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Jun 22nd, 11:40 AM - 11:55 AM

Session D1: Towards Effective, Bi-Directional Selective Fish Passage

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Pratt, Thomas; McLaughlin, Rob; and Muir, Andrew, "Session D1: Towards Effective, Bi-Directional Selective Fish Passage" (2015). *International Conference on Engineering and Ecohydrology for Fish Passage*. 41. https://scholarworks.umass.edu/fishpassage_conference/2015/June22/41

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Bi-directional, Selective Fish Passage: The Complications of Fish Passage in the Laurentian

Great Lakes

GREAT LAKES





Tom Pratt, Fisheries and Oceans Canada Rob McLaughlin, University of Guelph Andrew Muir, Great Lakes Fishery Commission







and the second s

A Brief History of Barriers

- Milling, mining and forestry
- Water regulation, recreation and hydroelectric power generation
- Control of invasive species





Januchowski-Hartley et al. 2013 United Canada 49% States 51% а United States 69% b 1,200 Kilometers 600 900 150 300 0

Sea Lamprey Expansion

Dates First Observed

Lake Superior: 1938

Lake Huron: <u>1937</u>

Lake Michigan: 1936 Lake Ontario: 1835

Lake Erie: 1921



lake trou

- Sea lampreys helped decimate Great Lakes fish populations
- Barriers are an integral component of a \$21MM annual binational sea lamprey control effort



Hansen, M.J. 1999. Great Lakes Fishery Policy and Management - a Binational Perspective.

Asian Carp on the Horizon



Electrical barrier keeping Asian carp out of the Great Lakes



Management Challenge INVASIVE CONTROL VS RESTORATION



FRAGMENTATION vs CONNECTIVITY

GENERAL CHART

Annual Sector Sector

and the second

C. market

C. C.



Research Goal

 Provide bi-directional movement of desirable fishes through and removal of invasive fishes in fragmented watersheds



PERSPECTIVES

1000 dams down and counting

Dam removals are reconnecting rivers in the United States

mychietry / ----Second tool ainable seafood rim developing countries a









FISH and COURT ROOM, 2013, 54, 100-144

Unintended consequences and trade-offs of fish passage

Robert J. McLangfiles¹⁴⁹, Erro B. B. Singell¹¹, Phondrey Castro-Santor¹², Michael J. Janue¹³, Matters A. Koope¹⁸ must C Point 17 for Anit-Aminute With Explore19

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Canada N10

distant and the

We weatherized widower for unintended conservations and werk-affi descripted with the sumpered holes. Providening of hill sumpresses at datas and data true Augustic Wedge erails are being carried out increasingly as resource managers suck ways to rokers begrammation of migrotory foly populations and renamy Multiversity and nature-like country ormer in tributories alread by dams. The breadly of provisioning parriest passage are inglikabled within. Nooble arreasted interestment and le-offs of apstroam passage an rouning to light, but romain poorly remained and anderangescheted. Unintended correctances arise when passage of native and describle introduced fishes is delayed, and use dialitacky results in justicent of movement and hubitst use that reduce Darwinson fitness (e.g. ecological traps), or to highly selective taximumically and numerically. Trade-officiential when y Automa intended to beach survey model interfers with measurement devision totended to control the unsecond spread of one rative fishes and exactly brevely many, or genus, discusses and contaminants carried by hatchery and wild felan Bootheast 217 April erses and tradu-offs will vary in importance from testime to system and care result in large scorestic and environmental cents. For some river eveness Accepted 30 per 2013 doctations about how to mininge fish passage investor substantial rides and could work from any of a formal, unacharol process that allows transporter, objectivand, where possible, quantitative evaluation of these data. Soch a process con also facilitate the design of on adaptive fromework. But provides valuable insights into

Keywords Data resident. Rohann, segrators, risk, separated decision making

Project Objectives

1. Develop selective bi-directional fish sorting technology as an adaptive management experiment

 Determine protocols for implementing bidirectional selective fish passage throughout the Great Lakes Basin
Set solutions in a global context

How to sort an assortment of things?

