# From Shore to Shore

A publication of the University of Minnesota Extension Water Resources Team

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## Zebra Mussel Impacts on Minnesota Waters

*This is a condensed version of an article written by Marte Kitson, Sea Grant Program, 218-726-8305, mkitson@d.umn.edu. The full article is available here: www.extension.umn.edu/environment/water/docs/zebra-mussels.pdf.*

Zebra mussels (*Dreissena polymorpha*) are small mollusks native to waters of Eastern Europe and Western Russia. In Minnesota, they create a variety of problems where they invade. Ecologically speaking, zebra mussels have the potential to completely alter water chemistry of a lake, river or stream due to their high filtration capacity. Despite their small size, a single adult can filter up to a liter of water each day; this process effectively removes nutrients from the water. Infestations, which commonly attain a density of 20,000-30,000 mussels per square meter, deplete nutrient resources in the water column. This alteration not only changes habitat for fish and other aquatic species, but can also limit the availability of food. Additionally, zebra mussels affect human recreation and infrastructure. Bottoms of infested waters often become covered in a thick layer of these bivalves, whose shells are sharp enough to easily cut the feet of swimmers and dogs. Zebra mussels have also been known to clog drinking water pipes up to 36 inches in diameter. These impacts make the zebra mussel a threat to our lakes and rivers and our use of those ecosystems. As zebra mussels alter the way we use infested waters, they and have, in turn, become an economic issue. Since they arrived in the Great Lakes and spread, controlling infestations has cost a lot of money, reaching millions of dollars annually.


You may think that zebra mussels are spreading like wildfire to waters of Minnesota. However, since 2000 only 34 Minnesota lakes likely became infested with zebra mussels due to the activities of recreational boaters, anglers and divers. That's an average of 2.1 lakes per year. With over 10,000 lakes, 1.5 million anglers and 866,000 registered boats moving frequently between waters, you'd think that average could be higher. Thanks to people's willingness to clean, drain and dry their equipment, it's not.

While people are largely responsible for the current infestations, we know that prevention is possible. It's our personal responsibility. It's our legacy. With continued public education and enforcement of boating regulations we can eliminate overland transport of this invader. Remember to do your part and "Clean, Drain, Dry" your boats and gear! ■

## Calendar of Events

For the most current calendar items and more details, visit ww.extension.umn.edu/environment/water/calendar/.

**Lake Health Conference**
**Date:** August 10-11
**Location:** Onamia, MN
**Contact:** Mille Lacs SWCD, 320-983-2160 or Jackie Froemming, 218-824-1068, froem022@umn.edu

**NEMO Forest Lake Tour and Workshop**
**Date:** September 1
**Location:** Forest Lake, MN
**Contact:** John Bilotta, 612-624-7708, jbilotta@umn.edu

**2015 Clean Water Summit**
**Date:** September 15
**Location:** Minnesota Landscape Arboretum, Chaska, MN
**Contact:** www.arboretum.umn.edu/2015CleanWaterSummit.aspx

**Water Resources Conference**
**Date:** October 13-14
**Location:** RiverCentre, St. Paul, MN
**Contact:** John Bilotta, 612-624-7708, www.wrc.umn.edu/waterconf

## Inside...

# The Watershed Game: Educating the Local Leaders of Today and Tomorrow

*John Bilotta, Extension Educator, 612-624-7708, jbilotta@umn.edu*

The Watershed Game is not Monopoly. There is not a jail and no Park Place. Rather, there is a farm, a forest, a community and water. The goal is to achieve clean water in a community watershed by choosing practices, policies, and plans while balancing resources, which like Monopoly includes money.

The Watershed Game is an interactive tool that helps community leaders and students understand the connections between land use, clean water and their community. Participants learn how a variety of land uses impact water and natural resources. They learn how their choices can prevent adverse consequences. Participants increase their knowledge of best management practices (BMPs), the benefits of planning, the role of policies, and how these tools can reduce runoff and reduce the impacts of storms and flooding on infrastructure and natural resources. The activity is designed to foster interaction and cooperation among participants, and ensures that everyone understands that water doesn't respect political boundaries.

### Lake, River, Stream Version: Educating Local Officials and Community Leaders

The Lake, Stream, and River Versions are designed to be used with adult-based audiences including elected and appointed officials and community organization leaders. Designed to fit within a 45 minute session, to-date, over 100 facilitators in 12 states are trained in using this activity. The Stream Version represents a small headwaters stream watershed; the Lake Version represents a lake and its watershed; the River Version represents a large river system.

