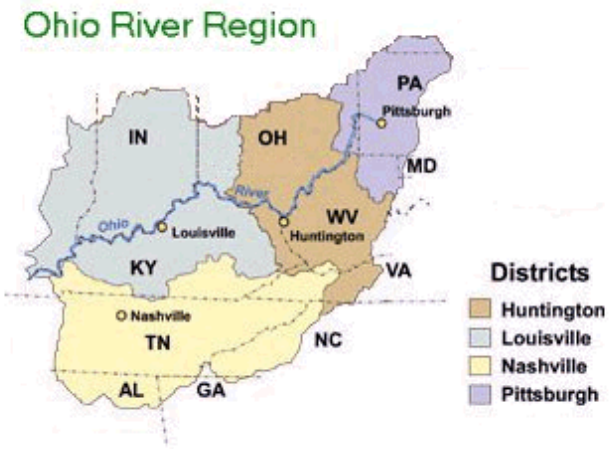
Ohio River Water Quality Program



The Corps' Water Quality Program in the Ohio River region is responsible for the monitoring and management of water quality at reservoirs, lakes, tributaries and rivers that have Corps-operated structures for flood control and navigation. The Corps also monitors sediment and water quality in relation to dredging and dredged material placement and conducts water quality modeling and studies in cooperation with regional partners.
In the Ohio River Region, the Corps' Water Quality Program is conducted by the four district offices shown on the map, with their Civil Works boundaries.

These districts are responsible for a number of activities related to the management of water quality in the Ohio River and tributaries, including:

- Monitoring
- Modeling & evaluation
- Data management
- Restoration and remediation
- Partnerships & coordination
- Reporting

This page will provide background information on these water quality activities. Highlights of ongoing or recent events related to water quality in the Ohio River Region will be available online soon.

Monitoring

The Corps of Engineers conducts a variety of monitoring at water resources projects in order to assess and maintain water quality conditions:

- Lake and reservoir monitoring
- Sediment pollutant monitoring
- Macroinvertebrate surveys
- Algal surveys
- Bacterial monitoring
- Zebra mussel monitoring

A listing of monitoring activities planned by Corps districts in the Ohio River Region during the current Fiscal Year is available online. The Corps is always interested in collaborating with other agencies and organizations interested in participating in water quality monitoring. The Corps has some authorities that may be used to provide additional funding for data collection in some applications.

Lake and Reservoir Monitoring: Reservoirs are man-made lakes or impoundments formed by the construction of one or more dams. Water quality conditions in reservoirs are different from those in a free-flowing stream or river because of a number of physical and biological activities that occur in the reservoir pool. The most common water quality problems

at reservoirs are related to temperature (water is too hot or cold), dissolved gases (too little oxygen or too much nitrogen) and biological abundance (algae blooms). However, reservoirs and lakes may also have a number of other water quality-related problems such as bacterial contamination, excessive sediments or nutrients, persistent and toxic contaminants, and invasive species.

The Corps of Engineers monitors water quality at reservoirs to determine when and where conditions are approaching State established standards or project-specific water quality objectives. Monitoring stations include the pool above the dam (headwater), major tributaries and inflows, releases at the dam, and the tailwater downstream of the dam. The monitoring data is used in conjunction with computer models or other tools to determine what changes to the operation of dams and hydropower facilities are needed to maintain or restore water quality conditions.

These stations have sensors that monitor select water quality parameters, including temperature, dissolved oxygen, pH and specific conductance on a periodic basis. The data may be recorded on site or retrieved over telephone or satellite connections. This real-time, remote water quality data is critical to water quality management of a system containing a series of river/reservoir pools. At some projects, this data is supplemented by regular measurements of dissolved oxygen and temperature taken at the damsite by Corps rangers and dam operators.

The water quality conditions in a deep pool can vary greatly with depth as the water column becomes stratified in response to seasonal temperature and flow patterns. During periods of stratification, water quality monitoring is conducted at several depths to evaluate effects of day-to-day operations.

