

## IN THIS ISSUE:

What's Going on with the Carp | Green Lake's Water Quality Status  
Aquatic Invasive Species | George Washington was our Coolest President



[www.glakesd.com](http://www.glakesd.com)

## WHAT'S GOING ON WITH BIG GREEN LAKE CARP?

Over the past few weeks, we have received several inquiries from our property owners and the general public pertaining to dead carp floating all around Big Green Lake. Why are we seeing so many dead floating carp on our lake? What do we know right now? What does this mean for our lake in the short-term versus the long-term? Should lake users be concerned about their health?

### OUT-OF-THE-ORDINARY CARP DIE-OFF

Over the last two weeks in June 2016, our lake experienced an unusually high number of dead floating carp pretty evenly dispersed around the entire lake. We believe the reasons for this out-of-the-ordinary event are tied to "Good Science Lake Management Practices" which have been in the works for the past few years. The events leading up to the carp die-off are outlined below.

Our Lake Management Planning (LMP) Team began working to construct a carp barrier at the County K bridge several years ago. The purpose of the carp barrier is to prohibit carp from leaving the lake in late Spring every year, and then re-entering the K Estuary for spawning (this project is very similar to the Silver Creek Estuary Restoration which was deemed successful by 2005). Why is keeping the carp out of the estuary so important? Keeping the carp out of the estuary allows the estuary to heal itself through a complete revegetation of this 250+ acre waterbody. It brings back the plant life which acts as a filtering system for the lake. In terms of overall importance to Big Green Lake, the revegetation and restoration of the K estuary is the number one priority project for our Lake Management Plan. The only way to bring the plants back is to keep carp from getting back into the shallow waters of the estuary. Carp are a bottom feeding fish which feed by ingesting the bottom sediments of the estuary and cause enough disturbance to prohibit necessary healthy plant growth. Healthy lake plant populations are the foundation of a healthy lake and an absolute requirement for good water quality.

The carp barrier at the County K Bridge was recently completed and has been the biggest contributor to the unusual carp die-off which hit our lake the last couple weeks of June. Not allowing carp to fulfill their primary purpose (spawning) causes them great stress.

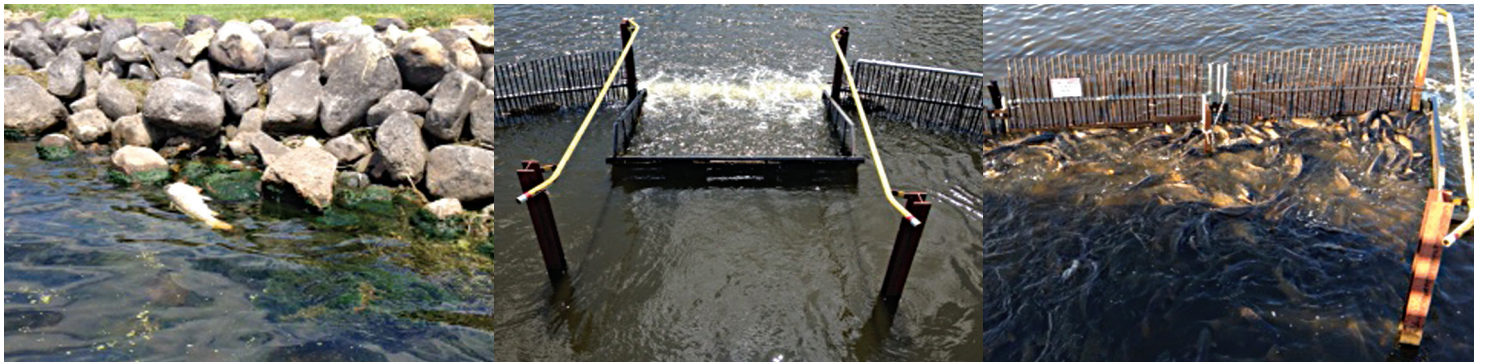
This additional stress caused by the carp barrier was a causal factor in the carp die-off along with other factors (more bow and spear fishing of carp, normal stress caused by spawning, inaccessibility to normal food sources, etc).

