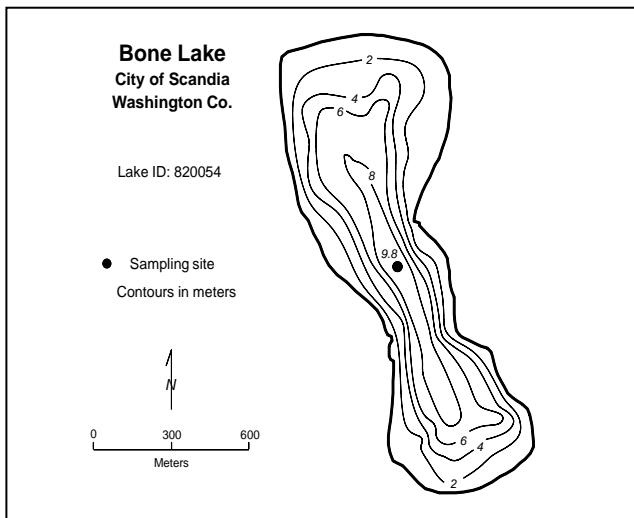


## Bone Lake

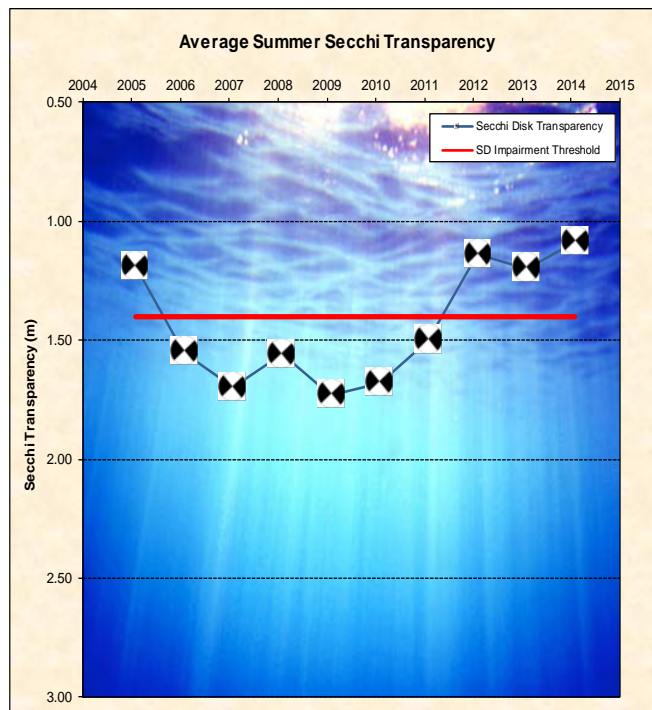
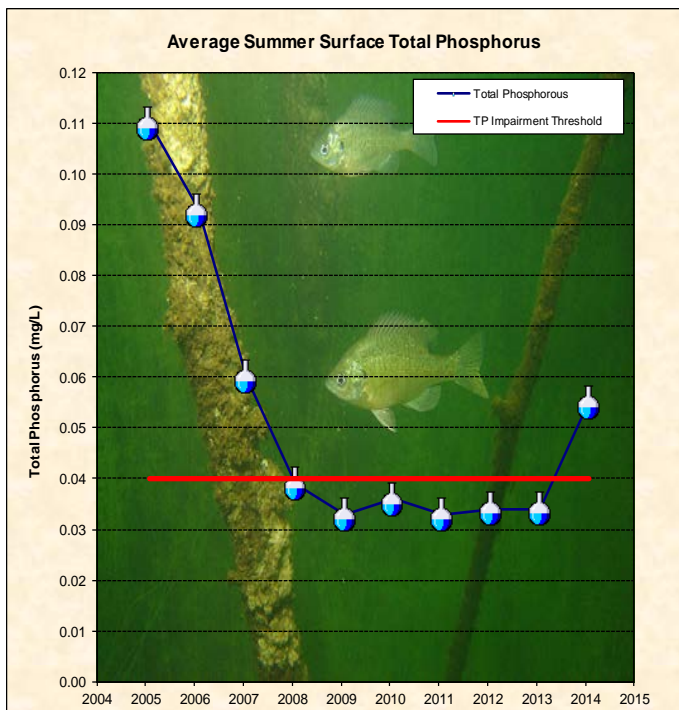
### 2014 Lake Grade: C-

- DNR ID #: 82005400
- Municipality: City of Scandia
- Location: Section 5 T32N-R20W
- Lake Size: 221.45 acres
- Maximum Depth (2014): 32 ft.
- Ordinary High Water Mark: 909.1 ft.
- 56% Littoral  
Note: Littoral area is the portion of the lake <15 ft. and dominated by aquatic vegetation.



