IOWA'S WATER
Ambient Monitoring Program

Iowa's Beach Monitoring Program 2008

Since its inception in 2000, the goal of the Iowa Department of Natural Resources' (DNR) Beach Monitoring Program has been to safeguard public health while striving to improve public understanding of watershed processes and the ways in which bacteria impact recreational waters. This is accomplished through the routine collection and analysis of water samples for indicator bacteria at swimming areas throughout the state in conjunction with comprehensive monitoring, research, and community outreach.

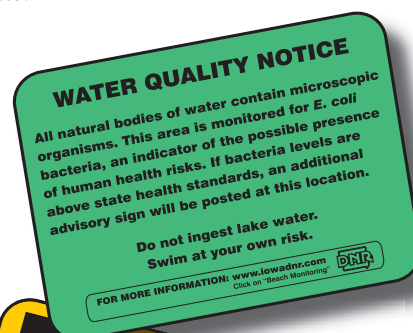Above: *Lake Anita Beach in Cass County.*

Left: *Student intern collecting water samples at Lake Keomah in Mahaska County.*

Below: *Signs posted at Iowa's state beaches.*

Beach Policy

Current beach policy is based on the two *E. coli* bacteria standards that apply to recreational waters in Iowa: a one-time sample maximum and a geometric mean. The first is used at beaches that have experienced consistent problems with bacteria in recent years; those classified as "vulnerable" or "transitional" beaches. Whenever a sample from any of these beaches has an *E. coli* result exceeding 235 organisms per 100 milliliters (ml) of water, a "Water Quality Advisory" is posted. The geometric mean, a standard based on five consecutive samples collected within a 30-day period, is used to determine if beaches are experiencing chronically high levels of *E. coli*. Bacteria sample results often vary by orders of magnitude from week to week; the geometric mean calculation provides an unbiased average across a number of samples (Figure 1). "Water Quality Advisory" signs are posted at any beach exceeding Iowa's geometric mean standard of 126 organisms per 100 ml water.

WATER QUALITY NOTICE

All natural bodies of water contain microscopic organisms. This area is monitored for *E. coli* bacteria, an indicator of the possible presence of human health risks. If bacteria levels are above state health standards, an additional advisory sign will be posted at this location.

**Do not ingest lake water.
Swim at your own risk.**

FOR MORE INFORMATION: www.iowadnr.com
Click on "Beach Monitoring"

CAUTION:
WATER QUALITY ADVISORY
FOR YOUR SAFETY

• Swim at your own risk
• Do not ingest lake water
• Shower after swimming
• Wash hands before eating
• Do not swim if you are ill

Increased risk of illness may be present based on recent monitoring for *E. coli* bacteria

FOR MORE INFORMATION: www.iowadnr.com
Click on "Beach Monitoring"

As in years past, state beaches were posted with educational signs providing information on ways to reduce health risks associated with swimming at public beaches. These signs also reference resources beachgoers can access to obtain water quality results along with other details about the program.
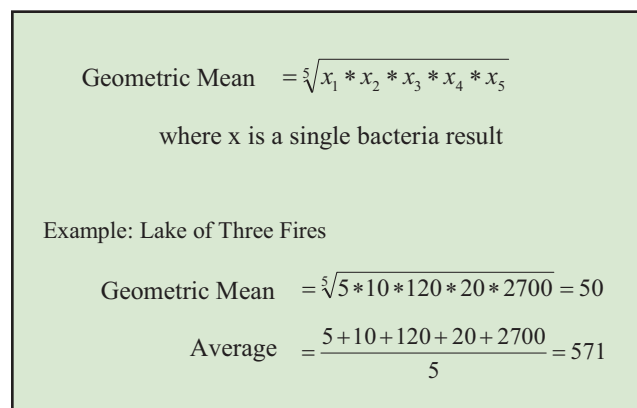
Sample Collection

State park beach monitoring took place from the week before Memorial Day through Labor Day in 2008. Samples were collected at most of the state's 37 state-owned beaches twice a week. At each beach, program staff collected water from three transects (left, center, and right) at three water depths (ankle-, knee-, and chest-deep) for a total of nine points within the swimming area. The water gathered from these points was combined and mixed to form a composite sample. This sampling strategy better reflects current water quality conditions compared to collecting and analyzing a single sample from each beach.

