

River Restoration: Practices and Concepts

Fish Passage on Midwestern Streams: Evaluation of Stability and Functionality of Dam Removals, Constructed Fishways and Culvert Crossings

Held at:
Illinois Institute of Technology
Wheaton, IL

November 7th and 8th, 2007

Proceedings Editor

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Illinois-Indiana Sea Grant College Program

Purdue University Calumet

Hammond, IN 46323-2094

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WELCOME

On behalf of the conference sponsors and supporting organizations and committees, welcome to today's River Restoration: Practices and Concepts Workshop. This hands on workshop in the latest techniques for stream restoration was inspired by the surge in fish habitat restoration projects that are currently occurring or will be occurring nationally. It is the goal of the Steering Committee that participants gain an understanding of the many factors that contribute to quality fish habitat restoration.

This two-day seminar/field workshop is intended for professional fisheries managers, engineers, planners, and others interested in this rapidly expanding area of river and stream restoration. The workshop will focus on evaluation of constructed fishways, dam removal, and culvert projects. Specifically we hope to address issues relating to the effectiveness of the various approaches to restoring connectivity on Midwestern Rivers and streams.

Many people donated their time to make this workshop a success. A special thanks goes to the Steering Committee members listed in these proceedings and to Illinois-Indiana Sea Grant College Program and Christopher Engineering, Ltd. for their support.

Please take a moment to fill out the Evaluation Forms for the conference. Your comments will guide the steering committee in selecting future river restoration workshops.

Thank you for participating in this workshop. By applying the knowledge gained here today, we can have a positive impact on stream restoration.

Sincerely,
River Restoration Steering Committee

River Restoration: Practices and Concepts Series Agenda

<u>Date and Time</u>	<u>Topic/Session</u>
Wednesday, November 7 th	
8:15 a.m.	Registration, Continental Breakfast
8:50 a.m.	Welcome
9:00 a.m.	<i>Hydrogeomorphology patterns in free flowing rivers, points to optimum bypass designs for juvenile salmon.</i> John Nestler, USACE, Vicksburg, MS.
9:50 a.m.	<i>The need for science-based adaptive management for fish passage design.</i> Larry Weber, University of Iowa, Iowa City, IA.
10:40 a.m.	<i>Break</i>
11:00 a.m.	<i>Solutions for fish passage and other in-stream effects at culverts in Northern Wisconsin.</i> Dale Higgins, U.S. Forest Service, Parks Falls, WI.
12:00 p.m.	<i>Lunch and Speaker.</i> Phil Moy, WI Sea Grant, Milwaukee, WI.
1:00 p.m.	<i>Fish movement through various fishway structures and instream barriers to fish migration.</i> Christopher Bunt, Biotactic, Inc., Kitchener, Ontario.
1:50 p.m.	<i>The tale of fishways in Michigan: The fish's perspective.</i> Gary Whelan, Michigan Department of Natural Resources, Lansing MI.
2:40 p.m.	<i>Break</i>
3:00 p.m.	<i>Ecologically based fish passage: emulating nature.</i> Luther Aadland, Minnesota Department of Natural Resources, Fergus Falls, MN.
3:50 p.m.	<i>Lessons from Brewster Creek Dam removal.</i> Don Roseboom and Tim Straub, USGS, Urbana, IL.
4:30 p.m.	<i>Evaluation of full dam rock ramp and bypass channel fish passage structures on Big Rock Creek.</i> Steve Pescitelli, Illinois Department of Natural resources, Plano, IL.

5:00 p.m.

Wrap-up discussion and discuss the logistics for tomorrow's field trips. Steve Pescitelli and Leslie Dorworth

Thursday, November 8th

8:30 a.m.

Coffee and Rolls

9:00 a.m. – 3:00 p.m.

During the day, you will be visiting several different sites in northeast Illinois that have been used or are using the various techniques discussed in yesterday's presentations. See below for a list of sites and what you will see at each site.