Some reservoirs have selective withdrawal capability which enables the release of water from the dam that has been drawn from a particular depth. Water quality profile data is used to determine the depth(s) for withdrawl that will maintain acceptable water quality conditions in the tailwater and downstream pools.

Hydropower facilities direct water through turbines in order to generate electric power. Water routed through a conventional hydropower facility has limited potential for reaeration (increasing dissolved oxygen). In order to increase the dissolved oxygen in the tailwater and downstream pool(s), hydropower facilities are sometimes asked to operate at capacities well below their peak. The Corps' Nashville District has a program for making a simple modification to hydropower turbines that significantly increases the dissolved oxygen of water passing through them.

Sediment Pollutant Monitoring: Since 1984, Corps districts have monitored bottom

sediments from lakes and reservoirs for priority pollutants on a 5-year rotational basis. Bottom sediments are a natural "sink" for many toxic and persistent pollutants that are hard to detect in the water column. This program has been successful at establishing baseline data for some water quality parameters and assessing damages caused by spills and changes to pollutant loadings. Sediments are typically analyzed for grain size, nutrients, selected metals, and priority pollutants

The Corps also conducts sampling and testing of sediments from Federal navigation channels that are proposed for dredging in order to evaluate options for disposal of the dredged material and to comply with State water quality certification requirements. Dredged material testing and evaluation is conducted in accordance with the Inland Testing Manual, developed by the USEPA and Corps of Engineers.

Macroinvertebrate Surveys: Macroinvertebrates are small aquatic organisms that are used as biological indicators of water quality by virtue of their short generation time and rapid community response to environmental factors. Biological indices, including those based on benthic macroinvertebrates, are increasing in popularity among States as tools to rate stream water quality.

Corps districts collect samples of macroinvertebrates in the early Fall from sites located in the head- and tailwaters of lake projects. In lakes, habitats suitable for macroinvertebrates are generally found in shallower regions along the shoreline. Selected substrates included gravel, rock, silt, and vegetation.

Algal Surveys: Algae are continuously exposed to their aquatic environment, have short generation times, rapid community response times, and are excellent biological indicators of water quality. Suspended algae, called phytoplankton, are distributed throughout the lake and may be easily collected from different depths using a water sampling bottle. In addition to samples used for examination of the algal cells, samples are also collected for analysis of chlorophyll a.

Bacterial Monitoring:

Zebra Mussel Monitoring: A surveillance program is being conducted for evaluation of existing and potential problems with zebra mussels at Corps projects in the Ohio River Basin. The program includes routine inspection of all visible surfaces for zebra mussels and for damage associated with zebra mussel attachment; implementation of protective measures, if

effective and possible; assurance of continued operation of stream gages and water quality monitors in contact with raw water; continued reservoir surveillance and monitoring; provision of public information programs on zebra mussels; and field demonstrations of treatment technologies developed by the Corps and other agencies.

Zebra mussels most likely spread through Ohio River waterways by barge traffic. In 1991, zebra mussels were first observed in the lower Ohio River at low densities as adults. Over the next few years, with further transport by barge and increased zebra mussel reproduction, their distribution grew in both number and size range throughout the Ohio River system. By 1994, zebra mussels at Ohio River locks and dams could be observed in layers 4-8 cm (about 2-4 inches) thick on concrete, metal, rope, and other materials providing solid substrate. Zebra mussel densities also increased in areas characterized as soft sediment as a result of zebra mussel attachment onto one another.

In 1997 and 1998, zebra mussel concentrations appeared to stabilize in the Ohio River while increasing in some and decreasing in other localized areas. Signs of successful zebra mussel reproduction were still evident. To date, complications in operation caused by the zebra mussel have been minimal. This is in part due to the proactive stance taken by Corps districts to prevent problems associated with the zebra mussel through incorporation of different chemical and physical treatments to protect lock and dam structures, navigation vessels, water quality monitors, etc.; high power hoses and other equipment to assist in zebra mussel removal; and additional time added in certain project scheduling to compensate for the fact that zebra mussels must first be removed before underwater diving inspections can be made.

