

Minnesota Chapter Report

NCD Rivers and Streams Technical Committee

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MINNESOTA DEPARTMENT OF NATURAL RESOURCES, DIVISION OF FISH & WILDLIFE

Big Stone River

MN DNR partnered with the Big Stone County SWCD to replace a failing outlet structure on Bentsen Lake with a rock-arch fishway. The original structure was built in 1968 and was near complete fish barrier. The new structure included six rock weirs and an overall slope of three percent. The project was funded primarily by a Conservation Partnership Legacy Grant and DNR Fisheries funds. Total cost was approximately \$100,000.

Prior to construction:



Completed:



Stony (Wabedo) Creek Culvert replacement at Stony Creek Road (TWP C) – Wabedo Township, MN:

The goal of this project is to restore connectivity of approximately 8.5 miles of stream from Wabedo Lake to the upper reaches of Stony Creek and its major tributaries. Stony Creek is known for a significant run of spawning Walleyes and other species in the spring. The existing culverts, located approximately 0.2 miles upstream from Wabedo Lake, are undersized and perched on the downstream and upstream ends and hinder upstream movement of fish and other aquatic organisms. Project was initiated in 2020. Stream channel surveys were conducted in 2021. Culvert replacement engineering and design is in progress as of March 2022. Project is a coordinated effort with Cass County, Minnesota Department of Natural Resources, and Wabedo Township.

May Lake Creek Project

The goal of this project is to restore approximately 4.6 miles of stream connectivity through five lakes from Leech Lake to the headwaters of May Lake Creek. From the outlet at May Lake to the inlet at Leech Lake, May Lake Creek has been extensively modified with five major and minor road crossings with poorly designed culverts. In addition, residential and business development has contributed to degradation of the stream channel and disrupted stream connectivity. In the past, White Suckers had been observed using the creek immediately downstream of May Lake for spawning, but this run has been limited or nonexistent in recent years. Historically, there were reliable anecdotal reports of Muskellunge in May Lake, but there have been no reports in recent years. The 2020 culvert replacement at Cleveland Boulevard, the first road crossing upstream from Leech Lake, was designed to facilitate fish and aquatic organism passage and incorporated stream channel survey data in the design and placement. The current focus is on restoring fish passage at the May Lake outlet. Three remaining culvert replacements are being considered. This is a major multi-year restoration/habitat improvement project initiated in 2020. Initial stream survey was completed in 2021. The project is a coordinated effort with Cass County, Minnesota Department of Natural Resources, and the City of Walker, MN.

SOIL & WATER CONSERVATION DISTRICT - DULUTH

This last year we worked on eight 15' + span open-bottom culvert crossing restorations, replacing undersized and perched culverts with open-bottom crossings utilizing simulated natural bed material to promote stream stability and fish passage. We also implemented a small stream restoration project involving a series of rock weirs on a tributary to Tischer Creek, and a larger stream restoration on Keene Creek aimed at rebuilding trout habitat and a stable channel after development and flood damage impacted the watershed. Both of these are in the Duluth area.

For next year we have a variety of similar projects in planning, with the most prominent being a ~4,500 lineal foot channel restoration on Miller Creek in Duluth, taking a historically ditched channel and returning it to its stable original pattern, profile, and cross-section, while installing a variety of habitat structures for fish and vegetative buffer plantings for a resilient floodplain community.

CARVER COUNTY WATER MANAGEMENT ORGANIZATION

We did fish surveys at 4 sites to inventory stream fish communities at our stream water quality monitoring sites. We use fish surveys along with macro sampling, mussel surveys, and water quality data to look at stream health. We use IBI/state standards from our various monitoring activities to prioritize water quality improvement projects. We also monitor for invasive fish, we have a gnarly goldfish problem in a few of our lakes and in streams.

MN DNR DIVISION OF ECOLOGICAL WATER RESOURCES (EWR)

Clean Water Legacy

Shell Rock River

Clean Water Legacy funds were used for 2 Shell Rock River projects. One site is in the Panicum Prairie WMA. Toewood was installed on two eroding banks. This was completed in January 2022.

