

# Road / Stream Crossings Workshop

## Inventory, Assessment, Design and Construction

October 2 – 4, 2018

Markee Pioneer Student Center - University Room  
University of Wisconsin-Platteville



*You'll never look at a culvert the same way again.*

# Road/Stream Crossings Workshop Inventory, Assessment and Design and Construction Agenda

Tab#

Tuesday, October 2

- 1 8:00 Welcome and Workshop Overview**  
Welcome to UW-Platteville, workshop objectives, expectations and outline
- Dr. Molly Gribb*, Dean of the College of Engineering,  
Mathematics and Science, UW-Platteville  
*Austin Polebitski*, Environmental Engineer/Water Resources Professor, UW-Platteville
- 2 8:30 Welcome to the Fisheries of the Driftless Region**  
Driftless Area Restoration Effort (DARE) overview -
- Jeff Hastings*, Project Manager of the Driftless Area Restoration Effort  
Trout Unlimited, Westby, WI
- 3 9:00 Fisheries of the Driftless Region**  
The biology and life cycles of common fish in the Driftless region
- Bradd Sims*, Fisheries Biologist, Wisconsin DNR, Dodgeville, WI
- 4 9:30 Ecological Impacts of Stream Crossings**  
Importance of stream continuity to aquatic life
- Mike Miller*, Stream Ecologist, Wisconsin DNR, Madison, WI
- 10:00 Break**
- 5 10:15 How Streams Work**  
A brief introduction to stream morphology
- Matt Diebel*, Water Quality Modeler, Wisconsin DNR, Madison, WI
- 6 10:45 How Roads and Crossings Affect Streams**  
Examples of a variety of road/stream crossing and road maintenance problems
- Dale Higgins*, Forest Hydrologist (Retired – US Forest Service)  
Chequamegon-Nicolet National Forest, Park Falls, WI
- *Mysteries of the Driftless – The Documentary (if time allows)*
- **11:45 Lunch , Markee Pioneer Student Center**

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- 7 12:30 Inventory, Assessment and Prioritization**  
Techniques and tools to estimate if stream is passable for aquatic species, identify problems and prioritize projects
- Mark Fedora**, Supervisory Hydrologist, US Forest Service,  
Ottawa National Forest, Ironwood, MI  
**Matt Diebel**, Water Quality Modeler, Wisconsin DNR, Madison, WI
- 1:30 Depart for Field**
- 8 1:45 CTH O over Tributary to Little Platte River**  
We will explore the effects multiple, relatively close, road-stream crossings have on this high gradient tributary, Little Platte, and watershed.
- 2:30 Arrive at Rock Road over Snowden Branch**  
Introduction to the site (**Bradd Sims**)
- Break into 3 groups, rotate every 15 min.**  
Site assessment - **Matt Diebel & Jon Simonsen**  
Erosion control - **Bobbi Jo Fischer**  
Stream reference reach, bankfull identification - **Mark Fedora & Dale Higgins**
- 4:15 Depart for Markee Pioneer Student Center**

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- 9 8:00 Municipal Roadway Projects—Permits, Exemptions & Best Management Practices**  
Wisconsin laws and policy related to road/stream crossings  
Proper installation and maintenance of erosion control measures  
**Maureen Millmann**, Wisconsin DNR Municipal Transportation Policy Coordinator
- 10 8:20 Designing for the Floodplain & Coordination Between Agencies**  
**Jon Simonsen**, Wisconsin DNR Environmental Analysis & Review Specialist, Rhinelander
- 11 8:35 Road-Stream Crossing Construction**  
Constructing road-stream crossings that provide aquatic connectivity  
**Bobbi Jo Fischer**, Wisconsin DNR Environmental Analysis, Supervisor WCR / NER
- 12 9:00 Stream Crossing Design & Exercises: Part 1**  
Overview of culvert hydraulics and design methods, hydrology, site assessment, alignment and profile  
  
**Dale Higgins & Mark Fedora**
- 10:00 Break**
- 10:15 Stream Crossing Design & Exercises: Part 1 (continued)**  
  
**Dale Higgins & Mark Fedora**
- **11:45 Lunch, Pioneer Student Center**
- **12:45 The Nature Conservancy Video – Rethinking Culverts**
- 1:15 Discuss afternoon field work and prep to leave**
- 13 1:30 Depart for Field**
- 1:45 Arrive at Main Street over Roundtree Tributary**  
Introduction to Site (**Bradd Sims**)  
  
