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NATURAL RESOURCES COMMITTEE
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Thank you for the opportunity to provide testimony for the record on Geological Hazards and mapping, H.R. 496, the *"Sinkhole Mapping Act of 2019"* and H.R. 4299, *"The Data Preservation Act of 2019."* This testimony is presented on behalf of the Association of American State Geologists (AASG). Our organization, founded in 1908, represents the State Geologists of the 50 United States and Puerto Rico. AASG seeks to advance the science and practical application of geology and related earth sciences across our lands. AASG strives to optimize the role that State Geological Survey agencies play in delivering benefits to the people of the United States in relation to developing economic prosperity, understanding and mitigating natural hazards, protecting property and lives, and preserving our natural environmental heritage.

AASG recognizes the work of Chairman Grijalva, Ranking Member Bishop, sponsors Representative Soto and Representative Velázquez, and the members of this Committee. We commend your efforts to strengthen our nation's capacity to address the challenges associated with public safety, water security, geologic investigations, strategic minerals, and the conservation of this country's great natural resources.

I share with you today the vital role that geological and geophysical mapping and data play in this regard, from addressing public safety concerns generated by geohazards, to open access and rediscovering of historical and potentially vulnerable geologic data resources through preservation. I will emphasize the role that both the State Geological Surveys and US Geological Survey can play in addressing these associated concerns.

Executive Summary

AASG strongly supports geologic mapping and geologic hazard mapping by Federal, State, and Local governments to reduce risks from geologic hazards in vulnerable areas by assessing the hazards and taking constructive action to minimize the consequences of potential future damaging events. Incorporating previously constructed, but less accessible, maps and data creates a force multiplier enabled by data preservation and *"The Data Preservation Act of 2019."*

AASG strongly supports all geologic hazard programs intended to save lives and reduce economic losses. Community resilience, or the ability to withstand or mitigate geologic hazards is dependent on knowing vulnerabilities to hazards and planning for those hazards. AASG applauds Rep. Soto for sponsoring H.R. 496 Sinkhole Mapping Act of 2019. Geologic hazards, like sinkholes, occur throughout the nation and the development of these risk-potential maps assist land planners, developers, water supply managers, infrastructure design, and many others to make informed decisions resulting in increased safety to the public. AASG believes a comprehensive geologic hazard bill that supports mapping, research, education and land-use planning is the most effective way to reduce the impacts of sinkholes and other geologic hazards.

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We acknowledge and support the role of the US Geological Survey in administering this program and we support the mapping to be performed by the State Geological Surveys at mapping scales appropriate for the hazard. AASG recognizes that sinkholes are a significant geologic hazard throughout our nation; however, they are not the only hazard. Without additional appropriations, this project could potentially take funding away from other important activities at the US Geological Survey. The *"Sinkhole Mapping Act of 2019"* does not include additional funding nor an authorization to support the mandated studies and maps.

AASG strongly supports preservation of and access to geological and geophysical data, which is facilitated through *"The Data Preservation Act of 2019."* AASG supports the reduction of the authorization funding level to $11 million from the current $30 million authorization.

AASG also supports a funding level, with additional funds outside of the current US Geological Survey budget from the current $1M to $11M. We recognize and support the role of the US Geological Survey in administering this program, which includes the development and compilation of state and federal geological and geophysical data inventories, an implementation plan, data standards and preservation "best practices," strategic planning, and collaboration among state and federal partners regarding preservation techniques. We acknowledge the significance of the National Digital Catalog at ScienceBase.gov, and that local and state agencies and our federal partners, such as the Department of Interior, Department of Energy, Department of Homeland Security, and the Environmental Protection Agency, rely on this data for purposes of water, energy and mineral resource assessments and sustainability, hazard mitigation, and protection of human health and the environment.

AASG understands that despite the continuous evolution of geological, geophysical, engineering concepts and analytical techniques, there is a constant need to revisit, reexamine, and reanalyze rock samples over time. These "second looks" at archived and heritage data lessen the need for costly re-sampling, and can yield energy and mineral discoveries worth billions of dollars and generate tens of thousands of jobs. Furthermore, as our nation develops, many of these collections are irreplaceable due to changing landscapes. *"The Data Preservation Act of 2019"* supports important Federal/State partnerships that achieve mutually beneficial goals related to the rescue and accessibility of invaluable geoscience data.

