

# Sediment and Nutrient Loading to Lake Pepin

**Issue:** Lake Pepin is filling in at 10 times its natural rate, and it is accumulating phosphorus at 15 times the natural rate.

## Lake Pepin

- 34 km long, 2-3 km wide, surface area 103 km<sup>2</sup>, watershed area 122,000 km<sup>2</sup>
- Water residence time about 1–7 weeks
- Inputs from tributaries:
  - St. Croix R.: 25% of flow, 4% of TP
  - Upper Mississippi R.: 50% of flow, 26% of TP
  - Minnesota R.: 25% of flow, 32% of TP, 75% of TSS
- Input from Twin Cities wastewater treatment: 24% of TP

## Our study

- Collected 25 lake sediment cores (5 transects of 5 cores each) from Lake Pepin
- Cores went back to before the time of settlement by European immigrants, which was about 1830 in this part of the state
- Analyzed cores for sediment and phosphorus content
- Analyzed diatoms (a type of algae) to determine past total phosphorus (TP) levels in the lake water

## What we found

### Sediment

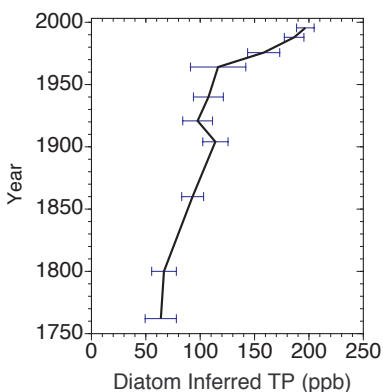
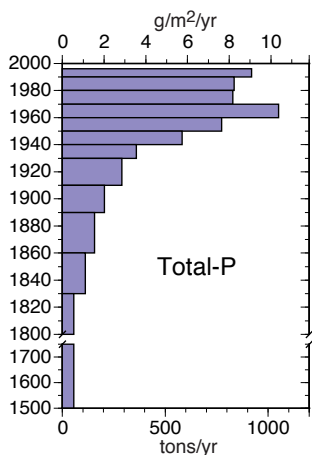
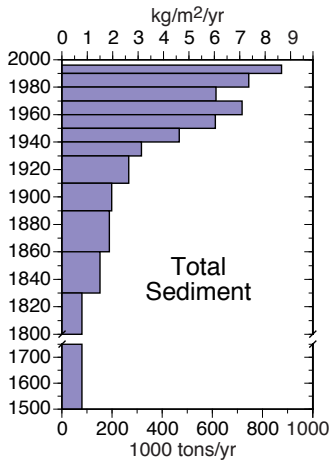
- Lake Pepin is filling in with sediment at about 10 times its natural rate. At this rate, it will be completely filled with sediment within 340 years. (By “natural” rate, we mean the rate before European settlers arrived.)
- Relative to 1830, the lake has lost 17% of its volume.
- The modern flux of sediment is about 900,000 metric tons per year.

### Phosphorus

- Phosphorus is accumulating in the sediment at 15 times the natural rate
- Phosphorus loading to the lake appears to have increased by about seven times (or more) above natural rates. (“Loading” means the kg of phosphorus entering the lake each year.)
- Lake water TP concentrations have increased from about 50 ppb (parts per billion) to 200 ppb, making Lake Pepin highly eutrophic.

### What caused these changes?

- The most dramatic increases in both sediment and phosphorus inputs to Lake Pepin began in the 1940s.
- These increases correlate with acreage of row crops, river flows, and population.



## Funding Partners

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