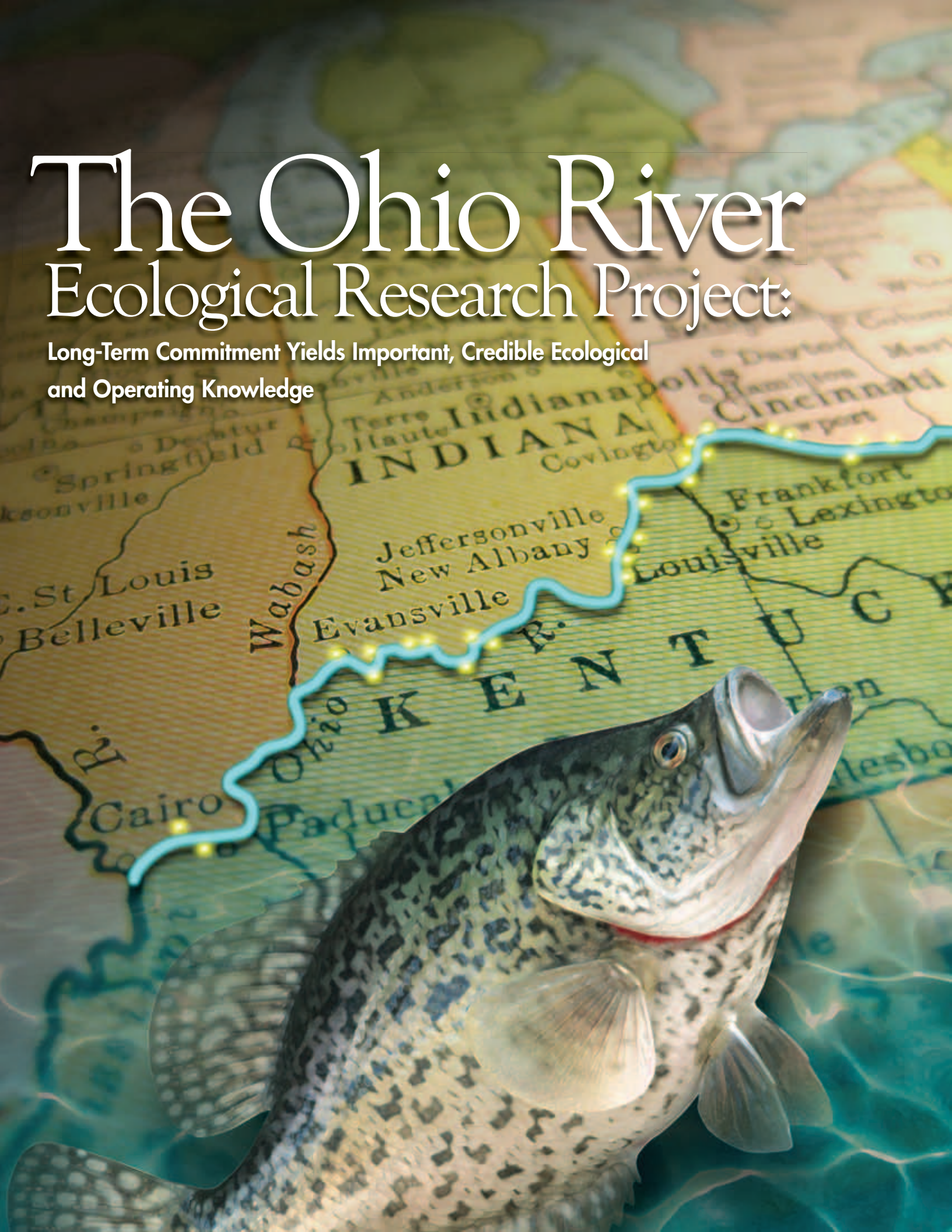


# The Ohio River Ecological Research Project:

Long-Term Commitment Yields Important, Credible Ecological  
and Operating Knowledge



**W**ith more than 15,000 unique samples taken, 112 separate species collected, and nearly a million individual fish evaluated, the ongoing 37-year Ohio River Ecological Research Project (ORERP) is the world's largest and longest-maintained freshwater database on the potential effects of power plant thermal discharges. This comprehensive collaborative study, conducted adjacent to most of the 27 river-cooled power plants along the twists and turns of the 1,000-mile Ohio, has enabled utilities to show that thermal discharges do not significantly impact the spatial distribution of fish communities in the Ohio River near power plants.

Spawned by Section 316(a) of the Clean Water Act in the early 1970s and managed by EPRI since 2002, ORERP has yielded invaluable information for power plants and local communities while documenting important ecological changes in one of the nation's most important rivers. The 316(a) regulations require that power companies demonstrate the presence of a "balanced, indigenous community" of fish near a power plant's thermal discharge to establish that the plant is not harming or reducing populations of fish and aquatic invertebrates. When 316(a) became law, no one knew that it would usher in this one-of-a-kind collaboration, but after nearly four decades of sampling, the knowledge gained and the money saved clearly demonstrate the benefits of such a project.