The GLSD took on the role of picking up the majority of the dead floating carp and we were able to examine these fish up close. In addition to the added stress mentioned above, we also saw first-hand significant body scarring which would be consistent with thousands of carp trapped under a bridge for several weeks banging their bodies into a metal barrier in an attempt to complete their spawn. Our best estimates indicate that 1,500 to 2,000 dead carp were picked up on the lake between June 20th and July 1st. This number represents a relatively small percentage of the carp actually in our lake. Nevertheless, this type of carp die-off and the associated terrible smell which comes with dead fish, even 1,500 to 2,000 dead carp, can cause many people to become uncomfortable and concerned.

### SO WHAT ELSE DO WE KNOW RIGHT NOW

We strongly believe that the carp die-off was directly tied to an aggressive carp barrier at the K bridge, but we were still unclear and unable to accurately predict the pure volume of carp that would ultimately show up at the K bridge and continuously try to get past our barrier and into the estuary to complete their spawn.

As part of our follow up to this carp die-off—a relatively big event new to our lake—we captured dying carp for virus and disease testing purposes. These fish are currently being tested, however the test results may not be known until late summer. Even if a small portion were carrying some type of disease or virus, it would have been understandable for the virus/disease to spread easily and quickly throughout the

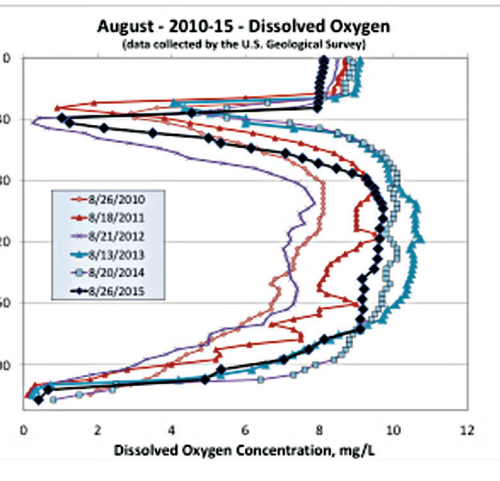


Left: The recent carp die-off left thousands of carp floating in Green Lake's waters. Center: A new carp barrier was installed at the County K Bridge to restore and revegetate the K Estuary. Right: Thousands of carp were kept from entering and completing their spawn in the K Estuary.



# GREEN LAKE’S WATER QUALITY STATUS

The U.S. Geological Survey (USGS), in cooperation with the GLSD, has documented the Green Lake’s water quality on a monthly basis from April through Sept. since 2004. The USGS also evaluates a few of the tributaries to the lake to quantify nutrient input to the lake. The USGS uses very consistent and rigorous sampling protocols that enable the water quality of the lake and its tributaries to be regularly evaluated and examined for long-term trends. In general, the water quality of Green Lake in 2015 was relatively similar to that during the past few years; however the water clarity in the lake has been improving (as described in previous newsletters). Throughout the period of monitoring, a layer of water with very low dissolved oxygen has been measured in the lake at a depth of about 30 to 45 ft in mid to late summer(see graph below). As a result of this zone of water with low dissolved oxygen, the lake has been listed as impaired by the Wisconsin DNR. Over the past few years(2013-14), this zone of low dissolved oxygen did not form to the extent measured in recent years. In 2015, however, the zone returned and it was almost as bad as it has ever been documented. To determine what causes this zone of low dissolved oxygen to develop and what can be done to prevent or reduce it in the future, a collaborative 3-4 year study between the GLSD, Green Lake Association, USGS and several consultants was recently started. This study will involve more detailed monitoring on the lake including placing underwater sampling equipment in the lake (with surface buoys),and detailed water-quality modeling. Results of this study and the ongoing water-quality monitoring will be presented at annual State of the Lake meetings sponsored by the GLSD.



