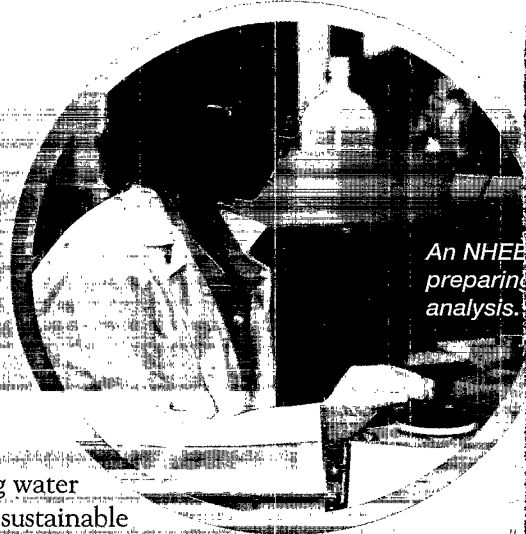


protect human health and safeguard the natural environment



**Research and Development**  
National Health and  
Environmental Effects  
Research Laboratory

An NHEERL scientist loads samples into a high-performance liquid chromatograph coupled to a mass spectrometer.



An NHEERL scientist preparing for analysis.

## Clean, Safe Water

EPA's goal is to ensure that all Americans have clean, safe drinking water and that the nation's waters, wetlands, and coastal areas are healthy, sustainable ecosystems. When properly protected, the nation's waters will support fish and other aquatic life, recreational uses, and commercial activities. NHEERL's drinking water research program is investigating the potential health problems caused by microbial and chemical contaminants, and the mechanisms by which specific contaminants cause health problems. Various factors (stressors) affect the health and sustainability of delicate aquatic ecosystems. To improve ecosystem risk assessment, EPA conducts research to identify, assess, and manage aquatic stressors. Three important types of stressors are being studied by NHEERL scientists: chemical stressors, nonchemical stressors such as habitat alteration, and nutrient overloading (eutrophication). In addition, NHEERL scientists are developing techniques to diagnose impaired aquatic ecosystems within watersheds.

## Ecosystems Protection

Ecosystems are extraordinarily dynamic, complex, and unpredictable. EPA conducts ecosystems research to provide the scientific understanding needed to maintain or restore the integrity of ecosystems now and in the future. This research provides information at multiple geographic levels: local, watershed, state, regional, tribal, national, and international.

NHEERL's ecosystem research program focuses on four areas:

- monitoring and assessing ecosystem condition,
- defining ecosystem processes (including stressor-response relationships) and developing computer models to predict responses to future changes in stressor levels or ecosystem condition,
- assessing risks to ecosystems, and
- managing ecosystem risks and restoring degraded environments.



An NHEERL scientist climbs to great heights to monitor the health of a forest.

NHEERL scientist  
in field  
to assess  
conditions.

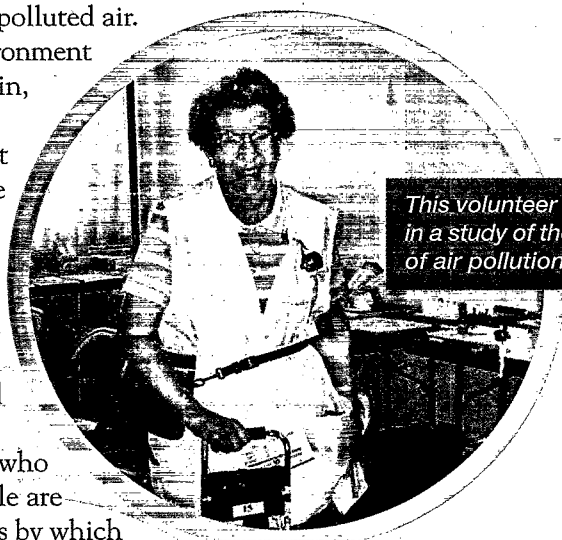
## Clean Air

EPA's air quality standards are designed to ensure that the air in every U.S. community will be safe and healthy to breathe. The standards are set so that even sensitive populations (including children, the elderly, and people with respiratory ailments) will be protected from health problems associated with breathing polluted air.

Reducing air pollution also protects the environment from the damaging consequences of acid rain, ground-level ozone, and other airborne contaminants.