Check out district reports on zebra mussel monitoring online.

Modeling and Evaluation

The Corps of Engineers water quality modeling on the Ohio River began over 30 years ago with some of the first applications ever made for operating water control structures on a river/reservoir system. Today, the four districts in the Ohio River Basin command expertise in a variety of models developed by the Corps and applied on the Ohio River and its tributaries, including CE-QUAL.-W2 and WQRRS. Models have been used for pre-impoundment studies on the impacts of proposed reservoirs, post-impoundment studies on how changes to operations of existing reservoirs will impact water quality, and for real-time management of water quality in some parts of the system. Many of the Corps water quality models are available online from the Waterways Experiment Station (WES) web site.

Much of the Corps water quality monitoring is conducted to collect data for the calibration of models for reservoirs or lakes. Modeling has received highest priority for projects where the Corps has the ability to make operational changes that can significantly impact water quality, such as reservoirs with selective withdrawal capability or hydropower facilities. Modeling has also been used to evaluate the impacts of basinwide conditions (e.g., drought), respond to chemical spills, and anticipate the impacts of major changes or repairs to water control structures. The Corps' water quality modeling efforts have received interest from other water resource agencies, and has resulted in several partnerships between the Corps and States and other Federal agencies. These partnerships include efforts to apply the Corps' models to Total Maximum Daily Load (TMDL) studies for waterway segments affected by discharges from Corps' dams.

Data Management

The Corps of Engineers does not have a centralized management system for water quality data. Each district has developed data management systems that satisfy their individual needs. A general description of the data management systems used by the districts in the Ohio River Basin is provided here.

District	Water Quality Data Management
Huntington	http://www.lrh-wc.usace.army.mil/wq/lkcond.html
Louisville	http://www.lrl.usace.army.mil/wc/
Nashville	http://www.lrn.usace.army.mil/hh/wq.htm
Pittsburgh	http://wmw.lrp.usace.army.mil/

Recent developments in district management systems have been aimed at integrating water quality, sediment quaity and biological data into Geographic Information System.

Restoration and Remediation

No additional information at this time.

Partnerships & Coordination

As mentioned above, the Corps is actively seeking partners for water quality monitoring, evaluations, restoration and remediation. These partnerships can promote better quality data, avoid duplication of effort, and create a broad-based support for watershed practices that will restore and protect water quality. Partnerships with States and local agencies can enable the Corps to apply additional Federal funds for cost-shared studies and projects.

The Huntington, Louisville and Pittsburgh Districts have partnered with ORSANCO on the Ohio River Water Supply Study. The study includes taking chemical inventories of transported and stored cargo on the Ohio River; utilization of a time of travel model; and effects of reaeration at selected lock and dam structures on the river.

The Nashville District participated in an environmental education project with high school science students from Harlan County, Kentucky. The Corps' provided a demonstation of water quality monitoring techniques in a watershed heavily impacted by past coal mining and ongoing timbering activities. Over the next several weeks this group of science students and their teachers collected data and assessed the water quality problems in the Crane Creek watershed. The students prepared a paper recommending possible solutions to existing problems.

The Louisville District began a partnership with Clermont County, Ohio which includes placing and operating two additional remote sampling units in the headwaters of W.H. Harsha Lake. These two units, located in the Little Miami River basin, are part of a five unit network operated by Clermont County.

Reporting

Internally, water quality data and evaluations are sent to Corps' area offices for distribution to individual lake projects. Copies

are also sent to State water quality agencies. Several districts have made portions of their water quality data available online (click the district name below). Requests for water quality data not available online should be made in writing to the appropriate district water quality coordinator.

Huntington	Louisville	Nashville	Pittsburgh

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