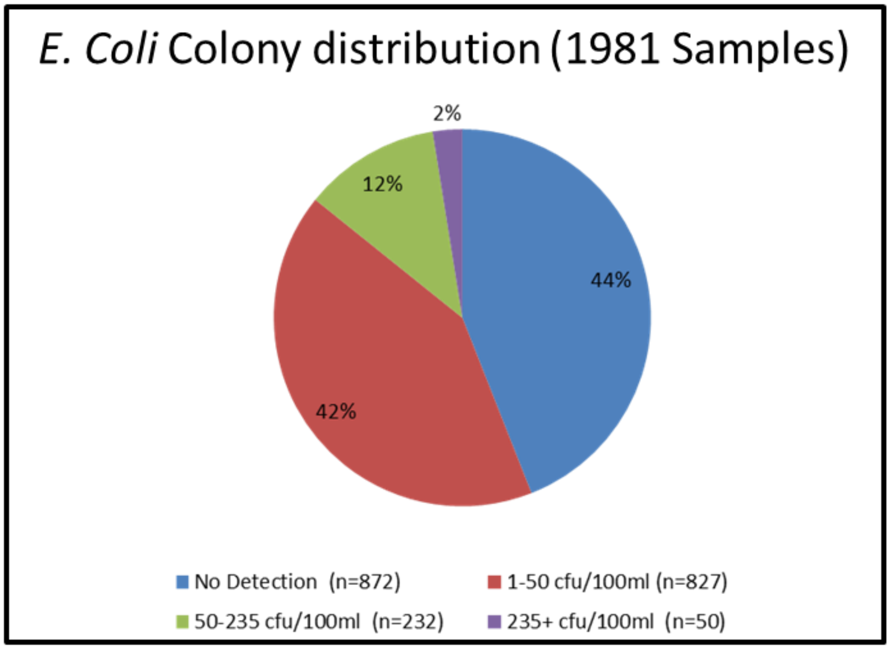
Clear Lake Water Quality Sampling Summary 2016

Bacteria

Beginning in 2016, the Dakota Water Watch program scaled back the amount of bacteria monitoring done, especially in lakes. Over the previous few years, we learned that the amount of *E. coli* we were seeing in lakes was very low. The chart below shows that of 1,981 samples taken from different lakes over the past few years, only 50 (2%) exceeded the South Dakota recreational standard of ≤235 cfu/100mL, while nearly half showed no detection for *E. coli*. The samples that did show an exceedance were usually taken from sites near inlets to the lake or were taken after significant rain events. In addition, there were typically other indications that there was potentially an issue at that site such as a smell or very turbid water.



As a replacement for the bacteria monitoring done by Dakota Water Watch volunteers in the past, the program began using the sampling method used by the DENR as part of their statewide lake assessment program. For Clear Lake, this entails collecting one sample from four sites around the lake on different days and mailing them to the state health lab for analysis. In 2016, we encountered a few shipping issues with getting the samples to the lab in under the 30 hour holding time. Because of this, we were only able to get results from two samples last year. While this is less than our goal of four samples, the state typically only samples for bacteria twice during the year, so we were able to generate a dataset equal to what the state would have done. The chart below shows the bacteria counts, both of which were far below what would be any cause for concern.

Clear Lake, 2016 *E. coli* Bacteria (MPN/100mL)				
Sample Site ID	Date	Time	Monitor Name(s)	Count
4807-03	6/15/2016	1210	Phil George	123
4807-02	7/26/2016	830		1.0

Trophic State Index/Mid-lake Sampling

A lake's trophic state, or productivity, is its ability to support plant and animal life. Lakes with low productivity are called oligotrophic and generally have clear deep water with little aquatic plant growth. High productivity lakes are called eutrophic or even hypereutrophic and are shallow, turbid, and have lots of aquatic plants and algae. Lakes in between these two endpoints are called mesotrophic. In order to determine where a lake is on this scale, we use a method called the Trophic State Index. It uses Secchi depth along with chlorophyll-a and total phosphorus to calculate numbers between 1 and 100. The higher the number the more productive the lake is. The chart below shows the ranges for each trophic state classification and characteristics of a lake that you would typically see within that range.

Characteristics of Trophic Status		
TSI value	**Status**	**Characteristics**
0-35	Oligotrophic	Clear water, oxygen in hypolimnion throughout the year, salmonid fisheries dominate, hypolimnion of shallow lakes may become anoxic during summer
36-50	Mesotrophic	Water fairly clear, increasing chance of hypolimnetic anoxia during summer
51-65	Eutrophic	Anoxic hpyolimnia, macrophyte problems possible, warm-water fisheries only, blue-green algae dominate, algal scums, low transparency, may discourage swimming and boating
66-100	Hypereutrophic	Dense algae and macrophytes to algal scums, few macrophytes, rough fish dominate, summer fish kills possible

Two sets of mid-lake samples and three Secchi depth measurements were collected form Clear Lake in 2016.

2016 Clear Lake Mid-Lake Sampling Results									
Sample Site ID	**Lake**	**Date**	**Time**	**Monitor Name(s)**	**Secchi Depth**	**Ammonia**	**Nitrate**	**TKN**	**Total Phosphorus**
4807BB	Clear Lake	6/28/2016	900	Phil George	1.34	<0.05	<0.2	1.30	0.046
4807BB	Clear Lake	8/26/2016			1.11	---	---	---	---
4807BB	Clear Lake	10/3/2016	1100	Phil George	1.05	<0.05	<0.2	0.96	0.013

Both Secchi depth and total phosphorus numbers are in line with what has been collected from Clear Lake in previous years. The following chart shows the TSI values calculated from each parameter.

2016Clear Lake Trophic State Index Values					
Site	**Lake**	**Date**	**TSI Chlorophyll-a**	**Phosphorus**	**Secchi Depth**
4807BB	Clear Lake	6/28/2016	63	59	56
4807BB	Clear Lake	8/26/2016	---	---	58
4807BB	Clear Lake	10/3/2016	58	41	59

Based on samples collected in 2016, Clear Lake is eutrophic. This is very good for a lake in eastern South Dakota where many lakes have TSI numbers approaching 100. The phosphorus numbers are particularly good, with the sample from October falling in the mesotrophic range. Many lakes in this region have an overabundance of total phosphorus, which means that algae growth is only limited by turbidity and the amount of sunlight that can penetrate the water column. More information is needed to draw a definite conclusion, but it appears as though algae in clear lake are limited by the amount of total phosphorus. This is a good thing, but it highlights the importance of keeping nutrients like phosphorus and nitrogen from entering the lake. Were the amount of total phosphorus to increase, it is likely that the amount of algae would increase as well.