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A CHARACTERIZATION OF WATER CHEMISTRY AND PLANKTON FROM FOUR PRAIRIE LAKES

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ABSTRACT

Plankton and water chemistry were sampled in four glacial prairie lakes on six dates in 1995 and 1996. Phytoplankton and zooplankton were identified and enumerated. Chemical parameters included nitrate, total kjeldahl nitrogen, total phosphorus, silica, iron, manganese, sodium, potassium, magnesium, calcium, chloride, sulfate, bicarbonate, carbonate and chlorophyll *a*. Station depth, secchi depth, turbidity, and conductivity were also measured. Two of the lakes were located in moraines and two were located in outwash. One lake was less than 13,000 years old as determined by position, and three were older. Two of the lakes were hypertrophic and two were eutrophic. Two of the lakes were slightly saline in 1995-1996, and two were fresh. Values obtained were compared with previous data bases maintained by the junior author and state agencies from in the 1970's and 1989-1994.

Roy Lake (Marshall County) is located in Mankato moraine (less than 13,000 years old). It was slightly saline with the following mean values measured in 1995-6: 1170 μ S conductivity, 376 ppm sulfate, 251 ppm bicarbonate, 122 ppm calcium, and 91 ppm magnesium. Roy Lake was eutrophic (7.8 ppb chlorophyll *a*, 0.03 ppm total phosphorus, 1.31 ppm total nitrogen, 2.32 m secchi depth, and 4.2 ntu turbidity). Mean values for other phytoplankton nutrients were: 0.07 ppm iron, 0.07 ppm manganese, and 8.5 ppm silica.

Pickerel Lake (Day County) is older and located in outwash. It was fresh with the following mean values measured in 1995-6: 580 μ S Conductivity, 73 ppm sulfate, 189 ppm bicarbonate, 36 ppm calcium, and 34 ppm magnesium. Pickerel Lake was eutrophic (17.7 ppb chlorophyll *a*, 0.03 ppm total phosphorus, 0.75 ppm total nitrogen, 1.25 m secchi depth, and 7.4 ntu turbidity). Mean values for other phytoplankton nutrients were: 0.17 ppm iron, 0.07 ppm manganese, and 4.5 ppm silica.

Bitter Lake (Day County) is older than Pickerel and located in outwash, downstream from Pickerel Lake. Bitter is a saline lake in most years. However, during 1995-6, its water level rose and it was slightly saline with the following mean values measured in 1995-6: 3758 μ S conductivity, 3248 ppm sulfate, 386 ppm bicarbonate, 142 ppm chloride, 509 ppm magnesium, 401 ppm sodium, and 93 ppm potassium. Bitter Lake was hypertrophic (33.7 ppb chlorophyll *a*, 0.64 ppm total phosphorus, 9.56 ppm total nitrogen, 0.78 m secchi depth, and 38.9 ntu turbidity). Mean values for other phytoplankton nutrients were: 0.20 ppm iron, 0.14 ppm manganese, and 5.0 ppm silica.

Oak Lake (Brookings County) is located in 14,000 year old moraine. It was fresh with the following mean values measured in 1995-6: 610 μ S conductivity, 123 ppm sulfate, 178 ppm bicarbonate, 36 ppm calcium, and 32 ppm magnesium. Oak Lake was hypertrophic (35.6 ppb chlorophyll *a*, 0.13 ppm total phosphorus, 1.41 ppm total nitrogen, 0.42 m secchi depth, and 37.3 ntu turbidity). Mean values for other phytoplankton nutrients were: 0.28 ppm iron, 0.12 ppm manganese, and 10.3 ppm silica.

Comparisons with previous data bases did not indicate major changes between years for Roy, Pickerel and Oak but indicated drastic change between years for Bitter. Major ion concentrations other than calcium were almost an order of magnitude lower in 1995-6 than sampled by the junior author in 1975. In addition, water depth and clarity were much greater in 1995-6 than in all previous years. In previous years Bitter was dominated by non-nitrogen-fixing coccoid bluegreen algae including *Anacystis (Microcystis) incerta* and *cyanea*. *Anacystis* spp. populations were 2 orders of magnitude lower in 1995, however Bitter experienced a heavy bloom of the nitrogen-fixing *Aphanizomenon bolsaticum* (flos-aquae) in midsummer 1995, a species not previously recorded from Bitter.