Panicum upstream:





Panicum downstream:





The Juglans AMA site is immediately downstream of Albert Lea Lake so there is very little sediment supply. We implemented practices (riffles, tree drops, and pervious cedar dikes) intended to mobilize channel sediment in hopes of scouring deeper pools and narrowing the channel over time. The permeable cedar dikes were an idea of Barr Engineering that we allowed due to the lack of tall, coniferous trees in the area. This was completed in February 2022.





MN DNR EWR RIVER ECOLOGY UNIT (REU)

Center for Aquatic Mollusk Program

The MN DNR's Center for Aquatic Mollusk Programs (CAMP) continued its efforts on the conservation and restoration of native mussels in 2021. Working with the Army Corps of Engineers and Mussel Coordination Team, we monitored Higgins Eye essential habitat areas and reintroduction sites in the Upper Mississippi River: Pool 2 at Hidden Falls; Pool 10 at Prairie du Chien (Wisconsin) and Harpers Ferry (Iowa); St. Croix River Prescott (Wisconsin); Cedar River near Charles City (Iowa). Additional mussel surveys were completed on the Mississippi River for a Competitive SWG grant to Minnesota and Wisconsin. Divers located a population of Spectaclecase mussels below Lock and Dam 3 near a positive eDNA detection in 2020. The CSWG is evaluating population status and characterizing occupied habitats of Spectaclecase, as well as, examining laboratory culture techniques for juveniles. Lastly, CAMP biologists completed two long-term monitoring sites in the St. Croix River and Ottetail River. Minnesota has 16 established long-term monitoring sites to measure mussel density and species richness trends. In 2022, at least 5 additional long-term monitoring sites will be sampled statewide. In addition, Pool 5 of the Upper Mississippi River will be systematically sampled and compared to a previous survey completed in 2006.

Reintroduction of threatened & endangered mussel species by CAMP occurs in 3 major watersheds: Cedar (mucket and black sandshell), Cannon (mucket), and Mississippi (Higgins eye, mucket and snuffbox). Since 2019, 5,600 sub-adults have been released in the Cedar River; 1,800 in the Cannon River; 2,425 in the Mississippi River below Lock and Dam 1. In the summer of 2021, biologists monitored reintroduced mussels to measure growth and survival in the Cedar and Cannon rivers. At each release site passive integrated transponder (PIT) tags were attached to a subset of mussels. The first year of monitoring the Cedar and Cannon rivers showed promising results; 56% PIT-tagged mussels were detected, and 39% were physically recaptured in the Cedar River, and 66% were detected and 27% recaptured in the Cannon River. Mussel growth in both rivers ranged from 10 – 30 mm. Monitoring efforts will continue for 3 constitutive years, and an initial monitoring of the Mississippi will occur August 2022. Additionally, CAMP will continue to reintroduce mussels in these watersheds as thousands of 2-3 year old mussels are currently held in secondary culture systems at Waterville Fish Hatchery and the Minnesota Zoo, and through yearly propagation efforts under an ENRTF grant.

An additional competitive SWG grant project will commence in 2022 – Regional assessment of widespread mussel declines: a multistep approach to examine potential causes. This project expands a larger cooperative study to examine causes of freshwater mussel declines in North America. This will include mussel surveys, environmental data collection at different scales, and health assessment juvenile mussels in paired streams in the St. Croix and Minnesota River basins, as well as a survey for Salamander Mussels in Minnesota.

