



EPRI Eel Protection Research Program

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EPRI

Scope of Presentation

- About EPRI
- EPRI Projects: 1998 - Present
- 2000 Symposium & Eel book
- Research needs at power plants
- Research needs in general

"If God had wanted us to be beneath the surface of the ocean, He would never have put eels down there."

- Dave Barry, humor columnist

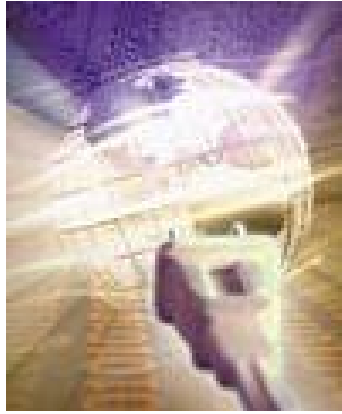


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EPRI Overview



Vision: Promote a sustainable society by enhancing harmony between energy activities and the environment

Mission: Be the premier provider of timely, credible scientific and technical knowledge, tools and services on environment, health and safety to:

- Inform critical policy and regulatory deliberations
- Support cost-effective compliance, stewardship, strategic issue management and business decision-making
- Address longer-term sustainability issues

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EPRI Fish Protection Programs



Fish Protection at Cooling Water Intakes (§316(b))

- Impingement control
- Entrainment control



Hydropower Environmental Research

- Fish Passage Management
- Instream Flow Management
- Sediment & Project Decommissioning Management

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Scoping Report: Review of Life History, Population Trends, and Potential Impacts

Conclusions/Summary:

- Evidence of a coast-wide 'decline' in abundance
- Complexity and plasticity of life history precludes the application of standard fisheries assessment and management approaches
- Basic population parameters (survival, metamorphosis, recruitment) poorly quantified and understood



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Scoping Report: Review of Life History, Population Trends, and Potential Impacts

Conclusions/Summary (cont'd):

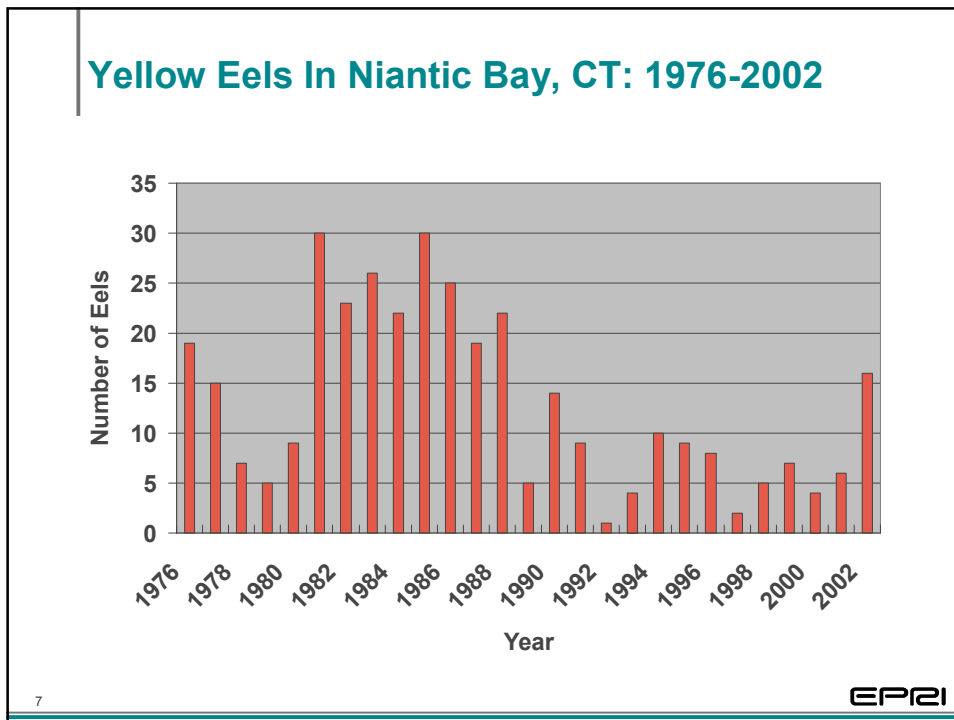
- Effective upstream passage measures exist, BUT for eels, substantial uncertainty exists regarding the effectiveness of traditional downstream passage measures used for other migratory fish
- Monitoring data extremely limited
- Richkus & Whalen. 2000. *Dana* 12: 83-97



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2001: Review of Downstream Migration, Passage, and Protection Technologies

Cosponsors: NYPA, Hydro Quebec, Ontario Power, Dominion Power, Allegheny Energy, Exelon, and U.S. DOE

- Migration triggers: approaching or reaching sexual maturity, rainfall, increased flow
- Timing: variable but generally during the fall, at night in the main river flow
- Turbine entrainment mortality: 6 - 37%
- Downstream passage protection: light and infrasound most promising for guidance; bar racks/louvers also promising; trap and transport and project shutdown
- **Need more field research**

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Bar Rack/Louver Research: Laboratory

OBJECTIVES:

- Quantitatively evaluate the ability of selected fish species to guide along various configurations of bar racks and louvers
- Qualitatively evaluate fish behavior in the vicinity of the bar racks and louvers



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ALDEN Research Laboratory, Inc.

