

Fish Protection Issues: Selected Publications

Sections 316(a) and (b) of the Clean Water Act require the protection of fish and shellfish from discharge and withdrawal of surface water for power plant cooling. Since the 1970s, EPRI has pursued a research program to inform the electric power industry and the public on tools and information resources for fish protection in accordance with Clean Water Act requirements. The following is a select list of recent reports on fish protection technologies, environmental impact assessments of cooling water intake structures, and issues related to the thermal discharge of cooling water.

An abstract of each publication is available; just click on the report number or download them from www.epri.com by searching the

same number. For information on retrofit of cooling towers for fish protection, see EPRI Technical Briefs [1022212](#) and [1025097](#).

Please note: all "publicly available" documents are free; all other document downloads are subject to eligibility or pricing requirements.

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An Introduction to Social Costs and Resources for 316(b) Entrainment Evaluations	3002006306 2015
Design of Fish Return Systems and Operations/Maintenance Guidelines	3002001422 2015
Using Compliance Alternative 2 the Design Intake Flow (DIF) to Meet §316(b) Requirements	3002006309 2015
Hydrolox Traveling Water Screen Fish Impingement and Survival Case Study: Plant Barry Generating Station	3002005832 2015
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Electric Barriers for Fish Protection at Cooling Water Intakes	3002003431 2014
Engineering and Biological Assessment of Fine-mesh, Fish Protection-Modified Traveling Water Screen Retrofits	3002001104 2013
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Post-Impingement Survival of Juvenile and Adult Fish with a Passavant-Geiger Multi-Disc™ Screen: Laboratory Evaluations	3002000180 2013
Technical Comments on EPA's – Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities: Notice of Data Availability Related to Impingement Mortality Control Requirements and EPA's Stated Preference Survey	1025381 2013
Effects of Distance and Debris Exposure on Survival and Injury of Juvenile Fish within a Fish Return System	3002001467 2013
Program on Technology Innovation: Tradeoffs between Once-Through Cooling and Closed-Cycle Cooling for Nuclear Power Plants	1025006 2012
Fine Mesh Traveling and Vacuum Screens, Approach Velocity, Impingement Survival and Spraywash Pressure: Supplemental Laboratory Studies	1023769 2012
Effects of Fouling and Debris on Larval Fish within a Fish Return System	1024999 2012

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Fish Protection Technology (continued)		
Field Evaluation of Debris Handling and Sediment Clogging of 2.0 mm Fine-mesh Traveling Water Screen at the Hawthorn Power Plant, Missouri River, Kansas City, MO	1024697	2012
Potential Impacts of Closed-Cycle Cooling Retrofits at U.S. Power Plants	1025097	2012
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Technical Comments on EPA's National Pollutant Discharge Elimination System—Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities	★ 1019858	2011
Laboratory Evaluation of the Beaudrey WIP Screen for Protecting Early Life Stages of Fish at Cooling Water Intake Structures	★ 1019864	2011
Laboratory Evaluation of Fine-Mesh Traveling Water Screens	★ 1019027	2010
Evaluation of Factors Affecting Juvenile and Larval Fish Survival in Fish Return Systems at Cooling Water Intakes	★ 1021372	2010
Utility of Variable Speed Drives for Fish Protection at Cooling Water Intakes	★ 1021373	2010
Evaluation of Continuous Screen Rotation and Fish Survival: Studies at Plant Barry, Mobile River, AL	★ 1016807	2010
Beaudrey Screen Pilot-Scale Impingement Survival Study	★ 1018490	2009
Evaluation of Strobe Light and Acoustic Fish Deterrent System: Plant Barry	★ 1014022	2008
Latent Impingement Mortality Assessment of the Geiger Multi-Disc™ Screening System at the Potomac River Generating Station	★ 1013065	2007
Laboratory Evaluation of Modified Ristroph Traveling Screens for Protecting Fish at Cooling Water Intakes	★ 1013238	2006
Design Considerations and Specifications for Fish Barrier Net Deployment at Cooling Water Intake Structures	★ 1013309	2006
Field Evaluation of Wedgewire Screens for Protecting Early Life Stages of Fish at Cooling Water Intake Structures: Chesapeake Bay Studies	★ 1012542	2006
Biological and Economic Assessments		
DNA Barcoding and Quantitative Polymerase Chain Reaction Techniques as Tools to Validate and Expedite Species Processing in Entrainment Samples	★ 3002006305	2016
Wabash River Fish Community 20 Years Following Retirement of Power Plant Once-through Cooling System	3002003424	2015
Federally-listed Threatened and Endangered Species and the Clean Water Act §316(b) Rule for Existing Facilities: A Summary of the U.S. Fish and Wildlife Service Biological Opinion and U.S. Environmental Protection Agency Requirements	3002004924	2015
Fish Protection Technical Brief: Key Genetic Applications That Can Improve Early Life Stage Characterizations and Quantifications	3002006304	2015
Entrainment Best Technology Available (BTA) Technical Resource Document	3002003429	2015
Internet-based Larval Fish and Egg Taxonomic Key for Freshwater Environments	★ 3002003958	2015
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Internet-based Tool for Entrainment Classifications of Freshwater Fish Species	★ 3002006303	2015
Internet-based Tool for Entrainment Classifications of Freshwater Fish Species. Technical Media (Data Base)	★ 3002006302	2015
Pilot-level Validation Methods for Entrainable Organism Condition Assignments	3002003426	2015
Fish Protection Technical Brief: Estimating the Physical Exclusion of Fine-Mesh Screens	3002003432	2014

