THE USGS ENVIRONMENTAL HEALTH MISSION AREA

"Everything we do is designed to safeguard the Nation's health, economy, and resources"

A search of the internet and news cycles on any given day indicate that the American public, health organizations, industry, and government agencies want to know if contaminants and pathogens in the environment pose a risk to the health of humans, pets, livestock, or wildlife. Often the actual risk is not known. Sometimes the potential risk is overstated, sometimes it is unknown, and sometimes it does have an important impact on health.

The public demands answers to questions such as: *"Will my pet dog be harmed by swimming in a pond full of algae?"*; *"Does tapwater from my privately owned well have contaminants or pathogens in it that can harm my health?"*; *"Do hurricanes increase my chances of getting sick from contaminants or pathogens released into water, air, or soils?"*

Industry and government agencies need answers to questions about *the actual risk, not the perceived risk,* of contaminants associated with natural resource development and utilization.

Hunters and anglers want to know if contaminants or pathogens in the environment are harming fish or game, and whether these animals are safe to eat.

When land resource managers use chemicals to control invasive plants and animals they must understand if the public, or native species such as fish, plants, or wildlife can come in contact with toxic levels in the environment.

Without clear answers to these and similar questions, media attention to and fears about potential health impacts often lead to litigation, economic uncertainties and uninformed decision making.

WHY WE ARE UNIQUE:

Government agencies such as the U.S. Environmental Protection Agency (EPA), the Centers for Disease Control and Prevention (CDC), the Federal Emergency Management Agency (FEMA), and others play important roles in setting policy and regulations related to environmental health. These agencies conduct science based on their own policy and (or) regulatory missions. This leaves gaps in environmental health science that fall outside their missions. For example, the EPA sets policy and regulations for public drinking water and also supports research directly related to compliance and development of drinking water standards. This leaves extensive gaps in understanding the quality of the tapwater of more than 40 million Americans with privately owned wells. Additionally, the quality of the tapwater supplied by municipalities remains poorly understood because testing for compliance with drinking water standards occurs at the drinking water plant, not at the faucets of homes or businesses (lead and copper are the only exceptions). Many other examples of gaps in science due to the missions of these agencies include topics such as disaster preparedness and response to contaminants and pathogens in the environment, natural resource management, chemical control of invasive species, and naturally occurring toxins associated with algal blooms.

In contrast, the United States Geological Survey (USGS), is a science agency-it does not create regulations or policies. "Interior provides unbiased, multi-discipline science for use in understanding, mapping, and managing natural resources and hazards."[1] Instead USGS designs and conducts environmental health science that fills the knowledge gaps left by other agencies that are responsible for regulations and policies. In this way, the science conducted by the Environmental Health Mission Area (EHMA) *adds value* to the missions of other environmental health agencies and is not redundant. This vast national asset is made possible by congressional appropriations for the Toxic Substances Hydrology Program (TSHP) and the Contaminant Biology Program (CBP).

1. Department of Interior Overview, February, 2018.

WHAT WE DO:

- We determine whether or not contaminants and pathogens in the environment are risks to the health of humans and other organisms. We separate fact from speculation or fear by using impartial science.
- If there *is not a risk* we report it to the public and other stakeholders and we redirect our attention to something new.
- If there *is a risk* we provide answers to these questions:
    1. Where do the contaminants or pathogens come from (i.e., what is the actual source)?
    2. What happens to them once they enter into the environment? Does their toxicity decrease or increase? How do humans, pets, livestock, fish, and wildlife come into contact with them? And if so, how?
    3. At what levels do they begin to pose a health risk, and what are their actual health effects?
- Once these questions are answered other health and natural resource agencies and decision makers have the tools that help them minimize actual health risks while balancing competing priorities.

HOW WE DO IT:

- We work collaboratively with other environmental health agencies and scientists throughout the U.S. to identify and address the highest priority science gaps.
- We support a nationally connected network of scientists with specialized expertise in hydrology, geology, chemistry, and biology.
- We support a nationally connected network of laboratories with specialized capabilities in analytical chemistry, geochemistry, geophysics, toxicology, organism disease, genetics, and microbiology.
- We support long-term field measurement sites chosen to answer nationally significant questions such as how long contaminants can persist in ground water.
- We develop state-of-the-art laboratory and field methods that can be applied across the nation with comparable results.

