



Testimony of Pat Gaylord, PLS
Oregon Director
On behalf of the National Society of Professional Surveyors
highlighting
Surveying Data to Improve and Protect Oregon's Water Supply
before the
Committee on Natural Resources
Subcommittee on Water, Wildlife and Fisheries
U.S. House of Representatives
October 8, 2024

Mr. Chairman, members of the subcommittee, my name is Pat Gaylord, and I am Vice President and the Surveying and Geomatics Service Excellence Leader for David Evans and Associates Inc. I'm a licensed Professional Land Surveyor in Oregon, Washington and Idaho, a Certified Federal Surveyor (CFedS), and a member of the Professional Land Surveyors of Oregon (PLSO - www.plso.org). In addition to graduating from Oregon State University with a BS in Forest Engineering, I also serve as the Oregon Director to the National Society of Professional Surveyors (NSPS - www.nsps.us.com), the national professional society of individual licensed surveyors. The surveying profession plays a major role in collecting data for water stewardship decisions. It is an honor to appear before the subcommittee.

USACE & Sedimentation

Since 2011, the U.S. Army Corps of Engineers (USACE) Civil Works Strategic Plan has stressed sustainable solutions for the 21st century. For reservoirs, this requires considering all of the factors that impact their performance and reliability. Evaluating reservoir vulnerabilities to changes in sedimentation rates is critical to the long-term management and reliable performance of reservoirs. Drought results in much lower than normal reservoir pools, revealing sedimentation that could adversely impact storage. Airborne LiDAR and other forms of remote sensing technology can provide valuable surveying, mapping, and geospatial data to help map sedimentation levels in reservoirs and other water-related projects and infrastructure.

NOAA's Hydrographic Services Improvement Act (HSIA)

In December 2018, the Hydrographic Services Improvement Act (HSIA) was included as Section 1001 in S. 140, the Coast Guard Reauthorization bill and signed into Public Law 115-282, thereby authorizing the program from 2019 through 2023. Under this law, NOAA conducts and contracts for hydrographic surveys and other hydrographic services which are used to map our coastal areas and navigable waters. The bill also calls, via Section 1002, for the Secretary of Commerce to develop a strategy for how NOAA will increase contracting with the private sector for hydrographic data collection, with the strategy due to Congress within six (6) months of enactment of the bill. Both deliverables due to Congress under Section 1002 remain tardy over 5 years later and we would like to work with the Committee to have NOAA finally provide these deliverables.

NOAA's Digital Coast Program

NSPS strongly supports, and enthusiastically recommends NOAA's [Digital Coast](#) program based in Charleston, SC. In this program authorized by P.L. 116-223, roles and responsibilities are clearly defined. NOAA, as a data partner for Federal, State, and local government, created the demand for surveying, mapping, and geospatial data. The private sector provides the supply of surveying, mapping, and geospatial data.

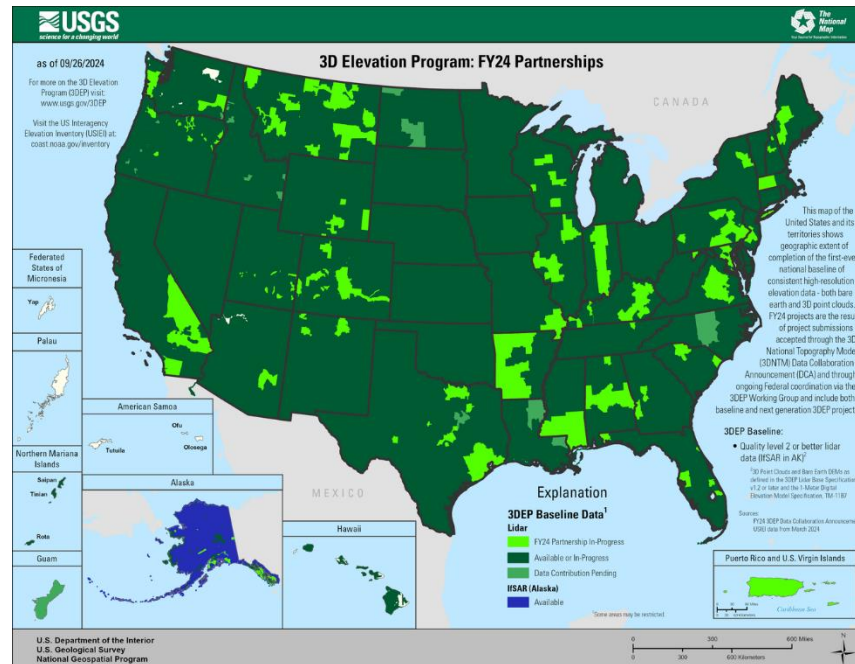
Data included in the Digital Coast ranges from surveying, mapping, geospatial, economic, demographic and ecosystem data to satellite imagery. In addition to making this data publicly available online, the Digital Coast provides a wide array of visualization and prediction tools that dramatically improve the effectiveness and efficiency of coastal management projects around the country.

