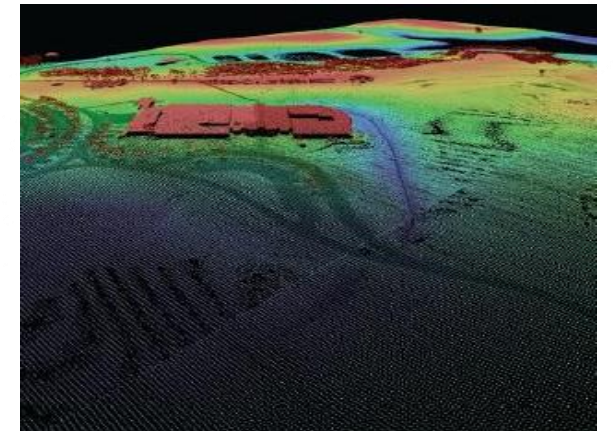
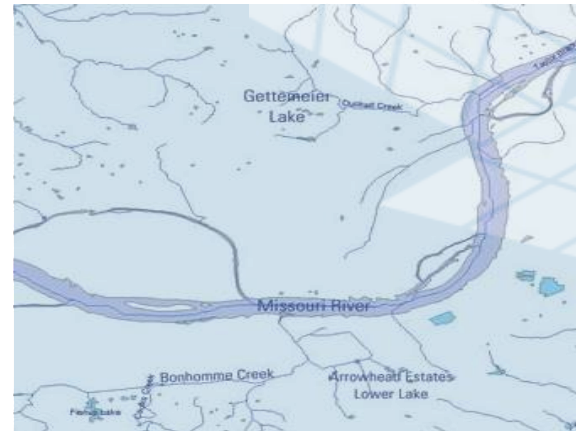
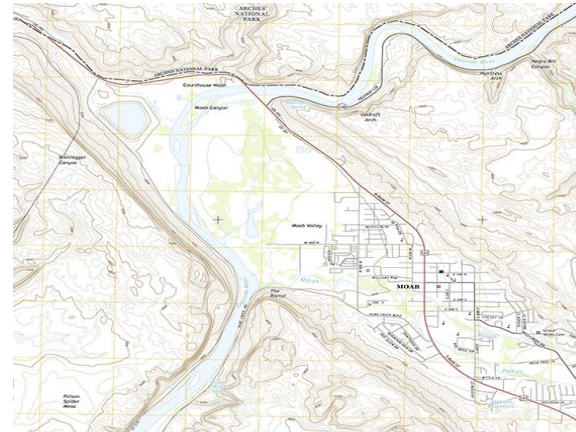




USGS 3D Elevation Program and Application for the National Hydrography Datasets – Status, Future Plans, and Opportunities to Collaborate

