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## **WATER QUALITY AND PHYTOPLANKTON DYNAMICS OF THE OTTERTAIL POWER PLANT COOLING POND, MILBANK, SD**

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### ABSTRACT

Ottertail Power Company maintains a 350-acre cooling pond to provide water to the boilers in their plant. Over the past several years, plant managers have witnessed blooms of algae, fish kills and calcium carbonate build-up on structures in the plant. The objectives of this project were to (1) develop baseline data describing current physical, chemical and biological conditions within the pond (2) develop a long-term monitoring plan for the pond and (3) draft recommendations to facilitate improvement of conditions within the pond. Water temperature, dissolved oxygen, conductivity, total hardness, total nitrogen, total phosphorus, water transparency, chlorophyll *a* and total and relative abundance of phytoplankton were measured monthly from five locations and three depths during 1998 and 1999. Ratio of total nitrogen (range 2.55 to 5.31 mg/L) to total phosphorus (range = 0.32 to 4.40 mg/L) averaged 3:1. Water temperatures varied by site and date (range 3 to 45°C). Dissolved oxygen ranged from 0.2 to 15.0 mg/L. Total phytoplankton counts ranged from 11,776 to 66,423 cells/ml. Chrysophyta, Chlorophyta and Euglenophyta were found in greater abundance during the winter months (range = 0 to 43,101 cells/ml) while Cyanobacteria dominated during the summer months (range = 0 to 28,709 cells/ml) at all sites. Calcium carbonate precipitation appears to be a function of high primary production and high calcium concentrations. Low nitrogen to phosphorus ratios appears to favor summer blooms of Cyanobacteria. Summer fish kills appear to coincide with high summer water temperatures and low oxygen levels. Water temperatures during a fish kill in July 1998 approached 40°C while oxygen levels from mid-depth to the bottom were less than 4.0 mg/L. Results of this effort provide a baseline against which future changes can be measured in the pond. Monitoring protocols have been established to facilitate future monitoring of the pond and corrective management prescriptions are under development.