EPA RESEARCH

EPA

TABLE OF CONTENTS

For more than 45 years, EPA has focused on its mission of protecting human health and the environment by protecting the air we breathe, the water we enjoy and drink, and the land on which we live. Every step along the way has been supported by science. Science and technology have served as the Agency's foundation to uphold the nation's landmark environmental statutes. Along the way, the Agency has continually honed its research to ensure that the information, innovative tools, and technical solutions EPA delivers match the real-world environmental and public health challenges faced by states, tribes, and communities.

From communities struggling to rehabilitate contaminated land in ways that revitalize local economies, to small towns looking for affordable new technologies to protect their drinking water systems, EPA research is making a difference. EPA scientists are working with farmers in Oregon and Vermont seeking to reduce nutrient pollution, and with state and local governments in Utah and Michigan to reduce particle and ozone air pollution and protect public health. This report highlights these stories and more.

Scientific and technical expertise are critical, but finding solutions also requires genuine cooperation. EPA scientists are working with partners across the country to deliver solutions to a wide range of environmental challenges. The impact is a noticeably cleaner and healthier environment.

For more stories about EPA research go to: www.epa.gov/sciencematters

PROTECTING THE AIR WE BREATHE

IMPROVING AIR QUALITY

Every day, millions of Americans encounter traffic-related air pollution, which can have negative health effects. EPA is researching this type of air pollution, called near-source pollution, and developing strategies to reduce the impact of traffic emissions on public health.

Kansas City Transportation and Local-Scale Air Quality Study

Many residents of southeast Wyandotte County, Kansas, are interested in learning more about local air pollution emitted by multiple transportation sources. Fleets of diesel trucks, major highways, light industry, and two rail yards are all part of this region. EPA is collaborating with residents and other stakeholders to investigate how factors like weather and transportation impact air quality. In this year-long collaboration, researchers are measuring fine particle pollution known as PM2.5 and black carbon, a component of PM2.5. These pollutants can impact lung and heart health, contributing to asthma and other respiratory problems, and trigger heart attacks and strokes in people with cardiovascular disease. Results of the study will help residents understand the extent of local air pollution.

Measuring Air Quality on the Streets of Oakland, California

Air pollution in cities can change over short distances, meaning that air quality and pollution can vary within a few blocks. Air pollution monitors used for regulation are stationary and therefore do not capture variations in air quality over these small distances. EPA collaborated with Aclima, a technology company, on their year-long study that equipped Google Street View cars with mobile air quality technology in Oakland, California. Researchers found that the technology was effective in providing information on urban air pollution patterns by block. EPA continues to work with Aclima to advance air quality measurement technologies.

Recommendations for Roadside Barriers to Improve Air Quality

Roadside barriers are walls built alongside roadways or trees and bushes that are planted along the road. EPA study findings show that properly designed roadside vegetation and noise barriers can reduce downwind pollution concentrations by altering air flow and intercepting pollution. Roadside vegetation can be most effective at reducing air pollution when barriers are thick and extend or wrap around an area so that pollutants cannot flow around the edges. EPA scientists have compiled a report with these findings *"Recommendations for Constructing Roadside Vegetation Barriers to Improve Near-Road Air Quality."*

Giving Citizen Scientists the Tools They Need to Protect Their Air

One of the challenges with conducting local air quality monitoring projects is knowing whether low-cost air sensors provide reliable data. Members of two groups in North Carolina worked with EPA researchers to evaluate a user guide and analysis tool that can assess the performance of these devices. The community groups used the guide and tool to evaluate the performance of low-cost sensors and provided feedback on how to improve them.

For more information about EPA's air sensor research, visit https://www.epa.gov/air-sensor-toolbox

By air, land, and sea: tackling the ozone issue on Lake Michigan's shores

HELPING STATES MEET AIR QUALITY STANDARDS

EPA provides the science critical to developing and implementing Clean Air Act regulations that protect the quality of the air we breathe. EPA researchers are on the front lines in Utah, Michigan, and elsewhere to help states address highly complex air pollution problems that are impacting public health.

Utah Winter Fine Particle Study

During the winter in Utah's northern valleys, cold air inversions trap pollution emitted from multiple sources, including vehicles, industry, and agriculture. This allows for the mixing of atmospheric chemicals that can form PM2.5, which is harmful to health at high levels. As a result, the area's more than two million residents experience levels of PM2.5 that exceed air quality standards at times during the winter. This has contributed to an increase in emergency room visits for asthma and in the risk for coronary events like heart attacks.

To assist the community, EPA scientists participated in the Utah Winter Fine Particle Study, one of the most comprehensive efforts to date to analyze the area's pollutants and determine the chemical processes in the atmosphere. Utah will use the data to determine the most effective strategies to reduce PM2.5 levels during the winter months and improve air quality for public health. The study is also expected to help other states with similar mountain valleys make decisions about air quality to protect their residents.

Lake Michigan Ozone Study

Halfway across the country, another community is having trouble keeping air pollution below set standards. Despite controls implemented over the years to lower emissions of air pollutants, communities near the shoreline of Lake Michigan still experience elevated ozone levels that exceed federal standards. Contaminants such as nitrogen oxides and volatile organic compounds interact with sunlight and hot temperatures to form ozone.

To help this community and other similar areas, EPA scientists collaborated with multiple agencies for the Lake Michigan Ozone Study–a field study to better understand ozone chemistry and meteorology along the Wisconsin-Illinois Lake Michigan shoreline. They took measurements over the land and the Lake to understand how lake breeze circulations and atmospheric dynamics may transport ozone and ozone precursors to the shoreline. With this information, state and local governments will be able to determine the best steps to protect their communities.

COLLABORATING WITH DOCTORS AND HEALTH PROFESSIONALS

EPA accomplishes its mission of protecting public health through research and partnerships that help people make healthy decisions for themselves and their communities. EPA works with public health partners to share information and tools, and to collaborate on projects. Working directly with doctors and health professionals gives EPA insight into public health challenges and science needs at a local level. These collaborations are already having positive impacts.