## WHAT’S GOING ON WITH BIG GREEN LAKE CARP? (CONT’D)

thousands of carp gathered under the K Bridge over the period of almost 2 months and continuously rubbing against each other for extended periods of time.

A carp’s need to spawn and get to their regular spawning grounds is a tremendously strong urge. In our lake, this spawning routine generally begins in late April and runs until mid-June. During the course of this 6 to 8 week spawn, we estimate that 20,000+ carp were making their way from the lake and trying to get past the K bridge carp barrier and into the estuary. On many days during this year’s carp spawn, the sheer number of carp under the bridge (see photo) and pushing on the carp barrier were unbelievable. The carp barrier has metal bars designed to let many desirable game fish back into the estuary for productive purposes (i.e. spawning, feeding, etc), however the metal bars in the carp barrier are positioned close enough together to not allow larger

female egg carrying carp through into the estuary. The size of the average female carp is 5 to 10 pounds in weight and can carry up to 2 million eggs.

The ideal carp spawning process involves the female laying her eggs in a shallow muddy/grassy area. Carp reproduction under the right conditions can be very successful; however, carp not allowed into the right type of waterbody (shallow and marshy conditions) will typically reabsorb their eggs which is our desired outcome. It’s important to understand, we don’t need the carp barrier to be 100% effective, if the barrier is 80-90% effective, then the few carp left in the estuary won’t be enough to stop our revegetation and restoration.

### SHORT-TERM VS LONG-TERM

In the short-term, the negative impact of the carp die-off is very obvious and transparent. We can all see the many dead floating carp all around the lake and the smell from decom-

posing fish is unpleasant to say the least.

In the long-term, however, there are a number of positive benefits from a carp die-off which greatly offset the short-term negative impacts. First, carp are an undesirable rough fish and the less carp in our lake, the better our lake will be. Carp disturb the bottom and cause water clarity and water quality to degrade. Carp take food out of a lake’s food web which can be used by other desirable species and organisms so less carp removing productive resources from a healthy lake means there are more resources to be shared by desirable game fish and other valued organisms.

The 10,000+ carp which have already been removed from our lake in 2016 are not coming back, these fish have been properly disposed of and our lake and estuaries become the primary beneficiaries resulting from these greatly diminished carp numbers. For example, prior to being revegetated and restored over 10 years ago, the Silver Creek Estuary was a shallow muddy water carp infested estuary with no real filtering or fisheries value. Today, the Silver Creek Estuary

provides an outstanding water filtering system for Silver Creek Tributary waters coming into our lake as well as a fantastic fish nursery for many of our lake’s desirable game fish. Our lake’s number one enemy is too much phosphorus. A revegetated and restored estuary removes phosphorus and helps to keep our lake cleaner and healthier. Finally, a healthy vegetated estuary also becomes a valued environmental corridor for wildlife and the entire community.

### SHOULD LAKE USERS BE CONCERNED ABOUT THEIR HEALTH?

We believe the short answer is “NO”. We continue throughout the summer to do weekly lake and tributary water quality monitoring and testing to ensure the public’s health is protected as much as possible. Our weekly monitoring and testing has not shown any problems or increases in E. Coli relating to the carp die-off or any other issues/problems.

Lakes and other water bodies are home to many living organisms, most of them good, but some bad. The GLSD water quality moni-

toring and testing information can be found on our website. From the main toolbar, click on “Programs”, then click on “Monitoring”, this will display a spreadsheet showing lake water quality bacteria numbers from around our lake for each week during a given summer.

In our “good science based opinion”, Big Green Lake was and is an exceptional lake. It is an outstanding natural resource in Wisconsin and will continue to be for many generations moving forward. We understand the negative ramifications associated with a short-term carp die-off, but in the long-run, the lake and our community can view this as a huge positive.

