



Water Quality Monitoring at Indiana Dunes, 2008–2018

Just as water is the most basic element of life, it is also the most common characteristic of national parks in the Great Lakes Network. You can see it, you can touch it, and almost everyone comes into contact with it during a visit to a park like Indiana Dunes National Lakeshore. Because it is so important, we monitor many aspects of water quality in park lakes including water chemistry and contaminants.

Middle Lagoon is the sentinel water body we use to monitor the health of the park's aquatic community. Measurements of basic conditions such as temperature, water clarity, and water level are paired with the laboratory analysis of water samples that reveal the levels of phosphorous and nitrogen as well as chlorophyll-*a*, an indicator of how much algae is in the lagoon. In addition, water samples collected from the Little Calumet River and other streams and ditches in the park are tested for chemical contaminants. All of these things provide a picture of aquatic health in the park, which is an indication of the well-being of the plants and animals that depend on these water bodies.

Nutrients — Phosphorous

Phosphorous is the primary nutrient influencing plant and algae growth in water. It occurs naturally (in small amounts) in plants and animals, which makes its way into water after those plants and animals die and decompose. Greater amounts are found in fertilizers and make their way into water by run-off. Phosphorous is a contributing factor when aquatic algal blooms occur, which can be unsightly and in some cases a threat to wildlife and people.

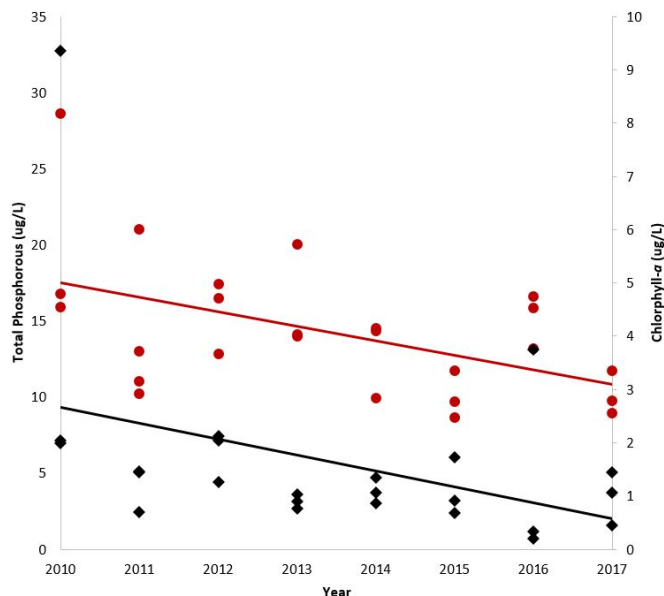
Middle Lagoon is dominated by submerged and emergent aquatic vegetation, but has relatively little algae growth. Since 2010, both total phosphorous and chlorophyll-*a* have declined in Middle Lagoon (*see graph at right*). We are not sure why this is occurring, but possible reasons include greater uptake by aquatic plants, or upstream improvements in wastewater treatment, water management, or agricultural use of fertilizers. It's also possible that more frequent and severe rainfall is creating a dilution effect. This is a trend we will continue to watch with interest.

Water Level

Water level is often the most obvious feature of a waterbody when standing on the shore. It's easy to notice if the surface is higher or lower than usual, especially if it affects people's access to docks or ability to enjoy boating



Middle Lagoon, Indiana Dunes National Lakeshore. NPS PHOTO.



Trends in total phosphorous (red circles) and chlorophyll-*a* (black diamonds), as measured in water samples from Middle Lagoon, 2010–2017. Both are measured in micrograms per liter (µg/L), also referred to as parts per billion (ppb).

and fishing. Water level is also important because it influences water chemistry and the habitat available for plants and animals in the shallower zones.