Teaming Up with Doctors to Fight Heart Disease

Working with partners, EPA is increasing outreach and training for public health professionals on the impacts of air pollution and cardiovascular health. EPA has been raising awareness of heart disease and its link to air pollution and other environmental factors as a partner in Million Hearts, a national initiative to prevent heart attacks and strokes.

EPA worked with the Centers for Disease Control to develop a course for healthcare professionals called Particle Pollution and Your Patients' Health. The course provides tools to help patients understand how particle pollution affects health and how to effectively use the EPA Air Quality Index.

PROTECTING PEOPLE FROM WILDFIRE SMOKE

Fires are increasing in frequency, size, and intensity, yet there is limited knowledge of the health impacts of smoke emissions and preventive measures that can be taken to reduce public health impacts. EPA is using its expertise in air quality research to fill in these gaps and help reduce the impact of wildfires and controlled burns.

Helping Kansas with Controlled Burns

Central Kansas is home to the largest remaining tallgrass prairie in North America. Fires were once a natural occurrence, but now they are intentionally set during prescribed burns. The fires burn the invasive plants and rejuvenate the soil, which encourages growth of native grasses. This benefits farmers and ranchers who graze cattle and bison on the land. However, the smoke plumes can contribute to air pollution in nearby communities and farther downwind that can harm people's health.

To help with this issue, EPA researchers traveled to Flint Hills, Kansas, in fall 2017 to take air measurements during the planned fires using a novel air sampling system developed by EPA. Researchers had previously visited the area in spring 2017 during peak burn season to take air samples. They are using the two data sets to see if there are any differences in smoke plume emissions from spring to fall. This information will help determine when and where to schedule the burns, which will help states maintain the prairie ecosystem while ensuring clean and healthy air.

Citizen Science to Understand Wildfire Impacts and Improve Communication

Exposure to wildfire smoke can be acute and unexpected, and last hours to weeks. That's why EPA developed the Smoke Sense app, which allows anyone with a smartphone to participate in an EPA study to understand the health impacts of wildfire smoke.

The Smoke Sense app gives users air quality information from EPA's Air Quality Index based on their location. During the pilot study, which ran from August to October 2017, participants could use the app to log health symptoms so that both researchers and users could get a better understanding of the impact that wildfire smoke has on health. Researchers are currently analyzing this data to inform health risk communication strategies. The app is available for Android and iOS, and is currently being updated for 2018.

Smoke Sense

The Health Impacts and Costs of Wildfires

Researchers at EPA and academic colleagues are learning more about the public health burden associated with wildfires. In a recently published study, the team estimated the number of premature deaths and illnesses caused by pollution related to U.S. wildfires and the economic value of that health burden.

The study found that between 2008 and 2012, wildfires posed a significant burden to public health leading to increased hospital admissions for respiratory and cardiovascular problems, and even deaths. These health effects had an economic impact as well. The economic value of these impacts is in the tens to hundreds of billions of US dollars. This study, the first of its kind, provides information that state and local health officials can use to protect the health of their communities.

NoMonia™ was selected as the winner of the "Executive Board Technology Award" at the 2017 National Federal Laboratory Consortium. An April, 2017 announcement in Water Online notes that "The award highlights a successful technology transfer from a Federal Agency to a private sector company to commercialize, design, and market the aforementioned technology."

PROTECTING OUR WATER

IMPROVING WATER QUALITY

EPA researchers provide the scientific and technical support needed to maintain drinking water quality standards. EPA researchers work with states, local governments, and utilities to keep clean drinking water flowing. Recent EPA drinking water research achievements include the following:

Working with Communities to Solve a Big Problem for Small Water Systems

Across the United States, ammonia is found at high levels in many agricultural areas where groundwater is the primary drinking water source. When broken down during the water distribution process, ammonia can be a significant source of nitrate, which in turn can pose significant water quality issues including corrosion, poor taste and odor, and health risks to infants. Ammonia can also compromise the effectiveness of traditional water treatment for removing arsenic and other contaminants.

EPA researchers developed and pilot tested a new, affordable and easy-to-use drinking water treatment process for small drinking water systems—now known as Patent No. US 8, 029,674 and marketed commercially by AdEdge Water Technologies under the trade name of NoMonia™. The innovative technology uses naturally occurring microorganisms to remove multiple contaminants in a single treatment process, without generating hazardous waste.

