Office of Science and Technology

Office of Water
U. S. Environmental Protection Agency

2008 ANNUAL REPORT




United States Environmental Protection Agency

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Foreword

The Office of Science and Technology (OST) is one of five offices within EPA's Office of Water. OST has the privilege of bringing sound science, engineering and public policy to bear in the pursuit of protecting and restoring the quality of America's waters. OST leads a wide range of activities to advance water quality, public health and environmental protection under the Clean Water and Safe Drinking Water Acts. OST is responsible for setting national goals for the quality of America's waters and providing tools to measure progress toward achieving those goals. Additionally, OST helps ensure that federal and state water programs reflect the latest scientific knowledge about how water becomes polluted and the impacts of water pollutants on human health and ecosystems. OST produces technology-based regulatory guidelines and analytical test methods; water quality-based standards and criteria recommendations; health-based advisories for beach swimming, fish consumption, and drinking water; risk assessments and special studies to determine the need for regulations; and models and other tools. Collectively, these help water program managers protect aquatic environments and human health. Ultimately, OST's standards, guidelines and methods serve as the foundation upon which EPA water programs are built and progress is measured.

In 2008, OST continued its long tradition of ensuring that sound science is the foundation for its work and that stakeholder input is actively sought as we formulate public policy. OST made many advances through collaboration with our regional counterparts; federal partners; and state, territorial and tribal co-regulators. OST issued proposed regulations for the construction and development industry that, when final, will prevent the discharge of nearly 27 billion pounds of sediment into the nation's surface waters. We also partnered with co-regulators in the states to ensure effective implementation of water quality standards, including providing the scientific, technical and policy tools to help states advance management of nitrogen and phosphorus pollution. OST continued to effectively manage the allocation and expenditure of grant funds for beach monitoring and notification programs, and produced an improved grant allocation formula and a new Beach Sanitary Survey Tool. OST provided the scientific analysis of data on dozens of drinking water contaminants and improved coordination with other EPA offices in water quality criteria development and water research needs. Finally, OST led the Office of Water's efforts to better understand the occurrence and consequences of pharmaceuticals and personal care products in our nation's waters so that EPA can make decisions about managing these pollutants.

In the upcoming year, OST will finalize the effluent guidelines for the construction and development industry, complete Phase II of the National Water Program Research Strategy, and publish a drinking water treatment technology report and the 2010 Preliminary Effluent Guidelines Program Plan under Clean Water Act (CWA) section 304(m). OST will continue to collaborate with states to support their adoption of numeric nitrogen and phosphorus criteria, support tribes through the Consolidated and Central Tribal Training program, enhance the effectiveness of the BEACH Act grant program, and improve the Agency's water quality standards management measures. OST will also continue to provide leadership to the National Water Program in science application. Through research and collaboration, we will progress in developing updated recreational criteria, evaluating contaminants of emerging concern, refining ambient water quality criteria and providing support to EPA's Drinking Water Program. In addition, OST will explore ways to foster state efforts to restore impaired waters, including efforts to make incremental progress toward restoration goals. OST will also focus on how climate change will affect water quality and what steps can be taken to adapt to those changes.

OST's fundamental strength is the expertise and commitment of its administrative and technical staff. They have proven their resilience, flexibility and ability to focus on results throughout a challenging 2008. OST's staff reflects the diversity, creativity and exemplary skills needed to solve today's environmental problems. Our engineers, scientists, economists and environmental specialists apply the latest technical advances and best science to achieve measurable results in meeting the national goal of clean and safe water. Whether addressing policy issues, water-quality research or technological innovation, OST professionals assure that water programs are built on an advanced and reliable scientific foundation. As such, I am confident that we will effectively meet whatever environmental challenges we face in the future.

Ephraim S. King
Director, Office of Science and Technology

OST's Mission: We develop sound, scientifically defensible standards, criteria, advisories, guidelines and limitations under the Clean Water Act and the Safe Drinking Water Act. We work with partners and stakeholders to develop the scientific and technological foundations to achieve clean water.

2008 Highlights

OST accomplished much in protecting the nation's surface and drinking water in 2008. Many accomplishments are detailed throughout this report, but several stand out as key efforts for the year, including:

- Construction and Development Industry—EPA published proposed effluent guidelines in November 2008 for national requirements for stormwater discharges from all construction sites greater than one acre. This proposal would require that, for the first time ever, large sites with high rainfall intensity and soils with high clay content meet an enforceable turbidity limit based on active treatment systems. The final rule will be published by December 1, 2009.
- Published the 2008 Effluent Guidelines Program Plan—The plan included studies for several industries. The studies evaluate methods of controlling pollutant discharge.
- Beach Protection Actions–In 2008, OST published a report on 2007 Beach Closings and Advisories, updated the National List of Beaches, published proposed changes to the BEACH Act Grants allocation formula and made available a new Beach Sanitary Survey Tool.
- Nutrient Criteria—In December 2008, OST released the report, "State Adoption of Numeric Nutrient Standards: 1998-2008," meeting EPA's commitment to periodically report on the progress of the 50 states in adopting numeric nutrient Water Quality Standards (WQS). OST also provided states with technical and policy assistance through numerous means in 2008.
- Recreational Water Quality Criteria—OST has taken several key steps under EPA's Critical Path Science Plan toward revising the recreational water quality criteria that states can use to update their WQS. These criteria protect millions of swimmers from water contamination.
- Contaminants of Emerging Concern in Water—Under OST's leadership, EPA began implementing a strategy for addressing pharmaceuticals and other contaminants that have recently been discovered at very low levels in surface and drinking water. The strategy focuses on four areas: strengthening science, improving public understanding, identifying partnerships to promote stewardship and taking regulatory action when appropriate.
- Health Effects Analyses—OST was a key player in the proposal of the third contaminant candidate list in 2008. The list is a requirement of the Safe Drinking Water Act. OST prepared 126 health assessment documents and identified research needs for drinking water contaminants.

- Education, Outreach and Training Efforts—OST created a new Web site to teach children and parents about safe fish consumption and developed educational water quality activities for grades K-8. OST also hosted Earth Day collegiate water debates and collaborated with the American Dental Association and the National Association of Clean Water Agencies to help prevent mercury-based pollution from dental amalgam. In addition, OST led the creation of EPA's Consolidated and Central Tribal Training Program and trained nearly 250 water quality professionals through its Water Quality Standards Academy classroom-style and online courses in 2008.

Technology-Based Solutions

OST develops technology-based solutions to meet Clean Water Act requirements for controlling point source wastewater pollution and protecting aquatic life. These solutions are based on the performance, availability and affordability of treatment and control technologies. OST's efforts in this area include establishing effluent limitations for industries that discharge wastewater, improving existing guidelines, identifying new industrial pollution reduction technologies, and establishing technology requirements for cooling water intake systems to prevent harm to aquatic life.

The effluent guidelines program is intended to reduce pollutant discharges to the greatest extent that is technologically feasible and economically achievable for an industry. To date, EPA has issued effluent guidelines for 56 industrial categories that collectively prevent discharges of almost 700 billion pounds of pollutants annually. For comprehensive information about OST's effluent guidelines program, visit *www.epa.gov/waterscience/guide*.

2008 Effluent Guidelines Program Plan

Every other year EPA publishes a plan and schedule, known as an Effluent Guidelines Program Plan (Plan), for development and revision of industrial wastewater regulations. This biennial Plan is required by Section 304(m) of the Clean Water Act.