HOW IT WORKS

STORY BY KATLE FEER LLOSTRATION BY GRAHAM MURDOCH

SINGLE-STREAM RECYCLING

he most annoying aspect of recording-and one of the bigsignt hurdles to fix widespread adoption—is having to separate paper, glass, and plastic before they bit the outro. New recycling machines are dhoring the tait. With single stream recycling, recyclables go imoone bin, which a fluids delivers to a materialrecovery facility, such as Willivantic Waste

Paper in Willimartic, Connecticut, There, a largely automaind system of conveyor belts, screens, magnets, and lasers separates maternis so that they can be said to metal and plastic recyclem and paper mills. Of the 570 recycling facilities in the U.S., 240 new have single stream operations, accorting to Elien Derenyi, of the solid-walle

research and consulting firm Governmental

Advisory Associates. While the system isn't perfect—thin tigh speed operation can lead to contamination from broken glass—the simplicity of it means households actually moutine mont. "It people want a higher mouting rate, it has to be convenient," says Char Miller, of the National Solid Wastes Management Association. "And I think the technology is only going to improve."

Recycling Rates in the U.S.



STA75

2.4 Taxs of carbon double legt set of the atmosphere set ton of solid waste recycled, whether by angle cheam or otherwise

One third Factor of multipal sold waste in the U.S. But's correctly model.

100 million Number of U.S. residents served by singleobserv servicing originants

92 Percentage temping rules remained when Partia's Marridiade County implemented angle-stream weyding in 2008



68 / POPULAR SCIENCE / AUGUST 2013

Aug 2013 Popular Science

Integrating Technologies

Elect



Integrating Technologies



Fish wheels are commonly used as a capture method to determine relative abundance and run timing of Yukon River salmon. These "test wheel" catch rates are used by fishery managers to assess the in-season salmon runs on a daily basis. The wheels use live boxes to store fish until they are counted by dip netting. Recent studies on Yukon River fall chum salmon suggest that holding time and crowding in live boxes may affect the ability of fish to travel upstream to spawning streams. This is of particular concern during years of low salmon abundance.

A remote video system was developed to obtain salmon passage rates without the use of fish wheel live boxes, eliminating fish handling and crowding concerns. After fish wheel capture, fish travel down a chute, are video recorded, and then re-enter the river. The system consists of a color CCD camera mounted above the fish wheel chute and connected



The video capture program allows easy identification of the species of fait and whether or not it is tagged.

U.S. Fish & Wildlife Service 1 800/344 WLD www.fws.gov

U.S. Fish & Wildlife Service

Yukon River Video Project Fairbanks Fish & Wildlife Field Office



This video system continuously records fish passing through the fisheheel and captures the information on a laptop for later analysis.

to a laptop computer through a video capture card. A time-lapse VCR is linked into the system for back-up. The system is powered by 12 volt batteries. During daytime operation, a water-wheel generator charges the batteries. At night, lights necessitate the use of a small gasoline generator.

Video capture software allows the recording of only video frames containing fish images. These images are stored in computer video files. Video capture can be triggered using various methods i.e, magnetic switch door, motion sensor, and image recognition. Frame rate and number of frames captured before or after a triggering event are controlled by the software. The resulting files are reviewed and tallied using video reviewing software specifically de-

For more information, contact: U.S. Fish & Wildlife Service Dave Dawn 101 12th. Ave., Room 110, Feirbenks, Alaska 99701 907.499.0790 signed for generating fisheries Catch Per Unit Effort data. The time-savings using this method over traditional viewing of time-lapse VCR tapes can be substantial.

Presently, three Yukon River fish wheels are equipped with this video system. Accurate daily counts of four salmon species, sheefish, whitefish, and various resident fish species are obtained using the video system. The benefits of video counting are a lowering of fish stress, 24 hour sampling, reduced data recording errors, and lower operational costs. Other applications of this technology include monitoring fish passage at dams and weirs, identification of marked/unmarked fish in tagging studies, and remote monitoring of animal behavior.

Visit the Fisheries & Habitat home page: http://alaska.tws.gov/lisheries/fieldaffice/http:// fairbanks/menitoring.htm

Shape recognition

Behavioral recognition

Color identification

Enumeration

Conceptual Approach Integrating Technologies

UpstreamElectricalGuidance



Conceptual Approach Integrating Technologies

Morphology

SeasonalDiel

Life History

Upstream Electrical Guidance

- Video shape
- recognition
 - Elevators
 - Screens
 - Ladders

Conceptual Approach Integrating Technologies



If you have any experience in this area (or ideas) we would love to hear from you: Tom Pratt: thomas.pratt@dfompo.gc.ca **Rob McLaughlin:** rlmclaug@uoguelph .Caat Lakes Andrew Muir:

amuir@glfc.org

KEEP CALM BECAUSE WE NEED YOUR HELP!