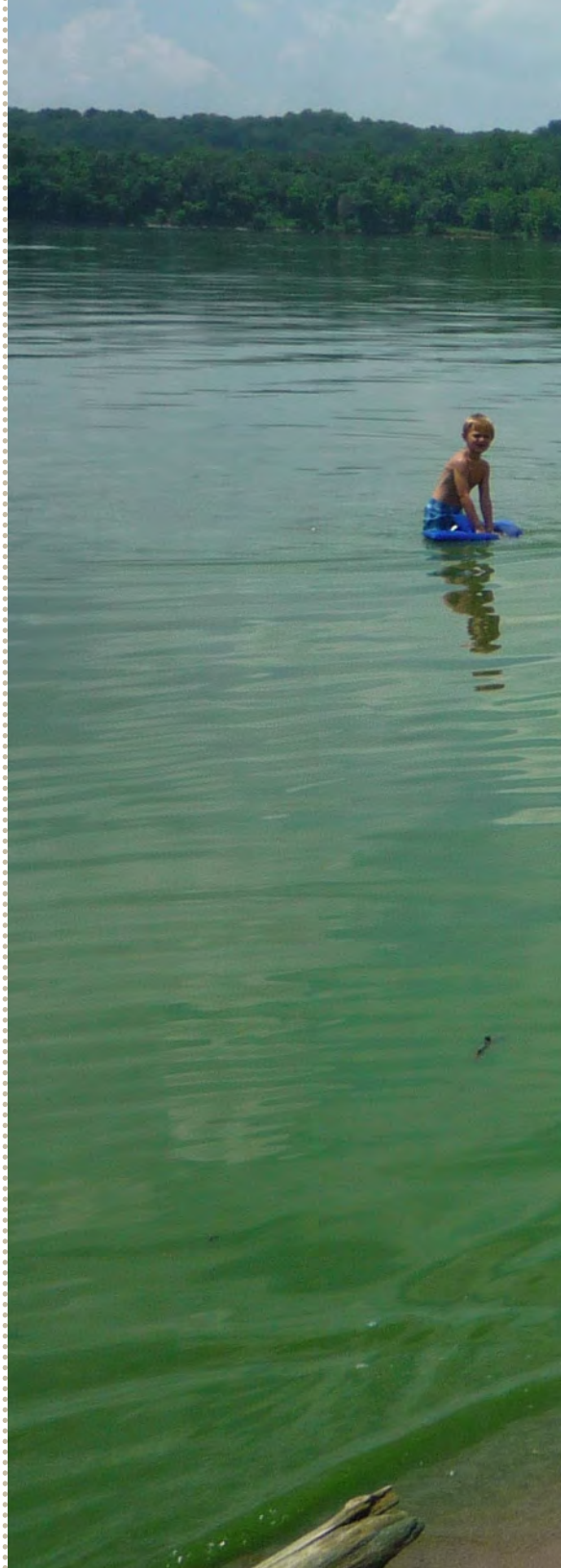
Working with AdEdge, EPA researchers conducted additional pilot tests in several small, rural communities, including most recently in Gilbert, Iowa. Based on piloting, the EPA technology proved to be the low-cost, sustainable solution they needed.

New Tools to Protect Private Wells

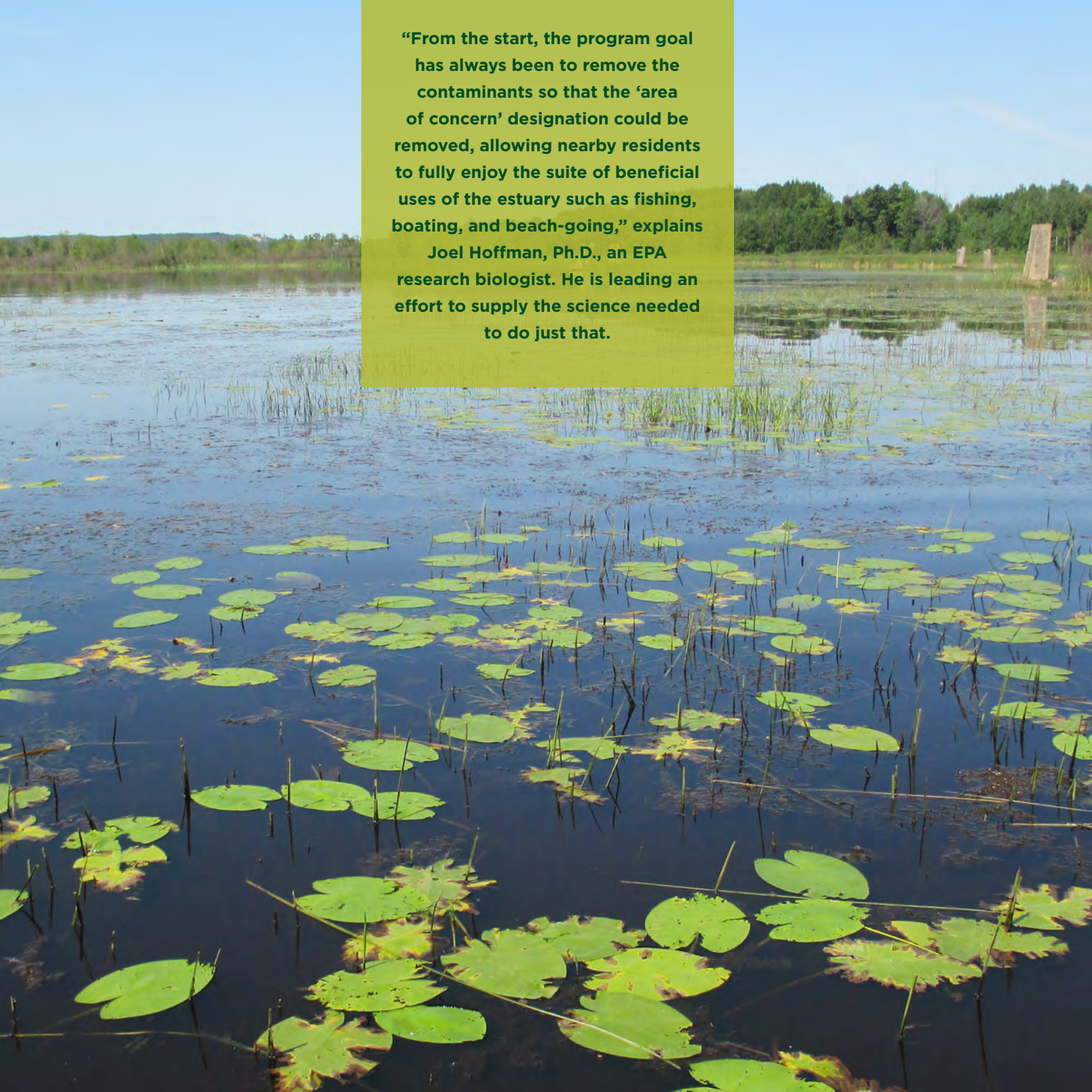
Protecting private drinking water wells is sometimes difficult because their locations are not compiled or mapped in most states. Using Oklahoma as a test case, EPA researchers developed techniques to estimate the number and distribution of private wells and their proximity to underground storage tanks (primarily used for gasoline and other petroleum products), which can leak and contaminate wells. EPA's estimated data were combined with a geographic information system to visualize the distance between storage tanks and private domestic wells. The new tool will be used by EPA, states, and local authorities to protect private drinking water wells.