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Bar Rack/Louver Research: Laboratory

- There was no distinct difference in FGE between the bar rack and louver arrays
- FGE at the 15° angle was higher than it was at the 45° angle, especially when the bottom overlay was used on the 15° arrays
- 15° guidance structures do appear to have considerable potential for guiding silver American eels away from water intakes

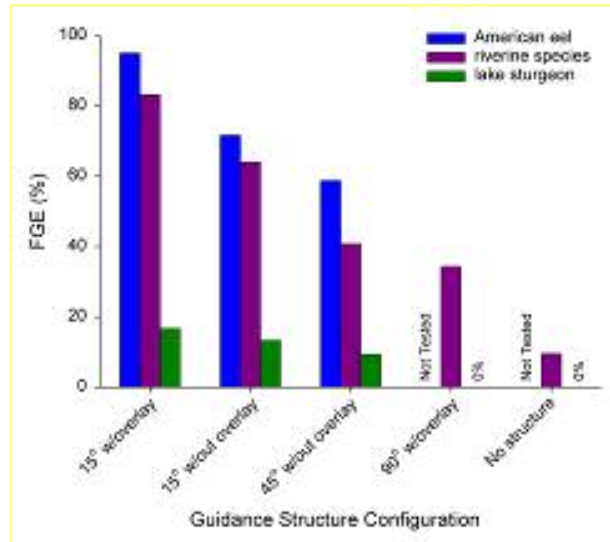


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Bar Rack/Louver Research: Laboratory



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Bar Rack/Louver Research: Field



OBJECTIVE: verify lab results

- Tests at Holyoke G&E Project, Connecticut River in 2004
- Test existing 15 degree facility and temporary 25 degree facility



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Farmington River (CT) - Rainbow Dam Research



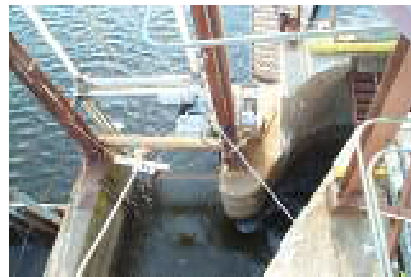
- Collaborators: EPRI, USGS Conte Lab, CT-DEP, UMASS (MS Thesis)
- Determine #silver eels passing through the Fishway and downstream bypass during fall 2003 and 2004.
- Determine relationships between downstream migration timing and magnitude, and environmental variables.

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Farmington River (CT) - Rainbow Dam Research

- Determine the effects of illumination on downstream passage.
- Compare the attractiveness of the fishway and bypass.
- Monitor locomotor activity of captive yellow- and silver-phase eels in automated activity chambers and compare patterns of activity to potential environmental triggers, i.e., rainfall, river flow, temperature, etc.



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Shenandoah River Eel Passage



- Co-sponsors: EPRI, Allegheny Energy, WV-DNR, and WVU (Steve Hammond MS Thesis)
- Quantify seasonal movements of eels in the lower Shenandoah River drainage by radio telemetry
- Determine any eel movement correlations with water temperature, river flow, and lunar cycles

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Shenandoah River Eel Passage (cont'd)



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2000 1st International Symposium



2000 AFS Annual Meeting, St. Louis, MO:

- Canada, France, Japan, Taiwan, Australia, New Zealand, Germany, Sweden, England, Ireland
- Book: Available August 15:
 - 37 papers
 - Early life history, recruitment, and habitat utilization
 - Eel fisheries
 - Spawning migration & protection



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Research Needs for Protection at Hydropower Projects

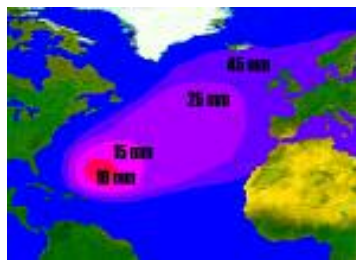
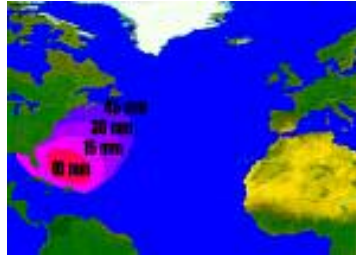
- **Upstream passage:** optimal location for ladders/entrances; attraction flows; upstream passage guidance manual
- **Downstream passage:** data base extremely limited; migration timing & cues; physical & behavioral method effectiveness



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Research Needs: General



- > 20 years since any research over spawning habitat
- Panmixia?
- Early life history?
- Sex determination?
- Catadromy?
- Decline or natural fluctuation?
- Climatic impacts on recruitment?