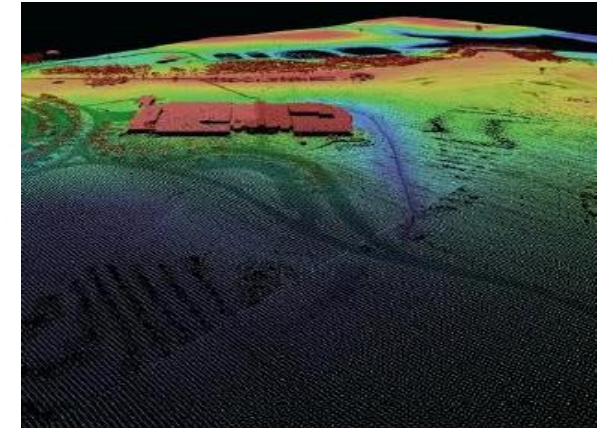
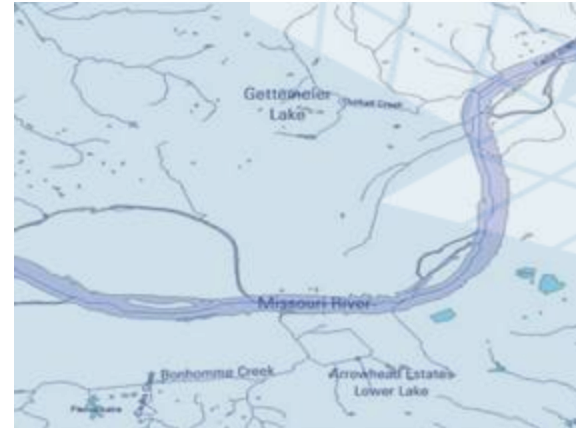
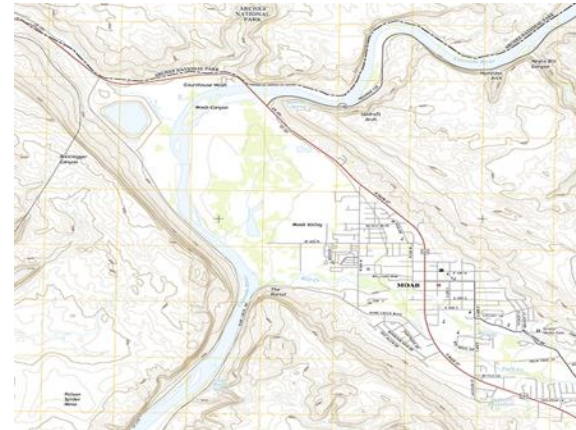




# 3D Elevation Program (3DEP) and National Hydrography Datasets Update for ICWP

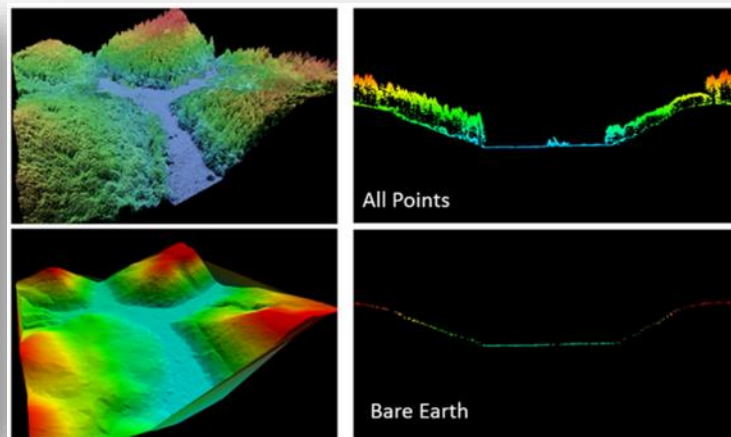
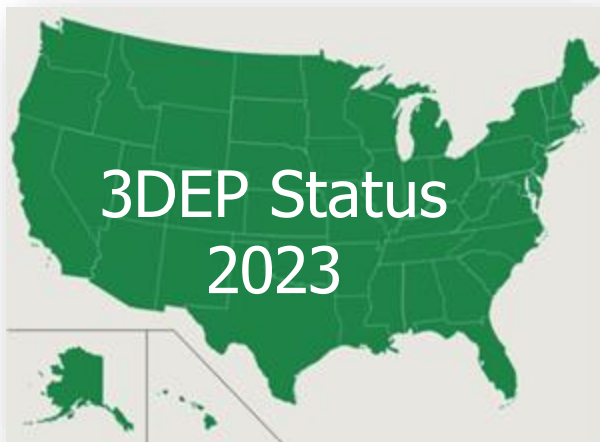


Vicki Lukas

Chief, Topographic Data Services  
National Geospatial Program  
October 9, 2019

# 3D Elevation Program (3DEP) Goal

- Complete acquisition of nationwide lidar (IfSAR in AK) by 2023 to provide the **first-ever national baseline of consistent high-resolution elevation data – both bare earth and 3D point clouds – collected in a timeframe of less than a decade**
- Address Federal, state and other mission-critical requirements
- Realize ROI 5:1 and potential to generate \$13 billion/year
- Leverage the expertise and capacity of private mapping firms
- Achieve a 25% cost efficiency gain
- Completely refresh national data holdings