Protecting Local Drinking Water Sources from Harmful Algal Blooms

Over the last decade, there's been a noticeable increase in cyanobacteria in Lake Harsha, a vital source of drinking water for more than 200,000 residents of Clermont County, Ohio. EPA established a local cooperative—made up of scientists, engineers, economists, and water resource professionals—to find the best ways to improve water quality in the surrounding watershed. Using EPA's Soil and Water Assessment Tool, the group found the source of the majority of excess nutrients. These findings helped determine what may be contributing to Lake Harsha's increase in cyanobacteria. The cooperative is finding ways to improve the watershed and protect drinking water, while serving as a model for other communities facing similar challenges.



According to John McManus, Administrator of the Clermont Soil and Water Conservation District, "This partnership has made a huge difference in what we've been able to do at the local level. The research and expertise involved in the Cooperative has made things possible that we would never have been able to do on our own."



“From the start, the program goal has always been to remove the contaminants so that the ‘area of concern’ designation could be removed, allowing nearby residents to fully enjoy the suite of beneficial uses of the estuary such as fishing, boating, and beach-going,” explains Joel Hoffman, Ph.D., an EPA research biologist. He is leading an effort to supply the science needed to do just that.

MAKING OUR COMMUNITIES HEALTHIER

GREAT COMEBACKS: COMMUNITY SUPPORT SPARKS REVITALIZATION AND RESILIENCY

Everyone loves a good comeback story. EPA researchers are empowering states and local communities with the tools, data, and science they need to revitalize their local economies and improved public health. A critical element in any good comeback story is the ability to rebound following a major setback. Here, too, EPA researchers are identifying how science and innovation can help communities be better prepared for events such as heat waves and storm surges.

Staging a Comeback Along the St. Louis River

EPA and a host of partners have been working to remediate, restore, and revitalize the St. Louis River Estuary, an area officially declared a "Great Lakes Area of Concern" for its legacy pollution. The goal is to improve water quality, allow for recreation, and for the ecosystem to once again support large runs of fish, bountiful stands of wild rice, and a nesting habitat for birds.

The EPA team has employed a host of innovative research methods including reviewing public Instagram photos to understand what is important to the local community. As aspects of the local environment are identified, mapped, and quantified, clean up funds can be directed to areas where impacts are maximized. While much work remains to be done, there are many encouraging signs that impairments will continue to shrink, and the "area of concern" designation will be lifted by the 2020 goal. By then, the cargo vessels moving in and out of the harbor will have plenty of company in the form of people fishing, birding, and swimming.

Living Shoreline

Coastal communities can be vulnerable to large storms. EPA researchers, working with local stakeholders, state, and federal partners, developed a set of recommendations for the Narrow River Estuary, part of the larger Narragansett Bay Estuary in southern Rhode Island to protect it from future extreme events. Loss of coastal marshes was identified as the main environmental threat facing these communities. The partners worked together to build a "living shoreline" and improve marsh conditions to better withstand flooding. These steps will help the Narrow River Estuary continue to be a great habitat for wildlife, provide flood abatement, and become more resilient to extreme weather events in the future.

Resiliency Case Studies: Washington, DC and Worcester, MA

A major part of this work is looking at urban environments and how to build resilience. EPA researchers looked at two cities—Washington, D.C., and Worcester, Massachusetts—to highlight how to quantify vulnerabilities and identify steps to combat them. Researchers evaluated these two cities because they offered excellent contrasts. Washington, D.C., is a populous city with geography that makes it vulnerable to sea level rise, storms, heat waves, and floods. Alternatively, Worcester has a smaller population and is vulnerable to extreme seasonal weather changes that can spark urban fires. These threats highlight the need for adaptation and mitigation efforts in both cities. Results were released in a final EPA report that evaluates eight aspects of resilience and has resources for local professionals to help focus their planning efforts.