Geologic Hazards

Geological hazards collectively cause tens of billions of dollars of physical damage and economic loss each year in the United States. (Ludwig et al, 2018). Invaluable lives are lost in these tragic events. Fortunately much can be done to lower the risks and reduce future damage.

Most natural hazards either are geologic in character or have a significant geologic component, and many anthropogenic hazards have geologic aspects. Landslides, rock falls, debris flows, earthquakes, tsunamis, volcanoes, expansive soils, floods, erosion, sinkholes, and avalanches all can have both local and regional effects. Anthropogenic hazards include dams that fail, abandoned mines that collapse, and land that subsides due to excessive water pumping. These hazards can all be mitigated and minimized through geologic investigations/mapping and creation of risk-potential maps.

Geologic investigations assist in our understanding of natural processes that create hazards and can extend our knowledge of past events beyond the brief time for which direct human observations are available. This work is critical in assessing the extent, severity, and likelihood of future events. Sinkholes are generally associated with karst terrain and limestone, and they can be further exacerbated with changes in groundwater levels. Wildfires can create conditions that intensify the potential for damage from debris flows and excessive erosion in burned-over areas. Hurricanes, floods, and tsunamis leave traces of their destruction in the geologic record, thereby allowing assessment of long-term risks. These insights can facilitate risk reduction through opportunities to limit damage and loss of life through the design and placement of future structures. Geologic mapping and investigations are the foundation blocks of knowledge needed to develop this actionable intelligence.

State geological surveys and the US Geological Survey play vital advisory roles and scientific mapping roles. The US Geological Survey currently has several geologic hazard programs; however, few are developing actionable predicted risk maps at the community/county level to assist in local planning. The federal role of the US Geological Survey allows the creation of national maps, such as the US Seismic Hazard Map, which are helpful for the regional development of building codes to mitigate loss. Federal programs also investigate the conditions and knowledge of why landslides and other geohazards may occur. This is critical information, but this information must be taken to the next level of developing localized mapping. State geological surveys are the ideal organization to bring the understanding of these geologic hazards to local planners. Any geologic hazard project must include the regional and investigative knowledge that the US Geological Survey holds along with the local geologic mapping and geologic investigations developed by the state geological surveys.

Data Preservation

H.R. 4299, “The Data Preservation Act of 2019” -- To reauthorize through 2024 the National Geological and Geophysical Data Preservation Program (NGGDPP) Act of 2005.

BUDGET HISTORY

Since implementation of the NGGDPP, the annual authorization has been $30 million, however, this program is annually funded at or slightly above the $1 Million level. Cooperative funding of state projects began in 2007, totaling $7.95 million through FY 2018 in awards to the states. In 2018, 30 states were awarded data preservation grants with an average award of $37,000. In 2019, the Data Preservation program was reinforced with additional critical mineral data preservation funds of another $960K resulting in 36 states being awarded data preservation grants with an average award of $57,700.

Authorization History

NGGDPP was established through the National Energy Policy Act of 2005 [PL 109-38, sec. 351] with authorization through 2010. Since 2010, the program has been operating without authorization. While the US Geological Survey has been supporting this program, the US Geological Survey has been asked to support many legislative mandates that may endanger the funding of this program in the

future. The reauthorization request will secure the authorization for this program to continue.