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Biological and Economic Assessments (continued)		
Quantifying Nonuse and Indirect Economic Benefits of Impingement and Entrainment Reductions	3002003427	2014
Entrainment Abundance Monitoring Technical Support Document: Updated for the New Clean Water Act §316(b) Rule	3002001425	2014
Clean Water Act §316(b) Existing Facility Rule Summary	3002004150	2014
Fish Life History Parameter Values for Equivalent Adult and Production Foregone Models: Comprehensive Update	1023103	2012
Seasonal Patterns of Fish Entrainment for Regional U.S. Electric Generating Facilities	★ 1023102	2011
Do Power Plant Impingement and Entrainment Cause Adverse Changes in Fish Populations? A Review of the Scientific Evidence	★ 1023094	2011
Bioindicators of Performance and Impingement Susceptibility of Gizzard and Threadfin Shad	★ 1023101	2011
National and Regional Summary of Impingement and Entrainment of Fish and Shellfish Based on an Industry Survey of Clean Water Act §316(b) Characterization Studies	★ 1019861	2011
Potential Entrainment of Dead or Moribund Fish Eggs and Larvae at Cooling Water Intake Structures	★ 1019860	2011
Entrainment Survival: Status of Technical Issues and Role in Best Technology Available (BTA) Selection	★ 1019025	2009
Role of Temperature and Nutritional Status in Impingement of Clupeid Fish Species	★ 1014020	2008
Benefit Valuation Studies under §316(b) of the Clean Water Act: An Overview	★ 1008473	2005
Impingement and Entrainment Survival Studies Technical Support Document	★ 1011278	2005
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Extrapolating Impingement and Entrainment Losses to Equivalent Adults and Production Foregone	★ 1008471	2004
Impacts of Volumetric Flow Rate of Water Intakes on Fish Populations and Communities	★ 1005178	2003
Technical Evaluation of the Utility of Intake Approach Velocity as an Indicator of Potential Adverse Environmental Impact Under Clean Water Act § 316(b)	★ 1000731	2001

Thermal Discharge Impact Assessments

Proceedings: The Fourth Thermal Ecology and Regulation Workshop	★ 3002008550	2016
Evaluation of Volitional Use of a Heated Discharge Plume by Resident Fish at TVA's Cumberland Fossil Plant	3002006431	2015
Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Power Plant on the Cumberland River, TN	3002003754	2015
Proceedings of the 3rd Thermal Ecology Workshop	★ 1025382	2012
Thermal Toxicity Literature Review	★ 1023095	2011
Clean Water Act Section 316(a): Past, Present, and Future	★ 1018500	2009
Proceedings of the 2nd Thermal Ecology Workshop	★ 1016809	2008
Establishing Alternative Numerical Thermal Limits for Rate of Temperature Change	★ 1016470	2008
Effects of Fluctuating Temperatures on Fish Health and Survival	★ 1012545	2007
Proceedings from the EPRI Technical Workshop on 316(a) Issues: Technical and Regulatory Issues, October 16–17, 2003	★ 1008476	2004

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