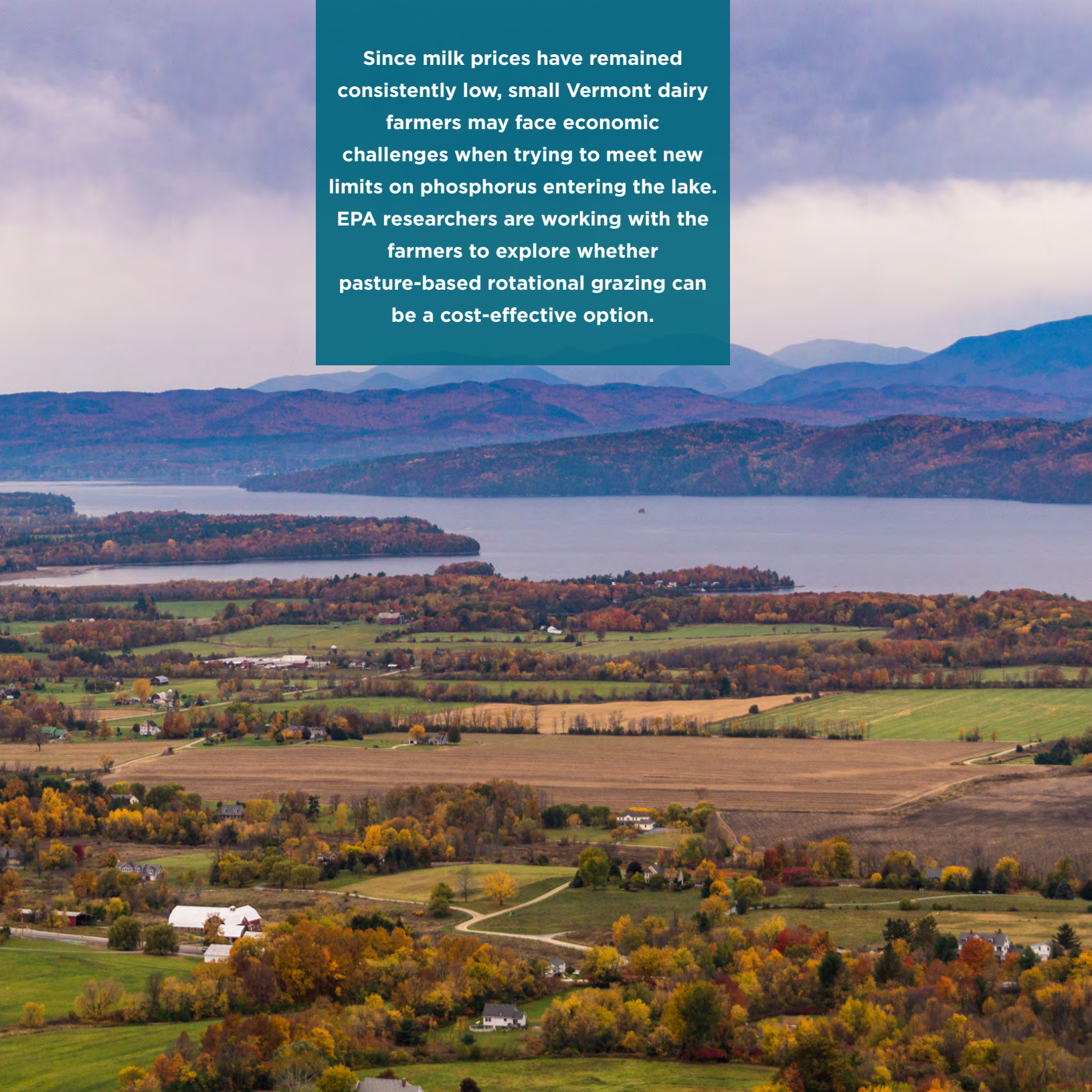
Making A Visible Difference in Lawrence, MA

Lawrence, Massachusetts is a mill and manufacturing city of approximately 76,000 people, primarily a poor (34.3% of the population below the poverty) and minority (74% Hispanic) community. The city is located along the Merrimack River, the source of the city's drinking water as well as for surrounding communities, serving more than 600,000 people in total.

Through a series of stakeholder engagement workshops and other venues, EPA scientists have been working with the community and other partners to enhance the quality of the Merrimack for drinking water and recreational opportunities, reduce flooding that threatens residents and the local water treatment facility, and address environmental justice issues. The work includes developing a comprehensive water strategy with the City and its partners, installing real-time water quality monitoring along the river, developing a flood resilience strategy for drinking water treatment operations, and working with youth to provide employment opportunities through green jobs.

The Excess Food Opportunities Map: A New Resource to Reduce Waste

EPA released the Excess Food Opportunities Map to help communities and other partners save money, feed people, and keep food out of landfills. The national, interactive map gives users the tools to understand the potential magnitude of excess food in their communities, and helps them make connections between generators and recipients so that more food is diverted from landfills and put toward beneficial uses. It identifies more than 500,000 potential generators of excess food and helps estimate the waste they generate. These include educational institutions, healthcare facilities, the hospitality industry, food manufacturers and processors, and food wholesalers and distributors. It also identifies more than 4,000 potential food recipients including food banks as well as anaerobic digestion and composting facilities.



Since milk prices have remained consistently low, small Vermont dairy farmers may face economic challenges when trying to meet new limits on phosphorus entering the lake. EPA researchers are working with the farmers to explore whether pasture-based rotational grazing can be a cost-effective option.

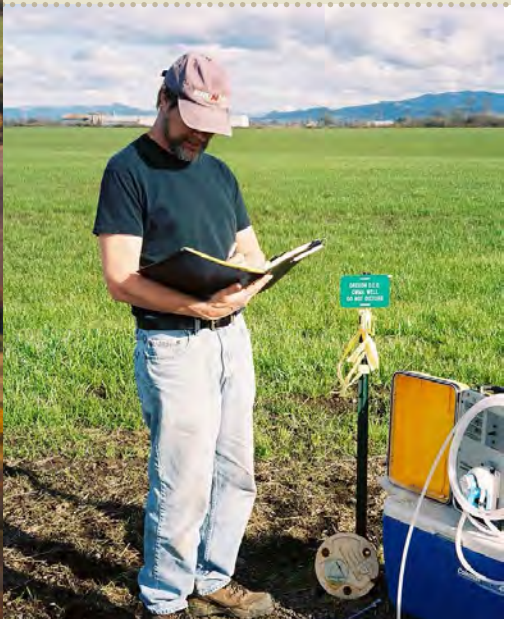
HELPING FARMERS SAVE MONEY AND REDUCE NUTRIENT POLLUTION

When too much nitrogen and phosphorus enter the environment, the air and water can become polluted. This is one of America's most widespread, costly, and challenging environmental problems. Agriculture is one of the largest sources of nitrogen and phosphorus pollution because of animal manure, excess fertilizer applied to crops and fields, and soil erosion. Reducing nutrient pollution at the source is an effective way to protect our waterways, while also helping American farmers.

Reducing Phosphorus in Lake Champlain, Vermont

In Vermont, the dairy industry makes up 70% of Vermont's agricultural sales and provides $360 million in annual salaries and wages. Many Vermont dairy farms are located in the Lake Champlain watershed. Lake Champlain is a drinking water source and supports tourism in the region, but the lake is impaired by phosphorus.