In September 2008, OST published EPA's final Plan for 2008, along with final detailed studies on dental amalgam and coal mining, interim reports of ongoing studies for the steam electric power generation industry, and unused pharmaceutical disposal practices. The studies evaluate both the pollutant discharges from these industries and the availability of technologies to control the discharges. OST also announced it is continuing to develop regulations for the airport deicing and construction and development industries. For more information about the 2008 Plan, see OST's Web site: *www.epa.gov/guide/304m/*.

Proposed Rulemaking for the Construction and Development Industry

In November 2008, EPA published in the Federal Register a proposed regulation to reduce erosion and control sediment discharges from construction sites. Sediment is one of the leading causes of water quality impairment nationwide. Discharges containing sediment degrade aquatic systems and increase water treatment costs. The proposal covers construction in all sectors—residential, commercial and transportation—and requires Best Management Practices and sediment basins, implemented through an EPA or state Construction General Permit (CGP) for all sites. In addition, larger sites of 30 acres or more located in areas with greater rainfall must meet numeric limits based on Advanced Treatment Systems. The proposed rule is innovative and risk-based, targeting those sites that will have the greatest sediment

discharges. The proposed construction and development requirements would prevent nearly 27 billion pounds of sediment from being discharged. Under court order, the final rule is scheduled to be published in the Federal Register no later than December 1, 2009. For more information, visit *www.epa.gov/waterscience/guide/construction/*.

Development of a Proposed Rule for Airport Deicing Operations

In 2008, OST drafted a proposed rule to establish effluent guidelines to control pollutant runoff associated with deicing aircraft and runways. More than one-third of deicing fluid is discharged without any treatment, resulting in discharges of more than 120 million pounds of chemical oxygen demand. EPA listed this category for rulemaking in its 2004 Effluent Guidelines Plan. In order to draft the proposed rule, OST visited 20 airports to collect information on deicing operations and wastewater generation, collection, treatment and recycling; issued a survey to a representative sample of airlines and airports; and sampled deicing fluid from six airports. OST also worked closely with industry representatives to ensure effective data collection and give them an opportunity to provide input. For more information, visit *www.epa.gov/waterscience/guide/airport*.

Development of a Proposed Rule for Cooling Water Intake Structures at Existing Large Power Plants

Clean Water Act section 316(b) mandates technology-based standards for cooling water intakes to minimize adverse environmental impacts from cooling water intake structures at power plants and manufacturing facilities. The withdrawal of cooling water harms billions of aquatic organisms each year, including fish, shellfish, and marine mammals. Most damage is done to early life stages of fish and shellfish.

EPA issued standards in February 2004 for existing large power plants that withdraw at least 50 million gallons of cooling water each day from surface waters. Environmental groups and industry representatives challenged the final rule. In January 2007, the Court of Appeals for the Second Circuit remanded key provisions of the rule, and EPA suspended the rule in July 2007, indicating that it would also proceed to amend the rule to address the remanded issues.

OST drafted a proposed rule that includes analysis of many new studies issued since 2004, and the results of over 20 OST-conducted site visits. Upon industry petition, the U.S. Supreme Court granted certiorari on the role of cost/benefits balancing in choosing a national performance standard, and oral argument was held on December 2, 2008. OST is currently waiting for the U.S. Supreme Court to issue its decision before proceeding.

For more information about cooling water intake rulemakings, visit *www.epa.gov/waterscience/316b/index.html*.

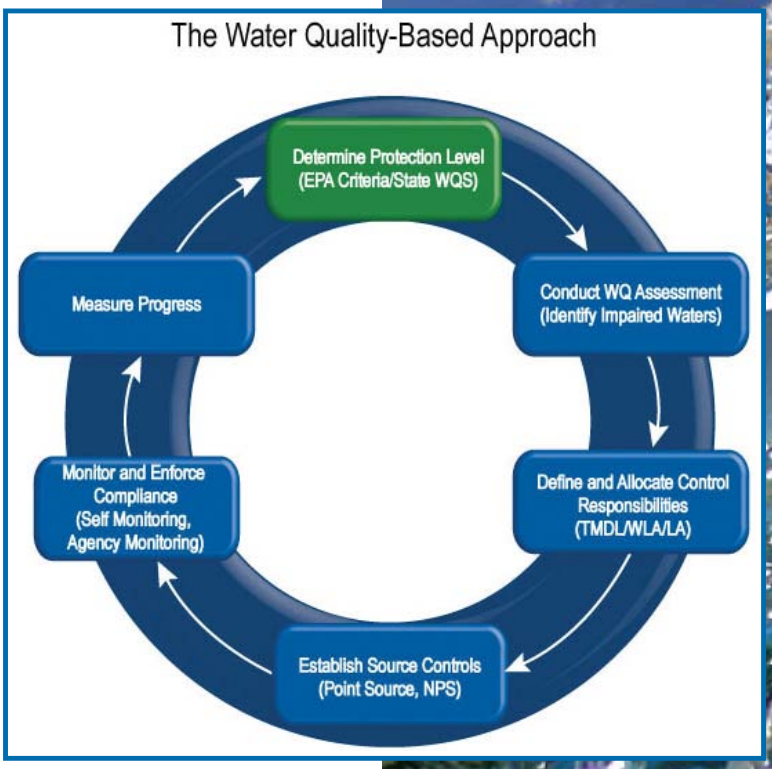
Water Quality-Based Standards

Unlike technology-based water programs, which are driven by technological and economic feasibility, water quality-based programs are driven by scientific determinations of risk and water quality conditions that must be met for the protection and restoration of aquatic life and human health. OST determines appropriate water quality characteristics for both treated drinking water and ambient surface waters. OST's drinking water work is discussed in the *Application of Sound Science* section of this report, as it is the scientific assessment work that underlies drinking water regulations. This section focuses on the water quality standards that are established to protect ambient surface waters.

Implementing the National Water Quality Standards Program

WQS are the foundation of the water quality-based control program mandated by the Clean Water Act. WQS define the goals for U.S. waters and set the standards against which all other surface water quality programs measure success. WQS consist of four elements:

- Designated uses for water bodies, such as recreation, aquatic life support, public water supply, agriculture, etc.
- Water quality criteria that establish numeric pollutant concentrations or narrative descriptions of water conditions that must be met to attain designated uses
- Antidegradation policy to maintain and protect existing uses and high quality waters
- Other policies that address the implementation of standards.



The *Water Quality-Based Approach* describes a management approach for protecting and restoring surface waters that is based on the water quality necessary to protect designated uses of water bodies. Through its Water Quality Standards Program, OST develops the recommended criteria and reviews the state standards that ultimately drive the protection and restoration of the nation's water bodies.

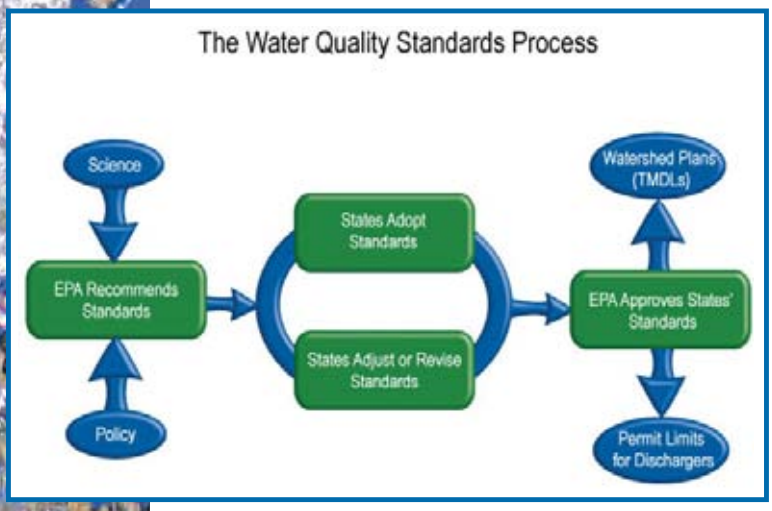
The Clean Water Act authorizes states and territories to administer WQS programs. OST and EPA's regional offices (Regions) provide federal oversight for the state and territorial programs, but all work together as co-regulators on a daily basis.