**Break into 3 groups (groups will rotate every ½ hour)**  
  
Identify reference reach, conduct pebble count, measure bankfull dimensions  
**Mark Fedora and Matt Diebel**  
Survey channel profile, cross-sections, and culvert and road elevations  
**Dale Higgins**  
Design checklist  
**Simonsen**  
  
Site Wrap-Up—*all instructors*
- 4:45 Depart for Markee Pioneer Student Center**

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**Tab#****Agenda - Thursday, October 4**

- 14 8:00 Stream Crossing Design and Exercises: Part 2**  
Bed and banks, structure type and size, sediment mobility and stability  
  
*Dale Higgins & Mark Fedora*
- 10:00 Break**
- 15 10:15 Cross Agency and Non-profits Coordination - STH 67 & STH 21**  
Case Studies  
*Bobbi Jo Fischer*, WDNR Environmental Analysis, Supervisor WCR / NER
- 16 10:45 Long Term Cost Savings from Upsizing Road Stream Crossings / Sources of Funding**  
Summary of Cost-Benefit Analysis of Stream Simulation Design at Road Stream Crossing  
& Grant Application Strategies  
*Jon Simonsen*, WI DNR Environmental Analysis & Review Specialist, Rhinelander, WI
- 17 11:15 Putting it all Together – Lessons Learned from 2016 Flooding in WI**  
Case Study  
**Dale Higgins**
- **11:45 Lunch, Pioneer Student Center**
- 18 12:45 Introduction to Computer Aids and Analysis regarding Aquatic Connectivity – Austin Polebitski, UWP**
- 1:00 Computer Aids and Analysis for Aquatic Connectivity @ UWP Engineering Computer Lab**  
Surface Water Data Viewer, FishXing modeling, HEC-RAS modeling  
  
*Austin Polebitski with Dale Higgins, Mark Fedora, Matt Diebel, Jon Simonsen*
- 19 3:00 Wrap-up, course evaluations**

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# Road / Stream Crossings Workshop Inventory, Assessment, Design and Construction, October 2 - 4, 2018

## Presenter Biographies

**Matthew Diebel – Wisconsin Department of Natural Resources, Water Quality Modeler, [matthew.diebel@wisconsin.gov](mailto:matthew.diebel@wisconsin.gov) / (608) 266-1494**

Matt Diebel is a water resources modeler in the Water Quality Bureau of the Wisconsin Department of Natural Resources. Matt's work focuses primarily on developing tools to help manage phosphorus and nitrogen in streams and lakes. His skills include ecological and hydrologic modeling, GIS, and statistical analysis. Matt has worked for the WDNR for eight years, previously as a research scientist, where aquatic connectivity was one of his major research themes. He earned an MS in Water Resources Management and a PhD in Limnology from UW-Madison.

**Mark A. Fedora, US Forest Service, Supervisory Hydrologist, [mfedora@fs.fed.us](mailto:mfedora@fs.fed.us) / (906) 932-1330 extension 318**

Mark manages the Ottawa National Forest's botany, fisheries, soils, watershed and wildlife programs. Monitor and help to implement hydropower licenses as they relate to National Forest resources. Mark is the Forest Service representative on the Bi-National Lake Superior Partnership Working Group.

### Education:

BS Forest Resources, Hydrology Emphasis, University of Minnesota, St. Paul, 1985  
MS Forest Engineering, Hydrology, Oregon State University, Corvallis, 1987

### Professional experience:

USDA Forest Service, Ottawa National Forest, Supervisory Hydrologist, 2011-present  
USDA Forest Service, Eastern Region, Regional Hydrologist (120 days), Milwaukee, WI, 2010  
USDA Forest Service, Eastern Region, and The Nature Conservancy, Great Lakes Program, Ironwood, MI, 2004-2009  
USDA Forest Service, Eastern Region Hydropower Assistance Team, Ironwood, MI, 2001-2004  
USDA Forest Service, Wallowa-Whitman National Forest, Pine Ranger District, Halfway, OR, 1991-2001  
JW Associates Environmental Consultants, Boulder, CO, 1990-1991  
USDA Forest Service, Wallowa-Whitman National Forest, Pine Ranger District, Halfway, OR, 1988-1990  
USDI Bureau of Land Management, Prineville, OR, 1988

Professional activities/memberships:

American Institute of Hydrology, Associate Hydrologist, 040

Relevant publications:

Banach, D., C. Brooks, M. Fedora, 2016. Using Multi-temporal Imagery to Improve Mapping and Inventory of Forested Roads in Michigan's Upper Peninsula. Manuscript accepted by the Transportation Research Board, TRB Paper 16-3971.

