Statement of David Applegate
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before
the House Committee on Natural Resources
Subcommittee on Energy and Mineral Resources
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Thank you Chairman Gosar and Ranking Member Lowenthal for inviting me today to testify on several bills that relate to the U.S. Geological Survey (USGS). I am Dave Applegate, Associate Director for Natural Hazards of the USGS. The topics we are addressing today—volcanoes, landslides, and geologic mapping—are ones the USGS has studied for over a century. We have a unique responsibility to advance the science and to translate those advances into information that policymakers and the public can use. We take that responsibility very seriously. I am pleased that Congress and the Natural Resources Committee maintain their interest in and support for our work and appreciate your consideration of these important topics.

I would also like to acknowledge the contributions of our partners and stakeholders to this endeavor. Several of them are represented here today. The USGS could not do what it does without the help of other Federal, State, Tribal and international agencies, the academic community, and the private sector.

As an agency with no regulatory mandate, the USGS is able to provide high-quality, unbiased scientific information to decision-makers across the country and the world. Maintaining this standard is the job of everyone at the Survey. For geologic hazards such as volcanoes and landslides, as well earthquakes, the USGS has responsibility for providing timely and accurate information to emergency managers and response officials, effectively delivering hazard assessments, and issuing warnings and advisories for certain geological threats (often in coordination with the National Oceanic and Atmospheric Administration [NOAA]). USGS uses its monitoring capabilities and expertise to inform and educate at-risk communities during crises and to anticipate and prepare for future geologic hazard events. Geologic maps are a foundational product that supports all the Survey's missions, whether assessing hazards, water, energy, and mineral resources, or environmental change. They are especially important for critical infrastructure planning.

H.R. 1675
National Landslide Preparedness Act

The USGS Landslide Hazards Program focuses on improving our understanding of landslide processes and developing tools that can be used by States and the private sector to assess and respond to landslides. The expertise in the program's staff represents an invaluable asset for both

domestic response and global response. For example, following the deadly landslide near Oso, Washington, in 2014, USGS landslide experts worked closely with their state counterparts to advise the county, state and federal response effort, in particular to the search and rescue operations that placed hundreds of workers below the still-active slope.

For a geologist, a landslide is any earth material that moves downslope, but landslides come in a variety of types, and the risk they present depends on the number, the kind and amount of materials involved, and how fast and far they move. Landslides cause billions of dollars in damage to property and infrastructure each year. We are generally more aware of landslide risks in mountainous areas, but they cause losses in every state and territory. Isolated landslides can occur without much warning and where they interact with human activities they can cause injury and loss of life. Some of the most destructive landslides, known as lahars, occur on volcanoes. Lahars can occur even when the volcano is not erupting and in the Pacific Northwest they have the potential to cause damage to communities even miles downstream from their source.

Wildfire can also exacerbate the landslide threat. Wildfire removes vegetation and reduces the ability of soil to soak up rainfall making ideal conditions for debris flows. Debris flows are fast moving landslides with a consistency of wet concrete and during even moderate rainfall they can create havoc downstream of burned watersheds. These conditions are common in Southern California where we work with NOAA's National Weather Service to operate a debris-flow early warning system for recently burned areas. Throughout the West, we work closely with the US Forest Service and other land management agency Burned Area Emergency Response (BAER) teams to rapidly generate maps of increased debris flow susceptibility that the teams can use to prioritize stabilization and mitigation efforts.

Because most landslides are local events, they do not often warrant a national response. State and local emergency management agencies, rather than the Federal Emergency Management Agency (FEMA), typically respond to landslide events. The state geological surveys are often the primary technical resource when it comes to landslide issues in their states, and we have strong partnerships with a number of the state surveys. Although the USGS, and other Federal agencies such as NOAA, the National Institute of Standards and Technology, as well as FEMA, do indeed provide important research and technical support to understand and respond to landslide hazards, we must do so in collaboration and coordination with State and local stakeholders.

Section 3 of the bill establishes a National Landslide Hazards Reduction Program. The section establishes an Interagency Coordinating Committee on Landslide Hazards and an Advisory Committee on Landslides. Both are important, because some program activities described by the authorization are properly undertaken by our colleagues at other agencies or by local agencies. For example Sec. 3(b)(1)(B) directs the USGS and other Federal agencies to "respond to landslide events." It is not clear what response entails here and it raises the possibility of overlap

with local agency responsibilities. Nevertheless, we do work closely with all partners on many types of hazards so we are confident that we could implement this appropriately. Likewise, the section directs the USGS and other Federal agencies to "implement landslide hazard guidelines" for different stakeholders. We would strive to do so without impacting existing roles and responsibilities.

Section 3 also would establish a National Landslide Hazards Database. We support such a system, but we should note that some of the information envisioned by the bill simply does not yet exist, or is held by other agencies, academic institutions, or private parties. 3DEP established at Sec. 5 would in part facilitate the implementation of this database.

It is unclear why the program should provide both annual reports and five-year national strategies, and we welcome a discussion on whether these could be combined for the sake of efficiency.

At Section 4, the bill authorizes the establishment of programs to assess subsidence related to groundwater. This is a serious concern in many parts of the country, especially in times of drought when reliance on groundwater resources increases. This is work that the USGS and its partners have undertaken for many years and this language would support those ongoing efforts.