Lessard Sams Outdoor Heritage Council (LSOHC)

Stream Restoration Project Constructed in 2021

Lake Carlos	Dam modified INTO ROCK ARCH RAPIDS	Modification	2021
Fredenberg Culverts	Fish passage	Modification	2021
Shell River Culverts	Fish passage	Modification	2021
Hallock Dam	Dam modified and extra riffles for grade control and stabilization	Modification	2021
Zumbro River at Mazeppa	Dam Removal	Removal	2021

Lake Carlos dam

NATURE AND SCOPE – Lake Le Homme Dieu and Lake Carlos will be reconnected to the watershed along with approximately 36 fish species are found downstream of the dam. The site will be stabilized and addressed erosion issues. Weir stones were placed in such a way as to provide a passable route for experienced tubers, canoeists and kayakers. Flat stones were also placed near the banks to be used for fishing platforms.

PURPOSE – This project addressed a scour hole and bank erosion issues. It improves the connectivity of river and lake system by modifying the dam structure into a rock arch rapids. Improves fish habitat by providing rock substrate with swift moving water. Additionally, it improves safety and recreation at the site while still maintaining the lake level.

Fredenberg Culverts

NATURE AND SCOPE – This project involves the replacement of two culverts that are currently barriers to fish passage near Schroeder, Minnesota. These culverts are located on Fredenberg Creek where the creek intersects with Ash Cell Road and the LTV Railroad. Each culvert replacement will consist of removing the current culvert and replacing it with an open bottomed structure that will allow for natural sediment transport and fish passage.

PURPOSE – There are approximately 27 species of fish that will benefit from river reconnection at these sites. This project will reconnect about 1.7 miles of quality cold water habitat. The primary purpose of this project is to improve the ecology of the river system by replacing the culverts and restoring fish and aquatic species passage upstream of the existing structures.

Shell River Culverts was done by Fisheries.

This project is replacing three undersized culverts with properly sized and placed culvert arrays on the Shell River, in Becker County MN. These road crossings have been identified as not allowing fish passage, and limiting normal stream functions especially sediment transport.

Hallock Dam

Dam conversion was finalized. Lead by Watershed District and Fisheries, we consulted on design. A rock arch rapids and a few riffles were installed to provide fish passage. This project will reconnect approximately 31 miles of the Two Rivers upstream to the Bronson Dam. A substantial amount of high quality riffle-pool habitat exists in the beach ridge segment of the Two Rivers between the two dams. Large river species present in the lower Two Rivers and Red River will be able to access this high quality habitat.

Zumbro River

NATURE AND SCOPE – The North Fork of the Zumbro River was historically dammed near the City of Mazeppa in 1876. Impoundment of the water along with land use changes resulted in a reservoir that filled with sediment and flattened the natural slope of the river. As a result the site lacks quality habitat, has high unstable banks and lacks floodplain connectivity. This project will implement Natural Channel Design (NCD) to restore about 3000 feet of the N. Fork Zumbro River and stabilize reservoir sediments. DNR Ecological and Water Resources (EWR) staff and DNR Fisheries staff have developed a restoration goal to restore the stream and floodplain to a stable form. This project will address bank and stream bed sources of sediment by applying a more stable dimension, pattern and profile to the main stream channel.

PURPOSE – The primary purpose of this project is to restore the geomorphic stability of the stream and reconnect the river with the floodplain. This project will: enhance riparian corridors and buffers, improve fish habitat, address and reduce bed/bank erosion, and improve water quality. Restoration was completed.

Fish Habitat Team

Drought conditions and lack of summer interns limited our ability to do fish sampling in 2021. In July we sampled one of our long-term monitoring sites on the Ottertail River, collecting a total of 591 fish of 23 species. In August we sampled one restoration site on the Zumbro River, collecting a total of 391 fish of 17 species.

Instream Flow Incremental Methodology (IFIM) Study for Little Rock Creek, Mississippi River – Sartell Watershed, Minnesota

Summary of Sustainability Analysis for Little Rock Creek

The groundwater flow analysis completed in March 2021 by the DNR shows that groundwater use in the Little Rock Creek area is reducing some of the seasonal low flows by more than 20% in four of twelve years analyzed. The associated fish habitat analysis showed that this amount of change in streamflow results in a loss of fish habitat during those periods.