Tribes must apply for federal authorization to administer WQS programs under the Clean Water Act. OST provides technical assistance to tribes in applying for federal program authorization and in developing and implementing WQS and other water

quality programs. To date, 44 tribes have federal authority to administer a WQS program, three of which OST assisted in receiving authorization in 2008. Across the U.S., 35 tribes have EPA-approved, Clean Water Act-effective WQS programs. OST also plays an active role in providing training and technical support for tribes (see the Education, Outreach and Training section of this report).

Providing Regional and State Support on WQS

In addition to developing federal regulations, and national policy and guidance, on WQS, OST provides support to the Regions and states on specific WQS actions. In 2008, OST assisted the Regions and states in advancing state WQS programs by providing EPA's latest science, helping the Regions communicate EPA's policies and helping states find workable solutions to complex standards implementation issues. For example, OST provided support for approximately 20 lawsuits, notices of intent to sue, and petitions each affecting anywhere between one and 50 states. OST also reviewed numerous state standards packages submitted to the Regions for review and approval. These included challenging issues such as combined sewer overflow regulations, revised standards for the Chicago area waterways, thermal mixing zone provisions, human health criteria and antidegradation policies. OST also took action to ensure that WQS apply to160 miles of the Mississippi River near St. Louis, allowing for public water uses such as swimming.



OST works closely with the Regions to support constructive, timely and defensible actions on state WQS submissions. Recently, Regions have increasingly been working earlier with their states to ensure that states' standards revisions are "approvable" before they are adopted and submitted to EPA. To help states submit approvable WQS, the Agency sets ambitious management targets. In FY08, EPA was able to approve 92.5 percent of the state submissions received.

For more information about the National Water Quality Standards Program, visit *www.epa.gov/waterscience/standards/*.

Improving Beach Water Quality, Monitoring and Public Information

EPA estimates that Americans make 910 million trips to coastal areas each year, spending about $44 billion annually. OST's Beach Program works in partnership with the Regions and state and local governments to protect water quality at U.S. beaches and thereby protect the health of beach visitors. The Beach Program focuses on five areas:

- Strengthening local beach WQS and monitoring efforts
- Providing faster laboratory test methods for beach water samples
- Predicting pollution problems by identifying causal sources and conditions
- Investing in human health and analytical methods research
- Informing the public about water quality problems at U.S. beaches.

Providing Funding for State Beach Programs

To improve water quality testing at the beach and to help beach managers better inform the public about water quality issues, Congress passed the Beaches Environmental Assessment and Coastal Health (BEACH) Act in October 2000. The Act authorizes EPA to award grants to eligible states to develop and implement beach water quality monitoring programs at coastal and Great Lakes recreational waters near beaches. These grants also support programs to inform the public about the risk of exposure to disease-causing microorganisms in the waters at the nation's beaches. In addition to notifying the public, states must also send EPA data on beach monitoring and notification for their coastal recreation waters, which EPA must maintain in a database.

In 2001, EPA started a BEACH Act grant program to help the 35 coastal and Great Lakes states develop and implement their monitoring and notification programs. Since then, the Agency has awarded more than $71 million in grant funds to eligible states to protect the nation's beaches, including $9.75 million in 2008. For more information, visit *www.epa.gov/waterscience/beaches/grants/*.

Improving the BEACH Act Grant Allocation Formula

A decade ago, state and local monitoring and notification programs differed across the country. EPA grants are designed to consistently protect and inform the public about beach waters in 35 eligible states. EPA uses an allocation formula to distribute these grant funds. The Agency consulted with states and the Coastal States Organization to develop the allocation formula, which considers three factors: beach season length, beach miles and beach use.

OST published a Federal Register Notice in August 2008 announcing proposed changes to the formula used to allocate BEACH Act grants to participating coastal and Great Lakes states (see *www.epa.gov/waterscience/beaches/grants/alloc-fs.html*). The incremental change to the formula, produced with the assistance of a multi-state stakeholder group, retains the existing formula distribution for the current level of funding while redistributing funds from states that are not spending grant funds in a timely or effective manner to other states. These reallocated funds and future grants appropriations are allocated on the basis of beach miles and beach use by the public.

EPA is considering three changes to its current BEACH Act implementation grant allocation formula, which would become effective in 2010:

(1) Making shoreline miles and coastal county population permanent factors in the allocation formula for the first $10 million of annual BEACH Act grant funds.

(2) Including a financial incentive component as part of the allocation formula to encourage states to spend their grant funds as efficiently and effectively as possible.

(3) Redistributing underutilized funds using a new allocation formula composed of values for beach miles and beach use.

National List of Beaches

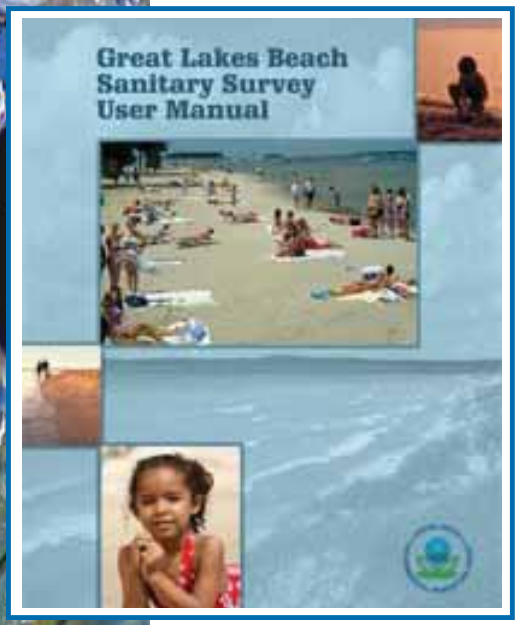
The BEACH Act also requires that EPA publish and periodically update a *National List of Beaches*, which provides a national baseline and measure of improvement of state beach monitoring across the country. It also provides information to the public about beaches in their state. OST published the first *National List of Beaches* in May 2004 and an updated list in September 2008. EPA compiled the 2008 list using information submitted by states from their 2007 swimming seasons. This list showed that in 2007, states identified 6,247 beaches, 59 percent of which were monitored and 41 percent of which were not monitored. These statistics represent an increase over the 2004 List, which showed that of 6,099 identified beaches, 57 percent were monitored and 43 percent were not. For more information, visit *www.epa.gov/waterscience/beaches/list/index.htm*.

Keeping Track of States' Beach Closings and Advisories

Each spring, OST releases a report summarizing the number, location and duration of beach closings and advisories ("notification actions") in the U.S. during the previous year's swimming season. In May 2008, OST released a national summary report of state data on beach closings and advisories during the 2007 beach season. In July 2008, the report was supplemented by state reports that include program-specific accomplishments, issues and other information provided by the states and made available on EPA's Beach Monitoring and Notification Web site (*www.epa.gov/waterscience/beaches/seasons/*). The report informs the public about how many beaches had notification actions, how many notification actions were reported and how long they lasted, and what percentage of days beaches were under a notification action.

