



## EPA EXPOSURE RESEARCH

Understanding human and ecosystem exposures to environmental stressors is critical in making informed decisions that can protect public health and create an environmentally sustainable future.

Environmental stressors can include chemical pollutants, microbes and pathogens, physical agents such as land use, and processes such as alteration of wildlife habitat.

[EPA's exposure science](#) leads to improved methods, measurements and models to assess and predict exposures of humans and ecosystems to harmful environmental stressors. Exposure science also provides the foundation for the development of approaches to reduce these exposures, and safeguard human health and the environment.

### Human Exposure Estimates

To protect humans from exposure to chemicals, EPA scientists consider all the ways that multiple chemicals can enter the human body and how the human body responds.



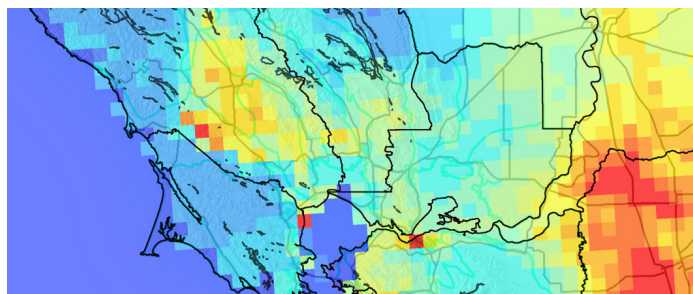
EPA exposure scientists have developed an innovative modeling system to estimate how humans are exposed to chemicals and how these chemicals move through and concentrate in the human body.

The modeling system links two types of models—the Stochastic Human Exposure and Dose Simulator

(SHEDS) and physiologically-based pharmacokinetic (PBPK) models. The SHEDS model can estimate the range of total chemical exposures in a population from different exposure pathways. PBPK models predict how chemicals move through and concentrate in the human body. These models provide invaluable tools for policy makers in making decisions that can protect humans from exposure to harmful chemicals.

### Air Quality Prediction

EPA's [Community Multiscale Air Quality model](#) (CMAQ) is a versatile software suite used to simulate the transport and fate of multiple air pollutants through the atmosphere on a range of scales—from urban to intercontinental.



The model is used by states and local governments as a tool for meeting National Ambient Air Quality Standards, and is used by the National Oceanic and Atmospheric Administration to provide daily air quality forecasts for the United States.

A new version of the model—CMAQ 5.0—is slated for release in September 2011. CMAQ 5.0 provides broader scaling options, allowing scientists to look at individual metropolitan areas, and expanded spatial scales, such as the entire northern hemisphere. Scientists will now be able to study the intercontinental movement of air pollution and how it may affect air quality and climate change.

## Beach Water Quality

EPA exposure scientists have developed a mathematical modeling tool that can help beach managers protect swimmers' health. The [Virtual Beach](#) modeling tool uses local data such as rainfall, wave height, and water temperature to predict concentrations of enterococci, and other indicators of waterborne pathogens 24 to 48 hours in advance.



Virtual Beach allows beach managers to make timely, informed decisions about when to issue health advisories or close beaches to protect human health.

## Decision Support Tools

EPA exposure scientists are developing spatially-explicit models and screening tools to assist decision-makers with sustainable land-use decisions, and with identifying and prioritizing decisions about environmental and health risks.



Two cumulative risk screening tools under development are the [Community-Focused Exposure and Risk Screening Tool](#) (C-FERST) and the [Regional Vulnerability Assessment Environmental Decision Toolkit](#) (ReVA-EDT).

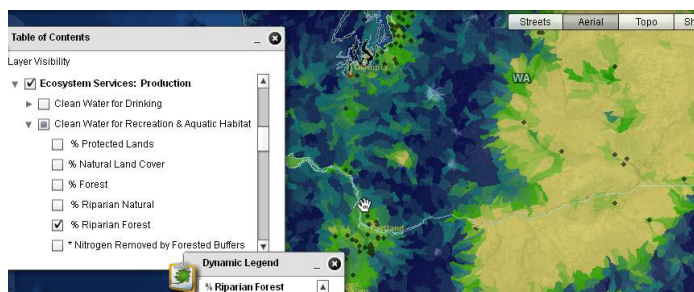
C-FERST is a web-based decision support tool that brings together data on environmental exposure and health. The tool includes maps of demographic data, pollutant sources, environmental concentrations, human exposures, and health risks. EPA scientists are working with pilot communities to refine the tool. Ultimately, it is anticipated that C-FERST will give decision makers and communities tools to make decisions about environmental issues specific to their location.

ReVA-EDT provides approaches and tools for decision-makers at national to local scales to evaluate the trade-offs

associated with alternative policy decisions when considering multiple stressors and resources simultaneously. ReVA's web-based assessment tools consider five major drivers of change: invasive exotic species, resource exploitation, changes in pollution and pollutants, climate change, and land-use change.

## National Atlas

EPA scientists, in collaboration with the National Geographic Society, the U.S. Geological Survey, and others, are developing a [National Atlas of Ecosystem Services](#) for the contiguous United States.



The program is an easy-to-use, web-based mapping application that will allow users to explore a visual representation of the benefits their communities derive from nature, and learn how these benefits can be conserved and enhanced for a sustainable future. The Atlas will also allow users to see the effects of different land use choices and how nearby, remote, and downstream communities can be affected by activities in their areas.

## Near Road Pollution

EPA is conducting a multidisciplinary series of near-roadway studies to learn more about air pollution near roads. As part of this research effort, EPA exposure scientists are studying the types of pollutants common near roadways, how people are exposed to them, and the extent of exposure. Exposure scientists are also working to improve modeling tools used for near-road air quality and human exposure assessments.

[EPA's near-roadway research](#) provides important scientific data and tools for federal, state and local governments and organizations to make decisions about future road projects and address health concerns related to roadways.