Based on our analysis of fish habitats and species in Little Rock Creek, it appears that a sustainable diversion limit of 15% of the August median baseflow would avoid adverse impacts and meet the requirements for sustainable use in Minnesota Statutes.

The IFIM report

https://files.dnr.state.mn.us/waters/groundwater_section/sustainability/littlerock/ifim-study-lrca-report.pdf

More information on the project and other analysis can be found on the Sustainable Use of Groundwater in the Little Rock Creek Area web page.

https://www.dnr.state.mn.us/waters/groundwater_section/sustainability/lrc/index.html

Watershed Health Assessment Framework (WHAF)

<https://www.dnr.state.mn.us/whaf/index.html>

Sign up for the REU's mussel and LTRM teams newsletters at this site.

https://www.dnr.state.mn.us/emailupdates/index.html?utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term=

Training Opportunity

The Fundamentals of River Science: Applied Geomorphology & Ecology

August 15 - 19 in Fergus Falls, MN

<https://www.dnr.state.mn.us/eco/streamhab/shpworkshops.html>

See brochure attached.

River Health & Restoration Workshops

Offered by the MN DNR River Ecology Unit

Our rivers and streams have been impaired by many factors resulting in poor water quality, lost biodiversity, accentuated flooding and drought, and increased rates of erosion and sedimentation.

As our rivers have become more widely recognized and appreciated as valuable natural resources that need restoration, the responsibility to better understand and properly restore these complex ecosystems takes on great importance. To that end, the Minnesota Department of Natural Resources offers a variety of stream related workshops.

The foundation of these workshops is to a) teach the fundamentals of stream science including: fluvial geomorphology, hydrology, connectivity, biology and water quality and to b) educate attendees in reference reach geometry techniques and approaches that ensure long-term health, stability, and resilience.



Our definition of Success:

Implementing projects that
reestablish self-sustaining geomorphic
and ecological processes that
» form & maintain quality habitat and
» protect or restore biodiversity.

River Science Series

- » The Fundamentals of River Science: Applied Geomorphology & Ecology
- » River Monitoring & Assessment
- » Restoring River Ecosystems: Design & Application

The Science of Healthy Waters Series

- » The Ditching Dilemma
- » The Dam Dilemma

Diagnosing Streams: Symptoms, Underlying Causes, & Remedies

Our definition of Restoration:

The act of relaxing human constraints on the development of natural patterns of diversity, where restoration measures should not focus on directly recreating natural structures or states but on identifying and reestablishing the conditions under which natural states create themselves (Ebersole et al. 1997, and Frissell et al. 1997 Frissell and Ralph 1998).

Workshops

Find more information on our websites:

MN DNR - River Ecology Unit

River Health & Restoration Workshops



General workshop information

- We take requests into consideration when scheduling each year's workshops, so we ask those interested in future workshops to express interest directly to contact on last page.
- Course offerings are limited due to small staff size in addition to field and research responsibilities.
- Beverages, snacks, lunches, and some suppers are included.
- Lodging is not included in the registration fee.
- Fieldwork is required so students need to be prepared to wade in streams and work outside in inclement weather conditions.

Instructors:

Neil Haugerud is a River Ecologist with the MN DNR River Ecology Unit. He earned his master's degree in Wildlife and Fisheries Sciences from South Dakota State University in 2003. He is experienced in stream biological monitoring, macro-invertebrate identification, reference site selection, and evaluating water quality. Neil's work focuses on project monitoring, river restorations, and geomorphological data analysis and management.

Mark Ellefson is a River Geomorphology GIS Specialist with the MN DNR River Ecology Unit. He earned his master's degree in Geographic Information Science from the University of Minnesota in 2014. His field experience encompasses fish sampling, bedload and suspended sediment sampling, discharge measurement, terrestrial LiDAR scanning and topographic surveying of stream channels. Mark's work focus is integrating field collected geomorphic data with GIS watershed analysis to better categorize the state's river systems and their geomorphic stability and erosion potential.