Making Beach Sanitary Surveys Easier to Conduct

EPA developed the Beach Sanitary Survey Tool as a follow-up action to the 2004 Great Lakes Regional Collaboration (GLRC). The GLRC is a cooperative effort to design and implement a strategy for the restoration, protection and sustainable use of the Great Lakes. OST, Region 5 and EPA's Great Lakes National Program Office worked in collaboration with state beach managers to develop a draft Beach Sanitary Survey Tool in 2006. In the summer of 2007, the tool was tested at 61 beaches in the Great Lakes region, under a one-time EPA grant of $525,000. The state and local governments testing the tool provided comments to EPA, who then developed the final Beach Sanitary Survey Tool and announced its availability in May 2008.



A sanitary survey is a method of investigating the sources of fecal contamination to a water body. Beach sanitary surveys involve collecting information at the beach, as well as in the surrounding watershed. The Beach Sanitary Survey Tool helps beach managers in the Great Lakes identify sources of bacterial contamination at their beaches so that these sources can be corrected, resulting in more days that beaches are open for swimming. Beach managers can also use the sanitary survey results to prioritize state or county resource allocations to help target further testing and improve beach water quality.

EPA's Sanitary Survey Tool consists of a user's manual and three types of beach sanitary surveys in paper and electronic form (see *www.epa.gov/waterscience/beaches/sanitarysurvey/*). EPA expects that use of the tool will result in cleaner beaches in the Great Lakes. The tool can also be used by other states in the future for other marine and inland waters.

Partnering with States to Develop Numeric Nutrient Standards

Nutrient pollution, especially nitrogen and phosphorus pollution, is a leading cause of water quality impairments in the United States. As a consequence, EPA has made protecting and restoring the nation's waters from nitrogen and phosphorus nutrient pollution a top priority. Over the past ten years, OST and the Regions have worked with states and certain river basin commissions to help them adopt numeric nutrient criteria into state WQS. These standards are critical because they facilitate more efficient and effective water quality assessments and watershed protection management. To be most effective, nutrient standards should include numeric criteria for total nitrogen and total phosphorus levels (pollutants that cause impairments) and water clarity and chlorophyll a (indicators of the extent of a water body's pollution).

In December 2008, OST published the report "State Adoption of Numeric Nutrient Standards: 1998-2008." The report covers state progress since 1998, when EPA released its national strategy for helping states develop numeric nutrient WQS for their major water body types (lakes and reservoirs, rivers and streams, estuaries and wetlands). It also implemented EPA's 2007 commitment to report periodically on state progress in adopting such standards. The report can be found on OST's Web site at *www.epa.gov/waterscience/criteria/nutrient/files/report1998-2008.pdf*.

OST continues supporting the development and state adoption of nutrient standards by:

- Providing implementation and policy assistance directly to states that are close to adopting numeric criteria.
- Building capacity of states that are less prepared to adopt numeric criteria by assisting them with data and statistical analysis.
- Building a science-based foundation for developing new nutrient criteria for estuaries, wetlands and large rivers by continuing to develop new technical guidance.
- Communicating effectively the consequences of nutrient pollution and the benefits of nutrient controls to watershed groups and the general public.

Examples of the support OST provided in 2008 included:

- Assisting Arkansas and North Dakota with completion of their nutrient criteria development plans.
- Completing data analysis for certain water body types in Kentucky, West Virginia, Wisconsin, Colorado, Illinois, Montana, Puerto Rico and Indiana.
- Providing technical reviews of Minnesota and West Virginia lakes nutrient criteria and the Hoopa Tribe Klamath River criteria.
- Conducting technical Webcasts on *Nutrient Criteria Development for Michigan Streams and Lakes: Site-Specific & Effects-Based and Minnesota River Nutrient Criteria Development: Emphasis on Biological Indicators & Relationships*.
- Holding two workshops in September 2008 for the Region 4/6 Regional Technical Assistance Group. The first workshop focused on statistical tools for deriving nutrient criteria and the second one focused on how to use periphyton data from all Region 4 states in developing actual candidate criteria.

- Conducting a Webcast for watershed groups on *Managing Nutrients in Your Backyard* and releasing online and CD versions of an educational presentation, *Sowing the Seeds for Healthy Waterways: How Your Gardening Choices Can Have a Positive Impact in Your Watershed*, that can be used by naturalist instructors, community garden clubs and other organizations to educate the public about gardening practices that minimize the runoff of nutrients to waterways (see *www.epa.gov/waterscience/criteria/nutrient/garden.html*).

State-adopted and EPA-approved numeric nutrient standards are critical for preventing the harmful effects of nitrogen and phosphorus pollution in the nation's waters and for restoring water quality from impairment caused by this pollution. Over the past ten years, OST has worked in close partnership with states, territories, authorized tribes and certain river basin commissions to help them progress toward the goal of adopting numeric nutrient criteria into their WQS. Their progress has been uneven, however, as indicated in the report. OST will continue to make this work a high priority throughout 2009.

For more information about nutrient criteria development, visit *www.epa.gov/waterscience/criteria/nutrient/*.

Application of Sound Science

EPA uses the best scientific information available to anticipate potential environmental threats, evaluate risks, identify solutions and develop protective standards. Sound science helps EPA ask the right questions, assess information and characterize problems clearly to inform Agency decision makers. OST leads the National Water Program in applying sound science through its development of tools, data, recommendations, policies and regulations that serve as the foundation upon which all other EPA water programs are built and against which they measure progress.

In 2008, OST led a variety of projects that resulted in EPA gaining important scientific knowledge that will help protect water resources. OST's efforts in these areas provide other EPA offices and state co-regulators with access to important data to support their projects and programs:

- Prepared health effects documents for 46 unregulated contaminants, toxicological data updates on 73 regulated contaminants, quantitative risk assessments on four flame-retardants and draft toxicological reviews of three additional contaminants in support of drinking water protection.
- Developed and began implementing a *Critical Path Science Plan* that is providing answers to scientific questions about how to establish more protective recreational water quality criteria.
- Completed the *National Lake Fish Tissue Study*, the first study of its kind with the largest set of chemicals ever studied in fish.
- Furthered research and information gathering and dissemination regarding contaminants of emerging concern in water.
- Expanded EPA's aquatic life criteria methodology to allow for development of criteria for contaminants of emerging concern.
- Continued work to develop new recommended ambient water quality criteria for selenium, atrazine, ammonia, acrolein and phenol.
- Published a draft *National Water Program Research Strategy* identifying the research, science and technology needs of the National Water Program.

Drinking Water Support

OST develops risk assessments for drinking water contaminants in support of regulatory decisions made by EPA's Office of Ground Water and Drinking Water (OGWDW). This support includes development of contaminant candidate lists (CCL), regulatory determinations and six-year reviews of currently regulated drinking water contaminants.

OGWDW publishes a CCL every 5 years determining which contaminants are most likely to pose a risk to human health. OST

helps OGWDW identify the health effects used to determine the list. In 2008, EPA published its proposed third CCL (CCL3). OST provided support by developing the approach used to group contaminants based on the potency and severity of effects. To support CCL3, OST prepared health effects background documents summarizing available toxicological information and identifying research needs for the 35 contaminants that have available occurrence data.

In July 2008, EPA finalized the regulatory determinations for 11 chemicals from CCL2. OST prepared the health effects support documents for each of these contaminants. "Do not regulate decisions" were made for the 11 chemicals because they did not occur at levels of concern on a national basis. OST developed health advisories for three of these contaminants because data indicated they occurred in certain regions of the country. Health advisory values can be used by the states and local public health departments to make local decisions regarding drinking water contamination. Several chemicals were deferred for later consideration because of deficiencies in the occurrence data. All of the deferred chemicals are on the proposed CCL3.