North Carolina Geographic Information Coordinating Council



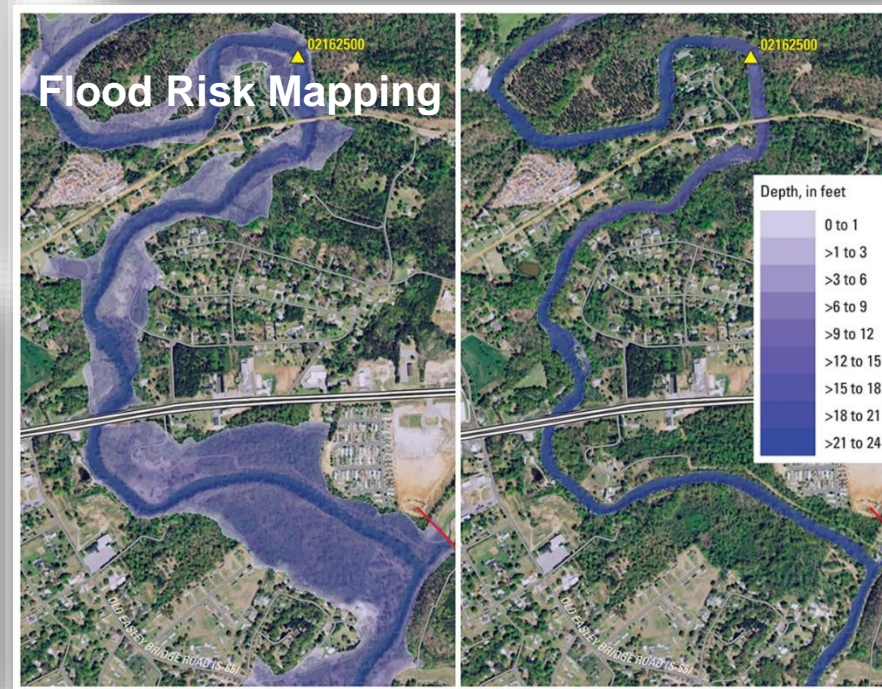
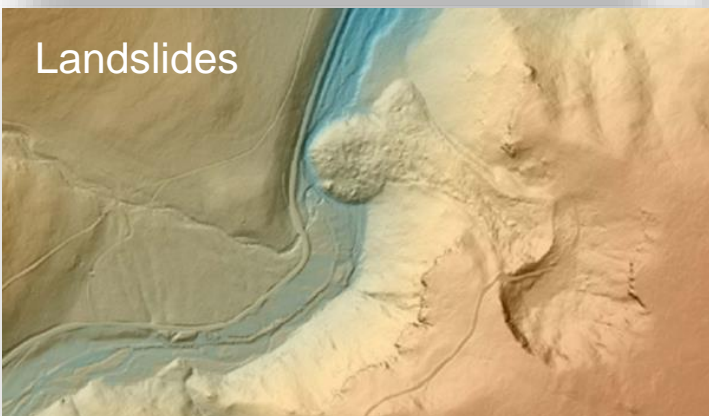
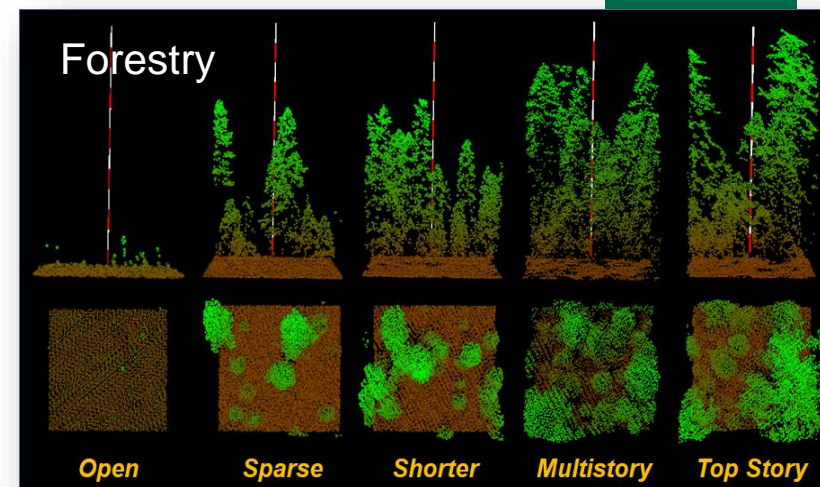
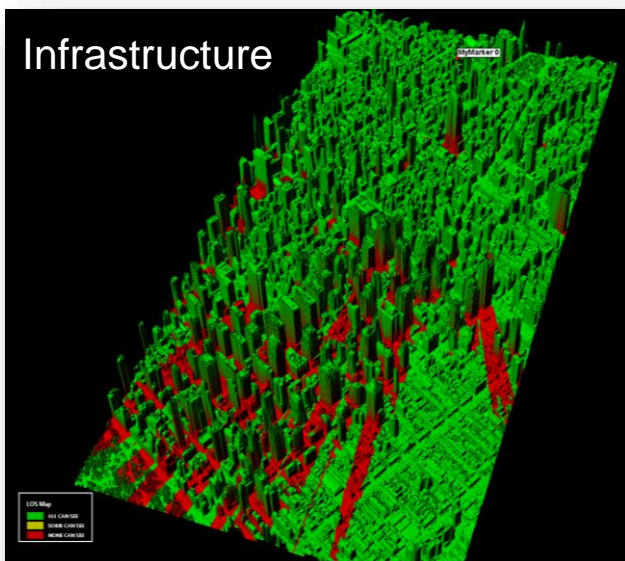
Vicki Lukas