*The GLSD harvested 1,500 to 2,000 dead carp on Green Lake between June 20th and July 1.*



## AQUATIC INVASIVE SPECIES- NOW AND FOREVER?

By: Mark Sesing & Krista Kamke

By now most of us have experienced aquatic invasive species (AIS) on Green Lake. Eurasian watermilfoil and Zebra mussels are close to the top of the list. You would find it difficult to swim or boat Big Green Lake and not run into these disrupting plants and animals. They have been here for decades and harnessing their impacts is not easy.

AIS management can be complicated, unpredictable and often seemingly impossible.

One bucket of trouble arrived on our shores in the late 1800’s. To wit; the common carp was introduced into Wisconsin waters as a desirable food fish. It was an idea with good intentions but one that quickly spun out of control. Within decades of the original plantings, carp were actively destroying fish and wildlife habitat wherever they spread, especially within shallow waters. Although carp are sometimes overlooked in the current guidance on aquatic invasive species (AIS) their mode of introduction and effects follow the script perfectly. Carp are non-native bottom feeding animals out of their original territory. They live long lives and grow rapidly. They are tough and resilient. At Green Lake, the fight is on, and the GLSD, with its partners, is literally in the water “taking it to them”. Difficult to eliminate, managing a moderated population via multiple technologies is more realistic. The toolbox includes metal bar barriers, funnels, injected air, nets, sound, commercial fishing, and traps. Control is time consuming, however the fruits of all that labor are translating into better water, better fish, and a balanced resilient habitat.

Another party crashing invasive is Eurasian Watermilfoil (EWM), an aquatic rooted plant that sends multiple stems up to the surface where it spreads out its feathery leaves,



*Carp*



*Eurasian watermilfoil*

hogging the light and neutralizing native plants. Navigation, with multiple stems wrapping around the prop, is a bit like boating through a mess of spaghetti. The dense matting growth stops boats, out-competes more desirable native plants and lowers oxygen in the water. When it floats into shores or confined bays, fishing, wading, and natural aesthetics are taken prisoner. Managing the worst of the mats is key. Harvest and chemical control is used and bio-restoration is underway in some areas.

Then there’s the small striped Zebra mussel. If you have a pier, you are already acquainted. If you wade into the lake, your feet will soon get acquainted. Although the Z’s will “clear” the water near shore (via filter feeding) they also stimulate rooted plant growth and filamentous algae by removing natural predators. Native mollusk populations are nearly suffocated from the dense colonization of the lake bed. Management of Z’s, once introduced, is difficult for large lakes like Green Lake.

The AIS mentioned above are obvious intruders. EWM and Carp are very actively managed, while Zebra mussel control tools are impractical. There are other AIS species in the lake including Curly leaf pondweed and Rusty crayfish.

Unwanted visitations- There are several potential regional invasives , not presently recorded at Green Lake, that alarm us. These include plants, fish, snails, zooplankton, and microbes. Some of notoriety includes the Round goby, a smallish fish that enjoys native fish eggs for breakfast. Anglers fishing the Fox River near



*Zebra mussel*

Green Bay know gobies. They are voracious eaters and known as bait thieves. The Asian Carp is close to invading Lake Michigan. The Quagga mussel, a relative of the Zebra but with deeper colonization patterns, could further cover lake substrate with mussel colonies. Quagga’s are in Lake Michigan so a single boat transfer could spell trouble. The Spiny waterflea comes in a small package (1/2 in.) yet grows into massive free floating populations, where they foul fish line and worse, changing the makeup of native plankton communities the native fish depend on and worsening algal blooms.

This is a sampling of invaders with the potential to cause problems at Green Lake. Prevention is the only path of management for many of them, and is possible. The same steps can prevent spread for all of these species: Inspect, Remove, Drain, Never move. Inspect your boat and gear before leaving. Remove any plants, animals, algae, or sediment you see. Drain your boat, including live well, engine, coolers, buckets, and bait containers. Never move live plants or animals away from a waterbody.