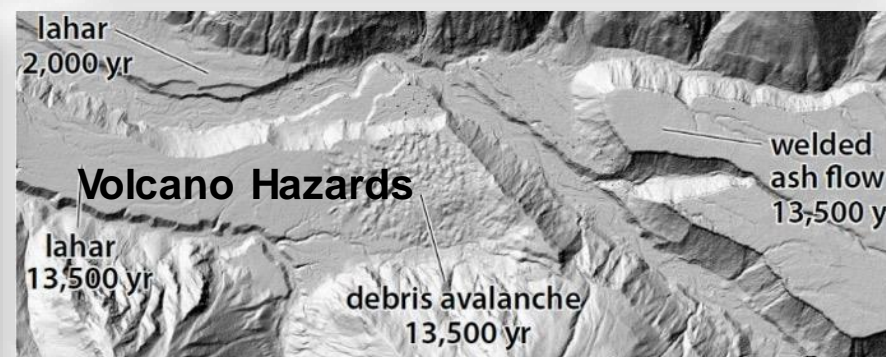
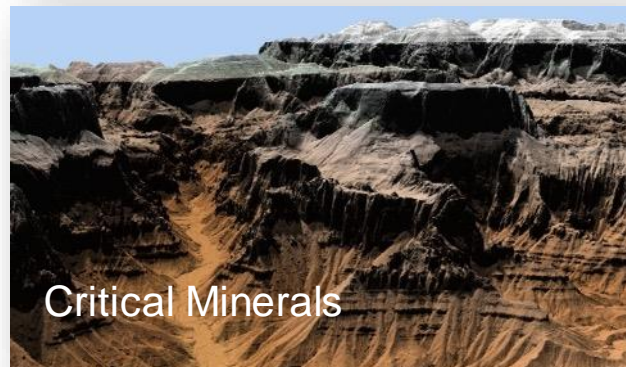
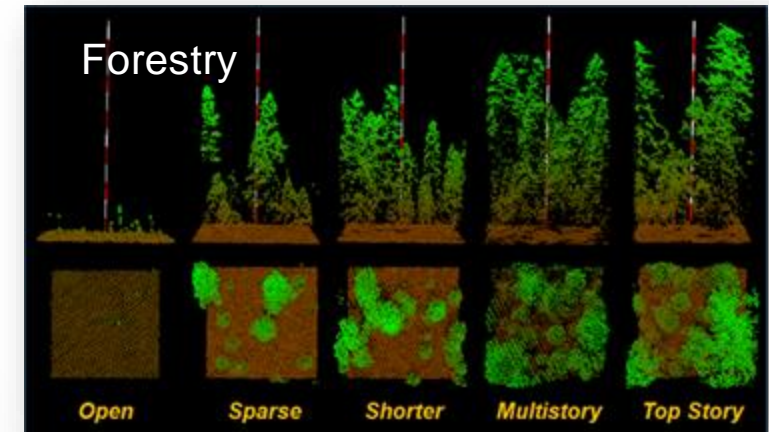
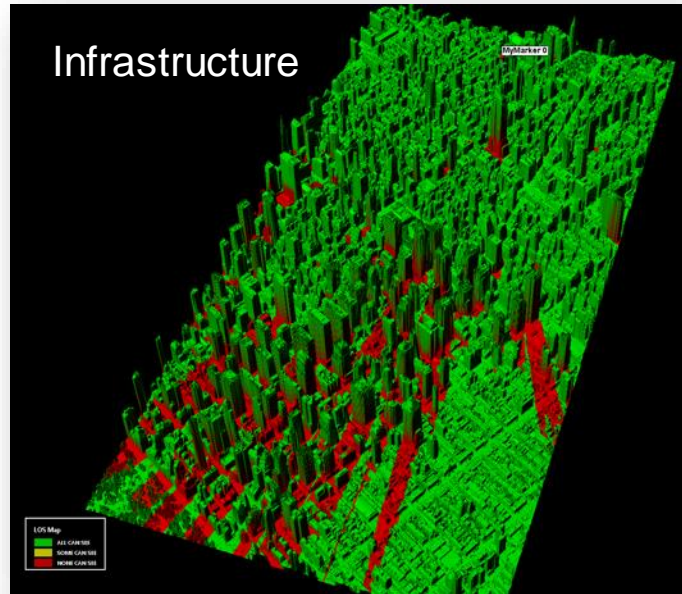


Rank	Business Use	Annual Benefits	
		Conservative	Potential
1	Flood Risk Management	\$295M	\$502M
2	Infrastructure and Construction Management	\$206M	\$942M
3	Natural Resources Conservation	\$159M	\$335M
4	Agriculture and Precision Farming	\$122M	\$2,011M
5	Water Supply and Quality	\$85M	\$156M
6	Wildfire Management, Planning and Response	\$76M	\$159M
7	Geologic Resource Assessment and Hazard Mitigation	\$52M	\$1,067M
8	Forest Resources Management	\$44M	\$62M
9	River and Stream Resource Management	\$38M	\$87M
10	Aviation Navigation and Safety	\$35M	\$56M
:			
20	Land Navigation and Safety	\$0.2M	\$7,125M
Total for all Business Uses (1 – 27)		\$1.2B	\$13B



# + 3D Elevation Program (3DEP) Goal

Complete acquisition of nationwide lidar (IfSAR in AK) by 2023 to provide the **first-ever national baseline of consistent high-resolution elevation data** collected in a timeframe of less than a decade





# 3DEP for Flood Risk Management

Conservative annual benefits estimated at \$502M

- Produce higher quality flood maps, including Flood Insurance Rate Maps
- Manage dam and levee safety programs to reduce flood risks
- Improve hydrologic modeling and flood forecasting
- Improve State and local flood risk management and response
- Improve storm water facilities and dam design
- Extract building footprints and identify the finished floor elevation to quantify potential damages based on flooding depths