EPA reviews each drinking water regulation at least every six years. In support of the Agency's second six-year review, OST updated the toxicological data for 73 regulated chemicals in 2008. These updates identify changes that might impact the health basis of the current regulations or suggest a need to revise the current health assessment due to research results published since the completion of the first six-year review in 2003.

In partnership with the Office of Research and Development (ORD), OST developed toxicological reviews for several chemicals of concern as ambient or drinking water contaminants that may affect human health. In June 2008, OST finalized quantitative health risk assessments for four brominated diphenylether flame-retardants. The assessments are available online at *www.epa.gov/iris*. OST also provided ORD with draft toxicological reviews for inorganic arsenic, copper and uranium.

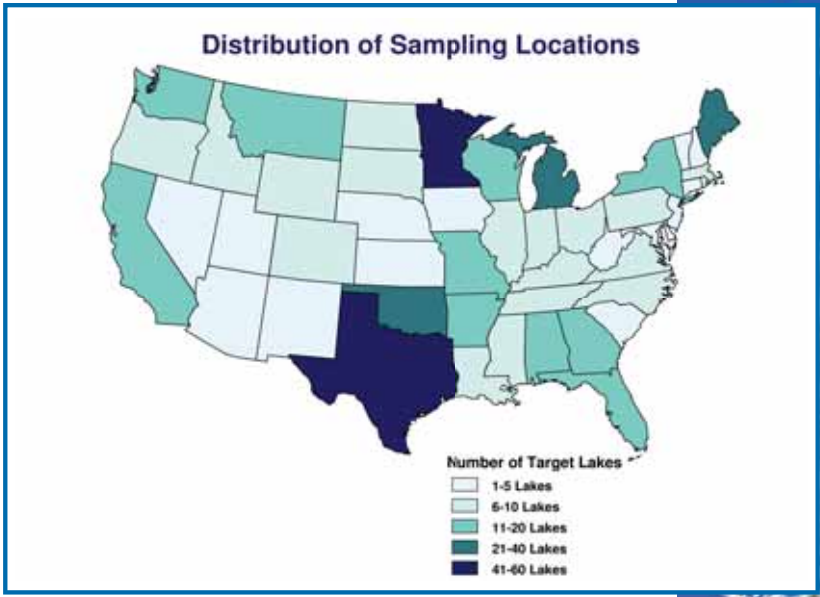
Developing New Recreational Water Quality Criteria

A critical component of OST's work is publishing new recreational water quality criteria that states can use to strengthen their WQS programs. The BEACH Act requires OST to develop these criteria, which protect millions of swimmers in the United States from illnesses associated with fecal water contamination. To revise the criteria to reflect current scientific data, OST and ORD are implementing the *Critical Path Science Plan* (Science Plan) developed by U.S. and international scientific experts and published by EPA in 2007. The Science Plan describes the high-priority research, overall research goals and key science questions associated with data gaps in the existing science that EPA will pursue, setting the foundation for the development of new or revised recreational water quality criteria recommendations.

In keeping with the Science Plan, OST met with stakeholders in February 2008 to communicate its research activities and obtain input on criteria implementation challenges. Through continued collaboration with ORD and experts in the stakeholder community, OST will help ensure research clarifies key questions and creates sound recreational water quality criteria.

For more information on the status of this research and OST's work to develop new recreational criteria, visit *www.epa.gov/waterscience/criteria/recreation*.

Establishing a National Baseline of Persistent, Bioaccumulative and Toxic Chemicals in Freshwater Fish



In December 2008, the first of two articles about EPA's National Lake Fish Tissue Study was published in the journal *Environmental Monitoring and Assessment*. The article describes the statistical design of the study, which allowed OST to develop national estimates for 268 persistent, bioaccumulative and toxic (PBT) chemicals in fish tissue from lakes and reservoirs in the lower 48 states. The study represents EPA's first effort to take a broad look at fish contamination since the late 1980s.

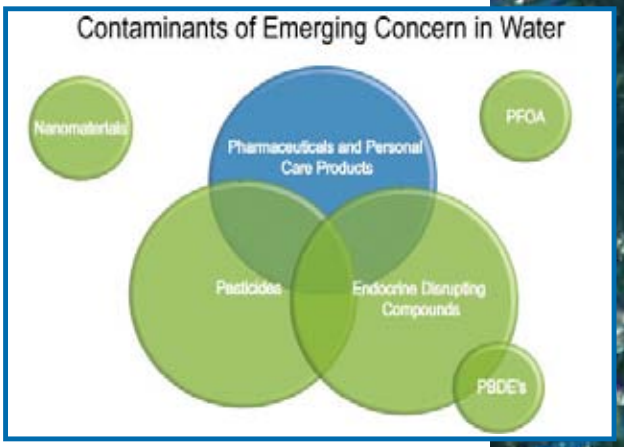
The study is the first national freshwater fish contamination survey based on a random sampling design. It also generated data that will define a national baseline against which EPA programs can assess the progress of pollution control activities to limit the release of these chemicals into the environment.

Preliminary results of the study have yielded compelling information. For example, mercury and PCBs were detected in all fish samples collected during the four-year sampling period (2000-2003). Dioxins and furans were detected in predator and bottom-dweller samples at 81 percent and 99 percent of the sites, respectively. DDT was detected in predator and bottom-dweller samples at 78 percent and 98 percent of the sites, respectively. The mercury concentrations for predators exceed EPA's recommended tissue-based criterion of 0.3 parts per million (ppm) for about half of the sampled population of lakes. EPA is using these data to support Agency efforts such as developing an Agency-wide strategy for monitoring PBT chemicals, assessing mercury in the environment and characterizing the state of the environment.

OST collaborated with ORD and worked with the Regions, 47 states, three tribes and two other federal agencies to conduct the study. A second journal article expected in mid-2009 will focus on implementation of the study and the final results.

For more information about this study, see OST's Web site at *www.epa.gov/waterscience/fish/study/*.

Understanding Contaminants of Emerging Concern in Water



The phrase "contaminants of emerging concern" (CECs) refers broadly to chemicals or microbiological organisms that are newly recognized in the environment as being of concern because of their known or suspected adverse ecological or human health effects. EPA needs to further study the occurrence, fate, and

transport of and exposure to these contaminants to better evaluate risk and determine whether they need to be controlled through federal regulations. EPA is aggressively pursuing efforts to improve its understanding of CECs. A key subgroup of CECs on which EPA and others are focusing attention is pharmaceuticals and personal care products (PPCPs).

EPA's Strategy for Addressing PPCPs in Water

In 2008, OST led the Office of Water in developing and implementing a strategy to improve the Agency's understanding of PPCPs in water and ability to take actions to address them. The strategy focuses EPA's efforts on four areas:

- Strengthening Science–identifying PPCPs in surface water and drinking water and targeting the collection of needed information on their occurrence, concentrations and effects
- Improving Public Understanding–providing information to help the public understand the issues and inform EPA's policy decisions
- Identifying Partnerships and Promoting Stewardship Opportunities–working with others to prevent CECs, particularly pharmaceuticals, from entering waters
- Taking Regulatory Action When Appropriate–using EPA's regulatory tools when sufficient data is available.

In 2008, OST made significant progress in implementing EPA's strategy by initiating or completing many projects with special emphasis on the areas of sound science and technology.