Earlier this year, NOAA published the [FY21-23 Accomplishments Report](#). On May 1, 2024, eight bipartisan members of the House sent a [letter](#) to their colleagues on the House Appropriations Committee requesting the House Appropriations Committee to “fully fund the Digital Coast Program” at \$4 million, as authorized, in FY2025. Among those cosigning this letter were Committee members Representatives Kevin Mullin (D-CA), Mary Peltola (D-AK), and Jennifer Gonzalez-Colon (R-PR).

U.S. Geological Survey's 3D Elevation Program (3DEP)

On April 16, the House Natural Resources Committee held a markup session on H.R. 7003, the National Landslide Preparedness Act Reauthorization of 2024, which includes a reauthorization for [USGS 3DEP](#) through FY 2028 with the support of 18 bipartisan cosponsors including Representative Dan Newhouse (R-WA). As a result, H.R. 7003 was reported favorably out of committee. On July 31, the Senate Commerce, Science, and Transportation Committee held a markup session on the Senate companion National Landslide Preparedness Act Reauthorization of 2024, S. 3788, that includes the reauthorization of the USGS 3DEP program. Section 2 of the bill would reauthorize USGS 3DEP through 2034. On August 1, S. 3788 was reported favorably out of committee with an amendment.

3DEP is satisfying the growing demand for consistent, high-quality topographic data and a wide range of other three-dimensional representations of the Nation's natural and constructed features, primarily through elevation data collected with LiDAR. Among the applications that benefit from 3DEP data are [flood risk management](#); [infrastructure](#); [landslides & other hazards](#); water resources; aviation safety; [telecom](#); homeland security; emergency response; [precision agriculture](#); [energy](#); [pipeline safety](#); and other areas.



(Image above per USGS, September 2024; <https://www.usgs.gov/3d-elevation-program>)

Indeed, USGS has identified more than 600 applications that would benefit from such enhanced elevation data. 3DEP will promote economic growth, facilitate responsible environmental protection, and resource development and management, assist with infrastructure improvement, and generally enhance the quality of life of all Americans. The USGS, with involvement from the private sector and other stakeholders, conducted a National Enhanced Elevation Assessment (NEEA), to determine and document the need for national elevation data within government and private markets. The results indicated that enhanced elevation data have the potential to generate \$13 billion in annual benefits, at a benefit:cost ratio of 4.7 to 1.

3DEP stands out as a [best practices](#) model for coordination, inter-agency and inter-governmental cooperation, and a strong definition of government and private sector roles and responsibilities in a public-private partnership.

3DEP has been acquiring three-dimensional information across the United States using LiDAR technology- an airborne laser-based remote sensing technology that collects billions of LiDAR returns while flying- and making results available to the public.