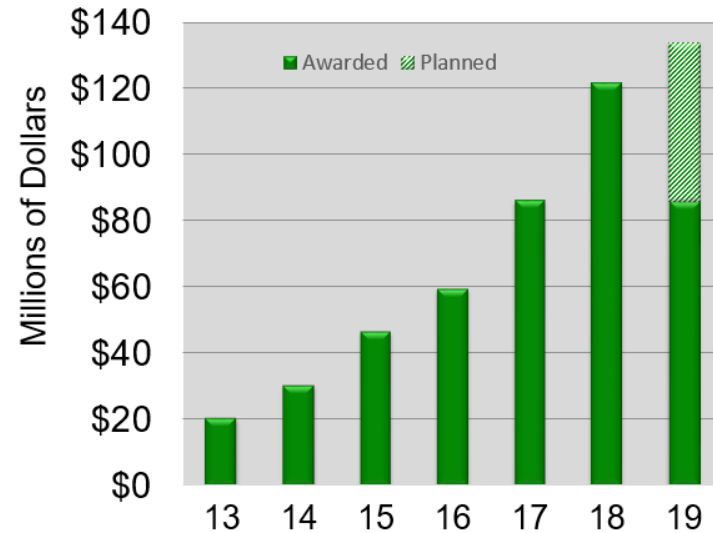
Lidar aids hydraulic modeling to determine flood-inundation on the Saluda River, near Greenville, SC



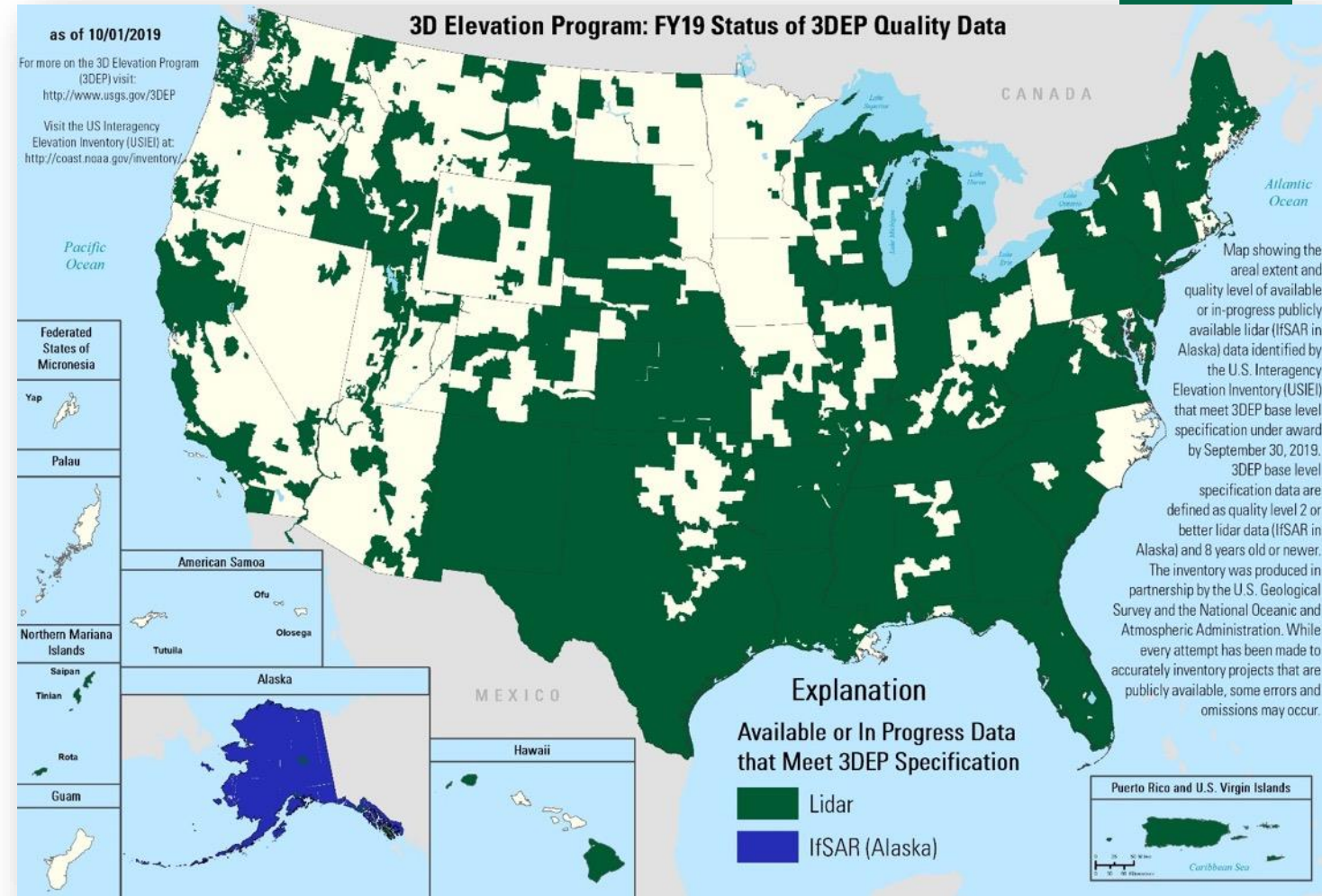
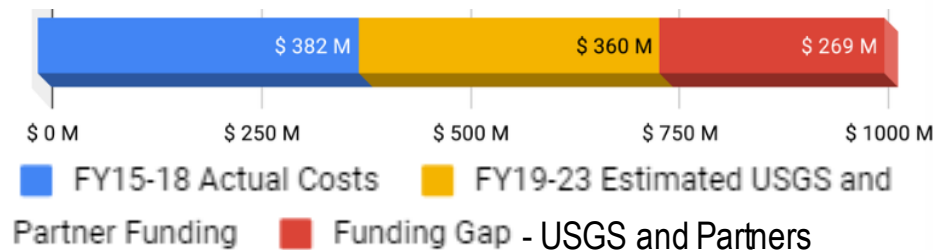
# + 3DEP Status Including FY18 Partnerships