Strengthening Science

OST completed or began a number of activities to strengthen the Agency's scientific knowledge of the existence and behavior of PPCPs in wastewater effluent, biosolids and fish tissue:

- Completed initial development of three new analytical methods to detect and quantify over 150 PPCPs, steroids and hormones in wastewater and biosolids, as well as a new method to detect pesticides in these same media. All of these methods are available on OST's Web site at *www.epa.gov/waterscience/methods/method/ppcp/*
- Studied Nine Publicly-Owned Treatment Works (POTW) to better understand the occurrence of PPCPs in untreated municipal wastewater (POTW influent) and fully treated effluent, and to evaluate and improve the performance of analytical methods. OST plans to release the results of the study mid-2009.
- Began reviewing treatment technologies that may remove PPCPs from wastewater, such as activated sludge, ozone disinfection, high intensity ultraviolet light and de-nitrification. OST expects to release a report in spring 2009.
- Conducted the Targeted National Sewage Sludge Survey to produce the first national estimates of which pharmaceuticals, steroids and hormones may be present in sewage sludge and at what concentrations. A report on the survey results will be released in early 2009. The survey is a valuable step in advancing the understanding of what is present in treated sewage sludge and provides important input for EPA and others to use in evaluating biosolids generated by the nation's POTWs.
- Completed a fish tissue pilot study on PPCPs, the first U.S. field study to investigate the occurrence of 24 commonly-used pharmaceuticals and 12 personal care products in fish tissue collected from five streams near wastewater treatment plants. Preliminary study results were

released in August 2008 (see *www.epa.gov/waterscience/ppcp/studies/fish-tissue.html*). An article reporting final results from the pilot study will be published in late 2009 in a special issue about PPCPs in the environment in the journal *Environmental Toxicology and Chemistry*.

- Included fish tissue and surface water sampling for PPCPs as part of EPA's National Rivers and Streams Assessment. Field teams began collecting water and composite fish samples at approximately 150 urban river sites in 2008 and will continue through 2009. Results are expected in 2011. For more information, visit *www.epa.gov/waterscience/ppcp/studies/fish-expand.html*.
- Commissioned a National Academy of Sciences workshop, held in December 2008, to better understand how to evaluate the potential risks to humans of low concentrations of pharmaceuticals in drinking water (see *www.epa.gov/waterscience/ppcp/studies/nas-risk.html*).

Improving Public Understanding

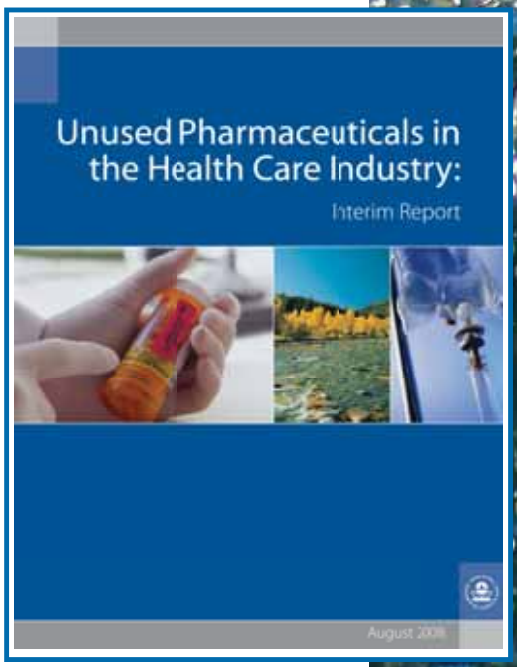
EPA believes it is important to communicate to consumers about how they can aid in preventing PPCPs from entering wastewater systems and water bodies.

In August 2008, OST launched a new Web site on PPCPs in water to explain to the public the Office of Water's strategy and activities it is pursuing (see *www.epa.gov/waterscience/ppcp*). The site links to EPA's Web site on PPCP research at *www.epa.gov/ppcp*.

OST has also led EPA's efforts to work with the Food and Drug Administration (FDA) and the White House's Office of National Drug Control Policy to revise the 2007 federal drug disposal guidelines to make them more consumer-friendly. This work will continue in 2009.

Identifying Partnerships for Stewardship Opportunities

EPA recognizes the importance of working with partners to implement its strategy successfully. In the spring of 2008, EPA's Office of Water sent letters to and met with state environmental and public health department directors, water industry associations, the environmental community and agricultural organizations to share and gather information about activities aimed at addressing PPCPs in water. Preventing pharmaceuticals from entering the environment is an important aspect of the strategy. OST has focused on making information available to the public on proper drug disposal through the federal disposal guidelines, by making information publicly available through its Web site and by supporting community drug take-back programs where consumers can dispose of their unused drugs. The Agency is working with the Drug Enforcement Agency to facilitate more take-back programs that comply with the Controlled Substances Act.



Taking Regulatory Action When Appropriate

EPA is using its regulatory authority when appropriate to address environmental concerns posed by pharmaceuticals in water.

EPA has been studying how the drugs enter waterways and what factors contribute to the current situation. OST initiated a study on the disposal practices of unused pharmaceuticals at health care facilities, such as

hospitals, hospices, long-term care facilities and veterinary hospitals to determine current disposal methods and identify alternate methods of disposal to avoid introducing these drugs into the water system. In August 2008, OST completed the Summary Interim Report, highlighting results from the study, and published in the Federal Register a proposed Information Collection Request (ICR) for the health care industry. For more information about the report and ICR, visit *www.epa.gov/waterscience/ppcp/* and look for the heading "Managing Unused Pharmaceuticals."

With regard to potential regulation of PPCPs in drinking water, the final CCL3 is scheduled for publication in August 2009. Based on public comments received in 2008, some pharmaceuticals are being evaluated for possible inclusion on the final list.

Expanding EPA's Aquatic Life Criteria Methodology

The recent pressures presented by CECs have made clear the need for EPA to develop ambient water quality criteria to help assess and manage the potential risk in the aquatic environment. The Agency is concerned about PPCPs that are designed to stimulate a physiological response in humans, plants and animals, and are commonly discharged at wastewater treatment plants.

Led by OST staff, EPA's CEC workgroup prepared an exploratory paper, "Aquatic Life Criteria for Contaminants of Emerging Concern: Challenges and Recommendations," to present some of the issues facing the Agency regarding the development of criteria for CECs. In the summer of 2008, EPA sought advice from the Science Advisory Board (SAB) Ecological Processes and Effects Committee regarding the technical merit of recommendations presented in the paper that will serve as a basis for future development of water quality criteria for CECs. The paper discussed how principles in the 1985 "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" (1985 Guidelines) could be adapted to develop criteria for CECs.

The SAB Committee completed their comments and final report on the paper in December 2008. In 2009, OST will convert the revised paper into a Technical Support Document to complement the existing Guidelines.

For more information about aquatic life criteria, visit *www.epa.gov/waterscience/criteria/aqlife/*.

Refining Existing Ambient Water Quality Criteria

In an effort to further protect the nation's waters, OST continues to refine EPA's national recommended ambient water quality criteria, the pollutant concentrations necessary to protect designated uses in surface waters. In 2008, EPA made recommendations for revised selenium, atrazine, ammonia, acrolein and phenol criteria.

Selenium Criteria for Protection of Aquatic Life

EPA published a draft national recommended tissue-based aquatic life criteria for selenium and requested scientific views in 2004. This draft freshwater chronic criterion was based on a study of over-winter mortality of juvenile bluegill sunfish. Uncertainties about the interpretation and use of this study led EPA to conduct further research to better characterize the over-winter mortality phenomenon. EPA completed this research in early 2008 and released a Notice of Data Availability (NODA) in the Federal

Register in October 2008. The NODA consists of a report on EPA's research, as well as a bibliography of additional selenium toxicity research completed since 2004. EPA will re-propose draft criteria in 2009.

