

From Shore to Shore

A publication of the University of Minnesota Extension
Water Resources Team

Winter 2016

Issue #123

www.shorelandmanagement.org

State of Water Conference – To Empower Minnesotans to Protect and Promote Clean Water

Registration is open for the second State of Water Conference, hosted by Freshwater Society, Conservation Minnesota, and University of Minnesota Extension. Kickoff your spring with a few days in lakes country and equip yourself to tackle our biggest water resource issues. Scheduled for April 14-15 in Alexandria, Minnesota, the State of Water Conference will get you ready to protect the lakes and rivers that make Minnesota so unique.

The State of Water Conference brings together state agencies, non-profit organizations, universities and colleges, as well as citizen groups like lake associations, to learn about and discuss the issues facing Minnesota's waters. This conference offers workshops and break-out sessions on a variety of water topics to bring you the information, tools, connections, and resources you need to build local capacity and define your next steps to improve the health of water in your community.

Conference attendees will be able to select from more than 40 presentations and 24 session topics, hear the latest news about water issues from Commissioners from Minnesota Pollution Control Agency and Department of Natural Resources along with the Executive Director of the Board of Water and Soil



Resources. Attendees will also have the opportunity to go in-depth into the issues by attending one of four half-day workshops.

Registration and track previews are available at <http://freshwater.org/state-of-water-conference/>. Registration ends March 25, 2016.

For more information, contact Jen Kader at the Freshwater Society, 651-313-5807, jkader@freshwater.org. ■



Calendar of Events

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

Watershed Game Training for Educators
Date/Location: February 10 in Minneapolis
February 17 in Duluth
Contact: John Bilotta, 612-624-7708, jbilotta@umn.edu

P8 Modeling
Date: February 24
Location: St. Paul, MN
Contact: Shahram Missaghi, 952-221-1333, miss0035@umn.edu

Native Plants, Septics, and Clean Water: A Workshop for Landscapers and Septic Professionals
Date: March 17
Location: Ottertail, MN
Contact: Karen Terry, 218-770-9301, kterry@umn.edu

Inside...

- 2 Stormwater Practices and Maintenance Core Curriculum – Empowering Practitioners and Educators to Learn Stormwater Basics and Teach Others
- 3 How a Tiny Bone in Common Carps' Inner Ears Played a Role in Developing Sustainable Management Schemes for this Invasive Fish in Minnesota
- 4 Fields to Streams: A New Resource for Talking About Water Management

Stormwater Practices and Maintenance Core Curriculum – Empowering Practitioners and Educators to Learn Stormwater Basics and Teach Others

Dr. Shahram Missaghi, Water Resources Extension Educator, University of Minnesota, 952-221-1333, miss0035@umn.edu
Eleanor Burkett, Water Resources Extension Educator, University of Minnesota, 218-822-2326, burke044@umn.edu

Motivated by the need for clean water, a collaborative group of stormwater educators, researchers and professionals from across the country have developed a national educational stormwater education program. Their goal was to develop a uniform research-based stormwater core curriculum that the public, educators, local governments and stormwater professionals can readily use.

In the 1980s, a national effort began with a goal of minimizing the impacts of excessive urban stormwater runoff by transforming outdated stormwater management practices. Excessive runoff may cause flash flooding, significant water quality degradation, and loss of property. The new ideas of stormwater management focused on employing and adopting proven methods and techniques to minimize and combat the excessive runoff. These efforts were followed by a surge of stormwater

educational materials. Much of the growth was “home based” and addressed specific local needs and issues. Education and resources were inconsistent, from state to state and within states, or not readily available.

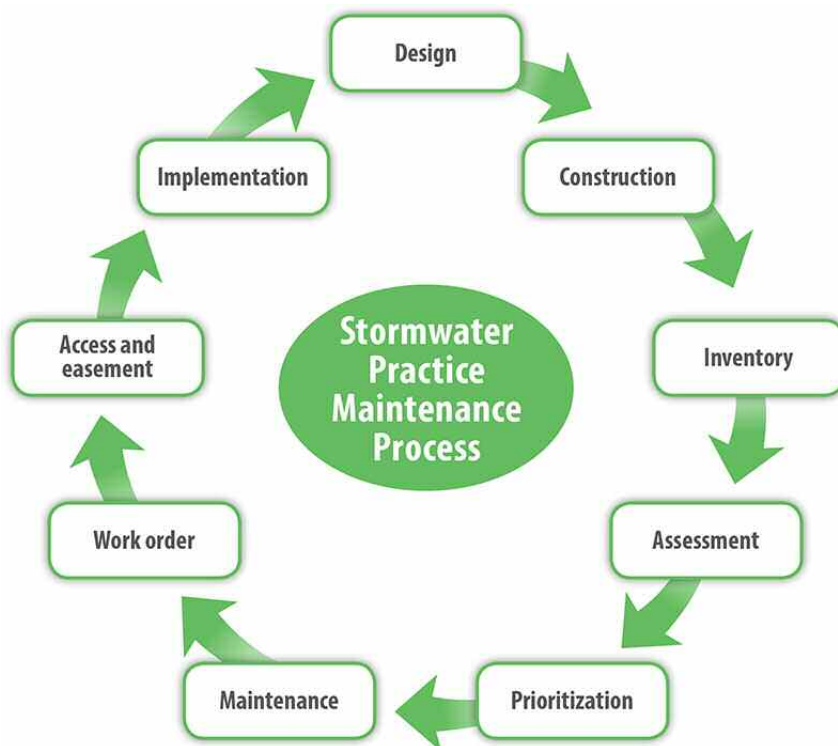
Stormwater Practices and Maintenance Core Curriculum is an online course providing something that has been missing: an introductory module. It’s a publicly available, uniform and comprehensive stormwater training for stormwater professionals that can 1) optimize stormwater operations, and 2) help stormwater professionals meet their community’s clean water goals.