Since milk prices have remained consistently low, small Vermont dairy farmers may face economic challenges when trying to meet new limits on phosphorus entering the lake. EPA researchers are working with the farmers to explore whether pasture-based rotational grazing can be a cost-effective option. Pasture-based rotational grazing lets farmers use manure as a resource and reduces the need for and cost of equipment, while also encouraging practices that build soil health, reduce erosion, and decrease phosphorus flows into the lake.



Reducing Nitrogen in Oregon's Willamette Valley

On the other side of the country, Oregon's Willamette Valley is also facing a nutrient pollution issue. When fertilizer is applied in amounts greater than can be absorbed by crops and the land, nutrients can move beyond their intended use, wasting farmers' money and impacting groundwater and surface water. Excess use of fertilizer-derived nitrogen leaching from farm fields has also led to local private drinking wells having nitrate levels exceeding EPA's drinking water standards.

EPA and federal, state, and local partners gathered soil data from local farms and helped determine best practices to minimize nitrate leaching while maintaining crop yields. This work improved water quality and helped Oregon farmers reduce how much they spend on fertilizer.

SAFER CHEMICALS

SUPPORTING THE TOXIC SUBSTANCES CONTROL ACT

In June 2016, Congress passed the Frank R. Lautenberg Chemical Safety for the 21st Century Act. The Lautenberg Act amends the Toxic Substances Control Act (TSCA), which is the Nation's primary chemical management law. The new law includes much needed improvements to protect American families from the potential health effects of chemicals, such as: mandatory requirements for EPA to evaluate existing chemicals with clear and enforceable deadlines, risk-based chemical assessments, increased public transparency for chemical information, and a consistent source of funding for EPA to carry out the responsibilities of the new law. EPA's research is providing critical chemical data, information, tools, and approaches to support the agency's implementation of the amended TSCA.

Prioritizing Existing Chemicals for Risk Evaluations

Chemical prioritization is the first step in evaluating the safety of existing chemicals under TSCA. Using multiple computational toxicology and exposure approaches, EPA researchers are developing new techniques and tools to inform the agency's chemical prioritization decision-making process. Through this work, EPA is increasing the number of chemicals for which data are available and expanding the type of data that are available. EPA is also developing approaches for using high throughput screening data to inform decisions about which chemicals may be high or low priority for risk evaluation.

Evaluating Risks from Existing Chemicals

Risk evaluation is the second step in evaluating the safety of existing chemicals under TSCA. Risk evaluation determines whether a chemical substance presents an unreasonable risk to health or the environment under the conditions of use, including to potentially exposed or susceptible subpopulations. EPA scientists are providing expertise on many different aspects of risk evaluation, including information on human toxicokinetics, ecotoxicity, human exposure, and health hazards. Additionally, experts on specific chemicals—like asbestos—are directly engaged in chemical-specific risk evaluations. EPA is also providing tools that help identify, screen, and organize relevant scientific literature to ensure that risk evaluations are based on the best available science.

Estimating Exposure to New and Existing Chemicals

Characterizing chemical exposure is an important aspect of estimating risk to ecological and human health. EPA researchers are providing data and tools to help estimate chemical exposure under different occupational scenarios. Additionally, EPA research is leading the way to characterize general population exposure to chemicals from common consumer products and building materials. Together, these efforts are building a more complete understanding of chemical exposure.

LAND MANAGEMENT

CLEANING UP CONTAMINATED SITES ACROSS THE COUNTRY

Every state and inhabited territory in the United States has at least one Superfund site —there are thousands of these contaminated sites across the country. Cleaning up these sites involves a complex process. EPA is developing methods and tools to help states, regions, and communities clean up contaminated sites while protecting public and environmental health.

Methods to Help Clean Up Contaminated Sites

When cleaning up a Superfund site, it is essential to determine the source of chemicals in the soil. These chemicals can stem from the site itself or be considered background contaminants, meaning they exist naturally or are the result of human activity. Background contaminants are particularly prevalent in cities—making it hard to determine the source of chemicals found in urban soil. EPA worked with several states to determine the source of soil contaminants by creating a process for both soil sample collection and analysis that can be used consistently across southeastern cities.