DATA PRESERVATION ACCOMPLISHMENTS AND APPLICATIONS

Funding at the $1M level limits the work of this demonstrated successful program. This funding level prevents large-scale capital improvements to core repositories and archival storage centers, which are needed throughout the nation; however, the NGGDPP has successfully implemented the National Digital Catalog and funded small data rescue activities and improvements in data and physical sample collections and management across the country. The following describes selected accomplishments of State Geological Surveys. In addition, examples of successful applications of previously archived geological and geophysical data are shared to illustrate the importance of these geoscience data resources, which can generate billions of dollars for the Nation's economy, create jobs, and save lives:

- Alabama has digitally cataloged approximately 170,000 fossil specimens within its paleontology collection, providing ready access of fossil information to energy companies who are constructing or moving pipelines. The companies incorporate this information into the Paleontological Resources section of the required Environmental Impact Statement within their applications to the Federal Energy Regulatory Commission. Archived vibracores can be used to evaluate damage to the Alabama coast due to the Deepwater Horizon oil spill and may be the basis for recovering significant funds for coastal restoration.
- Alaska completed a major curation project supported partly by NGGDPP involving a valuable core sample collection at risk of severe material and data loss: 818 boxes of moldy coal-bed methane core from five oil and gas wells were cleaned, re-boxed, restored and made available to geoscientists studying potential energy resources. Other archived cores once examined and analyzed for gold, silver, and tin, are now being analyzed for their promising REE potential.
- Arizona digitized and georeferenced more than 4900 maps, 5500 reports, 5100 images to date; over 30,000 additional files and maps have also been scanned - information used extensively by state and federal agencies in environmental and abandoned mine/mine safety programs, and by mineral resource exploration companies.
- California notes the importance of its Historic Mine Maps Collection, which is used to remediate public safety hazards posed by abandoned mines throughout the state. Almost every year there are reports of California residents entering or falling into abandoned mines and becoming trapped sometimes with deadly results. Maps in the collection provide information on mine locations that would otherwise go undetected.
- Florida converted more than 7000 geophysical logs to digital format, providing information about state's deepest wells, making the data more accessible and useful toward exploration of oil, natural gas and deep-aquifer drinking water. Evaluation of core samples and geophysical logs continue to lead to a refined understanding of the Floridan aquifer system. Moreover, examination of core samples led to discovery of natural sources of arsenic, which fostered development of techniques that mitigate the release of this element underground sources of drinking water.
- Kansas used drill cores in its repository that were collected in the 1960s to help determine the cause of a gas explosion and recommend solutions. In 2001, natural gas bursts in Hutchinson,

Kansas, resulted in downtown explosions and fires, as well as fountains of natural gas and brines three miles east of the fires and an explosion under a mobile home that killed two people. Using the drill cores and new seismic data, scientists determined that gas leakage from a salt cavern used to store natural gas had resulted in two anomalous zones of potential high gas pressure. Vent wells were drilled to release the pressure, which prevent further explosions. Originally acquired in the 1960s while the Atomic Energy Commission was trying to determine potential nuclear storage facilities, the core was used in 2001 to prevent further explosions and deaths from underground natural gas accumulations.

- Michigan received a mining company donation of 4000 core boxes and fortunately had sufficient staff process the samples and sufficient space to archive the materials for future access. Reinspection of the samples led to discover of a potash deposit ***valued at $65 billion***.
- Missouri received funding from NGGDPP and applied it to convert 400 hard-bound, paper field notebooks to a digital format via scanning for preservation and archival purposes, increasing public awareness of and accessibility to the information. The collection comprises more than 1,500 geology field notebooks that date back to 1855. The collection is one of a kind and would be impossible to replace should be lost or destroyed. The notebooks contain historic geologic data on outcrop locations, rock-unit layers, mining, karst, hydrology, structure, and other topics. They also contain historic data on physiography, vegetation, socio-economic and cultural information and a myriad of other subjects. The notebooks have proven to be essential for site location and characterization work on mine-related Brownfields work. The information has not only reduced costs and time by providing mine location data, but has also been the sole source of information for more than 1,700 historic mines, many of which have significant soil or groundwater lead contamination and are now proximal to residential development.
- Montana applied NGGDPP funds to collect and preserve mines and mineral data throughout the state, specifically, preserving drill hole logs, mineral evaluations, and many other data related to the New World Mining District. Preservation of mineralogic and geochemical data was also accomplished to evaluate hundreds of abandoned-inactive mine sites for reprocessing waste rock.
- New Jersey, Maryland and Delaware used geologic and geophysical logs from their respective collections to cooperate on a transboundary study to understand the Potomac Aquifer, which is a principal supplier of drinking water in each state. The project was supported by the USGS National Cooperative Geological Mapping Program (STATEMAP). The geologic information, made available in part from the NGGDPP program, assisted the team with identifying the dimensions of the aquifer, and for locating optimal drilling locations for additional test wells. Drilling test wells is costly, and the use of existing geologic and geophysical information allowed the team of researchers to make optimal use of their research funds.
- New York applied NGGDPP resources to support the scanning of over 1,700 maps, therefore preserving the documents and making them more accessible. State agencies, such as the Departments of Transportation and Environmental Protection, have used the scans of the New York bedrock maps for projects such as landslide mitigation, resource planning, and habitat protection. These maps have also been used by the engineering community in planning and construction of a new water supply tunnel for New York City. Engineers on the project stated that the existence of archival bedrock data in the New York Geological Survey open file saved the City “millions of dollars in drilling costs.”