The team began their work by conducting a needs assessment and reviewing the 2013 Washington State Low Impact Development materials as well as Minnesota Extension Stormwater U



evaluations (N=150). The team assessed existing curricula and resources, reviewed their consistency and determined gaps. They then developed the research-based curriculum and formative evaluation with content experts, instructional and graphic designers and an editor. The *Stormwater Practices and Maintenance Core Curriculum* course was produced using Moodle and the eXtension online campus. Finally, an extensive peer review along with two pilot evaluations were carried out to significantly improve the course. A detailed promotional plan has is being carried out. The project has already generated significant outcomes and impacts including a new collaborative regional stormwater group, an increase in skills of Extension Educators in developing online courses with national and regional scopes and a better understanding of multi-state stormwater issues and gaps.

The *Stormwater Practices and Maintenance Core Curriculum* will enable new and early career staff to obtain professional development training and will help stormwater professionals optimize their stormwater operations and meet their community clean water goals. To learn more about the course, take a video tour, or to enroll, access the free introductory course online at <http://z.umn.edu/swcc>, or contact Shahram Missaghi, miss0035@umn.edu, 952-221-1333. ■



How a Tiny Bone in Common Carps' Inner Ears Played a Role in Developing Sustainable Management Schemes for this Invasive Fish in Minnesota

Dr. Przemek Bajer, Research Assistant Professor, University of Minnesota, Minnesota Aquatic Invasive Species Research Center, bajer003@umn.edu

While public attention in Minnesota has focused on newly arriving aquatic invaders, and understandably so, efforts to control the state's oldest invasive fish, the common carp, have been rapidly advancing with considerable success. Over the last decade, research at the University of Minnesota resulted in several important discoveries that unveiled not only what makes carp invasive, but also what can keep their populations in check. This new information along with pilot studies demonstrating successful carp control strategies resulted in a renewed interest in controlling common carp populations in many areas of the state.

The most insightful clues about processes that regulate common carp (hereafter 'carp') abundance in Minnesota lakes resulted from examining tiny bones in carps' inner ears, called otoliths (see photo). Otoliths accrue annual growth marks like trees, and examining them unveiled histories of several carp populations in the metro area, sometimes going back more than 50 years. It showed that many of these populations were dominated by only two or three age classes, such as in Lake Susan in Chanhassen where 9 and 16 year old carp dominated. This suggests that although carp spawn annually, their young survive only during some years (e.g., 9 and 16 years ago in Lake Susan). Natural processes evidently limit the survival of carp eggs, larvae and fry during most years (Bajer and Sorensen 2010); this was confirmed by examining Department of Natural Resources data from more than 500 lakes. The fish surveys indicated that young-of-year carp were present in less than 10% of the lakes (Bajer et al. 2015).

But what processes limit the survival of carp eggs and fry (i.e., recruitment)? A

clue to solving this puzzle was revealed in the otolith ageing analyses. We noted that historical spikes in carp recruitment occurred when marshes adjacent to lakes experienced winterkilled (i.e., became anoxic due to snow and ice cover) and die-offs of native fish. This led to a hypothesis that native fish control the survival of carp eggs and fry in most lakes and years, except when they (the native fish) perish in a winterkill. We also hypothesized that adult carp, which are very mobile, can migrate out of lakes and into such post-winterkill marshes in the spring and use them as nurseries. Juveniles that hatch in such marshes then disperse back into lakes, completing the cycle.

Our hypotheses were corroborated by lake surveys finding carp fry in almost every winterkilled marsh but none waters where fish die-offs did not occur (Bajer et al. 2012). We also found that bluegills were the main predators of carp eggs and larvae in lakes but were absent in winterkilled marshes (Bajer et al. 2012; Silbernagel and Sorensen 2013). Further, telemetry studies showed that up to 90% of adult carp leave lakes in the spring and migrate into adjacent marshes to spawn and that juveniles move out of the marshes and into the adjoining lakes over time (Bajer et al. 2015b). Seemingly, the carp code has been cracked, at least in metro lakes of central Minnesota.