For more information about selenium ambient water quality criteria for the protection of aquatic life, visit *www.epa.gov/waterscience/criteria/selenium/*.

Atrazine Criteria for Protection of Aquatic Life

In 2003, EPA published draft national recommended ambient water quality criteria for atrazine, a widely used herbicide. Published to obtain scientific views, the draft criteria are based on the analysis of the Comprehensive Aquatic Systems Model (CASM) that provides the ability to assess the effects of the aquatic plant community's exposure to atrazine. In 2007, the Scientific Advisory Panel (SAP) for EPA's Office of Pesticide Programs (OPP) reviewed current amphibian research to determine the validity of the model and associated eco-monitoring work. The SAP identified several areas of the model requiring further development and evaluation. In 2008, OST and OPP implemented the SAP's recommendations, expanding the sensitivity analysis and validating the model for its use as a tool to interpret atrazine monitoring data. EPA now plans to release the atrazine criteria document and draft implementation guidance in 2009.

For more information about the atrazine ambient water quality criteria for the protection of aquatic life, visit *www.epa.gov/waterscience/criteria/atrazine/*.

Ammonia Criteria for Protection of Aquatic Life

In 1999, EPA published revised national recommended aquatic life criteria for ammonia to protect salmonids' greater than previously recognized sensitivity to ammonia, particularly in early life stages. Recent toxicity data for freshwater mussels indicates that larval and juvenile mussels may be more sensitive to ammonia than the salmonids on which the 1999 criterion was based. In response, OST is re-evaluating the 1999 ammonia aquatic life criteria regarding the protectiveness of the criteria for freshwater mussels.

In 2008, to evaluate uncertainties about the interpretation and use of existing larval and juvenile mussel toxicity data, an OST-led workgroup developed proposed position statements on the issues of scientific uncertainty. OST conducted external peer reviews of the workgroup's proposed position statements. In 2009, OST plans to finalize its re-evaluation and publish a draft ammonia criteria re-assessment.

For more information about ammonia ambient water quality criteria for the protection of aquatic life, visit *www.epa.gov/waterscience/criteria/ammonia/*.

Acrolein Criteria for the Protection of Aquatic Life

In December 2008, EPA published in the Federal Register draft national recommended criteria for the protection of freshwater aquatic life for acrolein based on EPA's 1985 Guidelines. Toxicity data and other information on the effects of acrolein were obtained from reliable sources and subjected to both internal and external peer review. Saltwater criteria could not be derived for acrolein because of a lack of acute and chronic toxicity data. Comments on the draft freshwater criteria for acrolein are being accepted through March 17, 2009.

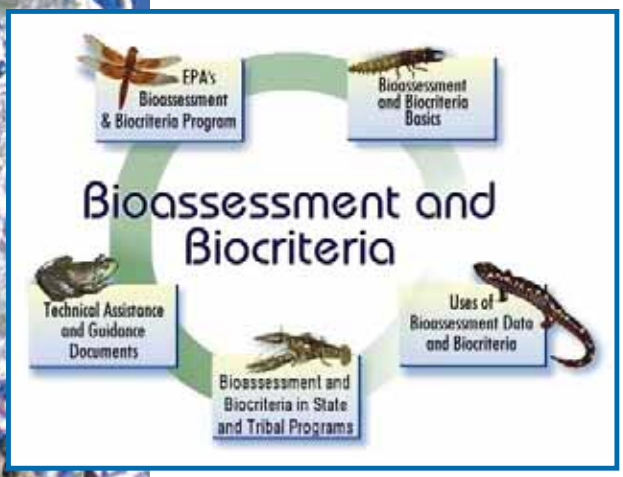
For more information on the development of aquatic life criteria for acrolein, visit *www.epa.gov/waterscience/criteria/acrolein/aq-draft.htm*.

Acrolein and Phenol Criteria for the Protection of Human Health

In September 2008, EPA published in the Federal Register updated draft national recommended water quality criteria for the protection of human health for acrolein and phenol to obtain scientific views. EPA revised the human health criteria based on EPA's 2000 "Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health." This methodology incorporates significant scientific advances made in the last two decades, particularly in the areas of cancer and noncancer risk assessments, exposure assessments and methodologies to estimate bioaccumulation in fish. The two updated criteria integrate new reference doses for acrolein and phenol. The new reference dose values have already been published in the Agency's Integrated Risk Information System (IRIS). EPA plans to publish final human health criteria for acrolein and phenol in spring 2009.

For more information on EPA's human health criteria for acrolein and phenol, visit *www.epa.gov/waterscience/criteria/humanhealth/*.

Developing and Using Biocriteria



The numbers and kinds of organisms present in water bodies can provide direct information about the health of those water bodies. Biological reference measurements, or biocriteria, can be developed to measure and assess the health of the water bodies, particularly whether they are attaining designated aquatic life uses.

In 2008, OST's biocriteria program made significant progress on several activities, including: (1) working with the Regions and certain states and tribes, to develop, test and implement biological criteria in state and tribal WQS, including piloting methods to refine aquatic life uses; (2) partnering with regional-state nutrient criteria teams in Regions 2, 4 and 8 to address the link between nutrient and biological criteria development in New Jersey, Florida and Colorado, respectively; (3) drafting an educational bioassessment Web site for high school students to teach them how to determine the health of local water bodies based on the type and amount of aquatic species present; and (4) developing a draft guide that explains how to incorporate biological information into states' WQS to define more precisely aquatic life designated uses of water bodies, the goals for restoring impaired waters and the baseline conditions for preventing future degradation.

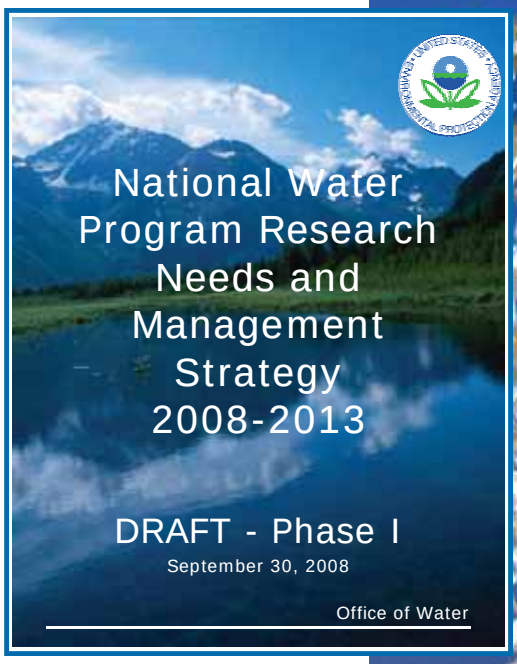
For more information about OST's biocriteria program, visit *www.epa.gov/waterscience/biocriteria/*.

National Water Program Research Strategy

ORD and other potential collaborators have expressed the desire for clarification of the National Water Program's research needs. The Regions and place-based programs have also requested more input into the types of research conducted on EPA's water programs. To meet those requests, EPA's Office of Water, led by OST staff, released Phase 1 of its National Water Program Research Needs and Management Strategy on September 30, 2008. The Phase 1 document is a compilation of the research needed by the National Water Program to successfully achieve the goals and obligations required by various water-related statutes, regulations and consent decrees, as well as those captured in the Agency Strategic Plan. Phase 2 will prioritize the research captured in the Phase 1 document.

The Phase 1 Strategy:

- Ensures that the National Water Program's water research, science and technology needs are comprehensively identified and documented.
- Expands partnerships and collaborations across EPA, the federal research family and the broader research community to meet water research needs.
- Supports commitments to collaborative corporate planning, prioritization and research management to meet the environmental goals of the National Water Program.



