

Barnum 11-0281-00

MN Lake ID: 11-0281-00
 County: Cass
 Ecoregion: Northern Lakes and Forests
 Major Drainage Basin: Upper Mississippi River
 Latitude/Longitude: 46.97000000 / -94.32000000
 Water Body Type: Public Waters
 Monitored Sites (Primary): 204
 Monitored Sites (Secondary): 202, 203

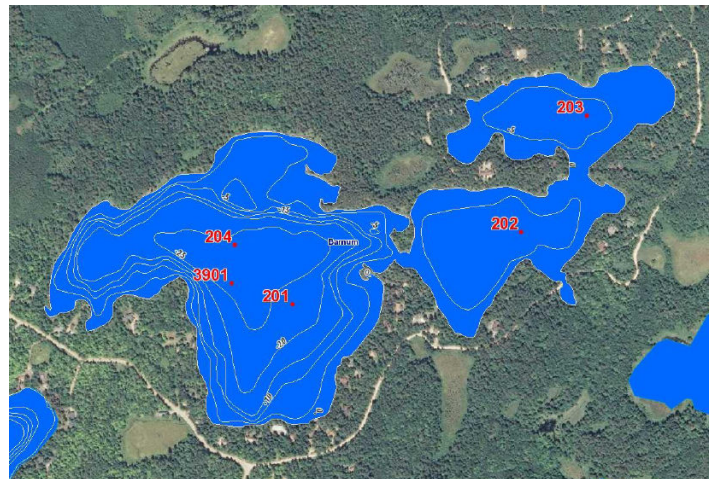
Physical Characteristics

Surface area (acres): 134
 Littoral area (acres): 84
 % Littoral area: 62%
 Max depth (ft): 30 (m): 9.1
 Mean depth (ft): N/A (m): N/A
 Watershed size (acres): N/A

Water Quality Characteristics - Historical Means

Years monitored: 2008-2009

| Parameters | Primary Site 204 | Site 202 | Site 203 |
|---|------------------|----------|----------|
| Total Phosphorus Mean: | 8.6 | 13.1 | 16.1 |
| Total Phosphorus Min: | 6 | 8 | 13 |
| Total Phosphorus Max: | 11 | 20 | 21 |
| Number of Observations: | 10 | 10 | 10 |
| Chlorophyll-a Mean: | 2.2 | 2.7 | 2.7 |
| Chlorophyll-a Min: | 1 | 1 | 1 |
| Chlorophyll-a Max: | 4 | 6 | 4 |
| Number of Observations: | 10 | 10 | 10 |
| Secchi Depth Mean: | 19.8 | 8 | 7 |
| Secchi Depth Min: | 12 | 8 | 7 |
| Secchi Depth Max: | 24.5 | 8 | 7 |
| Number of Observations: | 9 | 1 | 1 |
| Trophic State Index Mean (Primary Site): | 35 | | |
| Trophic State: | Oligotrophic | | |



Ecoregion Comparisons

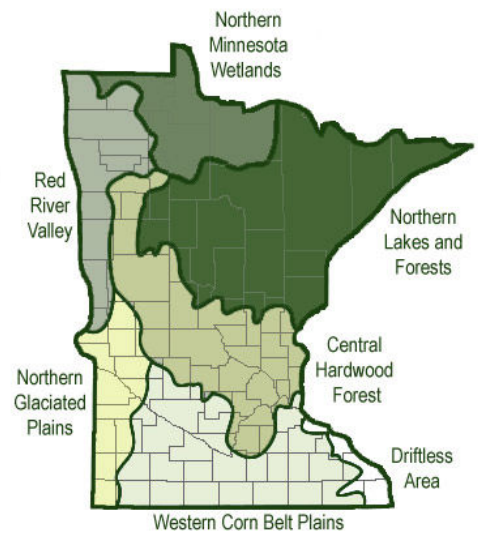
Minnesota is divided into 7 ecoregions based on land use, vegetation, precipitation and geology. The MPCA has developed a way to determine the "average range" of water quality expected for lakes in each ecoregion.