Finally, the bill provides authorization for a 3D Elevation Program at the USGS, or 3DEP. The USGS initiated 3DEP four years ago to collect high-resolution elevation data across the country, using lidar. These lidar data are critical for several aspects of landslide hazards research. For example, lidar is useful for the identification of landslides by providing input to slope-stability models which show where shallow landslides may mobilize into fast, potentially damaging debris flows. It is also useful to determine boundaries and conditions for landslide initiation, planning for evacuations and staging areas, creating accurate landslide inventory and deposit maps, estimating the shape and activity of landslides, providing baseline information for change-detection comparisons, such as estimating sediment transport rates. Lastly, lidar helps us develop novel approaches for estimating landslide thickness and ages of landslide deposits.

3DEP relies on contributions from other federal agencies as well as State, local, and Tribal governments, and we use the interagency 3DEP Executive Forum and Working Group to maximize leveraged funds and ensure that data acquisition meets as many needs of the most users as possible. Once partners commit to funding, we contract data acquisition to top private sector geospatial firms that have been selected through an extensive competitive process. The USGS manages data acquisition contracts and distributes data for the community, avoiding the costs of duplicate efforts at different agencies. 3DEP data are produced using USGS specifications that are accepted by the community. This creates a foundational dataset, which enables the broadest range of applications. The USGS also serves as the leader for elevation data,

or topography, on the Federal Geographic Data Committee. This interagency body coordinates government-wide geospatial data policy and 3DEP is the next generation of our responsibility regarding this important dataset.

The language in Section 5 would support the activities described above. The USGS has no concerns with it.

H.R. 4033
National Geologic Mapping Reauthorization Act

The vision of the USGS National Cooperative Geologic Mapping Program (NCGMP), first authorized by Congress in 1992, is to create an integrated, three-dimensional, digital geologic framework of the United States and its territories to address the Nation's changing resource needs. The NCGMP's mission is to characterize, interpret, and disseminate the geologic framework model of the Nation through geologic mapping and derivative research, in order to support the responsible use of land, water, energy, and minerals, and to mitigate the impact of geologic hazards on society thereby facilitating national security and economic growth through informed Earth resource management.

The program is composed of three parts. The first is FEDMAP, which funds new science that supports the mapping of geological and geophysical processes and structures, as well as topical mapping applications. Next is STATEMAP, which provides funds to the State geological surveys to support the development of geologic maps in cooperation with the USGS across the country. Lastly is EDMAP, which has provided almost $10 million since 1992 to support over 1,200 students' STEM education, training the next generation of geologic mappers. Further, the USGS and the Association of American State Geologists support the National Geologic Map Database to distribute geologic maps made possible by the program. Geologic maps are foundational to many types of investigations. Assessments of energy, critical mineral, and water resources, assessments of geologic hazards such as earthquakes, landslides, and volcanoes, and assessments of wildlife habitat and environmental toxins like asbestos, all rely on geologic maps. Each of the three parts of the program is essential to making geologic maps that are useful for scientists.

The USGS believes the expiring authorization was sufficient and this bill simply extends the authorization.

Discussion draft
National Volcano Early Warning System Act

Volcanic eruptions are among the most destructive phenomena of nature, and even small events can have a significant social and economic impact. Unlike many other natural disasters, however, volcanic eruptions can be predicted well in advance of their occurrence if adequate in-ground instrumentation is in place that allows earliest detection of unrest providing the time needed to mitigate the worst of their effects. There are 169 potentially active volcanoes in the United States. Many of these are prominent features on the landscape and, as recent reporting on the Yellowstone caldera show, they readily capture the public's attention.

Although USGS investigations of individual volcanoes goes back for over a century, the stand-alone Volcano Hazards Program was established in the 1980s after the eruption at Mount St. Helens. More recently, volcanic activity in the Aleutian Islands has reminded us about the hazard these eruptions present to north Pacific flight paths. As the 2010 eruptions in Iceland demonstrated, volcanic ash poses a hazard to civil and military aviation that may cause substantial disruptions to normal air traffic flows. Consequently, potentially active volcanoes must be monitored continuously. Since the program's establishment, the management of the volcano observatories has been consolidated and we are prioritizing geologic mapping, hazard assessments, and monitoring efforts for those volcanoes that present the most threat. The USGS has evaluated all of the Nation's volcanoes to determine the monitoring commensurate with the threat they pose. This national threat level assessment was conducted in 2005 and is being updated. The USGS and affiliated partners used this threat assessment to design a national-scale plan, the National Volcano Early Warning System (NVEWS), to detect unrest at the earliest stages using in-ground monitoring instrumentation deployed on the Nation's most threatening volcanoes.

To carry out its mission, the USGS partners closely with NOAA, the Federal Aviation Administration, and the U.S. Air Force 557th Weather Wing to address the threat volcanic ash poses to aviation. Several of the USGS volcano observatories are partnerships with state geological surveys and universities, and all observatories rely on a wide range of collaborations to deliver situational awareness to emergency managers, assess hazards, and help communities understand their risks.

NVEWS as authorized by this bill would support many of these efforts already under development by the USGS including upgrading and augmentation of existing volcano monitoring networks, installing new networks on significantly under-monitored volcanoes, and modernizing networks opportunistically. Activities not yet initiated by the USGS that would be supported by this bill include the establishment of a 24-7 volcano watch office and a National Volcano Data Center, and creation of an external grants program for volcano research. The

USGS agrees with the bill's objectives and we are actively pursuing opportunities to fulfill those objectives.

On behalf of the 8,000 employees of the Survey, thank you again for inviting me today. USGS looks forward to working with you and I will be happy to answer any questions you may have.