

# IOWA'S WATER

## Ambient Monitoring Program

### Iowa Participates in National Lake Assessment

#### What is the National Lake Assessment?

The National Lake Assessment (NLA) is a national study sponsored by the United States Environmental Protection Agency (EPA) that aims to characterize the condition of the nation's lakes. The EPA partnered with states and tribes to sample 1,028 lakes during the summer of 2007. The lakes were selected randomly using a statistical survey design so that the results from the sampled lakes could be used to represent the condition of a large population of lakes across the nation.

Field crews all over the country, including one from the Iowa De-

partment of Natural Resources (DNR), collected samples and took measurements using standardized methods. The information collected included indicators of water quality such as nutrients, dissolved oxygen, and algal density; biological indicators such as phytoplankton and zooplankton (algae and microscopic animals); recreational indicators such as algal toxins and indicator bacteria; and physical habitat indicators such as lakeshore characteristics and types of shallow water habitat.

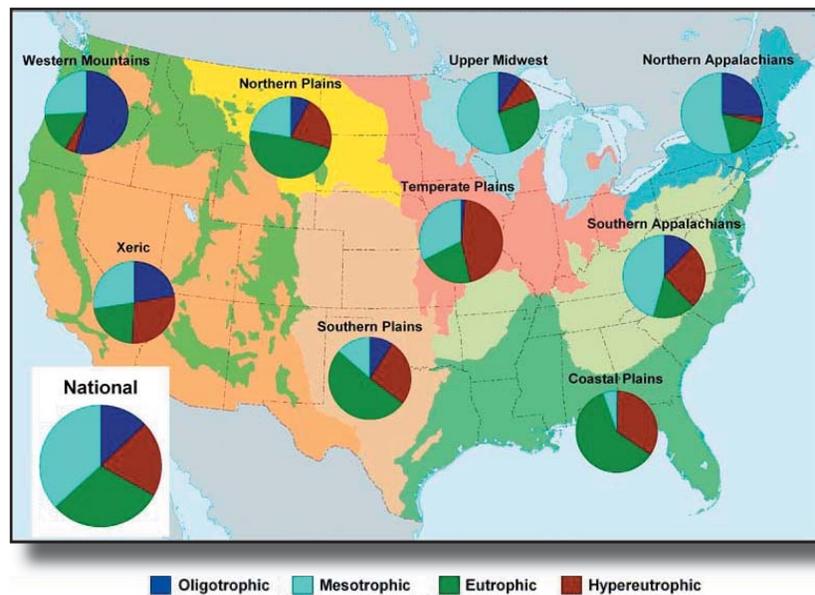
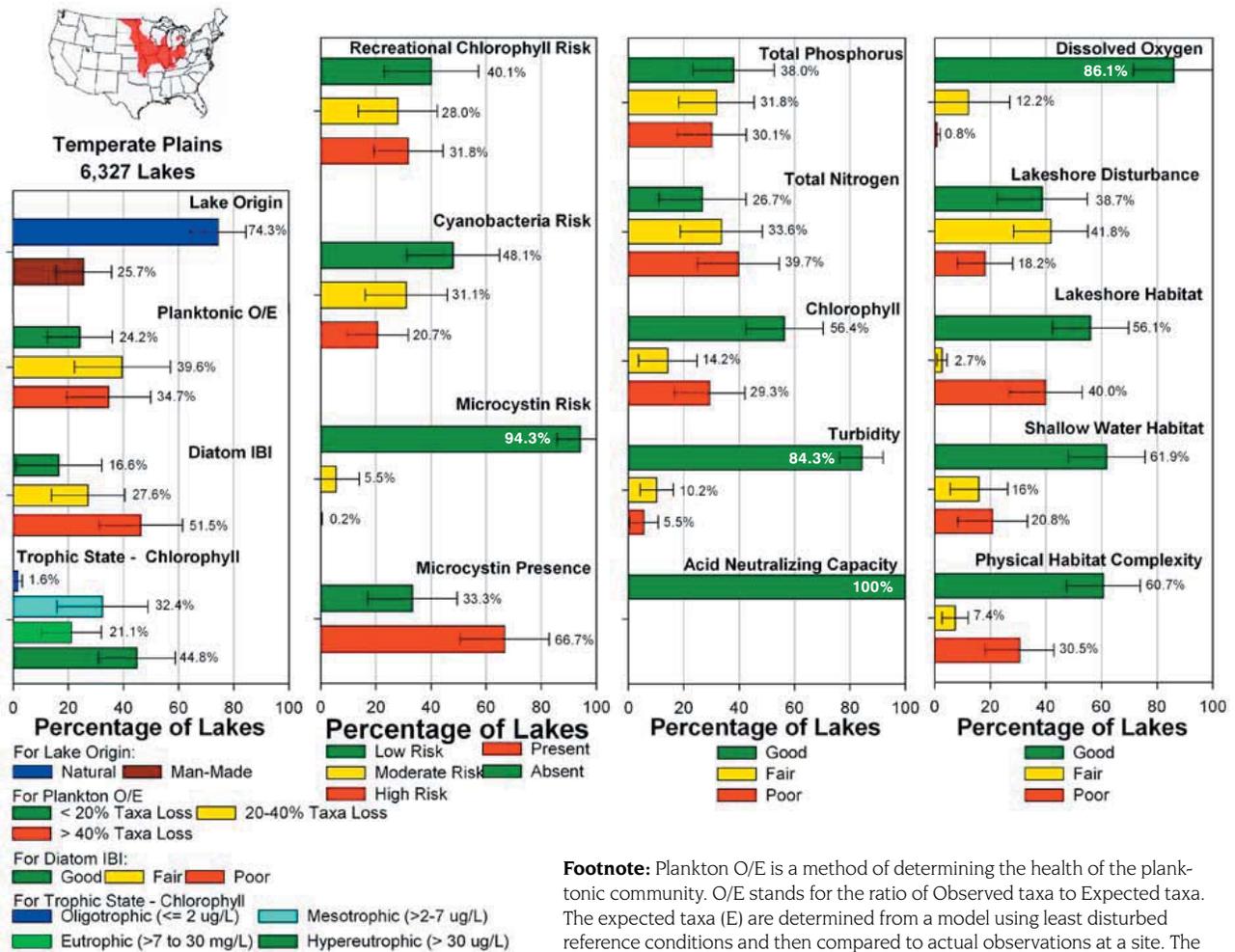