From 1985-1988, the MPCA evaluated the lake water quality for chosen reference lakes. These reference lakes are not considered pristine, but are considered to have little human impact and therefore are representative of the typical lakes within the ecoregion. The "average range" refers to the 25th - 75th percentile range for data within each ecoregion.

Cass County is in the Northern Lakes and Forests Ecoregion.

Barnum Lake (Site 204) compares to the ecoregion average ranges as indicated below:

| | |
|-------------------|---|
| Total Phosphorus: | Better than expected range, which indicates better than expected water quality for the area |
| Chlorophyll-a: | Better than expected range, which indicates better than expected water quality for the area |
| Secchi Depth: | Better than expected range, which indicates better than expected water quality for the area |



Minnesota Ecoregion Map

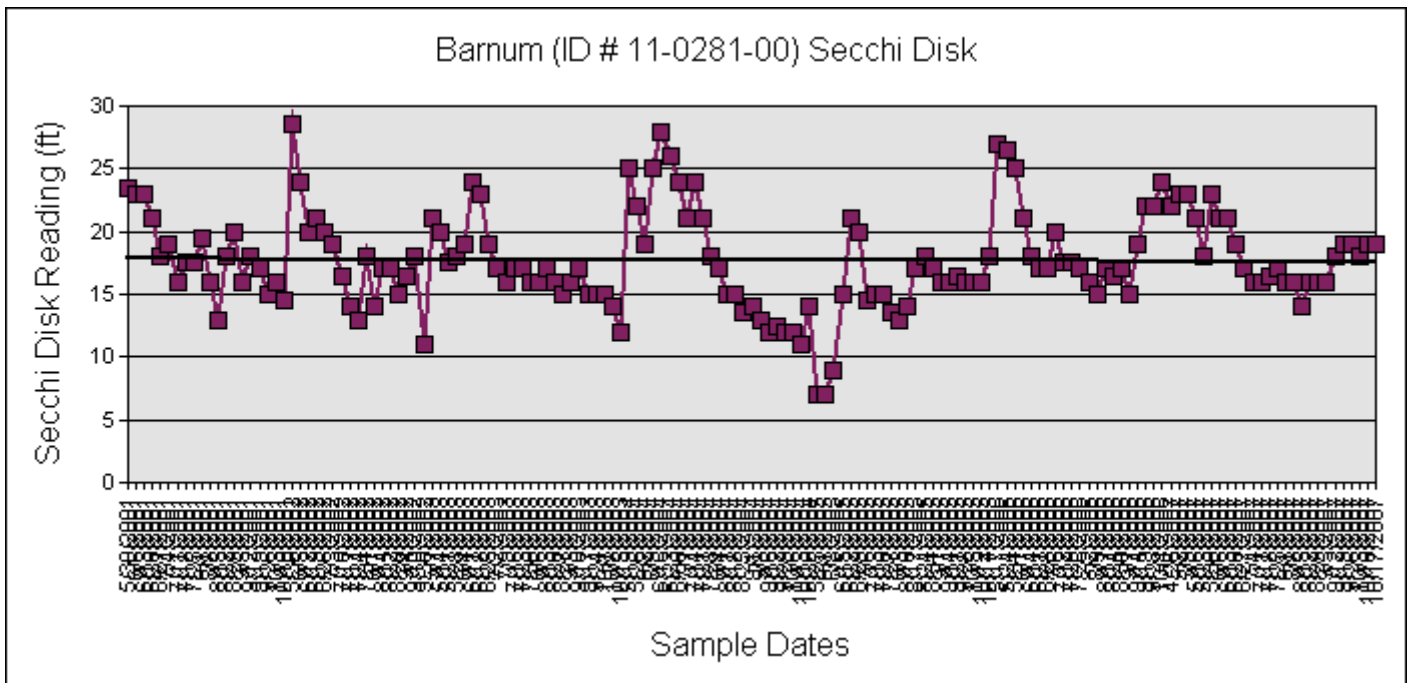
Trend Analysis Report

For detecting trends, a minimum of 8-10 years of data with 4 or more readings per season are recommended. Minimum confidence accepted by the MPCA is 90%. This means that there is a 90% chance that the data are showing a true trend and a 10% chance that the trend is a random result of the data. Only short-term trends can be determined with just a few years of data, because there can be different wet years and dry years, water levels, weather, etc., that affect the water quality naturally.