In previous years, beach monitoring was conducted on a weekly basis at all state park beaches. Sampling frequency was increased to twice per week at most beaches in 2008 in order to provide better, more timely information to make public health and management decisions. This not only allowed for a closer distribution of one-time samples, but also permitted calculation of the geometric mean earlier in the season and within a narrower timeframe. Instead of calculating the geometric mean based on five samples over five weeks, the number could be calculated from five samples over a two- or three-week period.

Results

During the 2008 monitoring season, 28 state park beaches exceeded the one-time standard for *E. coli* (235 organisms per 100 ml water) on at least one occasion; 12 beaches exceeded the geometric mean standard for *E. coli* (126 organisms per 100 ml water). Figures 2 and 3 illustrate monitoring results at beaches throughout the state.

$$\text{Geometric Mean} = \sqrt[5]{x_1 * x_2 * x_3 * x_4 * x_5}$$
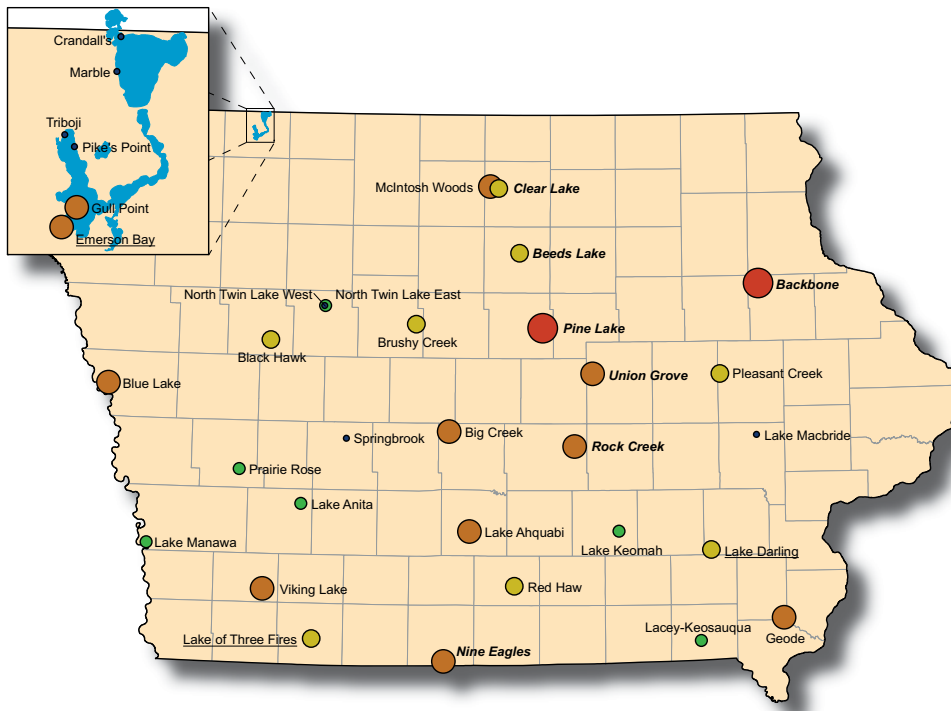
where x is a single bacteria result

Example: Lake of Three Fires

$$\text{Geometric Mean} = \sqrt[5]{5*10*120*20*2700} = 50$$

$$\text{Average} = \frac{5+10+120+20+2700}{5} = 571$$

Figure 1. Geometric mean formula and example.

Several factors, including rainfall events, the quantity of suspended sediments, and the number and location of potential sources of bacteria within the watershed, influence levels of bacteria in surface waters. Heavy rains mobilize bacteria and sediments within a watershed as runoff transports them to streams and lakes. Suspended sediments aid in the survival of *E. coli* and other microbes by providing nutrients and limiting the penetration of sunlight, which is lethal to bacteria, into the water column. The Flood of 2008 had significant impacts on water quality at several beaches throughout Iowa, some of which were completely inundated with water. Beaches at Backbone, Springbrook, and Union Grove State Parks were closed during the height of the flooding; the beach at George Wyth Memorial State

Figure 2. *Percentage of weeks in which samples exceeded the state one-time standard for* E. coli *at state park beaches during the 2008 monitoring season. Beach classes are noted in the lake name: standard text = "less vulnerable," underline = "transitional," and bold/italics = "vulnerable."*

Figure 3. *Number of weeks in which samples exceeded the state geometric standard for* E. coli *during the 2008 beach monitoring season.*

Park in Black Hawk County was closed indefinitely due to heavy damage sustained by swiftly moving flood waters. This flooding may be responsible, at least in part, for the elevated number of bacteria violations in 2008 at state and locally managed beaches when compared to previous years.