Data are available or in progress for 67% of the Nation

\*includes lidar and AK IfSAR



Data acquisition investments by all partners, by fiscal year

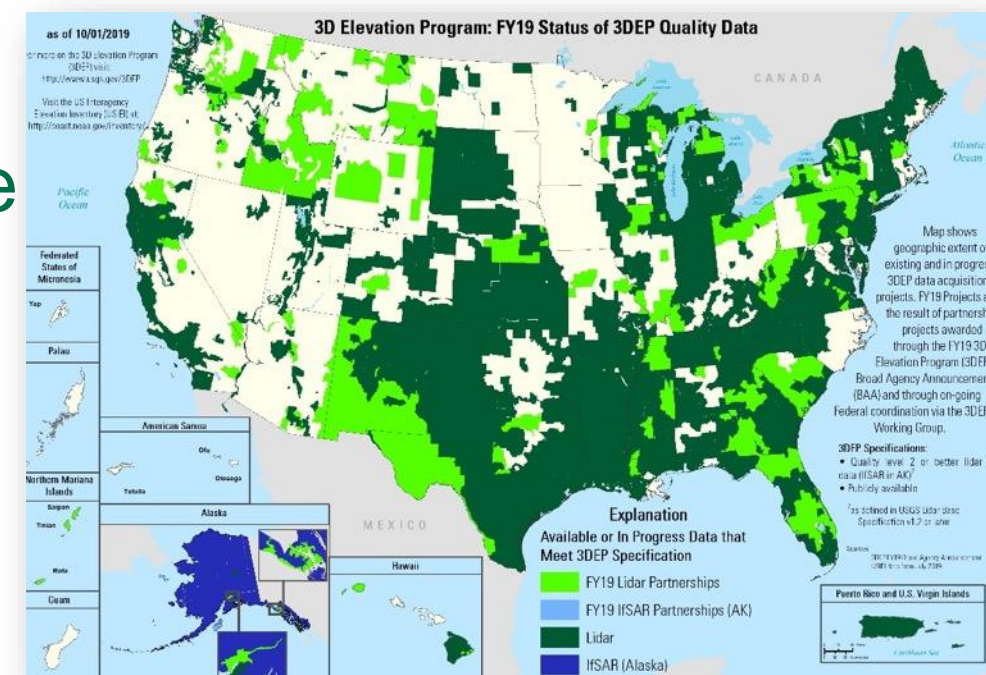


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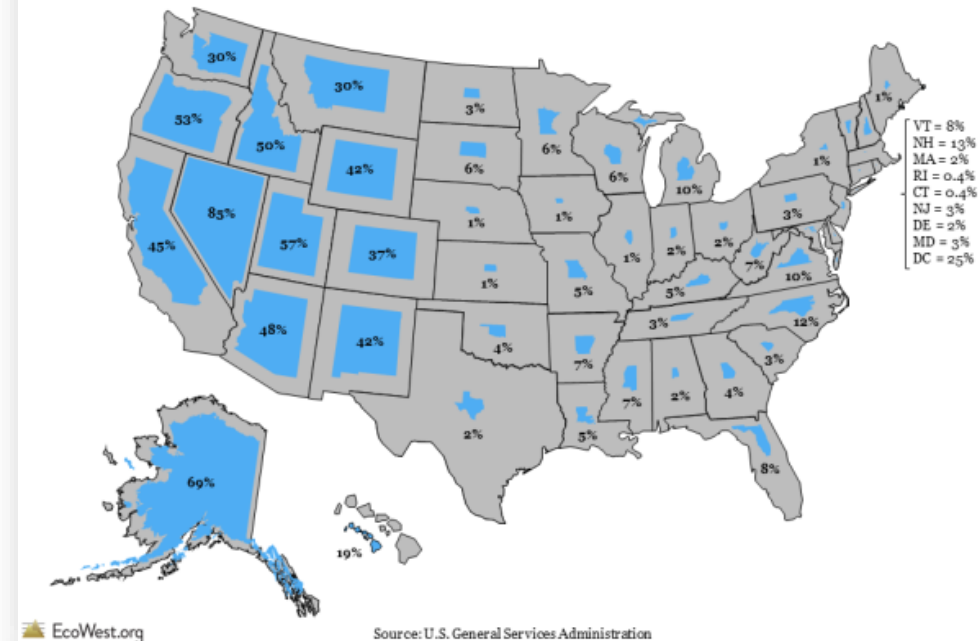
# Completion of 3DEP nationwide coverage

## Challenges and Strategies

- Significant amounts of Federal land in western US
- State and local investments in western states are mostly in populated areas, to support infrastructure, natural hazards
- What are strategies for increasing Federal investment in the west?
  - New DOI partnerships, working with USFS – doing an analysis of costs for Federal land under 3DEP Executive Forum
  - New Federal requirements may draw in other partners
  - EarthMRI critical minerals initiative
  - Hazards - landslides legislation, supplementals
  - Developing state plans for completing coverage under a project with the National States Geographic Information Council
  - Other western initiatives or groups?