The Phase 1 Strategy helps the National Water Program's partners in several ways. The strategy helps EPA research partners, such as ORD, align their research with programmatic research needs. It also helps potential external partners demonstrate the connection of their research to the interests of EPA and provide the Agency with a larger pool of potential collaborators. The strategy also provides the National Water Program with a foundation for determining priorities and serves as a tool to manage the full portfolio of research needs. Phase 2 of the strategy is anticipated to be available in September 2009.

Education, Outreach and Training

Fish Kids Educational Web Site

In August 2008, OST launched a new Web site (*http://www.epa.gov/fishadvisories/kids/*) to help children and their parents choose the healthiest fish to eat. The site was selected as the August site of the month by kids.gov, the official kids' portal for the U.S. government.

Whether they catch their own fish or buy it in a store, children and their parents can use the Web site to learn how to select fish that are low in contaminants. The Web site includes stories and interactive games to teach children ages 8-12 how to recognize common fish species and use fish advisories.

Educational Products About Water Quality for Grades K-2, 3-5 and 6-8

OST offers a variety of educational materials for students and teachers. Many are online and all are available in hard copy from EPA. Of particular interest is "A Day in the Life of a Drop," a series of worksheets developed in partnership with EPA's Office of Wastewater Management that are designed to help students understand where water comes from, where it goes once it is used and how their water use affects the environment. These worksheets include a teacher's guide with background information. OST also offers a tip sheet on ideas for surface water science fair projects for middle school students and crossword puzzles and other activities for elementary school students that help them learn the importance of protecting water quality.

Partnership to Reduce Dental Amalgam Discharges

On December 29, 2008, the Office of Water signed a Memorandum of Understanding (MOU) with the American Dental Association (ADA) and the National Association of Clean Water Agencies (NACWA) to establish and monitor the effectiveness of a Voluntary Dental Amalgam Discharge Reduction Program. Dental amalgam is used to restore teeth in dental practices. It is an alloy that contains mercury (approximately 50%) bound together with other metals. The purpose of this MOU is to have dental offices install and properly maintain amalgam separators and recycle the collected amalgam waste. The program will also establish performance goals and track the percentage of dental offices that install and use amalgam separators. This collaborative effort among EPA, ADA and NACWA will help build awareness and stress the importance of pollution prevention at the local, state, tribal and national levels.

To read the MOU, visit *www.epa.gov/waterscience/guide/dental/files/mou.pdf*.

Earth Day 2008 Collegiate Water Debates

On April 22, 2008, OST hosted students from Howard University, Michigan State University, Wake Forest University and University of Mary Washington to debate the pros and cons of two contentious topics: (1) whether downstream states should have authority to control pollution sources from upstream states directly and (2) whether to fund the replacement of the nation's water infrastructure through a bottled water tax. Hundreds of EPA employees and guests gathered to watch and learn from the debates, each of which lasted 90 minutes. The winners were decided by a panel of EPA subject matter experts. The event also featured a speech by Jeff Porro, author of the recent hit film *The Great Debaters*.

Water Quality Standards Academy

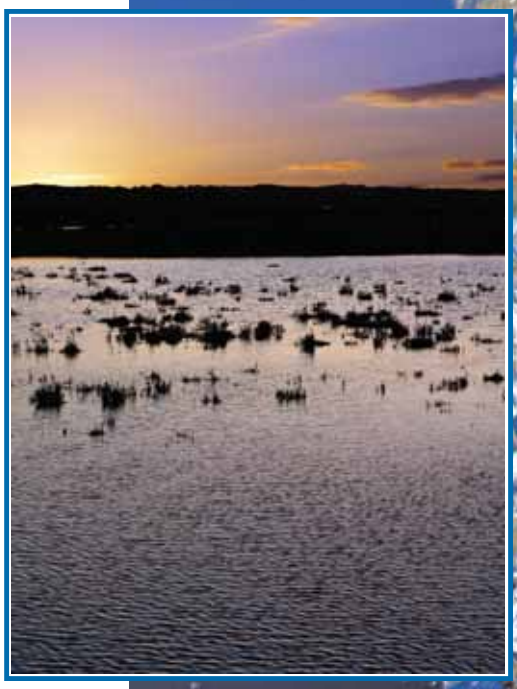
In 2008 the Water Quality Standards Academy (WQSA) continued its tradition of more than 14 years, providing high-quality training on the components of WQS and related regulatory programs. OST held two courses in the Washington, DC area and one customized course in California during 2008. These three courses trained 200 federal and state water quality professionals. Additionally, in May OST announced its new multimedia Internet-based training program. The online course makes training more widely available, easily accessible and cost effective, allowing both the public and WQS professionals to remain engaged. In 2008, 245 people completed the WQSA Online course.

The WQSA supports standards development by offering online, classroom-based and intermediate courses. The online course serves as an introduction to WQS, providing preparation for the classroom courses. The classroom-style, five-day course is offered at least twice a year to students with less than six months experience in the field. Students study the interpretation and application of WQS regulations, policies and program guidance and the development of water quality criteria. After completing the basic course, students can further their training by taking intermediate courses offered live via satellite broadcast. In the intermediate courses, students study related concepts in greater depth through lecture, discussion and case studies.

Providing Training for Indian Tribes

Through EPA's Consolidated and Central Tribal Training program, the Agency seeks to enhance tribes' abilities to manage water programs. Led by OST staff, this initiative centralizes all of EPA's training courses that assist tribes with creating and implementing water quality programs consistent with the Clean Water Act. The program will result in improved tribal access to training and help tribes create water quality programs that protect surface waters in tribal areas. The consolidation of EPA tribal training has two phases. Phase 1 began in 2008, resulting in a new EPA Web site that organizes existing and planned training courses from across the Agency (*www.epa.gov/water/tribaltraining/*) and inclusion of tribal members in the group of instructors who teach the Water Quality Standards Academy. In Phase 2 (2009-2012), EPA's Office of Water and the Regions will modify existing training courses and create new courses to meet unaddressed and additional needs.

Moving Forward in 2009



Although OST accomplished much in 2008, even more work remains for 2009. To increase protection of water quality and aquatic ecosystems through technology-based solutions, OST will finalize the effluent guidelines for the construction and development industry, propose the second phase of cooling water intake regulations under CWA section 316(b), revise effluent guidelines to control the runoff associated with deicing aircraft and runways, publish a report on drinking water treatment technologies, and publish the 2010 Preliminary Effluent Guidelines Program Plan under CWA section 304(m).

In the upcoming year, OST will continue to collaborate with states to accelerate their adoption of numeric nutrient criteria, publish numeric nutrient criteria for Florida, support tribes by continuing to build the Consolidated and Central Tribal Training program, enhance the revised BEACH Act Grant allocation formula by compiling data on beach mileage to ensure that distributed funds are used effectively, and improve the Agency's WQS management targets by decreasing the time necessary to complete actions on state standards submittals. In addition, OST will explore ways to help states make incremental progress toward restoration goals for impaired waters and work to develop tools that will help states address the impacts of climate change on water quality.

OST will also continue to provide leadership to the National Water Program in science application. Through research and collaboration, we will progress in developing recreational criteria, evaluating contaminants of emerging concern, assessing pollutants in biosolids, and refining ambient water quality criteria; and will continue to support EPA's Drinking Water Program, particularly in its final release of the CCL3.

OST invites you to track our progress throughout 2009 at *www.epa.gov/waterscience/*.

OST welcomes your suggestions on how to make this report more useful for our readers.

Please email comments to: lalley.cara@epa.gov.