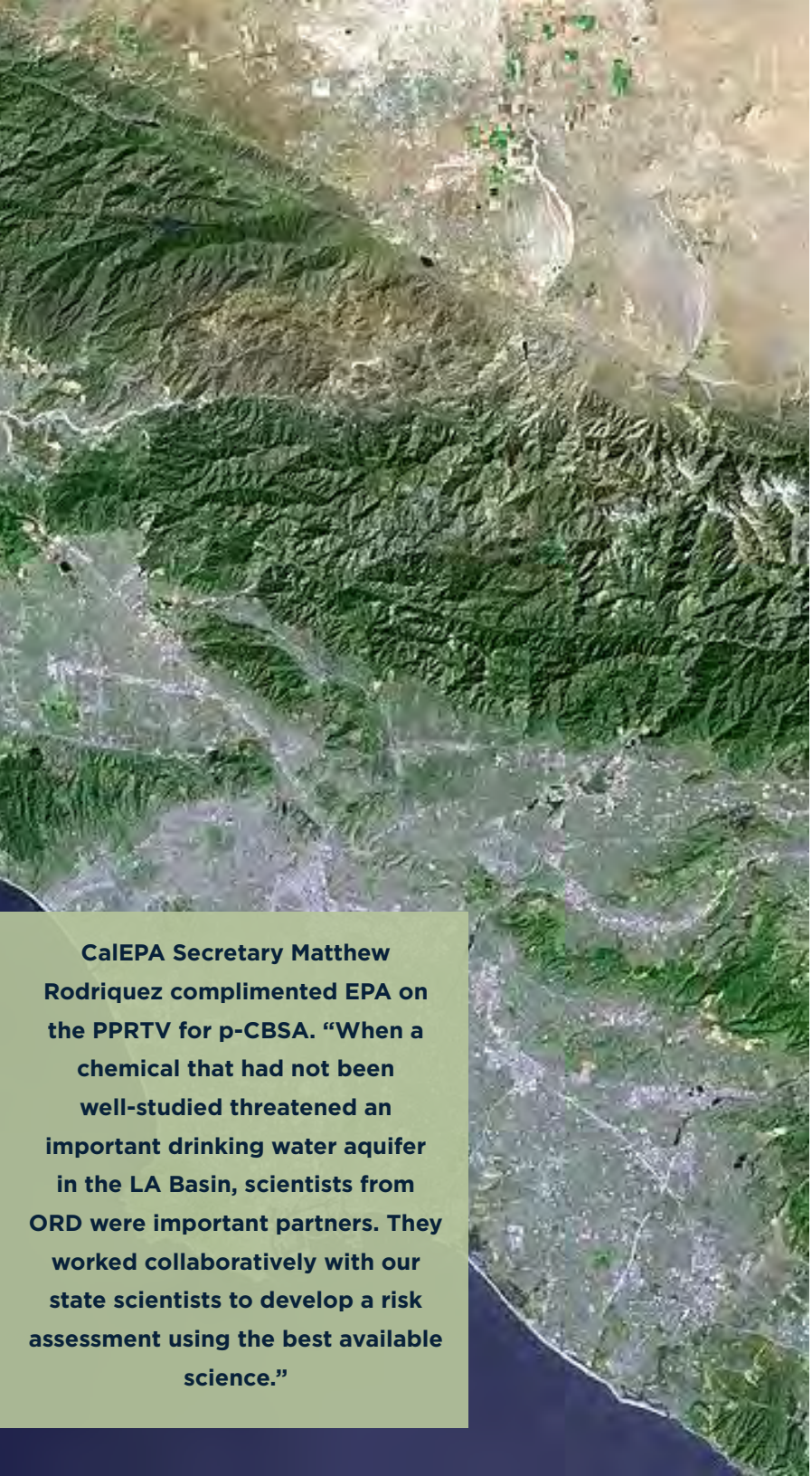
EPA collected soil samples from Kentucky, Tennessee, North Carolina, and Florida. Researchers then analyzed these samples and added them to an urban background database for metals and other chemicals. EPA, state agencies, and local authorities can use this data to make decisions around cleaning up contaminated sites.

Providing Technical Support to Communities

EPA's Superfund Technical Support Centers provide scientific expertise to help clean up contaminated sites. Through this network, EPA researchers responded to over 300 requests from EPA regions, states, and tribes in 2017 alone. Two examples of this work include ongoing efforts at the West Lake Landfill Superfund Site in Bridgeton, Missouri, and efforts to sample and analyze PFAS across the United States.

The West Lake Landfill Superfund Site consists of several inactive landfills. EPA reviewed data and reports from the Missouri Department of Natural Resources regarding methods to assess any subsurface oxidation. A sampling plan was developed by EPA for the outer area of the landfill to help determine the extent of contamination.

In July, EPA collected soil samples at a fuel storage site in Melville, Rhode Island where PFAS was used as part of a fire suppression system. The sampling effort measured a broad range of PFAS and evaluated whether PFAS precursors were present and at what level. Researchers also reviewed sampling and analysis plans and analyzed soil, sediment, groundwater, and surface-water samples.



CalEPA Secretary Matthew Rodriquez complimented EPA on the PPRTV for p-CBSA. "When a chemical that had not been well-studied threatened an important drinking water aquifer in the LA Basin, scientists from ORD were important partners. They worked collaboratively with our state scientists to develop a risk assessment using the best available science."

EPA's Provisional Peer-Reviewed Toxicity Values

Human health assessments are often requested for compounds found at contaminated sites that have limited or no available toxicity information. Consequently, these data-poor chemicals typically do not inform cleanup levels at Superfund sites. However, using cutting edge approaches to develop Provisional Peer-Reviewed Toxicity Values (PPRTV), EPA scientists can provide scientifically based information to help guide cleanups when data poor chemicals are present.

One of the most significant of the 12 PPRTVs completed in 2017, was for para-Chlorobenzene Sulfonic Acid (p-CBSA). This compound, a byproduct of the production of the pesticide DDT, was identified in potential drinking water sources near Superfund sites in California. The assessment will be combined with exposure information to characterize the public health risks associated with oral p-CBSA exposures.

IMPROVING HOMELAND SECURITY

HOMELAND SECURITY RESEARCH

EPA plays a critical role in helping prepare for any event that threatens the environment and public health. The Agency also works closely with the Department of Defense to help the military protect public health as it prepares and trains to protect the Nation.

Preparing for Nuclear Threats: Operation Gotham Shield

In 2017, EPA participated in the Gotham Shield exercise, a large-scale simulation of the detonation of an Improvised Nuclear Device scenario in the New Jersey/New York metro area. The goal was to evaluate how to prepare for different phases of such an attack, including prevention, protection, response, and initial recovery. The exercise advanced our ability to coordinate at the local and national levels, supporting effective response and recovery operations during major disaster situations.

EPA emergency response professionals and researchers participated in the response phase of the exercise, which included requests for waste estimations, including how to handle, treat, and dispose of large amounts of contaminated waste in preparation for recovery. The month-long national exercise was a collaborative effort led by the Federal Emergency Management Agency.

"Response to large disasters must be practiced to minimize their impact," explained Dr. Gregory Sayles, Director of EPA's National Homeland Security Research Program. "Large-scale exercises like Gotham Shield give us realistic situations in which responders can practice their real-time response, including using EPA-developed tools and technical support. These experiences greatly enhance the nation's ability to respond to real disasters when they come."