Our findings have clear management implications. First, carp populations in many chains of metro lakes are driven by recruitment occurring from relatively few and small winterkill-prone marshes or ponds. If those systems could be stabilized (e.g., via winter aeration), or blocked off, carp recruitment could be

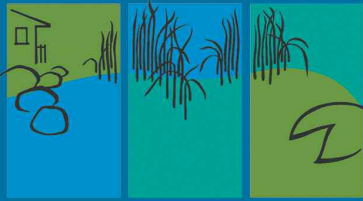
stifled. Once the production of young is under control, adults could be sustainably removed. This can be relatively easy as adult carp form tight under-ice aggregations that can be found using telemetry and removed by commercial fishermen. We applied different combinations of these management strategies in three chains of lakes (Riley, Purgatory, and Phalen), each time reducing the population of carp to non-damaging levels. In each case, water quality improvements were noted (Bajer and Sorensen 2015). A serendipitous finding was that by controlling carp populations and allowing plant communities to rebound (carp uproot plants), phosphorus levels in shallow lakes (e.g., Lake Casey in Little Canada) declined by 40%. It appeared that carp management was an economical strategy to reduce nutrient loads from marshes into lakes (Bartodziej and Blood, in review).

Our current efforts at the Minnesota Aquatic Invasive Species Research Center focus on developing management solutions for common carp in prairie lakes of southern Minnesota where the dynamics of carp populations are somewhat different. Pilot experiments planned for this summer will begin assessing whether biocontrol or toxins delivered in a species-specific manner could be used to control carp in combination with the strategies we have already developed.

NOTE: For a list of scientific studies or journal articles referred to in this article and accompanying photos, see the full article in the 2015-16 Winter issue of Water Resources News or contact Karen Terry, From Shore to Shore editor, at kterry@umn.edu. ■

Contact

Karen Terry
University of Minnesota Extension
From Shore to Shore Editor
320-589-1711
kterry@umn.edu



From Shore to Shore

www.shorelandmanagement.org

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.

The University of Minnesota is an equal opportunity employer and educator.



UNIVERSITY OF MINNESOTA
EXTENSION

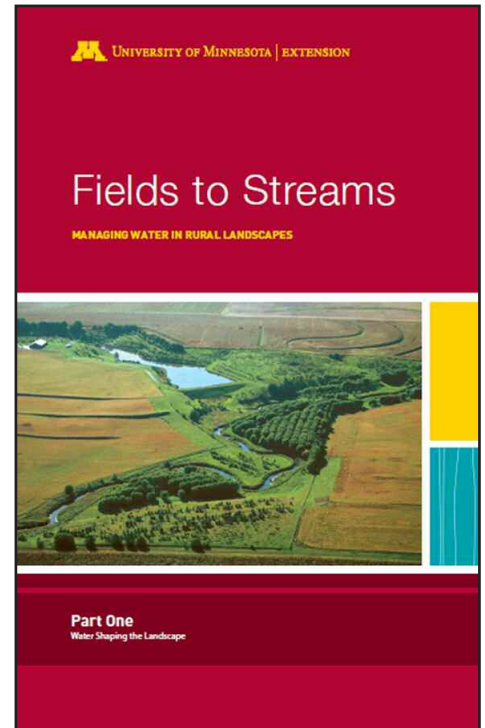
Fields to Streams: A New Resource for Talking About Water Management

How does the conversation go when a landowner asks a natural resources land manager about stream bank slumping, or a drainage ditch repair, or problems with algae blooms? It is rarely a quick conversation. Such problems reflect to some extent how water flows across the whole watershed through fields, streams, and ditches.

How do natural resources land managers explain the way water storage ponds or in-field management impacts a lake, stream or ditch a mile or more away?

Now there is a new publication from the U of M Water Resources Center to help landowners and land managers better understand and explain the science and practice of managing water in rural Minnesota. *Fields to Streams: Managing Water in Rural Landscapes* is packed with graphics and concise, relevant explanations about the water cycle and land management practices that impact it. *Fields to Streams* shows land managers how to help reduce the rate of erosion and sediment loss.

The online publication is divided into two PDFs and available for download from University of Minnesota Extension at z.umn.edu/FieldsToStreams. Part One, "Water Shaping the Landscape," explains the role of Minnesota's geology, changing rainfall, and land management practices in altering the amount and timing of runoff reaching and shaping streams and rivers (62 pages; 6.5 MB PDF). Part Two, "Managing Sediment and Water," describes practices for managing crops, drainage systems, surface runoff, wetlands, impoundments, and stream corridors to reduce peak flows and lessen the amount of streambank, bluff, and ravine erosion (39 pages; 2.3 MB PDF). It



concludes with some considerations for collaborating at the local watershed scale to identify problems and develop solutions.

Fields to Streams draws on research from Minnesota and Iowa. It was developed by a team of authors and contributors from universities, agencies, and the private sector led by the U of M Water Resources Center (WRC) and was funded by a grant from the McKnight Foundation.

Hard copies are being printed and will be available for purchase soon. If you are interested in purchasing copies when they are available or having high resolution files to print yourself, contact Karen Terry at kterry@umn.edu or visit the website z.umn.edu/FieldsToStreams for the most up-to-date information. ■