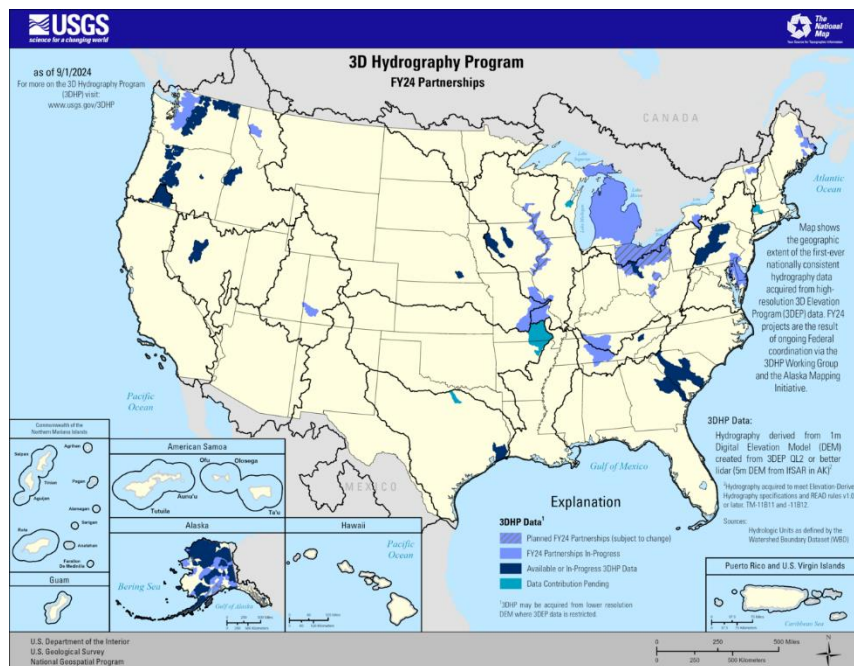
Optimally, USGS views 3DEP to be funded at \$146 million annually. USGS is on pace to achieve 100% national coverage by the end of FY2026. On May 1, 2024, thirty bipartisan members of the

House sent a [letter](#) to their colleagues on the House Appropriations Committee requesting “robust funding” for USGS 3DEP in FY2025. Among those cosigning this letter with Representatives Lori Chavez-DeRemer (R-OR) and Val Hoyle (D-OR) were fellow committee members like Chairman Bruce Westerman (R-AR), Kevin Mullin (D-CA), Grace Napolitano (D-CA), Sydney Kamlager-Dove (D-CA), John Curtis (R-UT) and Jennifer Gonzalez-Colon (R-PR). On May 15 the Senate companion [letter](#) to the Senate Appropriations Committee was cosigned by 11 bipartisan offices including Senator Ron Wyden (D-OR).

Active for roughly a decade, the 3DEP Coalition is comprised of representatives of a broad cross section of stakeholders, including nearly 60 organizations from surveying, mapping and geospatial; real estate; home building; flood management; emergency response; environmental; science; mining; insurance; telecom; agriculture; and infrastructure. As NSPS was a co-founder of the 3DEP Coalition, NSPS enthusiastically supports USGS 3DEP.

U.S. Geological Survey’s 3D Hydrography Program (3DHP)

The implementation of 3D National Hydrography Program ([3DHP](#)) marks the start of a new era of water data - the first systematic remapping of the Nation’s hydrography since the original USGS 1:24,000-scale topographic mapping program was active. Community-wide coordinated investments will contribute toward a consistent set of national water data to answer the most demanding water resource questions.



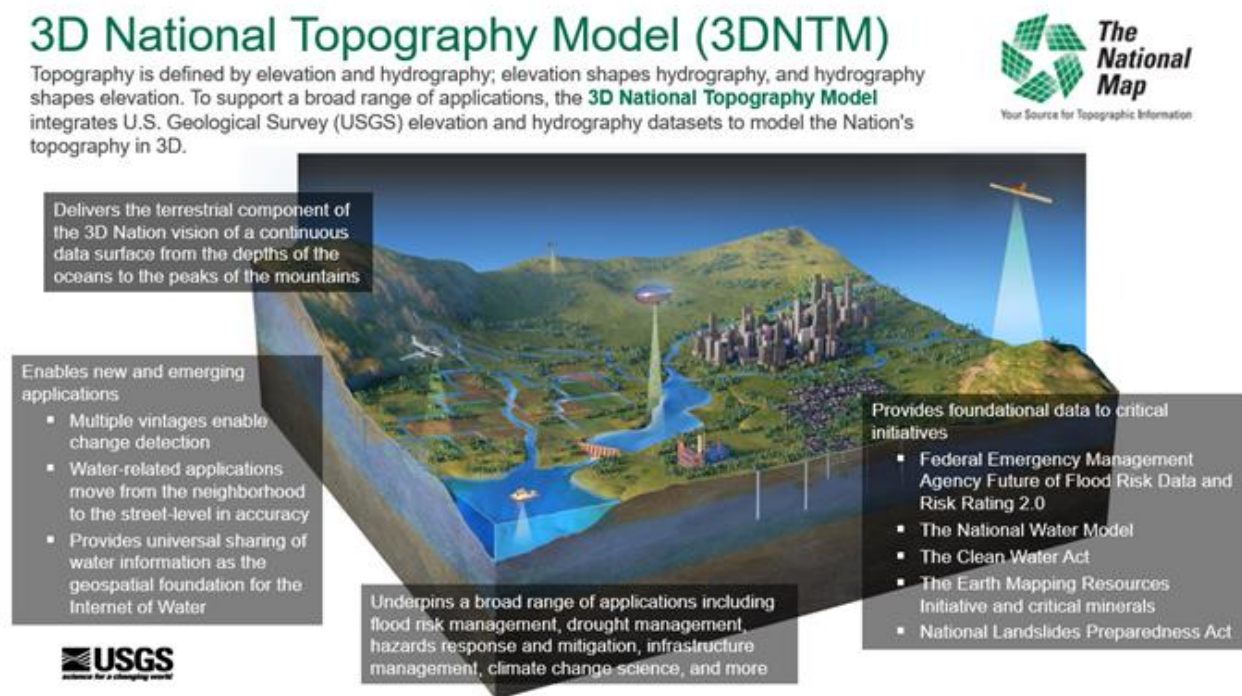
(Image above per USGS, September 2024; <https://www.usgs.gov/3DHP>)