There is not enough historical data to perform trend analysis for total phosphorus or chlorophyll *a* on Barnum Lake, Site 204. Site 201 had enough transparency data to perform a long-term Secchi depth trend analysis. The data was analyzed using the Mann Kendall Trend Analysis.

| County | MN Lake ID | Lake | Site | Data Evaluated | Date Range | Data Source |
|--------|------------|--------|------|----------------|-------------------------|----------------|
| Cass | 11-0281-00 | Barnum | 201 | Secchi Disk | 05-01-2001 - 10-31-2007 | All Historical |

No Significant Trend Exists



Individual Lake Data Summary

| | | | | | |
|--------|------------|--------|---------------|-------------------------|-------------|
| County | MN Lake ID | Lake | Site | Date Range | Data Source |
| Cass | 11-0281-00 | Barnum | 204 (Primary) | 06-01-2008 - 09-30-2009 | RMB Lab |

| Historical Mean | | | | | | 8.6 | 2.2 | 19.8 | 34 | 37 | 34 | 35 |
|---------------------------|----------|------|---------------|----------|-------------|---------|-----------|------------|-----------|-----------|----------------|----------|
| Date | Time | Site | Sampler | Lab Code | Data Source | TP ug/L | ChlA ug/L | Secchi Ft. | TSI Phos. | TSI ChlAL | TSI Secchi Ft. | TSI Avg. |
| 6/8/2008 | 12:00 PM | 204 | Richard Roddy | 78446 | RMB Lab | 10 | 4 | 21 | 37 | 44 | 33 | 38 |
| 6/30/2008 | 9:10 AM | 204 | Dick Roddy | 80737 | RMB Lab | 6 | 2 | 24 | 30 | 37 | 31 | 33 |
| 7/27/2008 | 1:05 PM | 204 | Dick Roddy | 83607 | RMB Lab | 6 | 1 | 19.5 | 30 | 31 | 34 | 32 |
| 8/17/2008 | 3:05 PM | 204 | Dick Roddy | 85410 | RMB Lab | 11 | 2 | 15 | 39 | 37 | 38 | 38 |
| 9/7/2008 | 9:55 AM | 204 | Dick Roddy | 86957 | RMB Lab | 9 | 4 | 12 | 36 | 44 | 41 | 40 |
| Annual Mean | | | | | | 8.4 | 2.6 | 18.3 | 34 | 38 | 35 | 36 |
| Date | Time | Site | Sampler | Lab Code | Data Source | TP ug/L | ChlA ug/L | Secchi Ft. | TSI Phos. | TSI ChlAL | TSI Secchi Ft. | TSI Avg. |
| 5/31/2009 | 2:20 PM | 204 | Dick Roddy | 98180 | RMB Lab | 11 | 2 | 24.5 | 39 | 37 | 31 | 36 |
| 6/21/2009 | 8:03 PM | 204 | Dick Roddy | 101102 | RMB Lab | 7 | 1 | 24 | 32 | 31 | 31 | 31 |
| 7/12/2009 | 6:45 PM | 204 | Dick Roddy | 103460 | RMB Lab | 9 | 2 | N/A | 36 | 37 | N/A | 36 |
| 8/9/2009 | 10:42 AM | 204 | Dick Roddy | 107100 | RMB Lab | 10 | 2 | 18.5 | 37 | 37 | 35 | 36 |
| 9/13/2009 | 12:50 PM | 204 | Dick Roddy | 110793 | RMB Lab | 7 | 2 | 20 | 32 | 37 | 34 | 34 |
| Annual Mean | | | | | | 8.8 | 1.8 | 21.8 | 35 | 35 | 32 | 34 |