Many voluntary and regulatory strategies are in place, yet new approaches are not being ruled out. One example would be a program to actively decontaminate visiting boats and gear. Possibilities include wash stations, enhanced launch site inspections, and general enforcement of Wisconsin’s invasive species law (NR 40).

Management of existing and potential invasives requires building strategies at multiple levels while considering biology, finances, recreation, regulation and education initiatives.



*Round goby*



PO BOX 417  
GREEN LAKE WI 54941

## GLSD COMMISSIONERS

Jerry Specht | *President*  
Ken Bates | *Treasurer*  
Nancy Hill | *Secretary*

## GLSD STAFF

Charlie Marks | *Administrator*  
Paulette Janssen | *Admin. Asst.*  
Paul Resop | *Plant Operator*  
Stuart Marks | *Plant Operator*  
& *Aqweed Harvester Supervisor*  
Dallas Lewallen | *Asst. Plant Operator*

## CONTACT US

[www.glakesd.com](http://www.glakesd.com)  
(920) 295-4488

Physical Address:  
N5295 Cty Rd TT, Princeton

Mailing Address:  
PO Box 417, Green Lake

## OFFICE HOURS

7:30 am–3:00 pm, Mon–Fri

For sewer emergencies after hours, please contact Charlie Marks at 920-291-6688.

## GEORGE WASHINGTON WAS OUR COOLEST PRESIDENT

George Washington was our coolest president. When the Declaration of Independence was signed in 1776 the temperature of the earth was about 2°F cooler and atmospheric carbon dioxide (CO<sub>2</sub>) levels were in the neighborhood of 280 parts per million (ppm). Today CO<sub>2</sub> levels hover around 400 ppm and the atmosphere, on average is about 2°F warmer as a result. Putting the history lesson aside, why should we care? What does this mean for Green Lake?

Green Lake is warming along with the planet and this trend will continue into the foreseeable future. The fish, plants, algae, wildlife, and unseen aquatic critters will face the tide in different ways. Some species will increase, some decrease, some move out, some will move in. All will not be welcome. Species shifts around the globe (on water and land) are already occurring and Green Lake is no exception. Lake scientists predict shifts toward warmer water species. Some lakes are likely to see more Bass and less Walleye. We cannot pretend to know the actual outcomes at Green Lake. Because it supports a cold water (Trout), cool water (Walleye), and warm water fishery (Bass, Bluegill) Green Lake promises to be a study of the warming phenomena. The sky is not falling but it is changing.

Speaking of the sky..... Because the atmosphere is warmer, it holds more moisture, but then releases

it at higher rates. Rains have become more “explosive”, leading to flooding of storm water systems, land conservation structures, and agricultural lands. Intense rains are more likely to erode soils, stream banks, and installed pollution control structures like retention ponds, buffer strips, and feed lot controls. Theoretically this could mean more nutrients going into the lake. In reality, the most current data shows stability in total loadings of phosphorus but increasing intensity of flowing water into the lake.

Do you fish on the ice? The warming trend is not a boon for ice anglers. The duration of ice cover on Green Lake is about one full month less when compared to George’s ice fishing days. Ice reflects light, open water much less so. Light not reflected is absorbed as heat, compounding the warming issue. This occurs in the Arctic regions as well, accelerating the glacial melt. The phenomenon is worldwide. Decreasing ice duration affects all lake life but the biological effects are variable and not always clear. From a recreational perspective the impacts are more obvious.... George would have caught more fish because he had an extra full month of ice to walk on. Martha would have been happy too.

Whatever your perspective on warming, it will continue to be a serious issue. This short article cannot begin to characterize the broad scope of impacts. However, understanding the complexity and ramifications will be an important aspect for adopting management strategies for Green Lake.