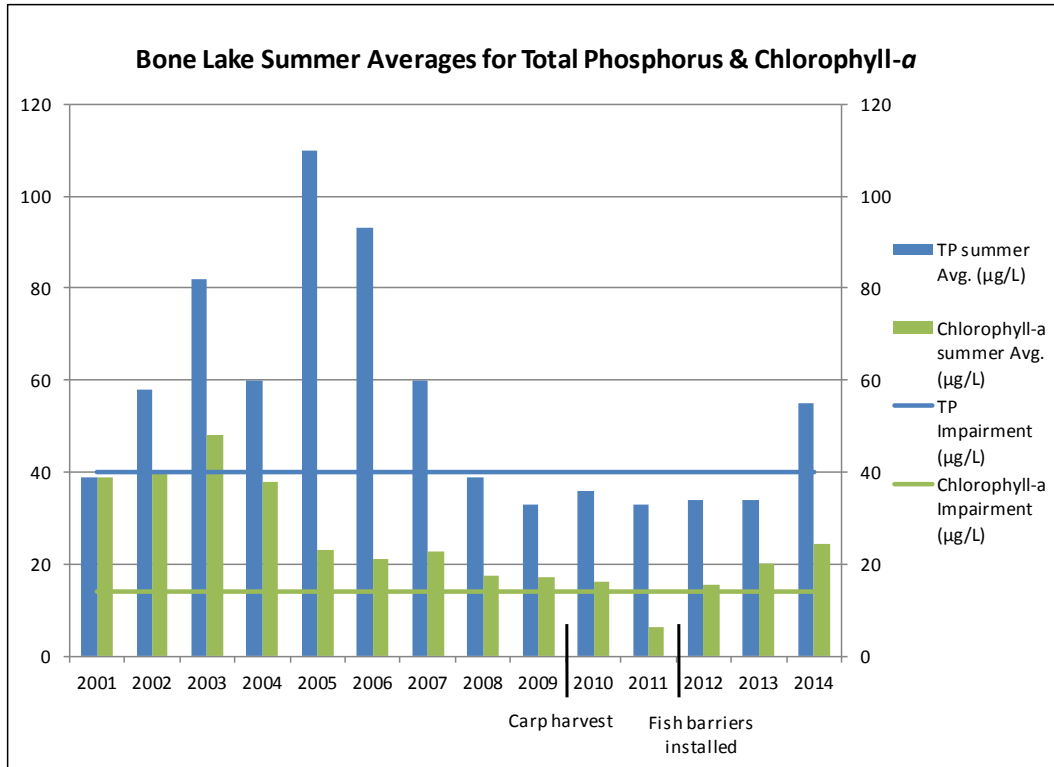
### Summary Points

- Based on the chlorophyll-*a* results Bone Lake was considered eutrophic in 2014, according to the Carlson Trophic State Index.
- Using the Kendall Tau correlation test ( $p < 0.01$ ) there is a statistically significant **improving** trend for the average total phosphorus and no trend for the average Secchi transparency at this time.
- The major land use is rural/agricultural.
- The lake stratified in 2014 with the thermocline varying between 5 and 6 meters.
- Bone Lake is listed as impaired for nutrients on the Minnesota Pollution Control Agency's Impaired Waters List.
- Eurasian watermilfoil and Curly-leaf pondweed (invasive aquatic plants) are extensive in this lake.
- Carp removal was performed in the winter of 2010.
- Low velocity fish barriers were installed at Bone Lake north inlet and Bone Lake outlet in the fall of 2012.