Two major research efforts at NHEERL investigate the effects of particulate matter (PM) and toxic air pollutants on human health and ecosystems. NHEERL's particulate matter research program is multidisciplinary and includes epidemiologic and human clinical studies, and laboratory studies using tissue cultures and animal and alternative toxicological testing models.

NHEERL's research is designed to discover who is affected most by PM exposure, how people are affected by PM, the physiologic mechanisms by which PM causes health problems, and the toxic characteristics of PM. Major goals of NHEERL's toxic air pollutants research program include understanding how toxic chemicals may cause cancer and the role of exposure duration in producing toxic effects.



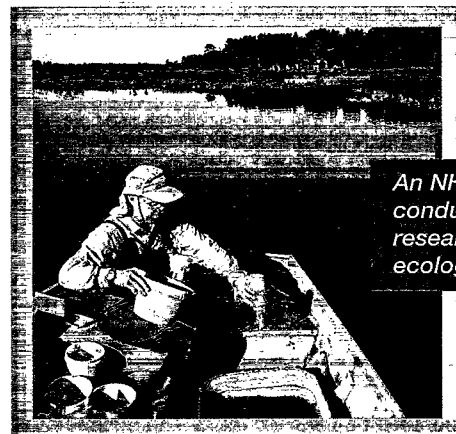
*This volunteer is participating in a study of the health effects of air pollution.*

## Global Climate Change

The earth's environment is constantly changing due to the complex interplay of natural processes and human activities. The potential consequences of these changes are wide ranging and could adversely affect human health, ecosystems, and socioeconomic sectors, all of which are vital to sustainable development. EPA is one member agency of the U.S. Global Change Research Program (USGCRP), whose purpose is to help understand, assess, and predict global change.

NHEERL scientists support the USGCRP by conducting research on:

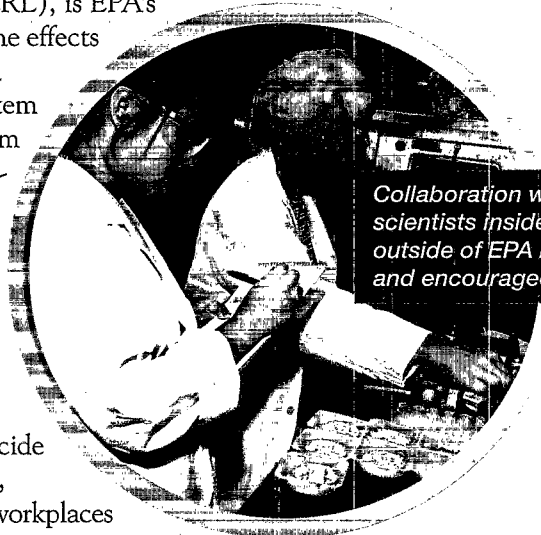
- the most efficient methods to monitor ecosystems for changing conditions,
- the relationship between changing environmental conditions and climate changes, and
- the impacts of global climate change on managed and natural ecosystems.



*An NHEERL scientist is conducting research on ecological change.*

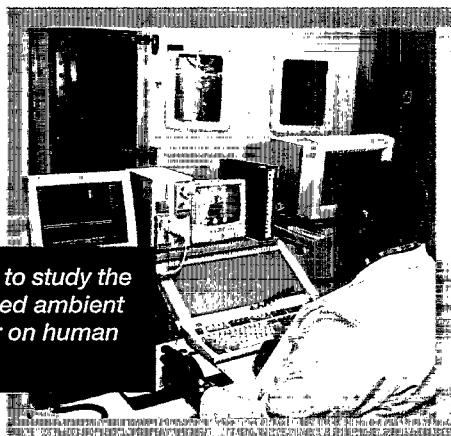
**T**he mission of the Environmental Protection Agency (EPA) is to protect human health and safeguard the natural environment. To accomplish this, EPA establishes and enforces regulations and conducts research that provides the scientific foundation for these regulations. The research arm of EPA is the Office of Research and Development (ORD), which consists of three laboratories and two centers. One of these labs, the National Health and Environmental Effects Research Laboratory (NHEERL), is EPA's focal point for scientific research on the effects of contaminants and environmental stressors on human health and ecosystem integrity. NHEERL's research program supports several of EPA's performance-based goals:

- provide clean air for all American communities,
- ensure safe drinking water and that the nation's waters sustain abundant aquatic life,
- keep foods free from harmful pesticide residues and other contaminants,
- protect communities, homes, and workplaces from toxic contamination,
- predict and moderate the effects of global climate change,
- assess the condition of, protect, and restore ecosystems,
- protect human health from environmental chemicals, and
- identify chemicals with endocrine-disrupting activity.