Field Sites:

- a. Brewster Creek – small stream dam removal site
 - b. Batavia Dam – large river dam removal site
 - c. Big Rock Creek – full dam ramp fish passage structure
 - d. Big Rock Creek – bypass channel fish passage structure
 - e. Yorkville Dam – Denil fish passage structure
-

12:00 p.m.

Lunch while in the field

3:00 p.m.

Return to IIT, Break

3:30 p.m.

Discuss the project sites, lessons learned

4:00 p.m.

Final wrap-up for this year's workshop

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 Functionality of Dam Removals, Constructed Fishways and Culvert
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Workshop Evaluation

How did you hear about the workshop?	<input type="checkbox"/> Newsletter <input type="checkbox"/> Website <input type="checkbox"/> Word of mouth <input type="checkbox"/> Email or listserv announcement <input type="checkbox"/> Other
What state do you work in?	<input type="checkbox"/> Illinois <input type="checkbox"/> Indiana <input type="checkbox"/> Michigan <input type="checkbox"/> Wisconsin <input type="checkbox"/> Other -- Please List: _____
What type of organization are you affiliated with?	<input type="checkbox"/> Natural Resource Department <input type="checkbox"/> Consultant <input type="checkbox"/> Park Department <input type="checkbox"/> Engineers <input type="checkbox"/> City Planner <input type="checkbox"/> Academia or student <input type="checkbox"/> Other- Please describe if necessary _____
Please rate the conference on the following items:	<p style="text-align: center;"><i>(Please circle one)</i></p> <p>Overall quality of presentations: <i>excellent good adequate poor</i></p> <p>Workshop notes and handouts: <i>excellent good adequate poor</i></p> <p>Audio-visual logistics: <i>excellent good adequate poor</i></p> <p>Lunches and breaks: <i>excellent good adequate poor</i></p> <p>Conference location, facilities: <i>excellent good adequate poor</i></p> <p>Overall conference: <i>excellent good adequate poor</i></p>
Which presentation(s) did you find most useful and why?	

<p>What two areas would you like to see covered in a future workshop? (<i>this will help us plan for the future</i>)</p>	
<p>Have you attended previous River Restoration Series Workshops?</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Stream Restoration, June 12-13, 2001 at Elgin Community College, Elgin, IL <input type="checkbox"/> Dam Removal, April 18, 2002 at Purdue University Calumet, Hammond, IN <input type="checkbox"/> Beyond the Basics of Dam Removal and Modification, June 4, 2003, Elgin Community College, Elgin, IL <input type="checkbox"/> Riparian Bioengineering and Restoration Techniques, July 14-15, 2004, Illinois Institute of Technology, Wheaton, IL <input type="checkbox"/> Restoring Stream Fisheries with Meander Pools, Riffles and Fishways, September 28th and 29th, 2005. <input type="checkbox"/> NA
<p>If yes, have you used the information presented in past workshops in your profession?</p>	<ul style="list-style-type: none"> <input type="checkbox"/> At work <input type="checkbox"/> Communicating to the public <input type="checkbox"/> Consulting other organizations <input type="checkbox"/> Education within your own organization <input type="checkbox"/> Educating local officials <input type="checkbox"/> Other – Please explain:
<p>How do you plan on using the information from today's workshop?</p>	<ul style="list-style-type: none"> <input type="checkbox"/> At work <input type="checkbox"/> Communicating to the public <input type="checkbox"/> Consulting other organizations <input type="checkbox"/> Education within your own organization <input type="checkbox"/> Educating local officials <input type="checkbox"/> Other – Please explain:

Please complete this survey and return it to the registration desk before you leave. If you are unable to turn in this survey the day of the conference, please send it to Leslie Dorworth, Illinois-Indiana Sea Grant College Program, Biological Sciences Purdue University Calumet, Hammond, IN 46323-2094, fax (219) 989-2130.

Thank you for taking a few moments to fill out this survey to better serve you at future workshops.