The 3DHP will significantly improve the level of detail, currency, and content of hydrography data by deriving (1) three-dimensional (3D) stream network datasets and watersheds from high-quality 3D Elevation Program (3DEP) data and (2) other elevation derivatives to support applications like hydrologic and hydraulic modeling. The 3DHP will improve the ability to track

information related to water as it moves through the hydrologic cycle by connecting surface-water features traditionally represented in the National Hydrography Dataset (NHD) to data about wetlands, engineered hydrologic systems, and groundwater; it will also improve the attribution of important hydrologic characteristics like streamflow permanence.

U.S. Geological Survey's 3D National Topography Model (3DNTM)

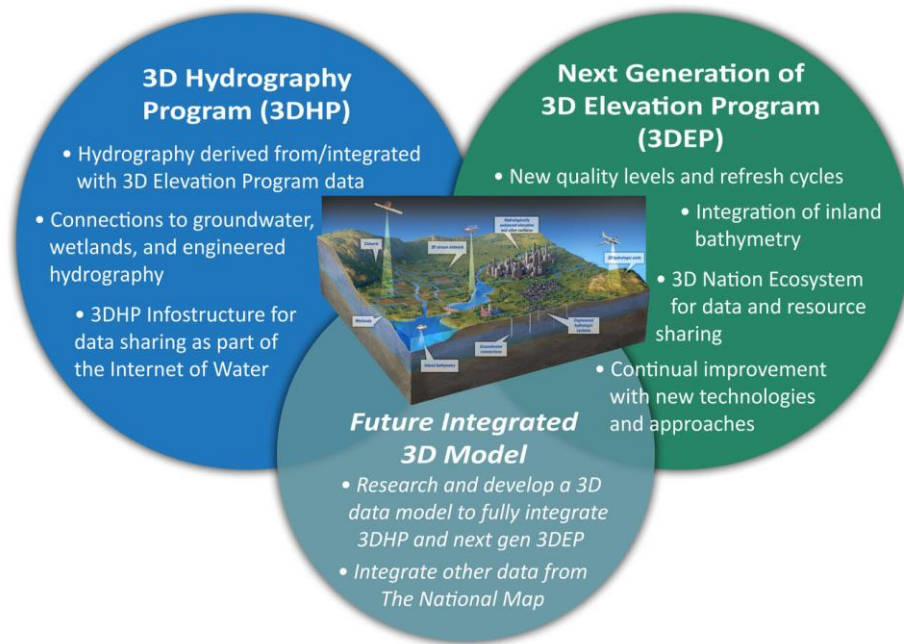
The USGS is responsible for the topographic mapping of the United States and fulfills this in part by co-leading both the U.S. Office of Management and Budget Circular A-16 Elevation and Inland Water themes and managing the Nation's elevation and hydrography datasets. As a part of this responsibility, the USGS developed a program plan, the [3D National Topography Model Call for Action Part 1: 3D Hydrography Program](#). This plan introduced the new vision for the Nation's topographic data; an initiative for refreshing the Nation's hydrography data and improving discovery and sharing of water-related data.



