An Overview of the New USGS Environmental Health Mission Area

Background

The health of aquatic and terrestrial organisms and people is under continuing threats from pathogenic diseases and exposure to a diverse array of chemical contaminants. The emergence of new health threats and changing patterns of established threats are affected by land use changes, habitat degradation, climatic trends, air and water quality, geologic alterations, and reductions in biodiversity. Understanding the role of the environment is essential to identify, prevent and mitigate these health threats. The U.S. Geological Survey (USGS) is strategically positioned to play an integral role in identification of emerging health threats to the environment, wildlife and people, and providing information essential to development of protection strategies.

As the Nation's largest water, earth, and biological science and civilian mapping agency, the USGS collects, monitors, analyzes, and provides scientific information and knowledge about natural resource conditions, issues, and challenges. With its diverse and interdisciplinary scientific capabilities USGS provides reliable scientific information that contributes to the protection and management of the Nation's natural resources, including Department of Interior trust resources. USGS is the leading federal agency that identifies and investigates health threats to fish and wildlife populations and the associated ecosystems. While USGS's core mission is focused on natural science, that science has broad applications to the environmental and public health communities.

In 2010, the USGS realigned its management and budget structure by establishing seven mission areas around which core USGS science activities are organized. These Mission Areas are:

- *Climate and Land Use Change*
- *Core Science Systems*
- *Ecosystems*
- *Energy and Minerals*
- *Environmental Health*
- *Natural Hazards*
- *Water*

For the first time, the USGS has an organizational construct focused on *Environmental Health*. It improves the ability of USGS to address its core mission responsibilities, as well as improving the ability to provide scientific information and knowledge to managers responsible for managing and safeguarding the health of the environment and the public.

What is Environmental Health?

There are many definitions of environmental health; they vary based on the perspectives and responsibilities of the authors. We define ***environmental health science as the multidisciplinary study of relationships among the quality of the physical environment, the health of the living environment, and human health.*** (See Diagram). Such a broad definition facilitates the ability

of USGS to provide natural science information across the spectrum of environmental health issues.

The quality of the physical environment includes a diverse array of physical, chemical, and aesthetic characteristics of both natural environments (environments affected to different degrees by human activities) and built environments (such as our homes and workplaces).

The health of the living environment reflects the health of all organisms from microbes to wildlife and domestic animals, and wild plants and crops. The living environment integrates the health and viability of all species and the ecosystems in which they reside.

People's health and well being is affected by both the quality of the physical environment and the health of the living environment with which they come in contact.

Diagram depicting the interrelationship of the quality of the physical environment, the health of the living environment, and human health as relates to environmental health science.

The quality of our physical environment, the health of our living environment, and human health are inextricably linked. The interactions among the physical environment, the living environment, and people affect environmental changes that determine exposure of aquatic and terrestrial organisms and people to emerging and resurging infectious diseases and environmental contamination. Changes in chemical use and the ways in which we handle and dispose of wastes affect our air, water, soils, and food. Changes in land use and increased development alters the landscape, modifies fish and wildlife habitats, affects species diversity, changes the spatial interconnections between human communities and our ecosystems, and increases the risk of transmission of infectious diseases among animals and with people. Increasing need for food, water, energy, and other resources, unprecedented increases in international travel and trade, climate change, and natural disasters all complicate efforts to protect the health of the environment and consequently, fish, wildlife, and public health.

USGS Leadership in Environmental Health Science

With considerable interdisciplinary expertise and capabilities, USGS works to identify, observe, monitor, map, model, and research the ecological, hydrological geological and climatic factors that influence the emergence of new health threats on the landscape. USGS has ongoing research and vast amounts of data on environmental quality and diseases of fish and wildlife – including zoonotic and vector borne diseases; water, sediment, and airborne contaminants;

bioaccumulation of contaminants in food webs; and natural hazards. These capabilities provide the foundation for USGS Environmental Health Science.

While the USGS mission focuses on providing this information to support protection and management of fish, wildlife, and other natural resources, that information has "added value" to those responsible for safeguarding public health. USGS science is useful for defining human exposure to zoonotic and vector-borne diseases, parasites, harmful earth materials, synthetic chemicals and substances, and biogenic contaminants. Animals often serve as sentinels of human health and knowledge of the harmful impacts of environmental health threats on animals can provide valuable insight into potential human health concerns. Partnerships with the public health community, however, are essential to ensure that the science that we produce is used to support enhanced understanding of the link between the environment and public health.

USGS Environmental Health Science Goals

The following goals for USGS Environmental Health Science have been tentatively identified as a basis for planning.

1. Anticipate, detect and assess emerging threats from contaminants and diseases affecting aquatic and terrestrial organisms and humans.
2. Characterize the environmental factors that control exposure to natural and anthropogenic contaminants, and their effects on, aquatic and terrestrial organisms and humans.
3. Elucidate the ecological and environmental factors that influence the occurrence and evolution of infectious diseases affecting aquatic and terrestrial organisms and humans.
4. Determine the interactions among contaminants, pathogens, environmental changes and other stressors that combine to affect the health of aquatic and terrestrial organisms and humans.
5. Enhance methods to anticipate and rapidly assess the environmental impacts of natural or anthropogenic disasters on the health of aquatic and terrestrial organisms and humans.
6. Synthesize and communicate integrated environmental health science information to decision makers and the public.

USGS Partners and Collaborators

USGS provides information and knowledge to other federal agencies, and state and local governments charged with protecting natural resources, public health, crop and animal agriculture, aquaculture, and homeland security. These agencies include the U.S. Environmental Protection Agency (USEPA), the Centers for Disease Control and Prevention (CDC), the U.S. Department of Agriculture (USDA), the National Institute for Environmental Health Sciences, and the Department of Homeland Security (DHS). As the science agency of the DOI USGS supports decision making of the U.S Fish and Wildlife Service (USFWS), National Park Service (NPS), Bureau of Land management (BLM), BOEM, Bureau of Indian Affairs (BIA), and the

DOI Natural Resources Damage Assessment Program. However, the timeliness and usability of the information USGS provides relies on close communication and coordination with these agencies.

The USGS Environmental Health Mission Area is committed to strengthening relationships with established partners, and to exploring new partnership opportunities. Coordination among USGS, other environmental agencies and organizations, and public and animal health agencies at the national, state, and local levels is essential to ensure that (1) capabilities for identifying emerging environmental health threats are enhanced, (2) USGS resources are leveraged among partners on the highest priority issues, and (3) data gaps are identified and filled and that the information is provided in a useable and timely manner.

Complementary Relationships among USGS Mission Areas

USGS activities that enhance and support environmental health span across all of the USGS Mission Areas. The establishment of strong linkages and cooperation with other Mission Areas, including identification of shared priorities and complementary capabilities, will be essential. By making strengthening relationships with the environmental and human health communities a priority, the new Environmental Health Mission Area can facilitate improved relationships with these stakeholders for all Mission Areas.

In Conclusion

The USGS Environmental Health Mission Area will strive to make USGS science a key resource in the management and protection of the Nation's environmental health. ***Please help to shape the USGS Environmental Health Science Strategic plan by providing input online at: http://www.usgs.gov/start_with_science/.***