### Classroom Version: Building the Knowledge of the Leaders for Tomorrow


*Students exploring the game board.*

New in autumn 2015, the Classroom Version of The Watershed Game is designed for middle and high school students. It can be played in both formal and informal learning environments. Working in teams, students apply tools (practices, plans, and policies) to decrease water pollution while balancing financial resources. The goal of the activity is to reduce pollution from various land uses to the stream without going broke. Up to 32 students can play the Classroom Version at one time. It is a multi-disciplinary lesson that addresses multiple education standards in science, social studies, and English language arts.

### The Classroom Version has two components:

1) The Introduction: Students learn about watershed and water pollution concepts prior to game play so they can better understand the Watershed Game. A teacher accomplishes Part 1 by using provided PowerPoint presentations, videos, articles, websites, and existing water science curriculum such as Project WET. Concepts include:

- What a watershed is
- Sources of pollutants
- Impacts of various pollutants
- Common land use categories
- PUs: Pollution Units
- Clean Water Goal

2) Student teams play the Watershed Game: Students break into four land use teams to reduce the amount of sediment or phosphorus pollution from their acreage. Teams examine, discuss and choose various pollution reduction tools, balancing the costs of those tools with the amount of pollution reduction each tool is able to achieve. Small teams track their selections and progress on worksheets. Teams present their efforts and, with the teacher's guidance, discover that they must work as an entire class to achieve the clean water goal for the watershed.

For more information, visit the website at http://northlandnemo.org/watershedgame.html or contact John Bilotta at jbilotta@umn.edu or 612-624-7708. ■

# Why Does a Lake Become Green and Stinky?

*Reprinted from www.shorelandmanagement.org/quick/wq.html*

Pungent green lakes are usually blooming with algae. Algae are simple, small aquatic plants. An algal bloom is a dense concentration of those plants. Like grass and trees, algae use sunlight, carbon dioxide and nutrients to generate energy and produce more algae. In most lakes, algal growth is limited by the availability of the nutrients nitrogen (N) and phosphorus (P).

Eutrophication is the word used to describe the process of nutrient enrichment leading to excessive plant growth and the subsequent sedimentation of dead and rotting vegetation to the lake bottom. This natural process is often accelerated by human activities in the watershed, which introduces unnaturally high quantities of nutrients into lakes. Two common bloom-forming algae are diatoms and blue-green algae. Diatom blooms usually occur in the late spring or early summer, turning the water a bright green or brown but not causing surface scums or odors. Blue-green algae blooms create greater problems for lake users. The most obnoxious forms are buoyant during the day and can form thick surface scums, especially on a calm sunny afternoon. This scum may be blown into shallow water, making the shoreline appear as though it has been slicked with blue-green paint.

When algae die, the bacteria that break them down use up oxygen in the water. If enough algae die at one time, decomposition may use up the oxygen faster than wind mixing or photosynthesis can replenish it. This can lead to anoxic (no oxygen) conditions and the build-up of hydrogen sulfide gas (rotten egg smell) or ammonia in deep water. Certain species of algae can also be toxic to domestic animals and even humans.

### What Causes Surface Scum on a Lake?

There are various causes of surface scum on a lake or pond. Look more closely to determine what is on the water's surface. An oily film or yellow-green dust on the surface of a lake make it look contaminated, but in most cases, nothing is wrong. In fact, something natural is probably occurring. An oily film in mid-summer may be caused by organic compounds from nearby wetlands, rotting vegetation or insect cases that were concentrated along the shore by wind after a hatch. Insects can hatch at any time from ice-out in the spring until mid-September. As the insect cases decompose, they sometimes produce an oily film. Yellow-green dust floating on the surface in late spring and early summer is probably pollen from nearly trees. In contrast, a scum from an algal bloom is green to blue-green, might have an oily sheen that resembles a motor oil slick, and can form a thick, soupy mass on the surface of the water.

### Does Foam on the Shore of a Lake Mean It's Polluted?

The foam found in lakes and streams is usually natural. Wind-driven currents frequently create parallel streaks of foam in open water that accumulate along windward shores and in coves. Foam is created as decomposing plants and animals release organic compounds into the water. The compounds reduce the surface tension of water, causing bubbles to form. Many people blame shoreline foam on detergents, but detergents don't create long-lasting foam since they quickly lose their sudsing ability. Industrial pollution effluents may have been a more common source of foam on surface water in the past, but these days point source discharges are more closely regulated through the National Pollutant Discharge Elimination System (NPDES) permits.

### Why Does the Water Quality of Our Lake Seem to Get Worse Throughout the Summer?

Lakes change a great deal over the course of a year. Changes are caused by seasonal weather patterns, watershed influences, and the life cycles of the lake's biota. During the winter, ice and snow severely limit the amount of light available for photosynthesis under the ice, so there is not much algal growth. In the spring, snowmelt washes nutrients into the lake. Many of the nutrients are used by rapidly growing aquatic plants (macrophytes) near the shoreline, resulting in a "clear water" phase.