"Through the wisdom and foresight of the companies that have participated off and on for almost 40 years, this project has generated scientific data that have allowed us to prove that there is minimal impact on fish populations and species due to thermal discharges," said Al Gaulke, an environmental specialist with American Electric Power (AEP) who has provided oversight and guidance for the project since 1974. "The bottom line is that regulators ask about the impact of your discharges on the water body. Everybody gets those questions, and you need reliable data to document impact."

## THE STORY IN BRIEF

A utility-sponsored program for the study of fish and aquatic invertebrates near generating facilities along the Ohio River provides long-term data that help address questions raised by regulators and that help anticipate ecological issues that could arise in the future. This sustained and successful research serves as a model for programs that could monitor other major U.S. river systems and water bodies.



Gaulke has watched the project evolve over the years to reflect a broader regulatory oversight of utility operations and their potential effects on ecosystems, including the effects of toxic pollutants. While a focus on thermal discharges has always been the cornerstone of the project, ORERP has also addressed entrainment and impingement of aquatic species, regulated under Section 316(b). Entrainment occurs when small fish and other aquatic organisms pass through the intake screens and trash racks into the plant, sometimes suffering injury or death. Impingement occurs when larger fish and invertebrates are drawn to and trapped against the intakes' trash racks or screens. The 316(b) regulation for entrainment and impingement at existing power plants was recently updated but remanded to the Environ-

mental Protection Agency in mid-2007 for revision.

"It's the long-term nature of the data that allows us to speak with great confidence about how power plants on the Ohio River impact aquatic life," Gaulke said.

### Collection and Evaluation

The ORERP field studies assess the fish, habitat, and water quality near the 27 power plants that draw cooling water from the Ohio. Three times a year—in June, August, and October—researchers use seines and boats equipped with specialized collection gear, electric generators, and sampling probes to collect and study fish from the open waters of the river. Collection and tests are conducted at three sites upstream and three sites downstream of each participating facility. Each specimen

is identified, categorized by species, weighed, and measured.

Sampling methods have been adapted through the years to be consistent with methods used by regulatory agencies. In earlier years, hoop nets, gill nets, and trawls were used to sample fish, invertebrates, ichthyoplankton (larval fish), zooplankton (water fleas), phytoplankton (algae), and freshwater mussels. Current methods emphasize seining and electrofishing, which stuns fish long enough to catch and analyze them. Electrofishing is now done at night to be consistent with sampling methods used by the Ohio River Valley Water Sanitation Commission (ORSANCO) and state agencies. Habitat measurements are also made according to ORSANCO procedures. Project scientists estimate that nearly 3,300 separate seining samples and more than 3,500 separate electrofishing samples have been taken in the Ohio during the project, making it comprehensive, current, and credible.

## The Power of Broad Collaboration

Through the years, the project's scope and participant numbers have ebbed and flowed. Some facilities have been sampled nearly every year; others have been in the program only for a year or two; still others have been in and out of the program over the entire period. Ten companies currently fund the study: Allegheny Energy, AEP, American Municipal Power—Ohio, Buckeye Power, Duke Energy, Dayton Power & Light, FirstEnergy, E.ON US (Louisville Gas & Electric), Ohio Valley Electric Corporation/Indiana Kentucky Electric Corporation, and Tennessee Valley Authority. With financial interest in 6 of the 27 power plants on the Ohio, AEP is the one company that has been involved throughout the life of the project.

Pooling funds has proved to be a more efficient way to conduct research, but each facility determines its participation annually, according to factors such as research budgets, economic conditions, and ecological questions from regulators. "As with

## Power Plants on the River

The first coal-fired power plants were constructed in the Ohio River Valley during the late 1800s and early 1900s. There was little concern then about the effects on local fish populations. At the same time, locks and dams for navigation were changing the Ohio from a free-flowing, clear-water river to a series of impoundments in which industrial, coal-mining, and domestic wastewater discharges strongly affected water quality.

Studies have shown that certain fish species, such as mooneye, stonecat, and grass pickerel, which prefer clear water or clear water with aquatic vegetation, saw declining populations during the 1800s in response to the river modifications and increasing turbidity. Other species, such as black bullhead and channel catfish, which are more tolerant of degraded water quality, increased. Populations of skipjack herring and gizzard shad also increased

during this period of declining river conditions. Since the Ohio's fossil-fueled power plants withdraw up to 500 million gallons of water per day, it was only a matter of time before there was a concern about how these water withdrawals would affect fish populations in the river.

Water quality began to improve between 1950 and 1970, after greater regulation of industrial activities and the installation of sewage treatment facilities. There followed a corresponding increase in the abundance of numerous fish species. AEP researchers conducted fish collections from 1970 through 1985 and noted the increasing abundance of 22 species, such as largemouth and spotted bass, while catches of 7 typically pollution-tolerant species, such as black bullhead, had declined. Those findings indicated that the Ohio River fishery had improved, despite an increasing number of power plants along the river.

any ecological research, companies are concerned about getting a return on their investment," said Tim Lohner, AEP's principal environmental specialist, who has worked with EPRI to expand the project since joining AEP 16 years ago. "With this project, companies have saved far more money—tenfold more, at least—than they have spent. This program has been very beneficial in terms of avoided costs, because the cost to participate doesn't come close to the cost of building a cooling tower."