OUR STAKEHOLDERS:

The EHMA supports science used by, and in collaboration with, a diverse stakeholder group including Department of Interior agencies, other federal and state agencies, municipalities, academia, industry, and non-governmental organizations. The Department of Interior's top ten priorities expressed by Secretary Zinke in a recently released Departmental Overview, reflect common priorities of all stakeholders. The EHMA works to address these priorities:

- Sustainably develop our energy and natural resources
- Protect our people and the border
- Strike a regulatory balance
- Modernize our infrastructure

WHERE WE WORK:
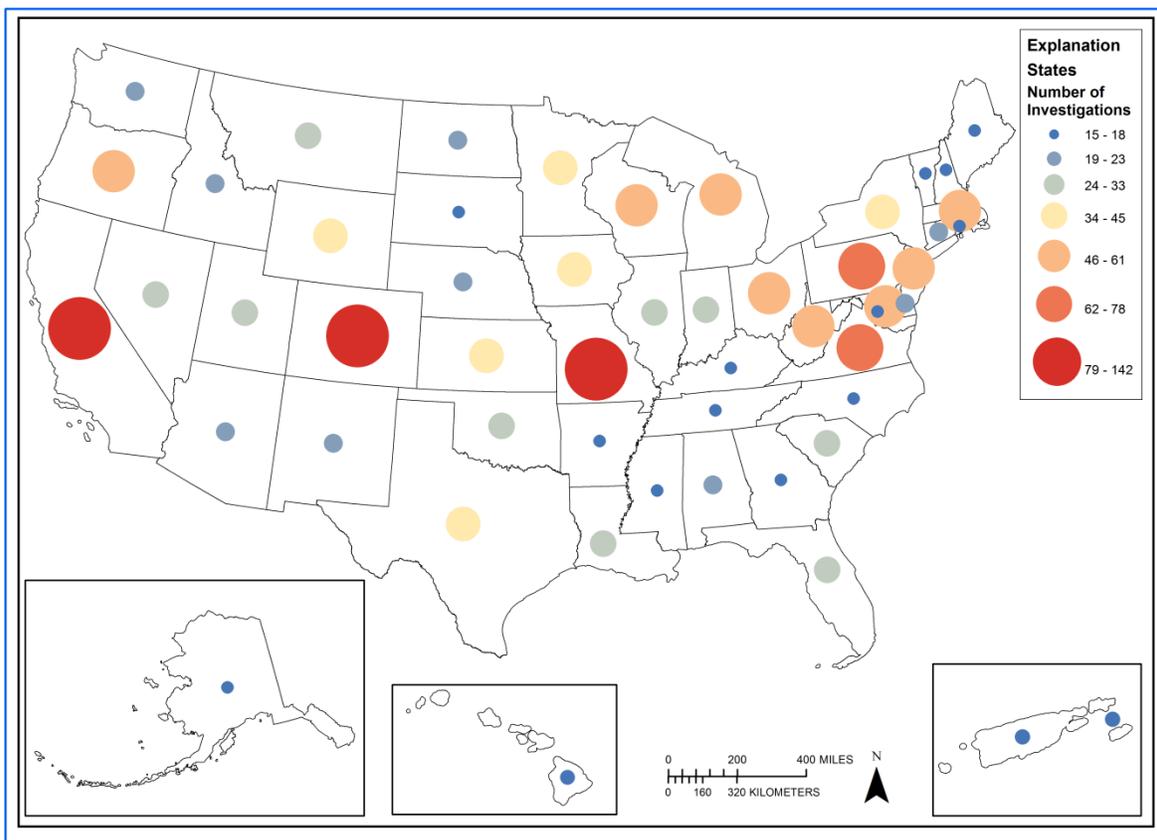
USGS Environmental Health Mission Area Field- and Laboratory-Based Investigations

State/CD boundaries obtained from Census: TIGER/Line Census Data 2017

The EHMA currently has facilities or activities in 29 states and 39 Congressional districts. Activities can move around the nation as needed (Table 1).