### Portion of each state that is federal land

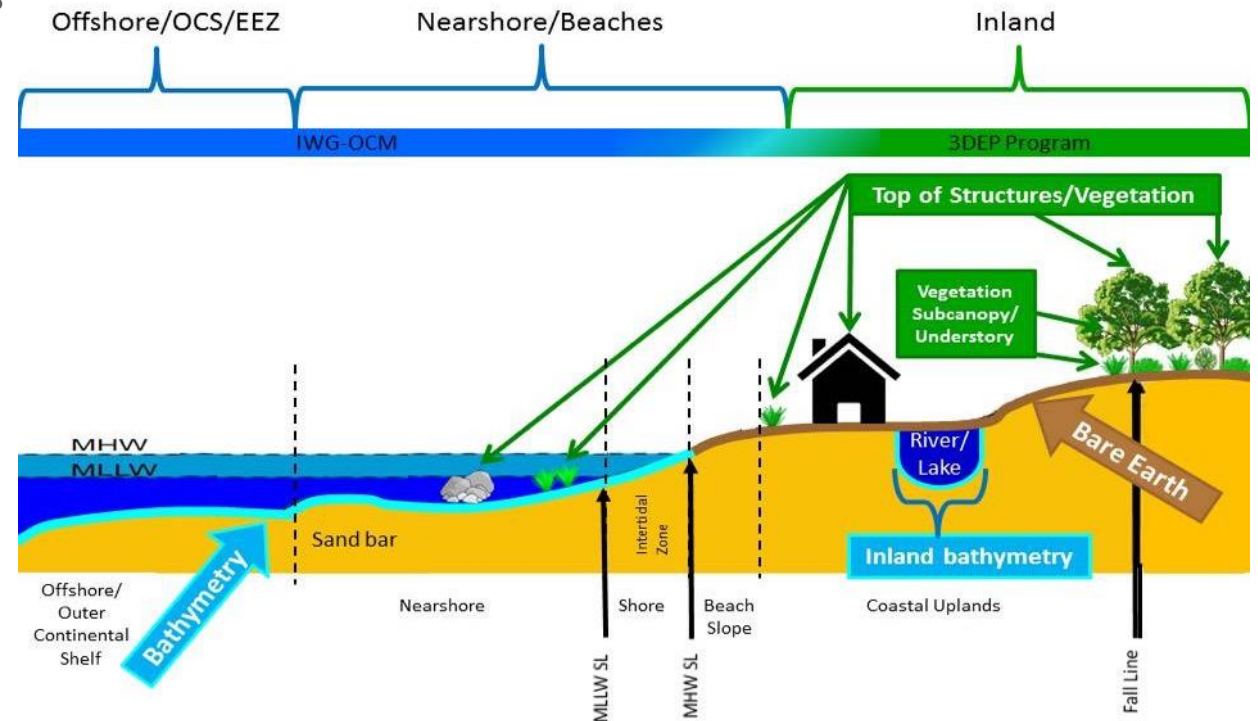




# 3DEP Future Generation Just Around the Corner

## 3D Nation Elevation Requirements and Benefits Study

- Working with NOAA to understand inland, nearshore and offshore bathymetric data requirements and benefits
- Plan for the next round of 3DEP when the first-ever national baseline of consistent high-resolution data is in place – what is needed for monitoring, change detection and other new applications?
- Gather technology-agnostic user information to be able to assess new technologies against requirements and identify the tradeoffs between different approaches
- Results will lead to a completely new approach regarding QLs, refresh frequency by geography, products offered, and other changes





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# Inland Bathymetry for 3DEP

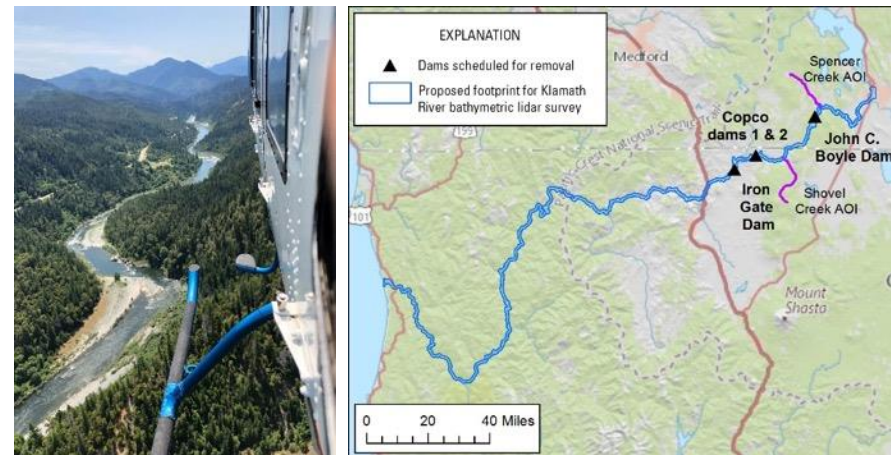
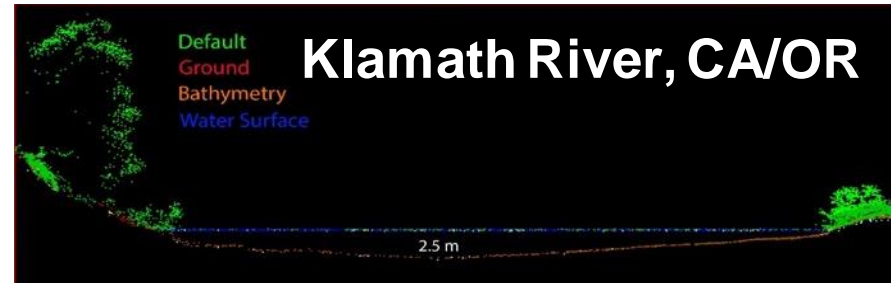
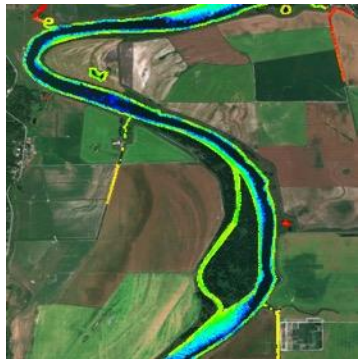
3DEP pilot projects help inform