Diebel, M., M. Fedora, S. Cogswell and J.R. O'Hanley, 2015. Effects of road crossings on habitat connectivity for stream-resident fish. *River Res. Applic.* 31: 1251–1261.

Jesse R. O'Hanley, Jed Wright, Matthew Diebel, Mark A. Fedora, Charles L. Soucy., 2013. Restoring stream habitat connectivity: A proposed method for prioritizing the removal of resident fish passage barriers. *Journal of Environmental Management* 125 (2013) 19-27.

Fedora, M. 2007. Aquatic restoration through hydropower licensing, Bond Falls project, Michigan. *Advancing the Fundamental Sciences, Proceedings of the Forest Service National Earth Sciences Conference, San Diego, CA, 18-22, October 2004.* General Technical Report PNW-GTR-689, October, 2007, pp 255-261.

Chandler, J., M. Fedora, T. Walters, 2001. Pre- and post-spawn movements and spawning observations of resident bull trout in the Pine Creek basin, eastern Oregon, p 167-172. *In* M.K. Brewin, A. J. Paul, and M. Monita (ed.) *Bull trout II conference proceedings.* Trout Unlimited Canada, Calgary, Alberta.

**Bobbi Jo Fischer – Wisconsin Department of Natural Resources, Environmental Analysis Supervisor, [bobbi.fischer@wisconsin.gov](mailto:bobbi.fischer@wisconsin.gov) / (715) 421-7845**

After obtaining her BS in Water Resources from UW-Stevens Point in 1997, Bobbi Jo Fischer began her career in 1998 with the Department of Natural Resources as a Water Management Specialist in Southeast Wisconsin. She worked primarily with developers and waterfront property owners to protect waterways and wetlands through education and compliance with the State. She worked as an Environmental Analysis and Review Specialist in DNR's Northeast Region for 16 years. She was responsible for the coordination of multi-disciplinary environmental reviews of highway, airport, and railroad projects in east central Wisconsin. Bobbi Jo worked closely with DOT, counties and municipalities to protect the environment during the planning, design, and construction phases of transportation related projects. Recently Bobbi Jo was promoted to Environmental Analysis (EA) Supervisor for EA staff in Green Bay, Wisconsin Rapids, and La Crosse offices.

Bobbi Jo serves on the *Stream Connectivity and Municipal Transportation Culverts Team*. This team develops tools, policy, and training regarding local municipal road-stream crossing replacements. The mission of the team is to ensure that the design and

construction of municipal highway culverts in Wisconsin are sized and placed appropriately to enhance and protect stream quality and aquatic connectivity.

**Jeff Hastings – Trout Unlimited, Project Manager of the Driftless Area Restoration Effort, [jhastings@tu.org](mailto:jhastings@tu.org) / (608) 606-4158**

Jeff Hastings has been the Project Manager for the Trout Unlimited -Driftless Area Restoration Effort for the past eleven years. Jeff attended the College of Natural Resources at the University of Wisconsin – Stevens Point where he majored in Wildlife Management and Biology. Prior to working for Trout Unlimited Jeff spent over 25 years managing county land and water conservation departments. Designing and installation of trout habitat work has been an important element of his career, along with pursuing grants and partners to implement projects.

**Dale Higgins – Retired from US Forest Service, Forest Hydrologist  
Park Falls, WI, [dalehiggins@hotmail.com](mailto:dalehiggins@hotmail.com) / (715) 518-3208**

Dale has performed a variety of hydrology and watershed management activities over the years involving streams, lakes, reservoirs and wetlands. From 1997 to 2018 he was actively involved in the survey, design and construction of over 250 road-stream crossings to improve aquatic organism passage, water quality, channel morphology, safety, flood resilience and reduce road maintenance. He has helped teach many road-stream crossing workshops in WI and the Eastern Region of the Forest Service. Dale has also worked on hydropower re-licensing projects, ecological classification of streams, river restoration, riparian management, and the development and monitoring of forestry best management practices for water quality. In 2017, he consulted on water resource problems in Tanzania.