Participants in the program say that while collaboration has not always been without its challenges, the cooperative effort has delivered compelling data essential to tracking the long-term effects of thermal discharge. Jim Stieritz, principal environmental scientist with Duke Energy, a participant since 1973 (including Duke's predecessor Cinergy), sees three primary benefits to the project: credibility, richness of data, and the ability to address regula-

tory questions with confidence.

"When you've got more than one utility involved, you've got more credibility," said Stieritz. "It's sort of a strength-in-numbers thing. And the richness and depth of the data can enhance sharing between companies, not just between individuals. Finally, the ORERP field data enable us to address questions when they first come up, rather than after laws have been passed."

In one example that Stieritz cites, the Thermal Working Group of ORSANCO had begun reassessing representative aquatic species for the Ohio River Thermal Model in 2006. ORSANCO had picked fish species that it felt were representative of the Ohio River, yet because of the ORERP database, environmental scientists at the utilities knew that some of the selected species were tributary species or were species that weren't well represented in the river. "We could only speak to this if we had the data," said Stieritz, "and we had the data in our field tests."

## A Potential for Future Collaborations

Considering the clear success and value of the ORERP collaborative program, will utilities join to conduct similar projects elsewhere in the country? “I do believe there is potential for similar collaborations, although it’s not always going to be easy,” said Doug Dixon, senior project manager for water environmental projects at EPRI. Dixon and environmental specialists at some of the 11 utilities on the upper Mississippi River tried to organize a collaborative project there in 2004; they learned that one size may not fit all for such studies and that different rivers have fundamentally different characteristics. Each project will be unique simply because each water body is unique.

One major difference can be simple geography. While the Ohio River flows east to west, which means that water temperatures are relatively consistent throughout the length of the river, the Mississippi flows north to south, presenting more variables in thermal research because of natural temperature changes that can affect fish communities. The Mississippi also has greater distances between power plants and greater river traffic from both commercial and recreational sources.

John Thiel, Environmental Impact Group supervisor at Dairyland Power Cooperative in La Crosse, Wisconsin, has conducted fish impact studies at power plants for 30 years. Thiel believes that despite the inherent differences between the Mississippi and the Ohio, a collaborative research project for the upper Mississippi should be revisited.

“In the future, with some of the 316(a) ramifications, I think we may need to reconsider collaborative studies on a large scale in order to reduce cost,” said Thiel. The Wisconsin Department of Natural Resources may require renewal of all 316(a) variances at every power plant in the state. Even now, Wisconsin is requiring re-evaluation of thermal caps, calculations, and mixing-zone limits. “There’s no doubt that a collaborative effort will give us much



better information, and obviously the more data and the more sites you’ve got, the more valid your conclusions,” Thiel said.

Whether collaboratives similar to ORERP emerge as a result of regulatory and environmental considerations remains to be seen, but Gaulke, the environmental scientist with AEP, has another take on why such collaborative projects are worthwhile. “As users of the water resource, you have a moral obligation to know and understand what your impact is, above

and beyond the absolute regulatory requirement,” Gaulke said. “That’s a factor that may not have been part of our thinking when this started, but it is definitely part of our thinking now.”

*This article was written by Joe Gallehugh. For more information about establishing research collaborations with neighboring utilities, contact Doug Dixon, [ddixon@epri.com](mailto:ddixon@epri.com), 804.642.1025.*



**Douglas Dixon** is a senior project manager in EPRI’s Environment Sector, specializing in a variety of fish protection-related issues. Before joining EPRI in 1997, he worked at ERM Inc., where he supported hydropower licensing efforts for the Federal Energy Regulatory Commission. Earlier he worked at the Virginia Institute of Marine Science, Versar Inc., and the Smithsonian Chesapeake Bay Center for Environmental Studies. Dixon holds a B.A. in biology from the State University of New York and a Ph.D. in marine fisheries science from the College of William and Mary.

## Is Collaboration in Your Future?

Successful collaboration among utilities on shared water bodies requires effort, but if done right, it can return the time investment many times over in cost savings, reliable and credible data, and enhanced credibility on pertinent issues. Besides these benefits, participants in the Ohio River Ecological Research Project demonstrate a commitment to the understanding and stewardship of resources. As one member put it, “We have an obligation to know how our operations are affecting our natural resources.”

Interviews with members of ORERP have identified the following key steps to a successful collaboration:

- Use independent environmental consultants.
- Consider using graduate students to gather and analyze results.
- Have a specific monitoring plan with specific objectives. For ORERP, it was the 316(a) requirements.
- Determine the type of sampling needed to attain your objectives.
- Sample a couple of sites every year; then sample every site in intervals of three, four, or five years. This approach saves money when using a statistical or ecological model.
- Design a five-year sampling plan. This saves money and encourages companies to plan their budgets in five-year increments to get a longer commitment for a more effective project.