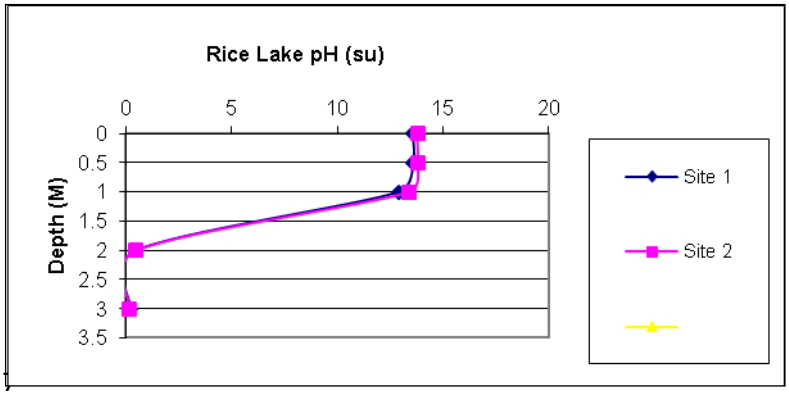


Figure 13: August 1, 2011 Dissolved Oxygen Profiles

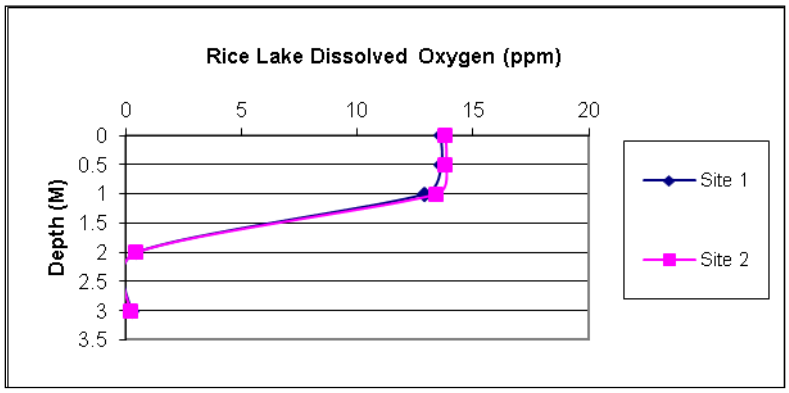


Figure 14: Rice Lake Temperature Profiles

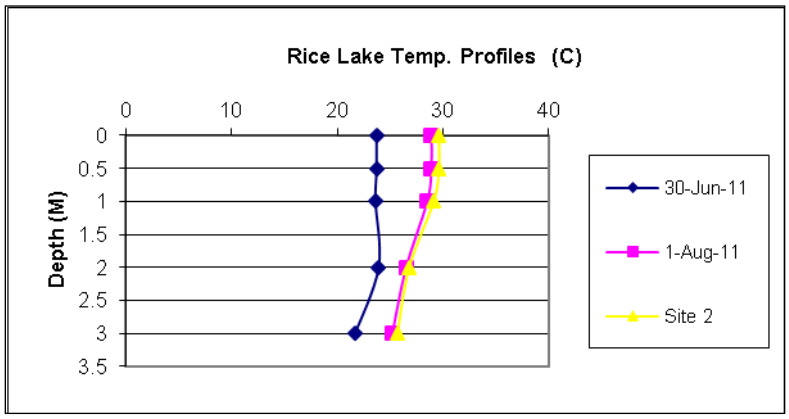


Table 1: Site 1 Laboratory Water Chemistry Data

Parameter	Depth (m)	June 30, 2011	August 1, 2011
Total Phos mg/l	0.5	0.0726	0.101
Chlorophyll a ug/l	0.5	15.5	55.4
Ammonia - nitrogen mg/l	0.5	<0.017	<0.017
Alkalinity mg/l	0.5	122	112
Total Phos mg/l	2.5	0.103	0.0842
Chlorophyll a ug/l	2.5	16.9	46.5
Ammonia - nitrogen mg/l	2.5	0.0183	0.0181
Alkalinity mg/l	2.5	127	117

Conclusions

Rice Lake exhibits highly eutrophic conditions similar to many southern Wisconsin seepage lakes. The lake water quality is poor and at times may inhibit both recreational opportunities and aquatic life. Specifically, blue-green algae blooms can cause human health concerns when ingested. The lake fishery appears to be reflective of water levels. In years of higher water, anecdotal information indicates panfish populations respond positively. The most recent years have seen more and more anglers on Rice Lake.

Multiple field investigations did not reveal any one significant source of sediment loading. There are areas to the east of Rice Lake that may be served by agricultural sediment basins. One waterway on the northwest which drains approximately 170 acres could be reconstructed and the outlet directed to a sediment basin before discharging into the lake.

Recommendations

1. Evaluate compliance with conservation plans on all agricultural lands within the watershed. Make necessary changes where needed.
2. Determine feasibility of constructing ag sediment basins (5-7) on drainage ways leading to Rice Lake.
3. Reconstruct existing waterway and consider installing an ag sediment basin to further capture sediment on northwest corner of the lake.
4. Discuss with DNR fisheries the possibility of performing a boom-shocking survey in 2012 or 2013.
5. Encourage the riparian landowners to engage in the self help lake monitoring program.
6. Examine potential alternatives for developing public access through the county-owned Silverwood Property.
7. Water quality data indicates highly eutrophic conditions. With internal cycling of phosphorus suspected, an analysis of the sediment nutrient conditions should be performed.
8. Conduct late winter dissolved oxygen monitoring to determine potential for winterkill conditions. Higher water levels in recent decades may have reduced the potential for winterkill.
9. Work with local municipality and property owner to remove inundated property along Hwy 106.

Thanks to the staff of the Dane County Land and Water Resources Department for assisting with this report. Steve Ottelien, Michelle Richardson, and Will Mann.

Thanks to Jopie Brouwer for sharing information on fish populations and water quality, Bob and Elizabeth Goessling for sharing personal observations and Hickory Hills Campground for providing lake access.