State	Congressional District	State	Congressional District
Alaska	1	New Jersey	12
Arizona	1,3	New Mexico	1

State	District		State	District
California	3,6,18		**Nevada**	2
Colorado	2,7		**New York**	20
Connecticut	2		**Ohio**	3
Florida	3,13		**Oklahoma**	5
Iowa	2		**Oregon**	3,4
Kansas	2		**South Carolina**	6
Louisiana	3		**Texas**	10,16
Massachusetts	2		**Utah**	4
Maryland	4,7		**Virginia**	7,11
Michigan	8		**Washington**	7
Minnesota	4		**Wisconsin**	2,3
Missouri	4		**West Virginia**	2
Montana	1			

Table 1. List of states and congressional districts in which EHMA has personnel, facilities, and/or activities.

EHMA programs provide major funding support to advanced USGS analytical chemistry, microbiology, geochemistry, and wildlife science laboratories in many cities across the U.S., such as: Columbia MO, Patuxent MD, Leetown WV, Madison WI, Lacrosse WI, Iowa City IA, Columbia SC, Lawrence KS, Lansing MI, Sacramento and Menlo Park CA, Boulder and Lakewood CO, and Reston VA.

WHO WE ARE:

- The Toxic Substances Hydrology Program (TSHP) was started in the mid-1970's to conduct research on the sources, fate, and transport of environmental contaminants in surface and subsurface waters—this research paved the way for innovative mitigation and cleanup strategies. The TSHP was originally part of the former USGS Water Resources Division.

- The Contaminant Biology Program (CBP) was initially established in 1940's in the U.S. Fish and Wildlife Service to fund research on the effects of environmental pathogens and contaminants on the health of insects, fish and other wildlife of concern to the Department of the Interior (DOI). In 1994, CBP, along with scientists from multiple DOI agencies, was incorporated into the newly created National Biological Survey (NBS). In 1996, the renamed National Biological Service was merged into the USGS as the Biological Resources Division (BRD), with the CBP located in the BRD.

- As part of the 2010 USGS reorganization into theme-driven Mission Areas, the TSHP and CBP were brought together to form the Environmental Health Mission Area.

- The combination of these two long-standing programs working together provided a unique portfolio of scientists, labs, field sites, expertise and capabilities across the U. S. that is unmatched by any other agency, academia, or the private sector. The President's

See page BH 54 and BH 56 for specifics on the Environmental Health Mission Area programs.

- Figure 1 depicts how these experts and their capabilities are combined to fill gaps in our understandings of contaminants and pathogens in the environment.

Figure 1. Environmental contaminant and pathogen science carried out by the USGS Environmental Health Mission Area.

EHMA SCIENCE PRIORITIES

Here are a few examples of high priority USGS EH science activities that focus on filling the gaps left behind by other agencies:

- Understand the health impacts of natural environmental toxins such as cyanotoxins, measuring their presence and magnitude, and predicting algal and bacterial blooms that can release toxins into surface waters, soils, and dusts.
- Help enhance drinking water safety by understanding how pathogens and contaminants in water sources are removed, increased, or changed as they move through the environment, water treatment and distribution infrastructure, and building plumbing to become tap water.
- Provide science on chemicals that are used in stewardship of public lands to control invasive pests, weeds, and dust, and to suppress wildfires. This science informs decisions that balance use with impacts, for example understanding levels of chemicals that can be used to maximize effectiveness while at the same time minimizing the potential for unintended health consequences to humans or non-targeted organisms.
- Help enhance food safety by understanding and reducing hazards posed by environmental contaminants and pathogens that can affect or result from food production.
- Understand, anticipate and mitigate the health hazards posed by contaminants and pathogens released into the environment by a disaster event.
- Provide science to understand and address actual versus perceived health hazards posed by byproducts from natural resource production and utilization.
- Understand how pathogens such as the avian influenza virus can survive, move, and be deposited in soils, water, and lake sediments.
- Apply USGS analytical technologies to physiological samples to help understand contaminant uptake, transport, fate, and effects in humans and other organisms. These technologies are increasingly recognized and requested by our collaborators in human health and medicine.

- Develop advance field, laboratory, monitoring, and modeling capabilities to understand hazards posed to the health of humans and other organisms by new contaminants of emerging concern and complex contaminant mixtures.

Visit the USGS Environmental Health wepage for more information:
https://www2.usgs.gov/envirohealth/

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