From Shore to Shore

A publication of the University of Minnesota Extension Water Resources Team

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Rain Gardens in Your Space – An Upcoming Webinar

Are you interested in rain gardens – what they are, how they work, what you need to know to create one of your own? If so, plan to attend a free webinar called "Capturing the Rain: Creating Gardens to Clean Minnesota's Lake and Streams" on Wednesday, September 14, from 12-1pm.

Rain gardens are shallow gardens recessed into the ground so that they hold water that runs off of the surface of the land during rain storms or when the snow melts. This runoff water often picks up pollutants such as road salt, litter, nutrients like phosphorus, animal waste, and contaminants from cars and other sources. If the runoff water is not stopped, it often finds its way into a nearby lake or stream, carrying the pollutants with it. Rain gardens are strategically situated to intercept the runoff water, preventing it from directly racing into a lake or river. The water that the rain gardens collect either soaks into the ground, gets used by plants, or evaporates into the atmosphere. The result: cleaner lakes and rivers.

If you would like to attend the webinar, call or email Karen Terry, 218-770-9301, kterry@umn.edu to reserve your spot. You will need a computer with access to the internet to participate; you will use either your computer speakers and microphone or a telephone call-in option for audio. The webinar will be recorded and made available online after September 14 – look in the next *From Shore to Shore* for a link to the recording.

State of Water Conference Recap

More than 200 Minnesotans attended the second biennial State of Water Conference at the Arrowwood Resort in Alexandria in April to learn the latest and most relevant issues surrounding Minnesota's lakes, rivers, and watersheds. The two-day event had more than 40 topic experts speaking in 24 break-out sessions, in addition to four 2.5-hour workshops. Governor Mark Dayton was the honored speaker during the luncheon on Friday, and Ron Schara from Minnesota Bound was the keynote speaker on Thursday.

The conference's break-out sessions were sorted into four categories: Aquatic Invasive Species, Local Impacts, Species Health, and Water Health. The visuals from many of the presentations are available here: http://freshwater.org/state-of-water-conference/. ■

Calendar of Events

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

The dirt on sediment pollution: A NEMO workshop on the Minnesota River for local leaders
Date: August 31
Location: Sailing from Savage, MN
Contact: John Bilotta, 612-624-7708, jbilotta@umn.edu

St. Croix NEMO Workshop on the Water
Date: September 14
Location: Sailing from Hudson, WI
Contact: John Bilotta, 612-624-7708, jbilotta@umn.edu

Capturing the Rain: Creating Gardens to Clean Minnesota's Lake and Streams
Date: September 14; 12-1pm
Location: Webinar
Contact: Karen Terry, kterry@umn.edu, 218-770-9301

Green Infrastructure for Clean Water: Rethinking Redevelopment and Retrofits 2016 Clean Water Summit
Date: September 22
Location: MN Landscape Arboretum, Chaska
For more information: www.arboretum.umn.edu/2016cleanwatersummit.aspx

Inside...

Dam Replacement Project Allows Fish to Migrate in and out of Cass Lake for the First Time in 100 Years via the Mississippi River

By Todd Tisler, Chippewa National Forest Fish and Wildlife Program Manager, ttisler@fs.fed.us

The Knutson Dam project is located within the Chippewa National Forest at the point where the Mississippi River flows out of Cass Lake's north shore. The world-renowned Mississippi River supplies significant social, economic and natural resource benefits to the Chippewa National Forest and areas throughout the watershed, all the way to the Gulf of Mexico.

Knutson Dam was originally built in the early 1900s as a logging dam, enabling harvested timber to move down stream via the river corridor. In 1926, the Forest Service purchased the dam under Public Law 270 and was subsequently responsible for its management and maintenance. Since then, instead of being used for logging, the dam has been used to regulate the water levels of the immediately upstream and downstream lakes, and the river. Over the years, managing the dam and water levels involved many partners, including the Minnesota Department of Natural Resources (MN DNR), the US Army Corps of Engineers and the Chippewa National Forest. Managing the water levels has created benefits like improving fish spawning conditions, allowing recreational access, and limiting high and low water level extremes.

The deteriorating physical condition of Knutson Dam (as inventoried in 2011) and a forest-wide watershed assessment at the same time, created an opportunity to address the many structural and natural resource issues the old dam created. As a result, the Chippewa National Forest engineering and fisheries staff worked closely with the MN DNR Fisheries and Ecological Resources Division in planning, funding and designing a new structure: the rock arch rapids. Early consultation and site review with Dr. Luther Aadland, River Ecologist with the MN DNR, resulted in the initial concept design. Dr. Aadland is a nationally-recognized river restoration expert and with his input and guidance, the Chippewa National Forest engineering and fisheries staff produced a final design that embraces the most modern and innovative restoration concepts available.