Over nine years of sampling, Iowa's state-owned beaches have shown weekly fluctuations in *E. coli* concentrations, but overall bacterial levels have been generally good. When all samples collected between Memorial Day and Labor Day between the years 2000 and 2008 are taken into account,
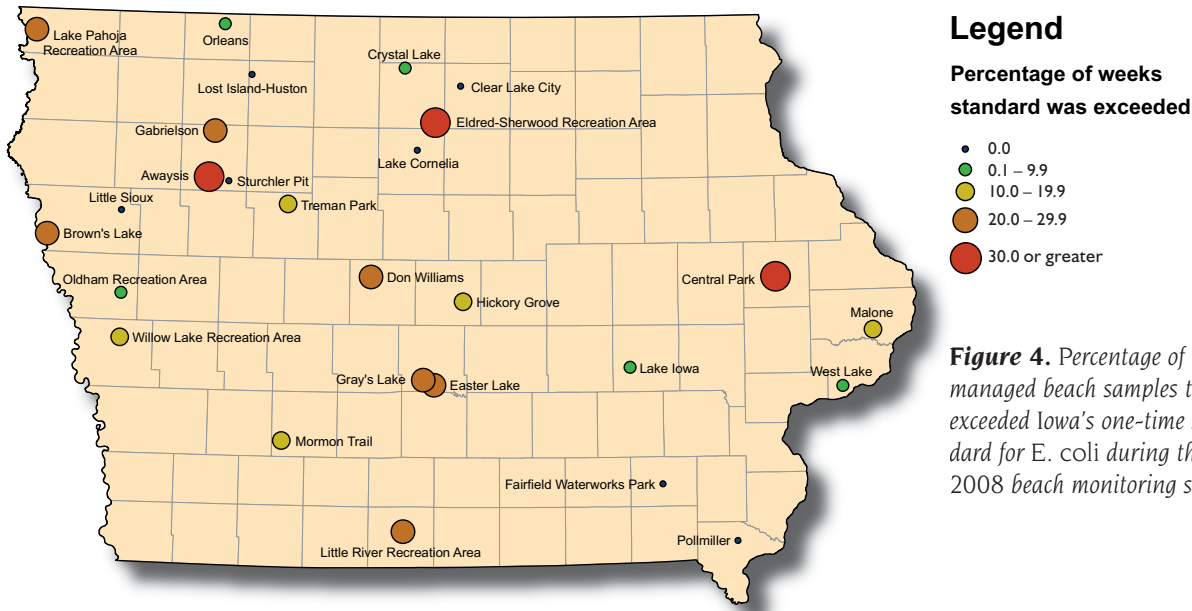
Legend

Percentage of weeks standard was exceeded

- 0.0
- 0.1 – 9.9
- 10.0 – 19.9
- 20.0 – 29.9
- 30.0 or greater

Figure 4. Percentage of locally managed beach samples that exceeded Iowa's one-time standard for E. coli during the 2008 beach monitoring season.

beaches met or were below the one-time standard for *E. coli* 90.3% of the time while beaches met or were below the geometric mean standard for *E. coli* 92.5% of the time.

Locally managed beaches in Iowa are also able to participate in the Beach Monitoring Program on a voluntary basis. Unlike state-owned beaches which are subject to Iowa DNR beach policy, beaches not located on state property may use the data as they see fit for management purposes. In 2008, seven of the 27 beaches participating in the program had no samples exceeding state water quality standards, while another five had only one violation. Overall, samples were below the one-time standard of 235 organisms per 100 ml of water 85.1% of the time at locally managed beaches. Compiled monitoring results from locally managed beaches are illustrated in Figure 4. (Note: locally managed beaches that did not submit at least two-thirds of their weekly samples are not represented in this summary.)

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