(Image above per USGS, October 2024; <https://www.usgs.gov/3d-national-topography-model>)

The 3D National Topography Model ([3DNTM](#)) is a new initiative that updates, improves, and integrates USGS elevation and hydrography data to support the most demanding scientific requirements and enable data-driven decisions across user communities.

Topography is defined by terrain and water, each influencing and shaping the other. The 3DNTM is a new USGS initiative to embrace this inherent relationship between the Earth's surface and the water that interacts with it. The initiative updates and integrates USGS elevation and hydrography data to model the Nation in 3D. The transition to an integrated approach to create and manage elevation and hydrography data will result in higher quality data that are updated more frequently.



(Image above per USGS, October 2024; <https://www.usgs.gov/3d-national-topography-model>)

The 3DNTM provides the terrestrial component of the USGS and NOAA shared vision of a 3D Nation to build an elevation foundation – from the peaks of our mountains to the depths of our waters. Shared by USGS and NOAA, this vision recognizes the importance of elevation data for both resilient communities and the United States economy.

The 3D Nation Elevation Requirements and Benefits Study (3D Nation Study) (NOAA, 2022) conducted jointly by NOAA and the USGS identified potential annual benefits of 10.8 billion dollars U.S. for new topographic and inland bathymetry data. These benefits are possible when publicly available data without restrictions are available to support innovative uses and mission critical requirements of a broad user community.

Snowpack Mapping

Snow-capped mountains, where snow accumulates all winter and often well into spring, function as frozen water towers by storing water as snow into late spring and summer. When spring weather arrives, and the snow melts, the high elevation areas produce a large pulse of streamflow that redistributes water downstream through the landscape.

These seasonal dynamics are critical components of the surface water cycle for both humans and ecosystems. The mountain snowpack is the lifeblood of the American west – it is by far the biggest water reservoir and is the source of 75-80% of surface water flow in western states.

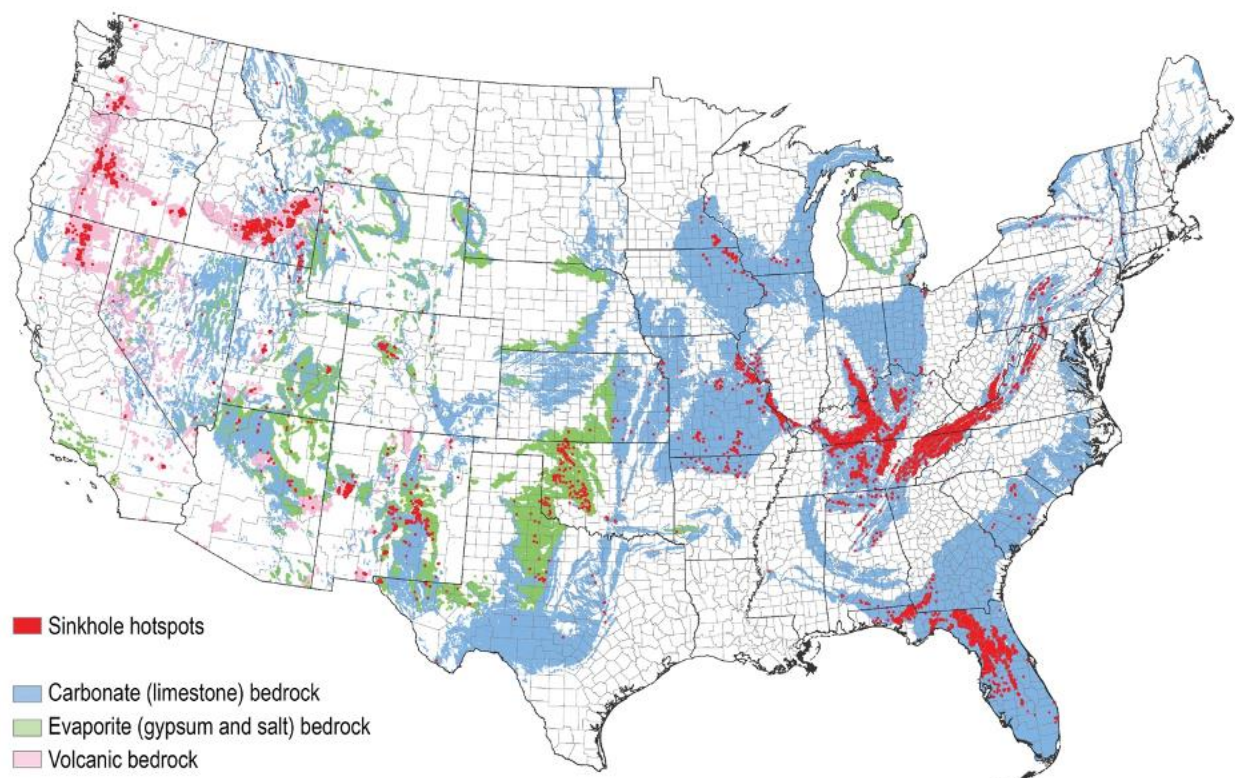
The conventional method of monitoring the seasonal snowpack – manual and automated measurements managed by the USDA NRCS and California Snow Surveys – provides a very sparse snapshot of conditions at a small number of locations. This tiny sample means that