Knutson Dam (before)

Knutson Dam (after)

Subsequently, in collaboration with the MN DNR, Leech Lake Band of Ojibwe, and the US Army Corp of Engineers, a Knutson Dam Improvement Project Design Plan was developed and implemented in 2015.

The project included several significant accomplishments:

- Removed the Knutson Dam structure from the Mississippi River channel, thereby restoring access for aquatic organisms to over 30 miles of the Mississippi River, its tributaries, and 72,000 acres of lakes.
- Improved the hydrologic function of the Upper Mississippi River by installing a fixed-crest rock weir and rock rapids for managing the water level of the Cass Lake Chain.
- Reduced the incidences of lakeshore erosion on Cass Lake by minimizing the duration of high water periods due to increased hydraulic capacity compared to the previous Knutson Dam structure.
- Improved recreational opportunities at the site. There is a popular Chippewa National Forest campground adjacent to the Cass Lake lakeshore and Mississippi River channel. Visitors will now be able to access both Cass Lake and the Mississippi River safely, fish off the banks and pier, and enjoy the more natural lake, river and shorelines. Increased use by kayakers is also expected due to the presence of the rapids.
- Improved safety due to the elimination of the dangerous hydraulic conditions associated with the swift flow and under-currents that existed with the former gate openings. Hydraulic energy dissipation now occurs within the rapids.
- Created spawning habitat for fish species such as walleye and white sucker. Both have been documented in Minnesota using similar structures to spawn.
- Engaged and collaborated successfully with many diverse stakeholders, including the Leech Lake Band of Ojibwe, MN DNR, US Army Corp of Engineers, Otter Tail Power Company, US Fish and Wildlife Service, Midwest Glacial Lakes Partnership, and the US Forest Service.

For more information regarding the Knutson Dam Project, contact Todd Tisler, manager of the Chippewa National Forest Fish and Wildlife Program, at ttisler@fs.fed.us. ■

Disconnect: Dams and Other Barriers in Minnesota's Streams and Rivers

By Karen Terry, University of Minnesota Extension, 218-770-9301, kterry@umn.edu

When asked to define a river, stream or creek, most people will say that it is a body of flowing water within a defined channel. But if we delve deeper, we find that streams and rivers are much more than that. These fascinating ecosystems can be explored by examining five inter-related categories: biology, hydrology, connectedness, shape, and water quality. These components must be in balance for the system to remain healthy and stable. If one component is altered, the system will adjust to regain balance, often leading to unforeseen and undesirable consequences.

Concentrating on the concept of connectedness and using the term "stream" liberally to include anything from a creek to a river, connectedness in streams primarily lives in two dimensions: laterally and longitudinally. Laterally, healthy streams are connected to their floodplains. When flows (the amount of water in the stream) are high, such as during a flood, healthy streams can widen by expanding into their floodplains. The additional width and drag created by the vegetation typically growing along the stream banks serves to slow the water down. Slower water is less destructive so there is less damage downstream. Lateral connectedness also creates unique habitats upon which some species depend. Northern pike, for example, favor slow water with vegetation created by inundated floodplains. Lateral connectedness can be lost when a stream is separated from its floodplain by dikes or if the stream has cut deeply into its bed, which can happen as a stream adjusts to a perturbation.

The second dimension of connectedness is longitudinal: the degree to which a stream is connected upstream and downstream. It's true that streams are flowing water, but they are also flowing sediment. Depending on variables such as the slope of the stream bed, size of the stream channel, velocity of water, amount of water, and temperature of the water, the water in a stream has the capacity to carry a certain amount of sediment. In a stable stream system, the amount of water and sediment remains proportionally consistent: as stream flow varies seasonally and across years, sediment is picked up in some places and deposited in others but over time the amount of sediment remains constant.

When a barrier such as a dam blocks a stream, the dynamics change. Water is slowed by the creation of a pool behind the dam, which allows the sediment that the stream is carrying to settle out. Over time, sediment fills in the pool behind the dam. And, when water goes over or is released from the dam, it regains speed often resulting in streambank erosion. This erosion can lead to degraded water quality as the streambank material can contribute pollutants such as phosphorus, farm chemicals, and heavy metals.

Dams create other problems, too. Many of the aquatic creatures that live in streams migrate upstream and downstream to find adequate seasonal habitat (think: "deep pools for over-wintering") or for spawning habitat. For example, consider lake sturgeon in Minnesota: once quite abundant in larger streams, they became nearly extinct after the construction of many dams limited their ability to migrate upstream to the rocky, fast-water habitat in which they lay their eggs (over-fishing surely played a large role in their demise as well). As dams have been removed and modified, sturgeon are making a remarkable return to Minnesota streams. You can learn more about impacts of stream barriers on Minnesota fishes here: www.dnr.state.mn.us/eco/streamhab/barrier_pub.html.