- Oklahoma has a core facility and data center, the Oklahoma Petroleum Information Center, that is the size of 4 football fields and holds over 100 miles of core. It also holds 1000's of well logs, 1000's of boxes of drilling cuttings, very popular old aerial photographs that were scanned with NGGDPP funding. Equally popular old data such as mud logs which have also been scanned with NGGDPP funding. These data are being used daily in oil and gas exploration and production efforts across Oklahoma, and the geological survey is regularly told how invaluable these data are. Some of the recent plays that are in the news are the Mississippi Lime, Granite Wash, Woodford shale, and SCOOP (South Central Oklahoma Oil Province). The utility of the data preserved can be easily tracked by the requests for core viewing, examination of cuttings, and paper records as these and other plays develop.
- Pennsylvania gas archived core that was drilled and archived over the last 40+ years and has been utilized over the last five years for studies of the Marcellus shale. This horizon has recently fueled a significant increase in available gas resources to support the US economy. Were it not for the cores preserved and maintained by the PA Survey, and the work over the last 30 years to map, sample and evaluate the Marcellus – long before the advent of current drilling technology and the now recognized importance of organic shales - the rapid and efficient development of this resource would have been significantly delayed.
- Texas maintains three core research centers. In 2008, reinspection of a small manila pouch full of rock chips from a dry oil test well in southern Texas led to discovery of the Eagle Ford Shale play: a $25 billion economic impact in a 20 county area supporting more than 47,000 jobs. The pouch resides in a box among half a million boxes in a Texas Bureau of Economic Geology core research facility. The sample had likely not been inspected since the 1950s.
- Utah has record of over 24,000 air photos that were downloaded last fiscal year for use by geotechnical and environmental engineering consultants in support of investigations for new development to identify and locate potential geologic hazards, and in environmental assessments, and by local governments and others to document land-use changes. The Survey's Aerial Imagery Collection is being used on almost all internal geologic hazard projects and emergency responses, and is critical for mapping landslide occurrences (such as the over 500 square mile Wasatch Plateau landslide inventory mapping project, Seeley Fire emergency response, etc.), and other hazards.

Closing

In closing, AASG endorses a more multi-hazard bill, which will meet all of the individual states needs and utilize state geological surveys to identify the geohazards within their states and produce risk-based geological maps at the scale and in the areas most appropriate within their state. Sinkholes are a very real concern, but limiting geologic hazard identification and mapping to just one hazard is inefficient and often protects only a small portion of the population rather than a holistic risk assessment based on the most likely geohazard(s) in the region.

AASG supports fully the NGGDPP and the *"Data Preservation Act of 2019."* Reauthorization of this program will secure continuing the accessibility of our historical data and leverage them into accomplishments for our future. This program brings science, maps, and data into an accessible format for all scientists to utilize yielding potential scientific rediscoveries of geologic hazards, water

supply, minerals, and energy reserves in our lands. In addition, this program serves to avoid unnecessary costs of embarking in geologic exploration in areas already represented in historic collection. Given the tremendous success of this program, AASG strongly recommends that this program be reauthorized and that the appropriation and authorization level of $11M using funds outside of the US Geological Survey.

Thank you for this opportunity to address this committee. I hope you find this information helpful as you consider these important matters.

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