watershed snowpack conditions can change undetected and is not a volume measurement but rather an index compared to the historic record.

NSPS is advocating draft legislation to authorize the coordinated collection, management, and dissemination of precise and accurate surveying, mapping, and geospatial data benefitting key stakeholders at the local, state, and federal levels impacted from “snow to flow.” Such a collaborative effort should follow the model used by the successful public private partnerships (P3s) managed by the USGS (the 3D Elevation Program, or 3DEP) and NOAA (Digital Coast program).

H.R. 2855 – Sinkhole Mapping Act

H.R. 2855, the Sinkhole Mapping Act, introduced by Representatives Darren Soto (D-FL) and Gus Bilirakis (R-FL), and now with 9 other bipartisan cosponsors, directs the USGS to establish a program to study the short-term and long-term mechanisms that cause sinkholes, including extreme storm events, prolonged droughts causing shifts in water management practices, aquifer depletion, and other major changes in water use; and develop maps depicting the zones that are at greater risk of forming sinkholes. The USGS must establish a public website that displays such maps and other relevant information critical for use by community planners and emergency managers.



(Image above per USGS, May 2020; <https://www.usgs.gov/media/images/karst-map-conterminous-united-states-2020>)

A sinkhole is a depression in the ground that has no natural external surface drainage. This means that when it rains, all of the water stays inside the sinkhole and typically drains into the subsurface.

Sinkholes are most common in what geologists call, “karst terrain.” These are regions where the types of rock below the land surface can naturally be dissolved by groundwater circulating through them. Soluble rocks include salt beds and domes, gypsum, limestone, and other carbonate rock. Florida, for instance, is an area largely underlain by limestone and is highly susceptible to sinkholes.

When water from rainfall moves down through the soil, these types of rock begin to dissolve. This creates underground spaces and caverns.

Sinkholes are dramatic because the land usually stays intact for a period of time until the underground spaces just get too big. If there is not enough support for the land above the spaces, then a sudden collapse of the land surface can occur.

Airborne LiDAR (light detection and ranging) offers enormous potential for mapping sinkholes. LiDAR technology can identify surface clues to underlying karst formations and pinpoint underground karst activity.

Such an activity as authorized in H.R. 2855 can fully leverage an existing LiDAR data collection program already managed by USGS, commonly known as the 3D Elevation Program (3DEP), as codified by the National Landslide Preparedness Act (P.L. 116-323). NSPS stands ready to work with the Committee to enact H.R. 2855 with helpful edits to improve the bill.

U.S. Geological Survey’s Subsidence Program

More than 80 percent of known land subsidence in the U.S. is a consequence of groundwater use. Subsidence detection and mapping done by the USGS is needed to understand and manage our current and future land and water resources in areas where subsidence is a problem or may be in the future. In 2021, a ground subsidence program in USGS was authorized by Section 4 in P.L. 116-323. In March 2023, Representatives Josh Harder (D-CA) and Maria Salazar (R-FL) worked together to support the subsidence program known as the National Land Level Change (NLLC) Map as NSPS and has been coordinating with USGS leadership on this initiative since 2019.

Mapping ground changes in vulnerable areas across the nation will ensure that we can implement preventative measures to avoid potential disasters. Many parts of the United States are sinking, including major cities like Miami, Houston, New Orleans, and San Francisco. However, satellite mapping data that can show the exact amount of change has not been updated in decades. Land subsidence, or sinking, can increase flooding, alter coastal ecosystems, and damage infrastructure.