Fentanyl Fact Sheet for On-Scene Coordinators

Nearly half (over 19,000) of the opioid-related deaths in the U.S. in 2016 involved fentanyl. EPA and state-level responders have emphasized the lack of comprehensive information on the detection, sampling, analysis and decontamination for the fentanyl class of synthetic opioid chemical compounds. EPA researchers and staff worked together to develop the Fentanyl Fact Sheet. The document compiles current information for use by EPA On-Scene Coordinators, and may also be useful to first responders such as EMTs, hazmat teams, and law enforcement. EPA's research underway on fentanyl sampling methods and decontamination will strengthen the Fact Sheet over time.

Monitoring Air Quality during Open Burns

One major challenge the U.S. military faces is safely disposing of propellant waste, which can pose significant risk of explosion. One method of disposal is highly controlled open burning. Emissions must be closely monitored to make sure such burning does not pose health risks related to air pollution to nearby people. Working with collaborators from NASA, EPA researchers are using air sensors to sample plumes of smoke from open burning operations. This study is just one more example of how EPA research supports the nation's military and emergency response communities.

CROSS CUTTING RESEARCH

PROTECTING CHILDREN FROM LEAD EXPOSURE

Lead is a potent neurotoxin that causes irreversible damage. Although lead exposure has declined dramatically in the past 40 years, some populations continue to experience high lead exposures. Children, whose brains are still developing, are more susceptible to the neurological health effects of lead exposure. To protect children's health, it's critical that we know how various sources contribute to lead exposure.

Modeling Children's Exposure to Lead

When data are not available, it is difficult to estimate how much lead children are exposed to from different exposure pathways because there are many different media containing lead (dust, soil, water, food, air). EPA researchers addressed this by harnessing the strengths of two EPA computer models to understand the relationship between lead levels in children's blood and lead concentrations in drinking water and other sources. This analysis revealed that drinking water is an important route of lead exposure, especially among infants, and soil and dust ingestion is a main route of exposure for toddlers. The success of the analysis shows that this multimedia modeling approach is a good way to estimate children's exposures to lead and could be applied more broadly so that steps may be taken to protect their health.

Understanding Lead Exposure from Soil

Lead comes in different forms, and only some of the lead found in soil can be absorbed by the body and affect our health—this is known as "bioavailable" lead. EPA researchers looked at soil samples and blood samples from children living in Philadelphia. They found that the bioaccessible amount of lead in soil better explained variations in the levels of lead in the children's blood. These results indicate that public health officials can better protect children by considering the bioavailable portion of lead in soil instead of just the total amount of lead in soil.

Identifying Communities at Risk for Lead Exposure

Public health departments need ways to identify particularly vulnerable groups and lead exposure hotspots. A recent EPA study developed a statistical model that predicts lead levels in blood among children across the U.S. by using data such as age of housing, poverty rates, and race. The model can help officials focus limited resources on communities most vulnerable to lead exposure.

Working with Communities to Solve Lead Issues

The work on children's exposure to lead is incredibly important, but it's not the only work EPA researchers are doing to protect people from the health effects of lead.

EPA researchers continue to provide technical assistance in Flint, Michigan including reviewing daily data from the Flint water systems and training the Michigan Department of Environmental Quality on how to conduct corrosion control studies.

Soon after the water crisis in Flint, the city of Sebring, Ohio, failed to meet EPA's lead action level. EPA researchers provided technical assistance to the city for corrosion control, monitoring, and helped create an implementation strategy to reduce lead levels. This work resulted in decreased lead levels in Sebring.

EPA worked with the city of Galesburg and the state of Illinois on lead service line identification in the city. Galesburg has historically exceeded lead action levels, but through the project's efforts, has implemented corrosion control treatment, public education, and lead service line replacement.

HELPING COMMUNITIES ADDRESS PFAS

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made compounds that can make products stain-resistant, waterproof, and nonstick, but do not break down easily in the environment. There is evidence that some PFAS have negative health effects, but more research is needed. EPA has launched a cross-agency effort to address PFAS.

Drinking Water Treatment

In cooperation with drinking water utilities, EPA researchers are evaluating different treatment technologies that could remove certain PFAS from drinking water systems. States, public water utilities, communities, and military bases will benefit by having treatment technology guidance and accurate cost numbers for the treatment of PFAS in drinking water.

Toxicity Evaluation

EPA researchers conducted a review of available literature and identified a subset of PFAS chemicals that have sufficient peer-reviewed, published studies to support the development of toxicity values.

In addition to this current toxicity value development, EPA researchers have coordinated with researchers from the National Institutes of Health to conduct a battery of toxicity tests on a targeted subset of PFAS chemicals. Results will be combined with exposure estimates to identify potentially high priority PFAS for further study. Data may also be used to infer the toxicological properties of other PFAS that have little or no available data.

Developing Laboratory Methods

Tested and validated methods are needed to ensure that government and private-sector laboratories can accurately measure and monitor PFAS in the environment. EPA researchers are investigating and validating a number of methods for use by EPA, states, tribes, and communities.

Supporting States and Local Governments

EPA is also providing technical support to states, tribes, and local governments. Some examples of this work include conducting analyses of PFAS in the Cape Fear River in North Carolina, supporting site characterization at military installations where aqueous film forming foam has impacted groundwater, characterizing PFAS contamination in water and soil in New Jersey, conducting analyses of samples from New Hampshire, and reviewing sampling data collected in Maine. These efforts provide critical information to inform decisions regarding potential human health risks from ongoing, site-specific exposures to PFAS.

Exposure Research

EPA researchers are measuring PFAS in different environmental media (e.g., soil, water) to understand how and to what degree people might be exposed to PFAS. This research includes modeling to better understand the different sources and pathways for PFAS. This will help states, tribes, and local communities choose the most effective methods for protecting public health.

Questions? Email sciencematters@epa.gov

United States Environmental Protection Agency
Office of Research and Development
Washington, DC 20460

Stay Connected to EPA Research:

EPA Research Homepage:
epa.gov/research

Twitter:
@EPAresearch

Facebook:
facebook.com/EPAresearch

More stories about EPA Research:
epa.gov/sciencematters