Amanda Hillman-Roberts is the Restoration Coordinator with the MN DNR River Ecology Unit. She earned her master's degree in Environmental Sciences and Resources at Portland State University in 2009. She is experienced in project development, geomorphic monitoring, culvert assessment and working with legislators and funding councils. Her work focuses on identifying, coordinating, prioritizing and funding channel restorations and dam removal/modification projects.

Dr. Amy Childers is a River Ecologist and Outreach Specialist with the MN DNR River Ecology Unit. She earned her master's degree and doctorate in Chemical Oceanography from the University of Alaska Fairbanks in 2001 and 2005. She has been coordinating and helping instruct these workshops since 2007. Amy's other work focuses on stream science outreach, river restorations, and geomorphic monitoring.

DNR staff Various staff from the River Ecology Unit and Clean Water Legacy Program (both of which are within the Division of Ecological and Water Resources) and the Division of Fisheries instruct in their respective areas of expertise and provide expertise in the field. Recent instructors include Clean Water Legacy Specialists **Karl Koller, Jon Lore, Brady Swanson, and Jason Vinje.**

Diagnosing Streams: Symptoms, Underlying Causes, & Remedies

No prerequisites

This workshop was developed in recognition of the need for additional training and practical experience in diagnosing stream condition and the underlying causes of degraded health. This workshop teaches:

- the fundamentals of river "physiology and anatomy" -- hydrology, fluvial geomorphology, and ecology,
- the underlying causes and the resulting impacts to stream stability, water quality, and biodiversity,
- demonstrations of diagnostic tools, and
- practical experience gained by stepping through real examples including examples brought by attendees.

This workshop can be taken by those with any level of expertise that wants to learn how to identify stream issues and practice diagnosing the causes of underlying causes. 3 days. \$300.

The Science of Healthy Waters Series

No prerequisites

This series is designed for concerned citizens, natural resource professionals, administrators, decision makers... essentially anyone involved in watershed issues including rivers, lakes, and wetlands, water quality, aquatic and terrestrial habitat, land use, flooding and more. These workshops teach the fundamentals of stream function and health, address how streams are affected by a specific issue, and offer opportunities for engaged conversations about improving stream and watershed health.

The workshops in this series address a specific issue related to stream health and include:

- a) the science underlying integrative, system-based watershed management,
- b) the problems, issues, and barriers hampering our ability to protect and restore watershed health, and
- c) alternative approaches for accomplishing goals of clean water, improved fish and wildlife habitat, and reduction of flood damages and erosion.

In recent years we have offered **The Ditching Dilemma** and **The Dam Dilemma**. 3 days. \$300.

River Science Series

This series of workshops teaches the basic functions and processes of streams and rivers; stream classification; field surveying; assessment and monitoring of channel morphology, stability, and sediment transport; and restoration where natural, stable stream reaches are used as templates for design.

This series is designed for natural resource professionals whose work involves rivers and streams as well as those engaged in watershed-wide resource management issues. These workshops are a mix of lectures and field applications where students are required to complete fieldwork, data analysis, and present their findings. The goal of this series is to develop a foundation for work in this field where ongoing fieldwork, project experience and interdisciplinary collaboration will be critical to effective stream restoration.

The Fundamentals of River Science: Applied Geomorphology & Ecology

No prerequisites

Rivers and streams are formed by hydraulic, geomorphic, and biologic processes. This course discusses the fluvial geomorphological processes involved in creating and maintaining a stream's shape and stability, as well as the fundamental hydrology and hydraulics of rivers. We teach the skills necessary to properly determine a stream segment's type and degree of stability that requires the collection of field data needed for classifying streams based on bankfull channel dimensions, sinuosity, entrenchment, and slope. Upon completion of this course, students will have the field and office skills needed to classify a stream reach, greatly facilitating communications and planning among river managers worldwide. Students will also have a firm knowledge of the functions and processes that are critical to a river's health and biodiversity.

