

Mule 11-0200-00

MN Lake ID: 11-0200-00
 County: Cass
 Ecoregion: Northern Lakes and Forests
 Major Drainage Basin: N/A
 Latitude/Longitude: N/A
 Water Body Type: N/A
 Monitored Sites (Primary): 201
 Monitored Sites (Secondary): N/A

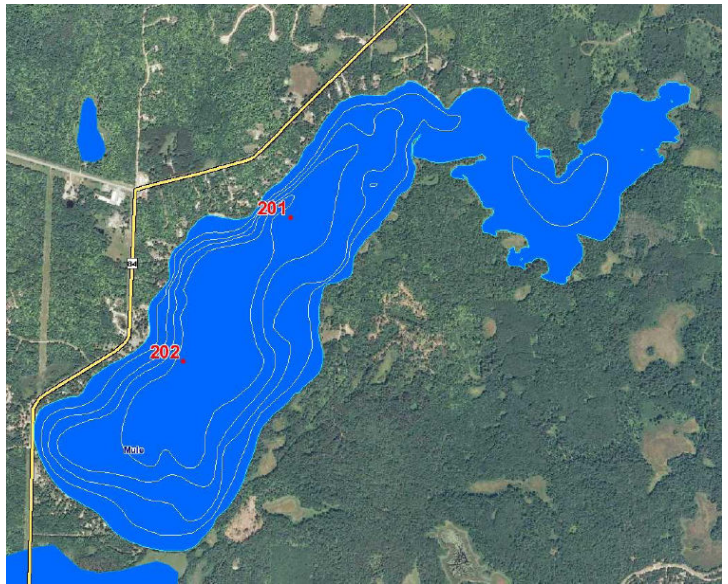
Physical Characteristics

Surface area (acres): 525
 Littoral area (acres): 182
 % Littoral area: 35
 Max depth (ft): 47 (m): 14.3
 Mean depth (ft): N/A (m): N/A
 Watershed size (acres): N/A

Water Quality Characteristics - Historical Means

Years monitored: 2007-2009

Parameters	Primary Site 201
Total Phosphorus Mean:	13.2
Total Phosphorus Min:	7
Total Phosphorus Max:	21
Number of Observations:	15
Chlorophyll-a Mean:	4
Chlorophyll-a Min:	1
Chlorophyll-a Max:	12
Number of Observations:	15
Secchi Depth Mean:	16.7
Secchi Depth Min:	9
Secchi Depth Max:	25.5
Number of Observations:	15
Trophic State Index Mean:	39.7
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.

Mule Lake 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:	Within expected range, which indicates expected water quality for the area
Secchi Depth:	Better than expected range, which indicates better than expected water quality for the area