Last but not least, many dams pose safety issues for humans and domestic pets as well. It is easy to see the danger of large dams, but smaller dams can be deceiving and deadly. The water rushing over the top of a dam creates a 'hydraulic roller' when it plunges down; humans and animals can get caught in this roller if they get too close to the dam and the power of the roller makes it difficult or impossible to get free.

Several dams have been removed or modified in Minnesota to alleviate these negative impacts on streams (Dam Replacement Project Allows Fish to Migrate in and out of Cass Lake for the First Time in 100 Years via the Mississippi River). These projects are based on safety concerns, the desire to restore fishing opportunities, and the growing level of understanding about streams as systems and the need for those systems to be in balance. For more information about Minnesota's streams, read "Are Minnesota Streams Healthy?" and explore "Healthy Rivers: A Water Course". ■

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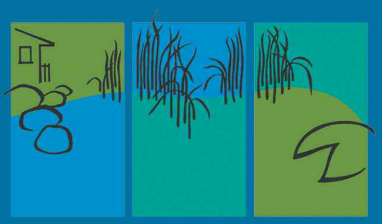

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From Shore to Shore is a free quarterly electronic newsletter. Archived issues are available online at www.shorelandmanagement.org

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

Sea Grant Minnesota

University of Minnesota Extension

Fish and Insects as Indicators of Waters' Impairment

By Doug Malchow, Extension Water Resources Educator, malch002@umn.edu, 507-280-5575

According to the Minnesota Pollution Control Agency's (MPCA) 2016 draft list of impaired waters, fish and aquatic insects are at risk in more than 300 additional lakes and stream sections than previously identified across Minnesota based upon water body assessments. These assessments represent how well the state's water can support fishing, swimming and other beneficial uses. Water bodies that fail to meet federally-set water quality standards are considered impaired and require that a cleanup study be conducted.

Based upon assessment research, the MPCA deemed 158 water bodies impaired for fish and 155 impaired for aquatic insects. The addition of the newly listed water bodies brings the total number of stream sections and lakes considered impaired for fish and insects to 880. Restoring these fish and insect communities may require improving habitat conditions by decreasing nutrient pollutants that cause algae blooms and decreasing sediment that clouds the water. Extensive tile drainage for cropland may also hurt aquatic life by changing water flow.

Impaired waters summary

The following sources of impairments were included in the 2016 MPCA report:

- Non-supporting for fish and aquatic insects: 313 new listings (158 fish and 155 aquatic insects), 880 total
- Nutrient pollutants: 87 new listings (41 streams and 46 lakes), 645 total
- Bacteria pollutants: 83 new listings, 617 total
- Mercury pollutants: 78 new listings, 1,670 total
- Dissolved oxygen stressor: 10 new listings, 132 total
- Sediment pollutants: 6 new listings, 370 total
- Other pollutants: 3 new listings, 215 total
- Chloride pollutants: 1 new listing, 47 total
- Nitrate pollutants: 1 new listing, 17 total

The good news

MPCA is proposing to remove two lakes from the impaired waters list. One shining example is Lake Shaokatan in western Minnesota where a comprehensive plan to reduce feedlot, agricultural, and urban runoff, and upgrade failing septic systems has resulted in all-time low phosphorus levels in the lake.

For a more complete discussion of the MPCA's draft 2016 list of impaired waters and to find out how you can comment on the draft list until August 31, please visit the MPCA website at: www.pca.state.mn.us/news/fish-and-bugs-risk-many-lakes-and-streams. ■

New listings by the numbers (from MPCA)

- 41 sections of streams — most in southern Minnesota — fail meet new standards designed to prevent algae detrimental to aquatic life and recreation like fish and swimming. The MPCA examined available data for 3,100 river sections and found that 415 stream sections do meet the standard, 41 do not, and the rest need more data for a determination. Nutrient standards have been in place for lakes since 2008, and standards for rivers went into effect in 2014. The agency may list more rivers as impaired by nutrients in future years as it further analyzes their potential to grow algae.
- 83 water bodies, including 2 areas of Lake Superior with beaches, have bacteria levels too high to meet standards. Bacteria can make water unsuitable for swimming and other recreation. Sources of bacteria include manure runoff, livestock in streams, and failing sewer systems.
- 78 water bodies have mercury levels in fish tissue or in the water that are too high to meet standards. Mercury can be toxic to humans and that's why the state of Minnesota issues consumption advisories for fish. The largest sources of mercury in Minnesota's environment come from air emissions like coal burning and taconite. About 90% of the mercury deposited on Minnesota comes from other states and countries.