

**Water- and sediment-quality data for Spooner Lake and Crystal Brook near
Spooner, Wisconsin**

Data Summary

This summary contains all data that were collected by the US Geological Survey for Spooner Lake District as a part of the program that was partially funded by Wisconsin Department of Natural Resources lake planning grant LPL-814. Much of these data have been or will be published in two annual data reports of the Wisconsin District of the U.S. Geological Survey. These reports are "Water-quality and lake-stage data for Wisconsin Lakes, water years 2002 and 2003" and "Water Resources data -Wisconsin, Water year 2002 and 2003". In addition, the data are archived in the U.S. Geological Survey's national stream flow and water-quality databases.

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Lake description and sampling locations:

Spoooner Lake is classified as a drainage lake, having one main inlet (Crystal Brook) and an outlet (Yellow River). The average depth of the lake is 7 feet and maximum depth is 17 feet, and surface area is 1092 acres ("Wisconsin Lakes" Wisconsin Department of Natural Resources, PUB-FH-800, 2001). The Lake's watershed area, including the lake, is 31.1 square miles, (Drainage Area Data for Wisconsin Streams", Henrich and Daniel, 1983, USGS Open-File Report 83-933).

Two sites in the lake were sampled for water quality and six sites were sampled for bed sediment quality. Crystal Brook was measured and sampled at the Highway 70 crossing southeast of the lake. Lake stage was measured at the dam at the lake's outlet. Locations of these sites are shown in Figure 1.

Lakebed sediment:

Bed sediment analyses are summarized in table 1 and a series of graphs (figs 2a-f). Sampling sites are approximately evenly distributed from the Crystal Brook inlet to the deep hole. The sites are numbered 1 – 6, with Site 1 being near the inlet and Site 6 being at the deep hole.

Lake water quality:

Lake-depth profiles:

Vertical profiles of water temperature, dissolved oxygen, pH, and specific conductance are typical of those for a shallow lake. Profile data in Tables 2a and 2b indicate there was little thermal stratification. However, as shown in figures 3a and 3b there was strong oxygen stratification and oxygen depletion in the lower 10 feet at the deep-hole sampling site by late summer. There was little oxygen depletion at the southeast sampling site (figs. 4a and 4b). Water was well mixed from top to bottom at both sampling sites at the spring turnover sampling on April 29, 2003.

Chemical constituents:

Analyses of water samples collected in April 2003 during spring turnover for selected chemical constituents for chemical characterization of the lake are given in Tables 3a and 3b. The constituent values were within regional values for northwestern Wisconsin as described by Lillie and Mason in "Limnological Characteristics of Wisconsin Lakes," 1983, Technical Bulletin No. 138, Department of Natural Resources.

Three common measures of water quality, which are used as indices, are concentrations of near-surface total phosphorus and chlorophyll a, and Secchi depth. These data are given in tables 4a and 4b and graphed in figures 5-7. The data indicate significant decline in quality from June through August at the deep-hole site. Water quality as indicated by Secchi depth and chlorophyll a was considerably better at the southeastern sampling site than at the deep-hole site.

Trophic status:

Another means of assessing the nutrient, or trophic, status of a lake is to compute trophic state indices (TSIs). The TSIs were developed to place phosphorus and chlorophyll a concentration and Secchi depth data on a common scale. TSI equations for Wisconsin Lakes developed by Lillie and others in "Trophic State Index Equations and regional predictive equations for Wisconsin Lakes," WDNR Management Findings, no. 35, 1993. These data are summarized in tables 4a and 4b and graphed in figure 8 show Spoooner Lake to be solidly in the eutrophic range.

Crystal Brook:

Crystal Brook flow, which was measured on seven different dates, was fairly constant, ranging from 18.1 to 20.1 cubic feet per second. Concentrations of total phosphorus at the time of measurements ranged from 0.036 – 0.051 mg/L and averaged 0.044 mg/L. About 72 percent of the phosphorus was in the dissolved form. These data are summarized in table 5 and figures 9a and 9b.