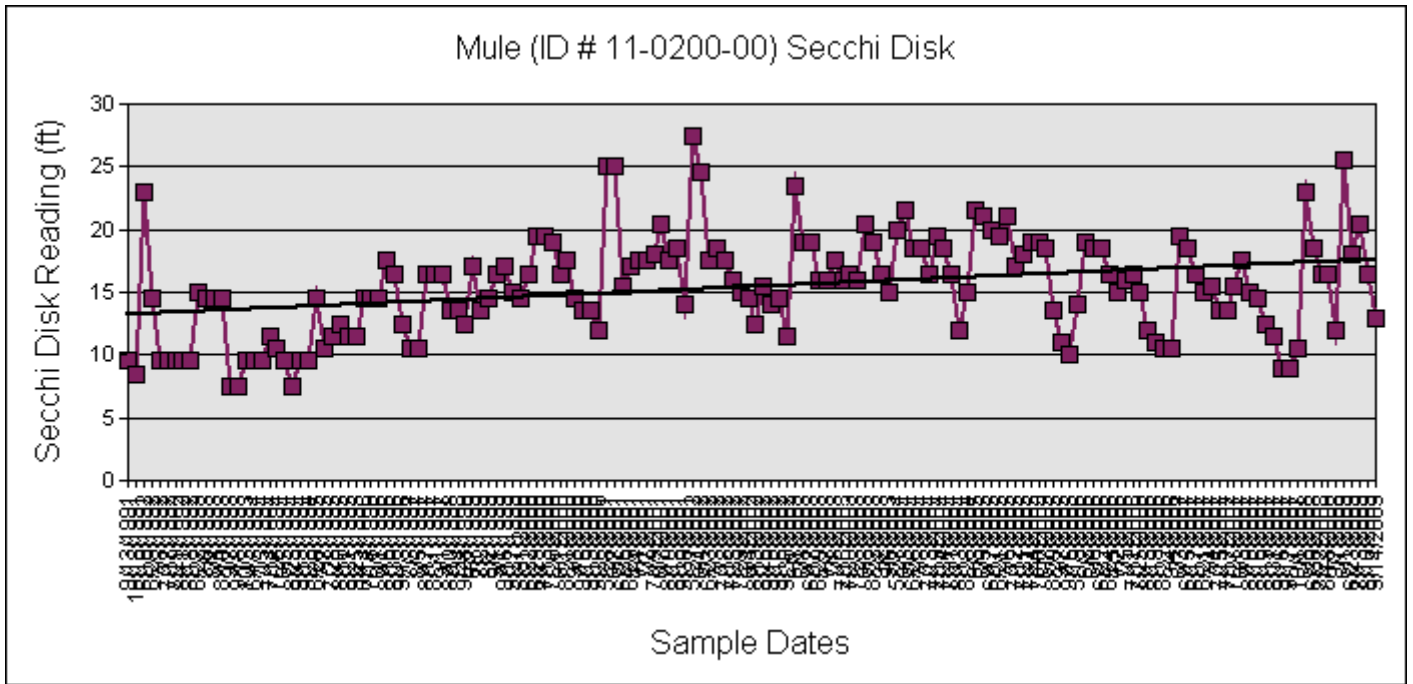
Trend Analysis Report

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 Mule Lake. 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	11-0200-00	Mule	201 (Primary)	Secchi Disk	09-01-1991 - 09-30-2009	All Historical

**The probability that a true significant trend exists is 99.9%
Secchi Disk is increasing, which indicates improving water quality.**



Individual Lake Data Summary

County	MN Lake ID	Lake	Site	Date Range	Data Source
Cass	11-0200-00	Mule	201 (Primary)	06-01-2007 - 09-30-2009	RMB Lab

Historical Mean						13.2	4	16.7	40	41	37	39
Date	Time	Site	Sampler	Lab Code	Data Source	TP ug/L	ChIA ug/L	Secchi Ft.	TSI Phos.	TSI ChIAL	TSI Secchi Ft.	TSI Avg.
6/3/2007	12:40 PM	201	Marjorie Dahlager	62150	RMB Lab	13	2	19.5	41	37	34	37
6/17/2007	2:40 PM	201	Marjorie Dahlager	63194	RMB Lab	7	5	16.5	32	46	37	38
7/15/2007	12:10 PM	201	Marjorie Dahlager	65184	RMB Lab	14	3	13.5	42	41	40	41
8/19/2007	2:30 PM	201	Marjorie Dahlager	67002	RMB Lab	13	8	12.5	41	51	41	44
9/16/2007	12:00 PM	201	Marjorie Dahlager	68582	RMB Lab	21	12	9	48	55	45	49
Annual Mean						13.6	6	14.2	40	46	39	41
Date	Time	Site	Sampler	Lab Code	Data Source	TP ug/L	ChIA ug/L	Secchi Ft.	TSI Phos.	TSI ChIAL	TSI Secchi Ft.	TSI Avg.
6/8/2008	10:50 AM	201	Marjorie Dahlager	78445	RMB Lab	13	1	23	41	31	32	35
6/30/2008	9:15 AM	201	Marjorie Dahlager	80734	RMB Lab	9	4	18.5	36	44	35	38
7/27/2008	3:00 PM	201	Marjorie Dahlager	83595	RMB Lab	11	1	16.5	39	31	37	36
8/18/2008	8:15 AM	201	Beverly Peterson	85407	RMB Lab	8	4	16.5	34	44	37	38
9/7/2008	3:50 PM	201	Marjorie Dahlager	86967	RMB Lab	16	4	12	44	44	41	43
Annual Mean						11.4	2.8	17.3	38	38	36	38
Date	Time	Site	Sampler	Lab Code	Data Source	TP ug/L	ChIA ug/L	Secchi Ft.	TSI Phos.	TSI ChIAL	TSI Secchi Ft.	TSI Avg.
6/1/2009	8:35 AM	201	Marjorie Dahlager	98202	RMB Lab	14	2	25.5	42	37	30	36
6/23/2009	11:00 AM	201	Marjorie Dahlager	101629	RMB Lab	13	1	18	41	31	35	36
7/13/2009	8:50 AM	201	Marjorie Dahlager	103444	RMB Lab	12	2	20.5	40	37	34	37
8/10/2009	8:45 AM	201	Marjorie Dahlager	107097	RMB Lab	16	4	16.5	44	44	37	42
9/14/2009	8:35 AM	201	Marjorie Dahlager	110800	RMB Lab	18	7	13	46	50	40	45
Annual Mean						14.6	3.2	18.7	42	39	35	39