Figure 1. Trophic condition – chlorophyll.

The purposes of the NLA are to:

- Report on the condition of the Nation's lakes, ponds, and reservoirs, including:
  - Determining what percentage of the lakes in our nation are in good, fair, and poor condition based on trophic, ecological, and recreational indicators.
  - Determining the relative importance of key stressors such as nutrients and pathogens.
- Help states and tribes implement monitoring and assessment programs.
- Establish a baseline for lake condition that can be used for future trend assessments.



**Footnote:** Plankton O/E is a method of determining the health of the planktonic community. O/E stands for the ratio of Observed taxa to Expected taxa. The expected taxa (E) are determined from a model using least disturbed reference conditions and then compared to actual observations at a site. The O/E ratio therefore provides an estimate of the taxa loss at a site.

Figure 2. Temperate Plains NLA results. A total of 137 lakes were sampled to characterize the condition of the 6,327 lakes in this ecoregion.

Diatom IBI is another method of determining the health of the planktonic community. IBI stands for index of biotic integrity and is a score based on a number of different metrics related to the health of the diatom community.

It is important to note that this project is not meant to provide information on individual lakes or even on Iowa's lakes, rather on large regional and national populations of lakes.

## The National Lake Assessment in Iowa

Twenty Iowa lakes were included in this nationwide survey. Eighteen lakes were randomly selected through the survey and two lakes were hand selected by the EPA with input from Iowa DNR staff as reference lakes. In the summer of 2007 a crew from the Iowa DNR's Watershed Monitoring and Assessment Section gathered data and collected samples from the 18 randomly selected lakes. EPA staff or contractors collected the samples from the hand selected sites.