*Collaboration with other scientists inside and outside of EPA is common and encouraged.*

NHEERL's research programs are designed to help address EPA science questions, often by improving the hazard identification and dose-response assessment phases of the risk assessment process. NHEERL projects include epidemiologic studies, controlled clinical exposures of humans, laboratory toxicology studies, ecosystem monitoring research, and computer modeling exercises.



*This chamber is used to study the effects of concentrated ambient air particulate matter on human volunteers.*

A multidisciplinary approach characterizes research at NHEERL, whose scientists include biologists, chemists, ecologists, endocrinologists, environmental scientists, epidemiologists, microbiologists, molecular geneticists, neuroscientists, pathologists, pharmacologists, physiologists, physicians, statisticians, and toxicologists.

NHEERL has nine divisions. NHEERL headquarters and five health research divisions are located in Research Triangle Park and Chapel Hill, North Carolina. Four ecology research divisions are located in ecologically significant areas around the country.

### **NHEERL Health Research Divisions**

- **Environmental Carcinogenesis (RTP, NC).** Studies the association between environmental contaminants and cancer.
- **Experimental Toxicology (RTP, NC).** Examines the toxicity of environmental contaminants to specific organ systems and bodily functions.
- **Human Studies (Chapel Hill, NC).** Conducts epidemiologic and clinical research on the human response to environmental contaminants.
- **Neurotoxicology (RTP, NC).** Studies the effects of chemical and physical agents on the nervous system and behavior.
- **Reproductive Toxicology (RTP, NC).** Develops methods used to study the reproductive and developmental effects of environmental contaminants.

### **NHEERL Ecology Research Divisions**

The ecology research divisions assess the condition of regional ecosystems, including terrestrial and aquatic environments, and study the effects of pollution and other stressors on these ecosystems.

- **Atlantic Ecology (Narragansett, RI).** Atlantic seaboard ecosystems.
- **Gulf Ecology (Gulf Breeze, FL).** Gulf of Mexico ecosystems.
- **Mid-Continent Ecology (Duluth, MN and Grosse Ile, MI).** Inland and freshwater ecosystems.
- **Western Ecology (Corvallis and Newport, OR).** Pacific coast ecosystems.





*NHEERL scientists routinely use computer-enhanced microscopy.*

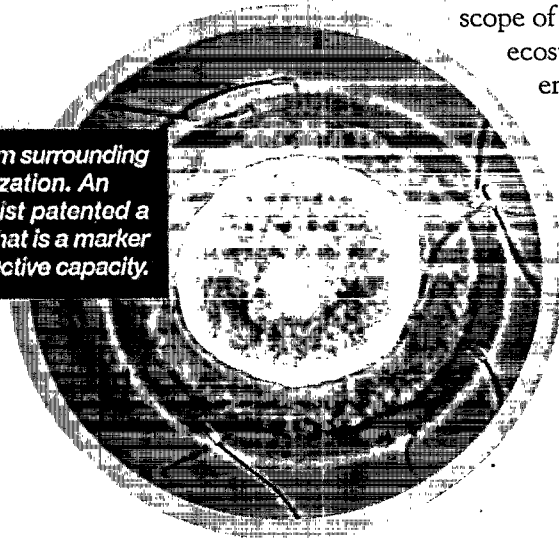
## Human Health Protection

The primary responsibility of EPA is to protect human health and the environment. In doing so, EPA uses risk assessments to identify and characterize environmentally related human health problems. Many early risk assessments relied heavily on default assumptions that were made in the absence of relevant scientific data. To provide a better scientific foundation for EPA's risk assessment process, NHEERL scientists study the factors associated with susceptibility to environmental chemicals and the cellular and genetic mechanisms by which pollutants cause health problems.

