

# Natural Hazards Science at the U.S. Geological Survey

*A sustainable society needs robust assessments of hazard and risk to prepare for disasters, and timely, updated information about changing hazards for situational awareness during times of crisis. To meet these needs, scientists, in turn, require fundamental understanding of natural processes and observations of natural events. As the Nation's leading, integrated Earth science agency, the U.S. Geological Survey (USGS) must pursue modern monitoring, provide observations, target research to improve fundamental understanding of hazardous processes, prepare assessments of hazard and risk, and communicate expert analysis and advice. To guide USGS science throughout the next decade, the USGS has developed the "U.S. Geological Survey Natural Hazards Science Strategy—Promoting the Safety, Security, and Economic Well-Being of the Nation."*

## USGS and Natural Hazards

The costs and consequences of natural hazards can be enormous, and each year more people and infrastructure are at risk. USGS science can help to understand and reduce these risks and to make and effectively communicate reliable statements about hazard characteristics, such as frequency, magnitude, extent, onset, consequences, and where possible, time of future events.

Science provides the information that decisionmakers need to determine whether risk management activities are worthwhile. As the agency with the perspective of geologic time, the USGS is uniquely positioned to extend the collective experience of society to prepare for events outside current memory. The USGS conducts hazard research to inform a broad range of planning and response activities at individual, local, State, national, and international levels.

The USGS has critical statutory and nonstatutory roles regarding floods, earthquakes, tsunamis, landslides, coastal erosion, volcanic eruptions, wildfires, and magnetic storms—the hazards considered in the "U.S. Geological Survey Natural Hazards Science Strategy." There are numerous other natural hazards of societal importance that were considered either only peripherally or not at all because they are either in another of the USGS science strategies (such as drought) or are outside the mission of the USGS (such as tornados).

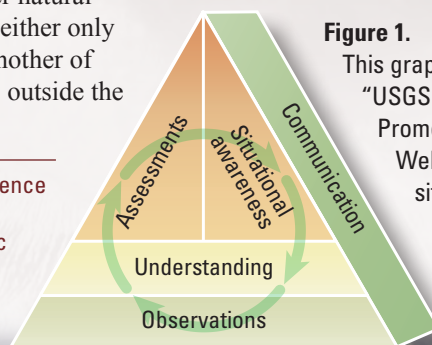
The hazards considered in the "USGS Natural Hazards Science Strategy—Promoting the Safety, Security, and Economic Well-Being of the Nation": tsunamis, earthquakes, volcanic eruptions, magnetic storms, coastal erosion, landslides, wildfires, and floods (shown on back).

## The USGS Natural Hazards Science Strategy

The mission of the USGS in natural hazards is to develop and apply hazard science to help protect the safety, security, and economic well-being of the Nation.

A sustainable society requires a responsive government to reduce the loss of life and disruption caused by natural hazards. Emergency managers and others who are potentially affected need robust assessments to prepare for hazardous events, and they need updated information for situational awareness during times of crisis. To meet these needs, scientists, in turn, require fundamental understanding of natural processes and observations of natural events. Thus, the "U.S. Geological Survey Natural Hazards Science Strategy" articulates four overarching and interrelated goals (fig. 1):

- Goal 1: Enhanced observations.
- Goal 2: Fundamental understanding of hazards and impacts.
- Goal 3: Improved assessment products and services.
- Goal 4: Effective situational awareness.



**Figure 1.** Four goals with communication throughout. This graphic conceptualizes the four goals of the "USGS Natural Hazards Science Strategy—Promoting the Safety, Security, and Economic Well-Being of the Nation." Assessments and situational awareness require understanding and observations. Communication is essential to all efforts.





Photograph of erupting Redoubt volcano, Alaska, 2009. The USGS and partners closely monitor about 30 of the 52 historically active volcanoes in Alaska, where eruptions can disrupt air traffic.

To accomplish each goal, based on months of input from USGS staff, stakeholders, and cooperators, the “U.S. Geological Survey Natural Hazards Science Strategy” identifies core responsibilities and strategic actions. Core responsibilities are activities that the USGS must continue in order to uphold its mission. In many cases, these are mandated activities that help to protect lives and assets, or strengths developed as a consequence of long-standing national need. Strategic actions are high-value, priority efforts that go beyond the core responsibilities and will reduce uncertainties about hazards, improve communication, and thus enhance the ability to provide accurate, effective assessments and situational awareness. If the USGS upholds these core responsibilities and takes these strategic actions, USGS hazards science will help make the Nation more resilient.

The strategy provides a vision for the future, and acknowledges the opportunities and challenges that face the USGS in addressing natural hazards. Within the USGS, hazard science spans most of the organizational structures called Mission Areas and the strategy also identifies numerous ways that the Natural Hazard Mission Area can better collaborate with other Mission Areas on hazard science.

#### For more information on Natural Hazards at the USGS:

USGS Natural Hazards Science Strategy at  
<http://pubs.usgs.gov/circ/1383f/>

Natural Hazards Web page at  
[http://www.usgs.gov/natural\\_hazards/](http://www.usgs.gov/natural_hazards/)

USGS water scientist determines flood level for the Skillet Fork River near Wayne City, Illinois, 2008.  
 Photograph by Robert R. Holmes, Jr., USGS.

## USGS Natural Hazards Activities

USGS activities in natural hazards:

- Collect observations that are necessary to understand, monitor, and warn about natural hazard processes.
- Advance the fundamental understanding of hazards and their impacts.
- Develop and improve assessments that are essential to risk reduction.
- Deliver situational awareness before, during, and after hazard crises and disasters, including warnings and advisories.
- Meet statutory responsibilities regarding earthquakes, landslides, and volcanic eruptions.
- Perform critical nonstatutory roles regarding floods, tsunamis, coastal erosion, wildfires, and magnetic storms.
- Provide Web pages that get tens of millions of page views each month as well as publications, social media messages, and other products that offer a vast range of helpful information.
- Work closely with a wide range of partners and stakeholders in government and communities.

## Intended Outcome

The objective of the “U.S. Geological Survey Natural Hazards Science Strategy” is to guide USGS efforts to protect the safety, security, and economic well-being of the Nation. The strategy supports and strengthens USGS science, which helps (1) provide timely, scientifically sound information to decision-makers before, during, and after disasters and crises; (2) operate monitoring networks and produce and distribute datasets of observations; (3) increase understanding of the underlying physical processes that produce hazards and determine where and under what conditions hazards occur; and (4) create, evaluate, and develop assessments based on scientific understanding that support decisionmaking and promote risk-wise behavior.

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