- Development of specifications
- Topo-bathy lidar collection criteria
- Eventual goal to operationalize inland bathy

3D Nation Study **PRELIMINARY** Information  
Source of approx. 500 mission critical activities that identified the need for inland bathymetry

State or U.S. Territorial government	43%
Federal Agencies and Commissions	31%
Regional, County, City, or other local government	11%
Academic or Not-for-Profit	10%
Private or Commercial	5%
Tribal government	1%

Completed surveys



Planned surveys





# Water is among the defining issues of our times

## Too much, too little, poor quality

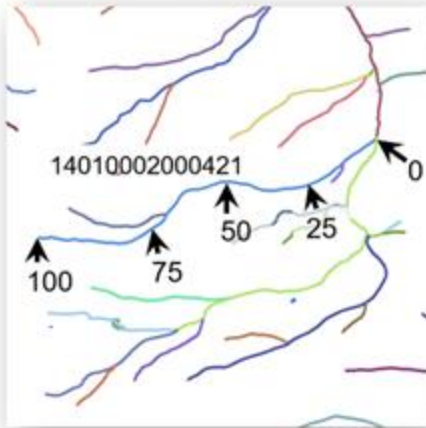
- Water crises are among the most probable and potentially impactful risks faced by society in the coming decade (World Economic Forum, 2014)
- A March 17, 2016 *New York Times* editorial summarizes that we as a nation have water-related “crises percolating all over, but lack the data necessary to make smart policy decisions”
- The nation has no **common infrastructure** for managing water information collected by the nearly two dozen federal agencies and hundreds of state and local organizations with water in their mission



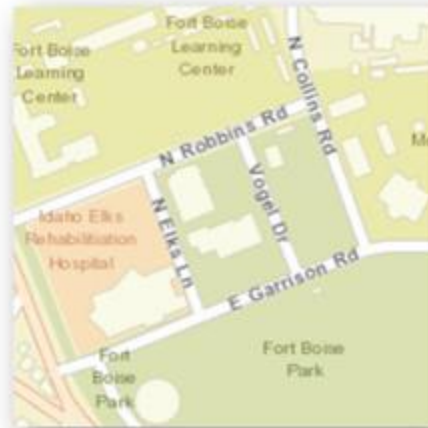
# + National Hydrography Datasets

Foundational datasets for indexing water-related information...

NHD reach code and measure



Street address



Hydrologic Unit Codes



Zip Codes



...and to the landscape: NHDPlus HR

Elevation-based catchments for each flowline in the stream network provide more detail like ZIP Code +4

Value-Added Attributes (VAAs) pre-calculate network characteristics to support routing like Google Maps driving directions

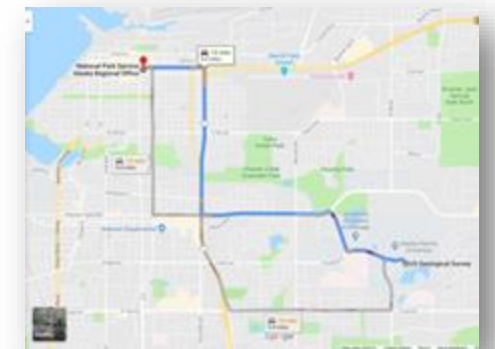
Together enable analysis between the stream network and terrestrial characteristics on the landscape, making network analysis easier and richer

Limitless data can be linked to NHDPlus HR, supporting development of consistent and repeatable modeling results