## Endocrine-Disrupting Chemicals

By definition, an endocrine-disrupting chemical (EDC) interferes with the production, action, or elimination of the natural hormones of the body. EDCs may adversely affect individual organisms, their offspring, and/or specific groups, such as the young. A broad range of substances, including widely used pesticides and numerous industrial chemicals, have been identified as potential EDCs. Because of the potential scope of the problem, the possibility of serious effects on human and ecosystem health, and the persistence of some EDCs in the environment, endocrine disruption is one of the highest-priority research areas at EPA. NHEERL researchers are taking a lead role in an international effort to develop several protocols to detect chemicals with endocrine-disrupting activity. These protocols will provide efficient, cost-effective procedures that industry and government laboratories can use to identify potential EDCs that should be studied further.

*...rm surrounding  
...ilization. An  
...ntist patented a  
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...ductive capacity.*



*A family enjoys a refreshing dip in a stream while an NHEERL scientist studies the stream's sediment for signs of habitat degradation.*

L scientist  
samples for

## Safe Food

Part of EPA's mandate to protect public health and the environment is to ensure that the foods Americans eat are free from unsafe pesticide residues. Because children are some of the most vulnerable members of our society, EPA policies and regulations are established to protect children from health threats posed by pesticide residues. NHEERL researchers contribute to the scientific foundation underlying these policies and regulations. Specifically, NHEERL scientists are conducting research to address the following questions:

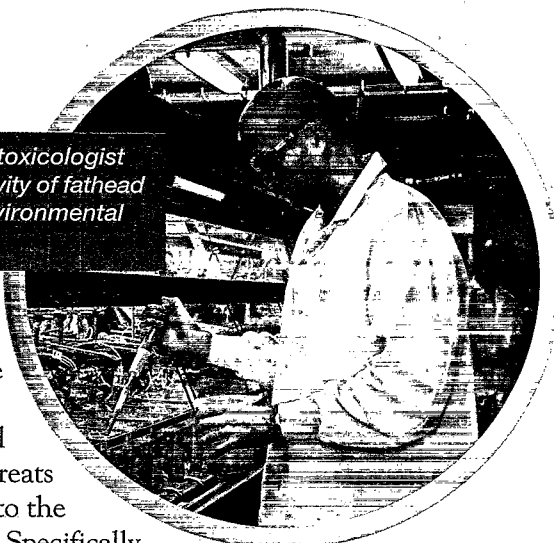
- How does age influence susceptibility to pesticide residues?
- To what extent do current regulatory programs protect vulnerable groups, including children?
- What is the most accurate way to measure or predict the effects of cumulative pesticide exposures?
- What is the best way to evaluate the combined toxicity of pesticide mixtures?

## Safe Communities

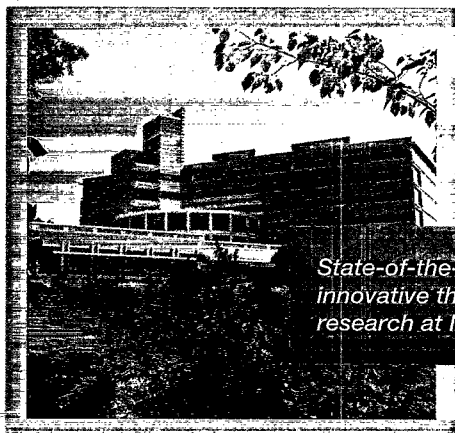
In its role of protecting the environment, EPA develops pollution prevention and risk management strategies aimed at minimizing or eliminating emissions and environmental contamination. The intent of these strategies (and associated policies and regulations) is to provide cleaner and safer communities, workplaces, and homes for Americans and to safeguard the health of ecosystems and natural communities. NHEERL supports EPA's Goal of Safe Communities by providing the scientific basis for such strategies and improving the capability of EPA to assess the risks posed by the use of pesticides, disinfectants and other chemicals. Current research efforts include:

- studying the safety of selected classes of bioengineered products,
- measuring the toxicity of chemicals to the developing nervous system in children,
- researching the risks of these chemicals to threatened and endangered species.

*Environmental toxicologist  
studying sensitivity of fathead  
minnows to environmental  
pollutants.*



*Numerous species  
an egg at fertilization  
NHEERL scientists  
sperm protein  
of male reproduction*



*State-of-the-science facilities and  
innovative thinking characterize  
research at NHEERL.*



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