| Date  | Total Phosphorus (mg/L) | Chlorophyll-a (µg/L) | Total Kjeldahl Nitrogen (mg/L) | Secchi Disk Depth (m) | Surface Temperature (Celsius) | Surface Dissolved Oxygen (mg/L) |
|---|-------------------------|----------------------|--------------------------------|-----------------------|-------------------------------|---------------------------------|
| 5/15/14   | 0.034                   | 26.0                 | 1.20                           | 1.80                  | 11.5                          | 11.31                           |
| 5/28/14   | 0.017                   | 2.5                  | 1.00                           | 1.60                  | 22.5                          | 9.55                            |
| 6/12/14   | 0.024                   | 22.0                 | 1.10                           | 1.30                  | 21.8                          | 10.74                           |
| 6/23/14   | 0.046                   | 31.0                 | 1.20                           | 1.40                  | 24.3                          | 13.26                           |
| 7/8/14  | 0.130                   | 26.0                 | 1.20                           | 1.20                  | 23.2                          | 8.20                            |
| 7/23/14   | 0.103                   | 26.0                 | 1.30                           | 1.00                  | 26.2                          | 9.12                            |
| 8/7/14  | 0.034                   | 26.0                 | 1.20                           | 0.90                  | 26.5                          | 10.64                           |
| 8/20/14   | 0.025                   | 13.0                 | 1.40                           | 0.80                  | 25.5                          | 8.46                            |
| 9/4/14  | 0.031                   | 23.0                 | 1.20                           | 1.00                  | 22.2                          | 8.91                            |
| 9/17/14   | 0.048                   | 27.0                 | 1.60                           | 1.10                  | 18.9                          | 7.57                            |
| 10/1/14   | 0.025                   | 31.0                 | 1.50                           | 1.60                  | 16.6                          | 9.33                            |
| 10/13/14  | 0.049                   | 42.0                 | 1.70                           | 1.10                  | 12.1                          | 10.78                           |
| <b>2014 Average</b>   | <b>0.047</b>            | <b>24.6</b>          | <b>1.30</b>                    | <b>1.23</b>           | <b>20.9</b>                   | <b>9.82</b>                     |
| <b>2014 Summer Average</b>  | <b>0.055</b>            | <b>24.3</b>          | <b>1.28</b>                    | <b>1.09</b>           | <b>23.6</b>                   | <b>9.61</b>                     |
| <b>Volunteer Data</b>   |                         |                      |                                |                       |                               |                                 |
| 5/4/14  | 0.034                   | 12.0                 | 1.20                           | 1.30                  | 9.7                           | NA                              |
| 5/26/14   | 0.014                   | 2.2                  | 0.85                           | 3.10                  | 21.0                          | NA                              |
| 6/9/14  | 0.035                   | 22.0                 | 1.20                           | 1.70                  | 24.3                          | NA                              |
| 6/20/14   | 0.035                   | 23.0                 | 1.30                           | 1.00                  | 25.0                          | NA                              |
| 6/29/14   | 0.043                   | 32.0                 | 1.30                           | 0.90                  | 24.4                          | NA                              |
| 7/12/14   | 0.034                   | 34.0                 | 1.30                           | 0.70                  | 25.6                          | NA                              |
| 7/16/14   | 0.031                   | 28.0                 | 1.10                           | 0.90                  | 25.2                          | NA                              |
| 7/23/14   | 0.039                   | 17.0                 | 1.30                           | 0.90                  | 27.5                          | NA                              |
| 8/1/14  | 0.026                   | 22.0                 | 1.10                           | 1.00                  | 31.0                          | NA                              |
| 8/14/14   | 0.014                   | 13.0                 | 1.10                           | 1.10                  | 25.6                          | NA                              |
| <b>2014 Average</b>   | <b>0.031</b>            | <b>20.5</b>          | <b>1.18</b>                    | <b>1.26</b>           | <b>23.9</b>                   | <b>NA</b>                       |
| <b>2014 Summer Average</b>  | <b>0.031</b>            | <b>20.5</b>          | <b>1.18</b>                    | <b>1.26</b>           | <b>23.9</b>                   | <b>NA</b>                       |
| Water quality thresholds are 0.04 mg/L TP, 14 µg/L CL-a, 1.4 m Secchi depth*              |                         |                      |                                |                       |                               |                                 |
| Shallow lake water quality thresholds are 0.06 mg/L TP, 20 µg/L CL-a, 1.0 m Secchi depth* |                         |                      |                                |                       |                               |                                 |
| <b>2014 Elevation (ft)</b>  | <b>High</b>             | <b>High Date</b>     | <b>Low</b>                     | <b>Low Date</b>       | <b>Average</b>                |                                 |
|   | 910.43                  | 5/20/2014            | 908.23                         | 10/23/2014            | 909.07                        |                                 |

\*MPCA description of Impaired Lake's Listing criteria: "At a minimum, a decision that a given lake is impaired for the 303(d) list due to excessive nutrients will be supported by data for both causal and response factors. Data requirements for 303(d) listing consist of 12 or more TP measurements collected from June through September over the most recent 10-year period. Ideally this should represent 12 separate visits to the lake over the course of two summers; however it might also reflect four monthly samples over the course of three years (a typical sampling regimen for many lake monitoring programs). In addition to exceeding the TP guideline thresholds, lakes to be considered for 303(d) listing should have at least 12 Secchi measurements and 12 chlorophyll-a measurements. This amount of data will allow for at least one season (preferably more) for paired TP, chlorophyll-a, and Secchi disk data and provide a basis for evaluating their interrelationships and hence the trophic status of the lake."



| Lake Water Quality Summary |             |          |          |           |           |           |           |           |           |          |
|----------------------------|-------------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|
|                            | Lake Grades |          |          |           |           |           |           |           |           |          |
|                            | 2014        | 2013     | 2012     | 2011      | 2010      | 2009      | 2008      | 2007      | 2006      | 2005     |
| Total Phosphorus (mg/L)    | C           | C        | C        | C         | C         | C         | C         | C         | C         | C        |
| Chlorophyll-a (µg/L)       | C           | C        | B        | A         | B         | B         | B         | B         | B         | C+       |
| Secchi depth (ft)          | D           | C        | D        | C         | C         | C         | C         | C         | C         | C        |
| <b>Overall</b>             | <b>C-</b>   | <b>C</b> | <b>C</b> | <b>C+</b> | <b>C+</b> | <b>C+</b> | <b>C+</b> | <b>C+</b> | <b>C+</b> | <b>C</b> |

## Bone Lake Water Surface Elevation Statistics

Outlet Elevation (culvert): 907.3 ft.

Ordinary High Water Level (OHW) Elevation: 909.1 ft.

100 Year Flood Elevation (CLFLWD): 910.6 ft.

Highest Recorded Elevation: 910.97 ft. (07/07/1975)

Lowest Recorded Elevation: 906.7 ft. (11/07/1966)

Datum: NGVD 29 (ft.)