Lake Ahquabi, Warren County  
 Coralville Reservoir, Johnson County  
 Browns Lake, Woodbury County  
 Little Clear Lake, Pocahontas County  
 Five Island Lake, Palo Alto County  
 Ingham Lake, Emmet County  
 Rice Lake, Worth County  
 Hawthorn Lake, Mahaska County

Welch Lake, Dickinson County  
 Heritage Point Lake, Wayne County  
 Swan Lake, Dickinson County  
 Little Wall Lake, Hamilton County  
 North Twin Lake, Calhoun County  
 Lake Macbride, Johnson County  
 West Okoboji Lake, Dickinson County  
 South Banner Lake, Warren County

Virgin Lake, Palo Alto County  
 Badger Creek Lake, Madison County  
 George Wyth Lake, Black Hawk County\*  
 Green Belt Lake, Black Hawk County\*

\*Reference lake sampled by EPA

Green color indicates that lake is included in the Prairie Pothole Region Assessment.

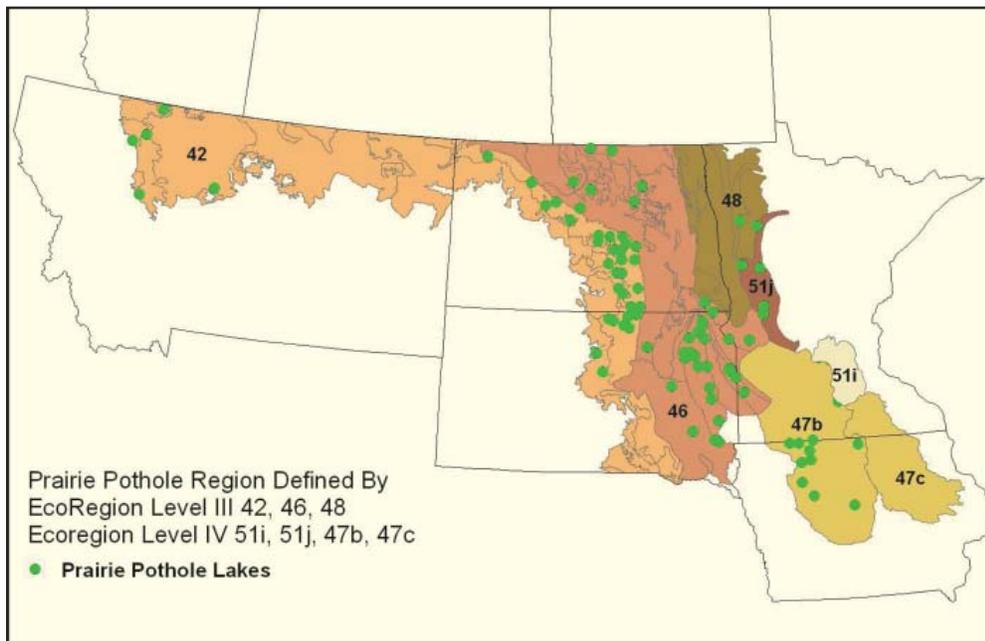


Figure 3. Prairie pothole lakes included in the Prairie Pothole Region Assessment.

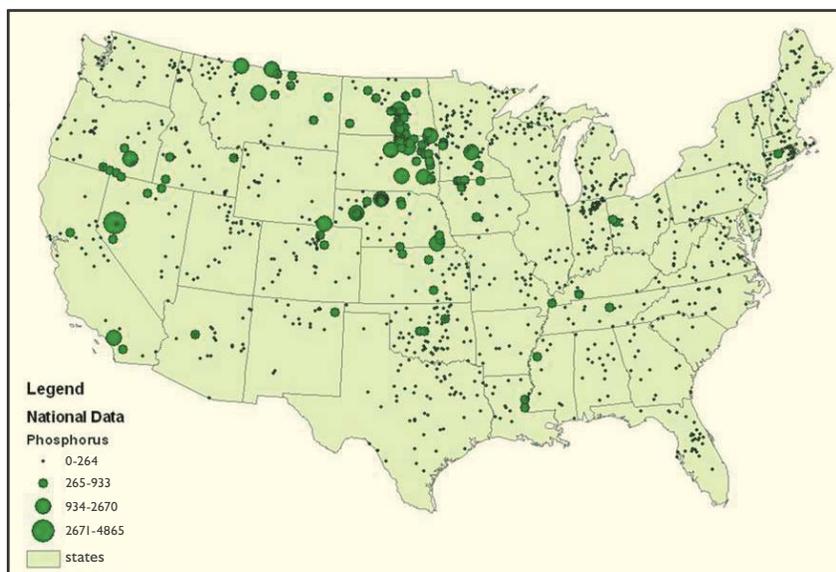
## Results of the National Lake Assessment

EPA released a report on the results of the NLA in December 2009. Overall, the NLA found that 56% of the nation's lakes support healthy biological communities based on an index of phytoplankton and zooplankton taxa loss. Another 21% of lakes are in fair condition and 22% are in poor biological condition based on this index. Poor habitat near the lakeshore and high levels of nitrogen and phosphorus were identified as the most significant stressors to the biological community.