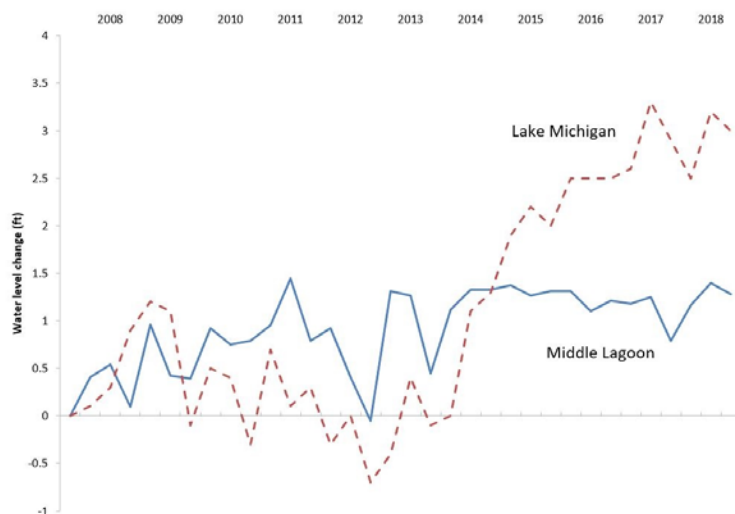
At Middle Lagoon, water level is determined by measuring the distance from the deck of the North Lake Street Bridge down to the water's surface. In May 2008, the water was more than 19 feet below the bridge deck. In September 2018 the average level rose to about 18 feet below the deck. The water level has increased by an average of more than one inch per year for a total increase of 15 inches in the past 11 years. Lake Michigan has risen about three feet over the same time period. Middle Lagoon reflects the rising and falling of Lake Michigan because of the big lake's influence on the water table and the sandy soils between the two.

Contaminants

Contaminants of emerging concern (CECs) are broad categories of pharmaceuticals, personal care products, and pesticides that are showing up in lake and river water everywhere. Park biologists collected water samples from 19 river, stream, and ditch sites in and near the park from 2014–2016 as part of a larger study to identify CECs in National Park Service waters. From samples collected in the first two years, 59 CECs were detected, including pain relievers, anti-seizure medicines, antidepressants, and diuretics. In 2016, 42 contaminants were identified. Over half of them were pharmaceuticals, with the anti-seizure medicine *gabapentin* occurring in 74% of samples and the anti-diabetic medication *metformin* in 34% of samples. Three *herbicides* were also common: metolachlor (95% of samples), acetochlor (71%), and 2,4-D (50%). A fourth herbicide, atrazine, and the insect repellent *DEET* were also found. These last two are among the most common chemicals found in all water samples collected from NPS units in the western Great Lakes.

A comparison of two sites on the east branch of the Little Calumet River provides a good example of how much watershed size, surrounding land use, and point sources (e.g., discharge pipes) influence water quality. On a small tributary in the upper part of the Little Calumet, where a combination of agricultural fields and forest dominate the land, there were only one or two contaminants consistently detected in water samples. By contrast, on the main river, downstream from an urban area and where a wastewater treatment plant discharges effluent, there were between 16 and 21 contaminants per sample, particularly pharmaceuticals and personal care products.

Indiana Dunes National Lakeshore is surrounded by a patchwork of protected, urban, industrial, and agricultural lands, so it is not surprising that the waters flowing through have a high number of contaminants. Fortunately, the concentrations of those contaminants are below the risk threshold for human or wildlife health.



Water level at Middle Lagoon (blue line, in feet below deck of North Lake Street Bridge) compared to Lake Michigan (red dashed line, in feet above sea level), during summer 2008–2018. Lake Michigan data from monitoring station at Calumet Harbor, Illinois, and available at <https://tidesandcurrents.noaa.gov/waterlevels.html?id=9087044>.



Upstream inputs of nutrients and sediment are made apparent in the milky-green color of the Little Calumet River as it flows under the Howe Road bridge near the Dunes Learning Center. NPS PHOTO

This is why our long-term monitoring is so important—so we can track conditions such as contaminant levels and sound the alarm if they reach a hazardous threshold. The benefits of this monitoring can be seen every day as people enjoy a day at the park, as the water stays clean, and as fish, birds, animals, and people alike continue to thrive. ●

Annual water quality monitoring is accomplished at Indiana Dunes National Lakeshore through the dedicated efforts of Josh Dickey, aquatic biological technician.