Survey Mark Preservation

Disasters, whether they are wildfires, earthquakes, tornadoes, hurricanes, landslides, or floods, can have an adverse impact on the cherished property rights enjoyed by the American people. Land surveyors, as stewards of the nation’s property corners and geodetic points, are entrusted with establishing and protecting such “marks” and monumentation. When disasters damage or obliterate such points, corners, and monuments, their reestablishment and restoration are essential

rebuilding, preserving a home or business owner's property rights, and getting back to normal. The preservation and remonumentation of marks set by professional land surveyors should be included in any disaster relief and cleanup effort. A major part of the success of the cleanup and rebuilding process will rely on the preservation of the surveying marks monumenting the property corners and geodetic marks.



Surveying marks are physical points on the ground identifying the location of property corners and boundaries. Surveying marks are visible and tangible objects that landowners can see and touch, and bring meaning to property corners, property boundaries, and property ownership. Surveying marks designate property lines, road right-of-way lines, utility easement lines, and various districts and agency boundary lines on the ground. The ownership of land, and consequently the ability to define boundaries, is dependent on surveying marks. Ensuring that boundaries and corners are protected means that the location of boundaries are readily identified. This allows landowners and agencies affected by a disaster to quickly rebuild improvements in the correct location.

It is in the public interest to preserve surveying marks by including land surveyors in pre-cleanup discussions and meetings with all governmental agencies, clean-up companies, landowners, and various contractors. Professional surveyors should be authorized to enter the disaster zone ahead of the cleanup crews when the impacted area is determined to be safe to locate, measure, post, protect, or preserve the position of surveying marks. The right-of-entry forms should include language explaining the importance of preserving surveying marks and authorizing land surveyors to enter the property, if needed. Survey mark preservation requirements, standards, and reimbursement eligibility should be incorporated into disaster relief protocols with all Federal, State, and local governmental agencies.

NSPS looks forward to working with the Committee to include a provision in legislation ensuring that survey mark reestablishment and preservation by professional surveyors be included in both pre-cleanup discussions as well as access to recovery and disaster relief and assistance programs.

FLAIR Act Implementation

In the 117th Congress, NSPS strongly supported enactment of the Federal Land Asset Inventory Reform (FLAIR) Act, introduced by then-Representative Ron Kind of Wisconsin and then-Full Committee Ranking Member Bruce Westerman of Arkansas.

On December 29, 2022, President Biden signed the FLAIR Act into law as part of the Omnibus appropriations bill. The provision, as part of P.L. 117-73, is found in H.R. 2617 the Consolidated Appropriations Act, FY 2023, also known as the Omnibus appropriations bill, in Division DD –

Public Land Management, Title I Department of the Interior Provisions, Sec. 103, Cadastre of Federal Real Property.

In order to be a good steward of our public lands, the Federal Government must first know precisely what land it owns. Unfortunately, the Federal government's ability to manage its public lands and indeed all its real property assets is terribly hampered by the lack of a current, accurate land inventory.

The FLAIR Act authorized the Department of the Interior to develop and manage such a multipurpose, uniform Federal GIS database to track and account for all Federal Real Property. The Secretary of the Interior is authorized to conduct an "inventory of inventories" to identify all inventory databases, whether efficient or inefficient. The efficient databases will be merged into a single multipurpose cadastre while the inefficient databases are repealed, thus preventing waste and duplication to continue.

This Federal effort helps state and local agencies verify their ongoing efforts to identify what each level of government owns. This will also enable government at all levels to find missing property through a "gap analysis."

Proper surveys, mapping and an inventory of Department of the Interior lands would improve land management, avoid wasteful duplication and redundancy, generate hundreds of millions of dollars in new revenue, and further the goal of "map it once, use it many times."

Unfortunately, the federal government has not yet started to implement the bill since its December 2022 enactment. Once the multipurpose inventory is complete, the government can become a better real property asset manager, and a responsible steward of its land holdings. This will result in more efficient land management, again providing savings. NSPS stands ready to work with the Committee and the Administration for full implementation of the FLAIR Act.

Conclusion

Mr. Chairman, I thank you for the opportunity to share our views and we look forward to working with the subcommittee to continue to build on past success and further improve and protect Oregon's water supply.