As macrophyte growth slows in mid- to late-summer, incoming nutrients and nutrients from decomposing aquatic plants become available for algae. Available nutrients, combined with warm water and plentiful sunlight, can result in a period of heavy algal growth, potentially making the lake green and scummy. Mid-summer water quality problems may be particularly acute if you live on a shallow lake where high winds can mix warm surface water all the way down to the lake's bottom waters. When that happens, nutrients are released from the mud and sediments up into the surface water where light is plentiful and algae can flourish. In autumn, and combination of decreased daylight, cooler temperatures, and more zooplankton grazing on algae reduces algal growth and yields clearer water once again.

### What Can I Do to Help Improve the Water Quality of My Favorite Lake?

You can improve your lake's water quality by becoming educated and involved. You and your neighbors can monitor the lake to learn why and how the water quality has changed and identify ways to minimize impacts. For instance, if erosion and excess nutrients are degrading water quality, follow the proven techniques for stabilizing shores suggested in Protecting our Waters: Best Management Practices for Protecting Your Shoreline. Protecting Your Shoreline explains how to minimize nutrient inputs, reduce human impacts, restore shorelines and monitor lakes. ■

# Contact

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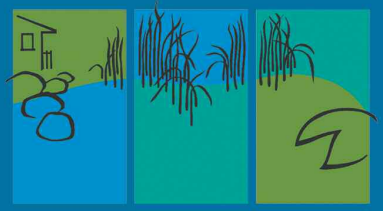

**From Shore to Shore**
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*A publication of the Water Resources Team, dedicated to educating Minnesota citizens about water resources issues to improve water quality, habitat, and aesthetics of our lakes and rivers.*

*From Shore to Shore* is a free quarterly electronic newsletter. Archived issues are available online at www.shorelandmanagement.org

To subscribe or unsubscribe, please contact Heidi Olson-Manska at olsonh@umn.edu or 320-589-1711.



Sea Grant Minnesota

University of Minnesota Extension

# SNAPSHOTS: Water Resources Team Programming and Research – Recent Past and Upcoming Opportunities


*Participants board the boat for the workshop on the water.*

## Stormwater Workshops Offered for Newly Regulated Communities

Extension's Water Resources Team developed curriculum for newly designated Municipal Storm Sewer System (MS4) communities. MS4 communities are required by the Minnesota Pollution Control Agency (MPCA) to apply for, complete, implement, and periodically update an MS4 permit which includes a program to control the quantity, quality, and rate of stormwater runoff.

The curriculum, "The ABC's for New MS4s or Why Should I Care?" was presented at a workshop in Mankato in June by Extension Educators Shahram Missaghi and Doug Malchow. Sixteen city, township, and county leaders representing seven newly-designated MS4 communities near Mankato attended the workshop. A second workshop was offered in Elk River for 20 leaders representing communities north and northwest of the Twin Cities.

The goals of the workshop, which was supported by and developed in conjunction with the MPCA, were to better understand watershed dynamics, consider the range of benefits of clean water, better understand the impacts of runoff and land use practices on water resources, introduce best management practices to control stormwater runoff, discuss what it means to be an MS4 community, and begin discussing the value of the new MS4s working cooperatively on stormwater issues.

If you are interested in learning more about hosting this workshop in your community, please contact Doug Malchow, Extension Educator, at 507-280-5575, malch002@umn.edu.

## NEMO Workshops-on-the-Water

Extension Educators John Bilotta and Shahram Missaghi recently partnered with several groups to offer a NEMO Workshop-on-the-Water on Lake Minnetonka. The workshop provided an opportunity for about 80 elected and appointed officials and community leaders to build their knowledge and skills that will assist them in making informed land use decisions that impact water resource protection and restoration in their geographical areas. Although the program occurred on Lake Minnetonka, leaders from cities in the west metro region and participating watersheds attended since the content was applicable to many local lakes and streams.

The workshop happened on board the Queen of Excelsior from 5-9 p.m. Participants were divided into two groups. Each group spent half of the evening on the lower deck learning about aquatic invasive species, impervious surfaces and stormwater runoff, and the importance of educating citizens about clean water. They spent the other half of the evening on the upper deck learning about how aquatic ecosystems function, how water quality is monitored, and what happens with the water quality data.

A similar workshop will be held on the St. Croix River on August 6. For more information about these workshops, contact John Bilotta, 612-624-7708, jbilotta@umn.edu. ■