NHDPlus HR catchments and VAAs



Zip Code +4 and Google Maps routing

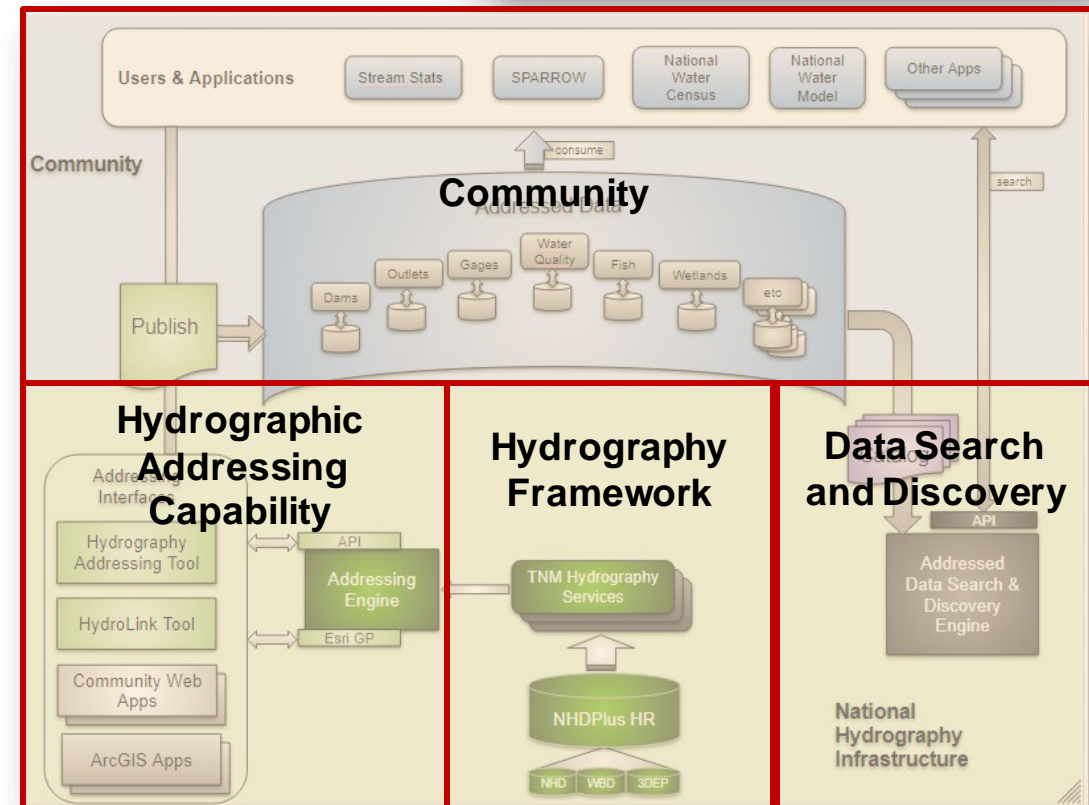


...to the network and drainage area: NHD and WBD



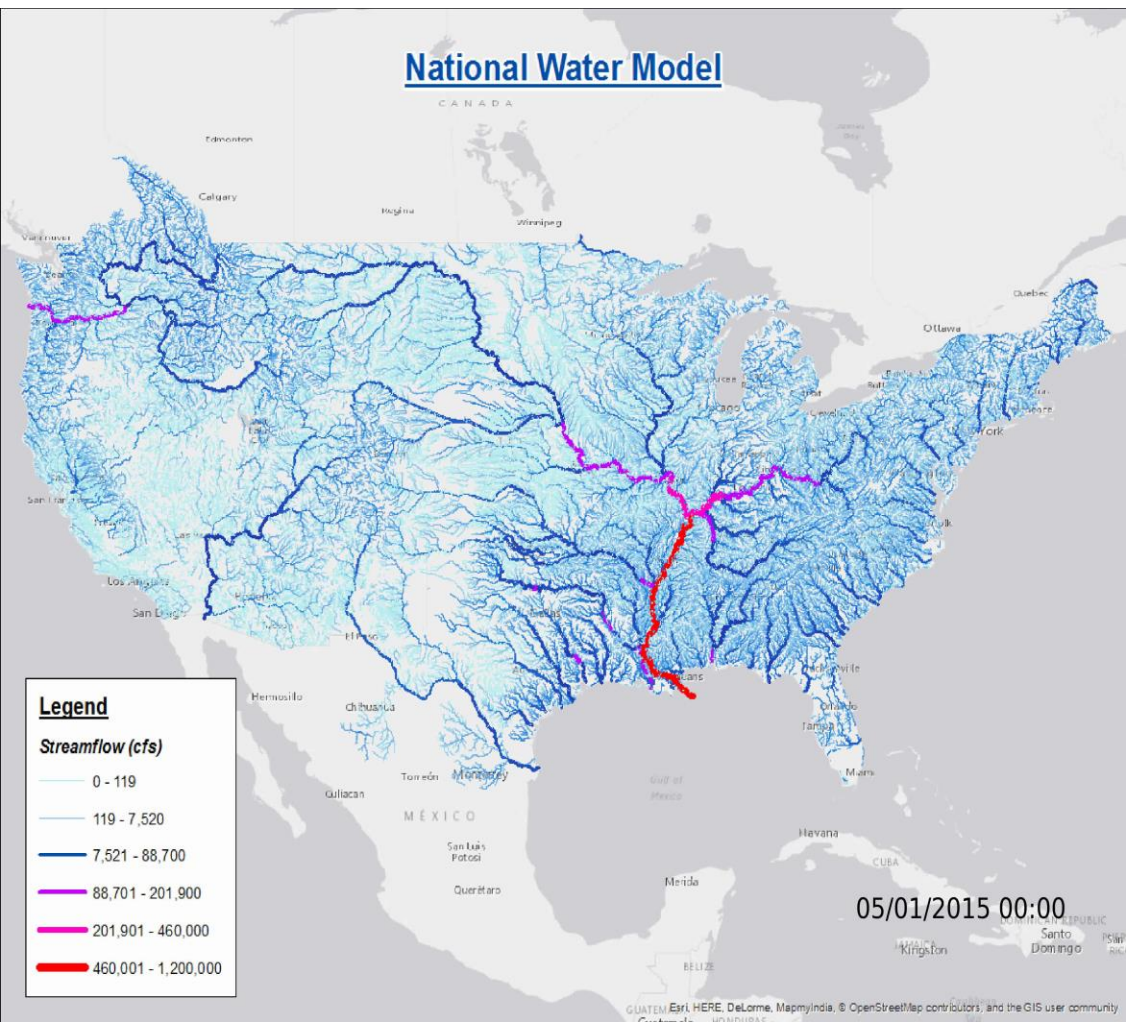
# National Hydrography Infrastructure

- Combine foundational hydrography datasets with hydrographic addressing, catalog, and search engine functionality
- Provides the universal infrastructure for sharing and discovering limitless sources and types of water information
- Underpins interagency hydrologic observing systems and enable models that account for all the water in the water cycle – from the atmosphere to the oceans