Most of Iowa and all of the lakes that were sampled in Iowa as part of the NLA fall within the Temperate Plains ecoregion. Results of the NLA show that the Temperate Plains ecoregion has the highest percentage of lakes in the hypereutrophic category (45%) based on chlorophyll trophic state index values (Figure 1). Trophic state index values are divided into four main categories that describe the productivity of the lake: *oligotrophic* (least productive), *mesotrophic* (moderately productive), *eutrophic* (very productive), and *hypereutrophic* (extremely productive). Mesotrophic lakes, for example, generally have a good balance between water quality and algae/fish production. Eutrophic lakes have less desirable water quality and an overabundance of algae or fish. Hypereutrophic lakes generally have poor water quality and experience frequent algal blooms and a lack of oxygen in deep water. Figure 2 shows the percentage of lakes in the good, fair, and poor categories compared to regional reference conditions for a number of different indicators.

## Prairie Pothole Region Lakes Assessment

The NLA also offered Iowa the opportunity to partner with environmental agencies from North Dakota, South Dakota, Minnesota, and Montana to do an additional regional assessment of prairie pothole lakes. Prairie pothole lakes are shallow, natural lakes formed when glaciers from the last ice age receded. The prairie pothole region extends from northern Iowa to central Alberta and is a major flyway for migratory waterfowl (Figure 3).



**Figure 4.** Phosphorus concentrations ( $\mu\text{g/L}$ ) at NLA lakes.

Comparisons of prairie pothole lakes to lakes nationwide show that the prairie pothole lakes (PPL) are shallow (PPL median maximum depth = 2.5 meters (m); national median maximum depth = 5.8 m). This analysis also shows that these lakes have very high concentrations of nutrients (PPL median total phosphorus =  $209 \mu\text{g/L}$ ; national median total phosphorus  $24 \mu\text{g/L}$ ). Figure 4 illustrates the high levels of phosphorus in the prairie pothole region compared to the rest of the nation.

## Lessons for Iowa from the NLA

The NLA was an opportunity for Iowa to participate in a national survey, learn new methods of monitoring lakes, and partner with other states to learn more about the lakes of the prairie pothole region. The results showed that, compared to other lakes across the nation, the lakes in our region are nutrient-rich and high in chlorophyll, but generally have good acid neutralizing capacity and dissolved oxygen concentrations. The NLA was beneficial to Iowa in that it provided a national and regional perspective to lake water quality that is not achieved by Iowa's ambient lake monitoring program alone.

## Acknowledgements

The Iowa DNR would like to thank EPA and its partners for providing funding, method development, data analysis, and reporting for the National Lake Assessment. The DNR would also like to thank its partners in the Prairie Pothole Region Lakes Assessment, especially Peter Wax, Mike Ell, Steven Heiskary, and Joe Gross for providing analysis and maps of the Prairie Pothole Lake data.

## Figure Citations

Figures 1 and 2: U.S. Environmental Protection Agency (USEPA). 2009. National Lakes Assessment: A Collaborative Survey of the Nation's Lakes. EPA 841-R-09-001. U.S. Environmental Protection Agency, Office of Water and Office of Research and Development, Washington, D.C. Figure 3: Joe Gross, North Dakota Department of Health. Figure 4: United States Environmental Protection Agency

## Funding

Water monitoring activities of the Iowa Department of Natural Resources are funded by Iowa Infrastructure – Environment First Fund appropriations, as well as grants provided by the U.S. Environmental Protection Agency from Sections 106 and 319 of the Clean Water Act and the Regional Environmental Monitoring and Assessment Program.

Iowa Watershed Monitoring and Assessment Program Web Site – [www.igsb.uiowa.edu/wqm/](http://www.igsb.uiowa.edu/wqm/)



Prepared by  
Iowa Department of Natural Resources, Geological and Water Survey  
109 Trowbridge Hall, Iowa City, IA 52242-1319