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Hydrogeomorphology patterns in free flowing rivers, points to optimum bypass: Designs for juvenile salmon

John Nestler

**U.S. Army Engineer Research and Development Center
Vicksburg, Mississippi 39180-6199**

See paper, in the presentation section: *“Optimum fish passage and guidance designs are based in the hydrogeomorphology of natural rivers”* for the abstract

The need for science-based adaptive management for fish passage design

Larry Weber

**Director, IIHR Hydroscience and Engineering
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River and stream restoration has been an active field of research and engineering practice during the past several decades. Given the inherent uncertainties in the desired future conditions, controlling processes, and response of the ecosystem to local or systemic changes, various strategies for restoration have been implemented. These restoration strategies range from simplistic “build-test” to more complex “adaptive environmental assessment and management” strategies. As societal desires shift from local restoration projects aimed to restore small streams to major restoration programs to restore our nation’s largest river systems, the need for the need for science-based adaptive management becomes increasingly important. Featured research and applied engineering design projects will demonstrate restoration projects from Snake and Columbia River juvenile fish passage programs and highlight a recent fish passage project for Midwestern fisheries.

Solutions for Fish Passage and Other In-stream Effects at Culverts in Northern Wisconsin

Dale Higgins

**Chequamegon-Nicolet National Forest
Park Falls, Wisconsin**

Over the past decade, the Chequamegon-Nicolet National Forest has designed and installed more than 125 culverts to improve aquatic organism passage, protect water quality, restore channel morphology and reduce road maintenance while providing a safe, efficient transportation system. This work provides examples of survey, design and construction practices for environmentally friendly culverts. Roads and culverts can affect streams through sedimentation, channel impacts and disruptions of fish passage. Stream profile surveys are necessary to determine culvert invert elevations that will pass aquatic organisms and restore channel morphology. Proper culvert sizing is important to prevent failures and is accomplished with traditional hydrology and hydraulics analysis that can be supplemented with bankfull width measurements. In low gradient streams (<0.35%), passage will normally be provided by setting a properly sized culvert flat, at an elevation where the tailwater will provide water depths and velocities that will pass all species present. This will also tend to restore or maintain channel morphology. For higher gradient streams, the culvert may need to be set at a slope to prevent channel head-cutting and maintain channel morphology. In these cases, stabilized rock, baffles or a simulated stream channel can be constructed in the culvert to provide velocity breaks that will allow organisms to pass upstream. If such streams have a mobile gravel bed, bedload transport must be maintained, the culvert width must be at least as wide as the bankfull channel and stream simulation is the preferred design method. Culvert failures and maintenance problems are minimized by sizing to pass the 100-year flood; utilizing beveled culverts; favoring one, large culvert over multiple culverts; and using good construction techniques such as proper bedding, compaction, temporarily by-passing flows around the construction site, stable side slopes of 2:1 or flatter, riprap and road surface drainage.

Fish Movement Through Fishway Structures & Instream Barriers to Migration

Dr. Christopher Bunt
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Kitchener, Ontario

Fish passage structures are an integral and growing component of efforts designed to restore river connectivity worldwide. These structures generally include fishways, fish ladders, fish bypass channels and fish locks – with design variations related to slope, size, configuration, construction materials, entrance location and other factors that affect performance and effectiveness. Some fish pass designs are better suited for some sites over others and some designs function better for some species and not others. There are clearly many facets that affect fish pass effectiveness for different fish species, but their relative influence is difficult to separate. Fishes have different swimming abilities, migration windows and perhaps motivations – all of which are reflected in fish attraction and passage through fish passage structures. For this study, I reviewed and summarized data related to attraction efficiency and passage efficiency of Denil fishways, Alaska Steeppass fishways, vertical slot fishways, pool and weir fish ladders, fish locks, fish bypass channels, velocity chutes, siphon tubes and open dams for 55 species of anadromous and potamodromous fishes. Attraction efficiency of various fish passage structures ranged between 45 % and 82 % and passage efficiency was consistent at approximately 30 %. In contrast, fish bypass channels attracted approximately 40 % of upstream migrating fish and passage efficiency was 48 %. The most effective attraction and passage occurred at dams with open gates, where attraction was approximately 90 % and passage was approximately 95 %. This evaluation of fish passage effectiveness can be used to restore river connectivity by ensuring that, when possible, the most appropriate structures are used to facilitate passage of target species.