Education:

M.S. in Forest Hydrology, University of Minnesota August 1979

B.S. in Forest Resources Development, University of Minnesota June 1977

Professional Experience:

Forest Hydrologist, Chequamegon-Nicolet NF, USDA-Forest Service, Region 9  
1985-2018

Hydrologist, Malheur National Forest, USDA-Forest Service, Region 6 1981-1985

Hydrologist, Jefferson National Forest, USDA-Forest Service, Region 9 1979-1981

**Mike Miller – Wisconsin Department of Natural Resources, Stream Ecologist,  
[michaelA.miller@wisconsin.gov](mailto:michaelA.miller@wisconsin.gov) / (608) 267-2753**

Mike Miller is a stream ecologist with the DNR in Madison. Recent work includes developing reference conditions (benchmarks) for a variety of physical, chemical, and biological measures used to assess stream health, is involved studies of the overall condition of stream resources in large watersheds like the Kickapoo River, developing

monitoring networks to assess the influence of climate change on streams, collaborates with U.S. EPA on regional stream monitoring projects, and assessing the extent that roadways fragment streams in the Driftless Area ecoregion.

**Maureen Millmann – Wisconsin Department of Natural Resources, Local Roads Policy Coordinator, [Maureen.millmann@wisconsin.gov](mailto:Maureen.millmann@wisconsin.gov) / (414) 303-5065**

Maureen Millmann has a BS in Biological Aspects of Conservation from the University of Wisconsin – Milwaukee and has worked for WDNR for 22 years. She has been an Environmental Analysis and Review Specialist with the WDNR's Bureau of Environmental Analysis and Science since 2001. She worked as a Transportation Liaison reviewing state and local transportation projects in the Southeast Region for 10 years. She has spent the last seven years as the statewide Municipal Transportation Coordinator, facilitating the development of the general permit for local road projects, training municipalities and WDNR staff on the implementation of general and individual permits, providing database and uploading services for those permits, and working on policy decisions for permitting the impacts to wetlands and waterways by municipal transportation projects.

Maureen serves on the *Stream Connectivity Team*. This team develops tools, policy, and training regarding local municipal road-stream crossing replacements. The mission of the team is to ensure that the design and construction of municipal highway culverts in Wisconsin are sized and placed appropriately to enhance and protect stream quality and aquatic connectivity.

**Austin Polebitski – University of Wisconsin – Platteville, Environmental Engineer/Water Resources Professor - [polebitskia@uwplatt.edu](mailto:polebitskia@uwplatt.edu) / (608)342-1553**

Austin Polebitski is an Associate Professor in the Civil and Environmental Engineering program at the University of Wisconsin Platteville. He teaches hydrology, groundwater hydrology, geographic information systems, and fluid mechanics to undergraduates, in addition to a fish passage seminar class. His recent research has focused on urban water demands, water conservation, and stream temperature patterns of Driftless area streams. He is an active member of ASCE-EWRI, AWRA, and the International Conference on Engineering and Ecohydrology for Fish Passage, serving as a coordinator and advisory board member. He earned a MS and PhD in Civil and Environmental Engineering from the University of Washington.

**Jon Simonsen – Wisconsin Department of Natural Resources, Environmental Analysis & Review Specialist, [Jonathan.Simonsen@wisconsin.gov](mailto:Jonathan.Simonsen@wisconsin.gov) / (715) 367-1936**

Jon has worked at the DNR Rhinelander office with the Environmental Analysis and Review program since 2005. He works closely with municipalities and DOT on transportation improvement projects to help ensure that impacts to wetlands, waterways, and other natural resources are avoided and minimized. In his area of coverage, he is responsible for helping all Department programs take the steps to make

informed environmental impact decisions and provide for public input to meet the spirit and intent of the Wisconsin Environmental Policy Act (WEPA). Jon also provides statewide assistance on a broad range of stream connectivity issues as well as program support for mapped floodplain issues on municipal road projects.

Education:

B.S. Zoology & Conservation Biology – University of Wisconsin at Madison (1997)

M.S. Agronomy – University of Wisconsin at Madison (2002)

Professional experience:

Jon has worked in a broad range of positions in applied biological sciences including: fisheries, lakes monitoring, invasives species education, water regulations, watershed improvement, endangered resources, biological surveys, and sustainable agriculture.

**Bradd Sims – Wisconsin Department of Natural Resources, Fisheries Biologist,**  
[bradd.sims@wisconsin.gov](mailto:bradd.sims@wisconsin.gov) / (608) 935-1935

Bradd Sims is a fisheries biologist with the WDNR out of the Dodgeville field office. He is entering his 21st year with the Department. Bradd is responsible for the management and protection of the fisheries resources in Iowa, Lafayette, and Grant Counties. His work focuses on habitat assessment and fish population dynamics of Driftless Area smallmouth bass and trout streams.