Session B4 - An Exploratory Evaluation of the Swim Path Selection of Western Blacknose Dace in a Modified Flow Field

Michael Goettel
Exploratory Observation and Evaluation of the Swim Path Selection of Blacknose Dace in a Modified Flow Field

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Fish Passage Barriers:

How does one modify traditional infrastructure in order to effectively facilitate fish movement and still meet the other competing criteria?

Photo credits: Wisconsin DNR, 2000
Conceptual idea: fill in the fine scale fish/hydraulics relationship data gap

Image courtesy of William Seychew, 2011

Goal: design with empirical evidence, moving to path prediction, decision theory or agent based models

Adapted from Webb and Hotchkiss, 2009
Trappers: Let the animal’s tracks show you how they behave for the given conditions – then you can predict future movement.
Data Collection Aims:

1) Swim Paths of Small Fish:
   - Distance to solid surface
   - Exposure to water velocities
   - Exposure to turbulent kinetic energy
   - Exposure to Reynolds stresses
     - Measured at many discrete positions along entire swim path for each fish

2) Qualitative Analysis: Possible observation of novel fish behaviors
Project Apparatus
Western Blacknose Dace (R. obtusus)

- UB Institutional Animal Care and Use Committee Authorization: #CEE01041N
- NYS DEC Permit: Scientific #1520
GO TO VIDEO
Trial 11 Bailout
X vel = 25 cm/sec
TKE = 23.2 cm²/sec²
Qualitative Analysis I
Holding Strategies

Flow
Qualitative Analysis II
Group Behavior
Trial 06 - TKE

Stream-wise Velocity Contours with Swim Paths (cm/s)

Velocity Field (cm/s)
Only 40% of time chose lower turbulence, analysis ongoing, conclusions forthcoming.
Summary

- Observed novel fish behaviors that should be followed up with quantitative studies
- Developed an approach to investigate the relationship of turbulence and velocity on fish swim paths
- Completion of data analysis will become the basis for more comprehensive studies
Future Studies: Multiple Variables and Physical Conditions

Possible parameters/metrics

X Vel

TKE

Shade

Cover

Weight Adjusted Combinations

2X Vel and TKE

4X Vel and TKE
Thank you!

http://vimeo.com/michael goettel