+ Future

Hydrography derived from lidar



Simulates conditions for 2.7 million stream reaches, representing *the biggest improvement in flood forecasting ever*

Forecasting at neighborhood level

Forecasting at street level

12

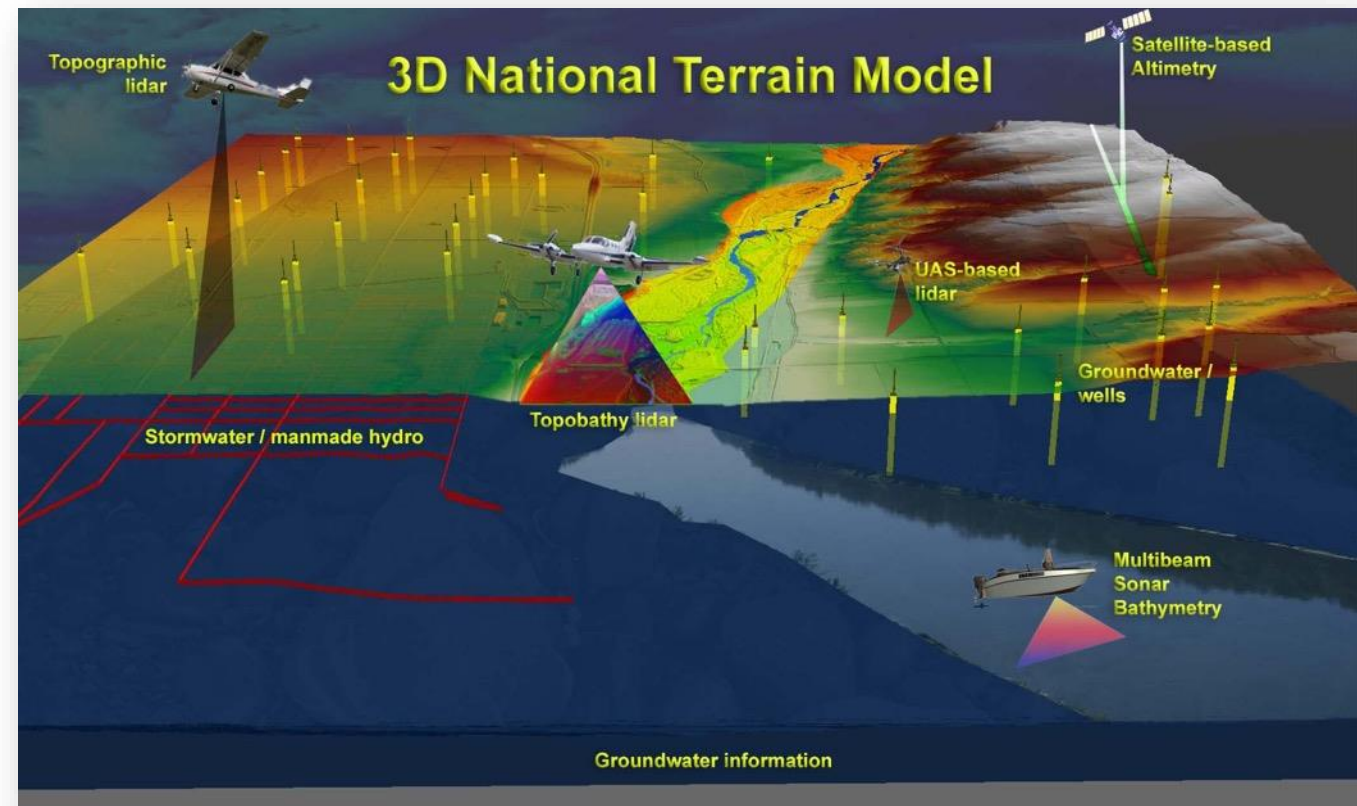
	IN USE TODAY: NHDPlus Medium Resolution	IN PROGRESS: NHDPlus High Resolution	FUTURE: Hydrography Derived from Lidar
Elevation source	30 meter	10 meter	1 meter
Hydrography source	1:100,000-scale NHD	1:24,000-scale or better NHD	1:5,000-scale or better derived from lidar
Number of features nationally	2.7 million	26 million	200-300 million



# + Next Generation – 3D National Terrain Model

Implement the USGS-NOAA 3D Nation concept of continuous topographic/bathymetric information from the peaks of our mountains to the depths of our oceans

- Integrate surface and subsurface features
  - Elevation and hydrography
  - Inland bathymetry
  - Connection points to groundwater and manmade hydrographic features
  - NOAA bathymetric data
- Improve and enable critical applications
  - Flood forecasting in 3D, at the street level
  - Hydrologic observing systems and models that account for water from the atmosphere to the oceans
  - 3D Geologic models
  - New and unimagined 3D applications



# THANK YOU!