5 days. \$1,000

River Monitoring & Assessment

Prerequisite: The Fundamentals of River Science: Applied Geomorphology and Ecology

This workshop is designed to teach natural resource professionals how to assess a stream's condition and stability and how to monitor streams through time.

Concepts taught include: • stream monitoring design and evaluation • sediment transport • channel stability assessment • use of biological indicators • understanding riparian vegetation.

Techniques used include: • geomorphic surveying, • Pfankuch's Stability Rating system • biological sampling • BANCS Model – quantifying channel source sediment contribution • introduction to suspended and bedload sediment sampling methods, FLOWSED and POWERSED • Prediction Level Assessment (PLA) of the Watershed Assessment of River Stability and Sediment Supply (WARSSS) methodology • riparian and channel monitoring techniques.

Students completing this course will be able to quantitatively describe a river's stability and condition through applying industry standard techniques and reporting. These skills provide natural resource professionals the ability to monitor a river's condition over time in a non-subjective manner then apply this knowledge in restoration prioritization.

10 days. \$1,500



Restoring River Ecosystems: Design & Application

Prerequisite: The Fundamentals of River Science: Applied Geomorphology and Ecology

This course will incorporate principles, methods, and tools for holistic stream restoration using natural materials and designs, with an emphasis on re-establishing both geomorphic and ecological processes. Fundamentals of restoration design that will be explained include: 1) diagnosis of underlying problems, 2) incorporation of local reference morphology, geomorphic and ecological processes, and 3) project design and construction techniques. Project types discussed will include remeandering straightened/ditched channels, dam removal, channel restoration following removal of dams with sediment laden reservoirs, dam conversion to a rapids, fish bypass channels around dams, culvert replacement/remediation, and bank stabilization. In addition to classroom lectures and field observations, students will design a restoration project utilizing collected and provided field data. Students will also test designs in a laboratory stream model. With this course, students will develop their foundation for work in this field that with ongoing fieldwork, project experience and interdisciplinary collaboration will lead to effective stream restoration.

5 days. \$1,000

2022 MN DNR REU Workshop Registration Form

Registering for:

Price

☐ **The Fundamentals of River Science: Applied Geomorphology & Ecology**

August 15 - 19 in Fergus Falls, MN

\$1,000

Registrant Information:

First & Last Name

Title/Position

Organization/Agency

Street Address

City, State, Zip

Daytime phone

E-mail address

Food allergy or dietary need

Payment information

- ➡ Payment is due with registration.
- ➡ MN DNR staff or other state agencies can pay by purchase order. For all others, checks should be made out to 'MN DNR'.
(Sorry, we can not accept credit cards.)
- ☐ Check is enclosed (make payable to **MN DNR**)
- ☐ Will provide purchase order (if MN state agency)
- ☐ If payment is not included explain when payment will be made.
- ➡ Registrations will be handled on a first come/first served basis; class size will be limited to 40 students.
- ➡ Cancellation after registering will result in a \$100 penalty. Cancellations less than two weeks prior to the first day of the workshop will result in forfeit of the registration fee or use towards the next time the workshop is offered.
- ➡ Class cancellations due to low enrollment will be determined two weeks prior to the start date.

Mail or fax registration to:

MN DNR, Attn. [Carla Koski](#)
1509 First Avenue North
Fergus Falls, MN 56537
Phone (218) 671-7976
Fax (218) 739-7601
Carla.Koski@state.mn.us

E-mails will be sent to confirm registration and to provide workshop information as the workshop date approaches.

For workshop questions or to express interest, contact:

[Amy Childers](#)
MN DNR - River Ecology Unit
Phone: (218) 671-7937
Amy.R.Childers@state.mn.us

Discounts

College Students: Full-time college students are eligible for a half price discount for the River Science Series workshops. Contact us for more information.

Repeat: Past students that would like to repeat a workshop in the River Science Series are eligible for a half price discount. For some it may have been several years since attending and feel more experience/training is needed. Also our expertise and methodologies have developed over the years along with the available software and field equipment.