Chief, NGP Topographic Data Services

November 6, 2019

+ 3D Elevation Program (3DEP) Goal

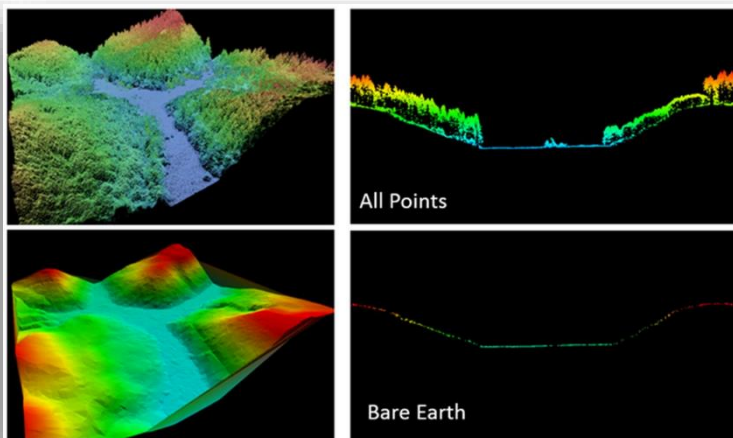
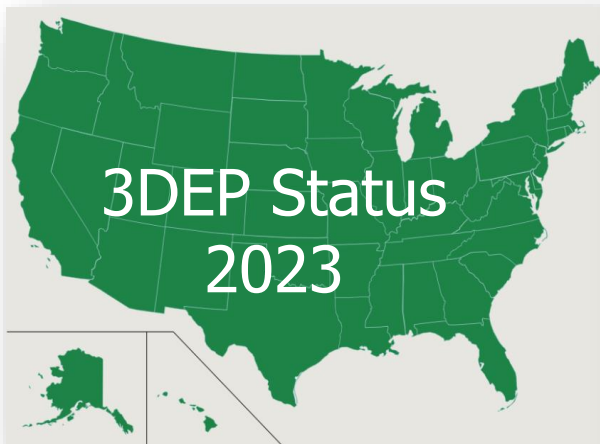
Complete acquisition of nationwide lidar (IfSAR in AK) by 2023 to provide the **first-ever national baseline of consistent high-resolution elevation data** collected in a timeframe of less than a decade



+ 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

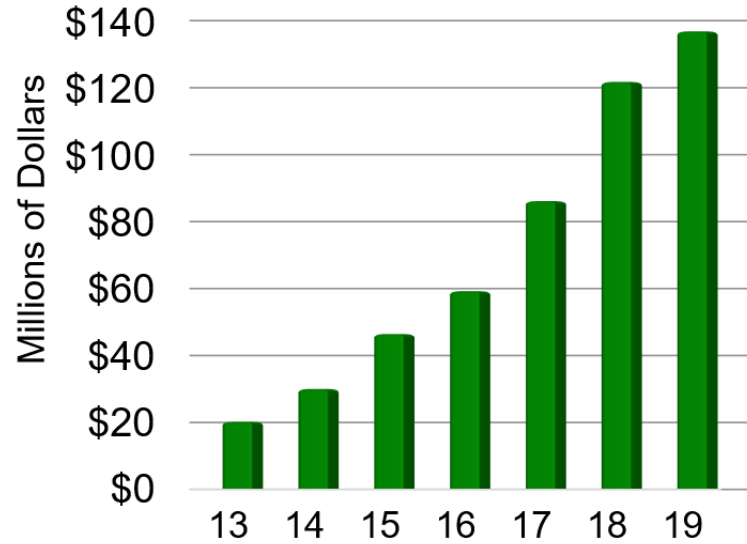
		Annual Benefits	
Rank	Business Use	Conservative	Potential
1	Flood Risk Management	\$295M	\$502M
2	Infrastructure and Construction Management	\$206M	\$942M
3	Natural Resources Conservation	\$159M	\$335M
4	Agriculture and Precision Farming	\$122M	\$2,011M
5	Water Supply and Quality	\$85M	\$156M
6	Wildfire 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



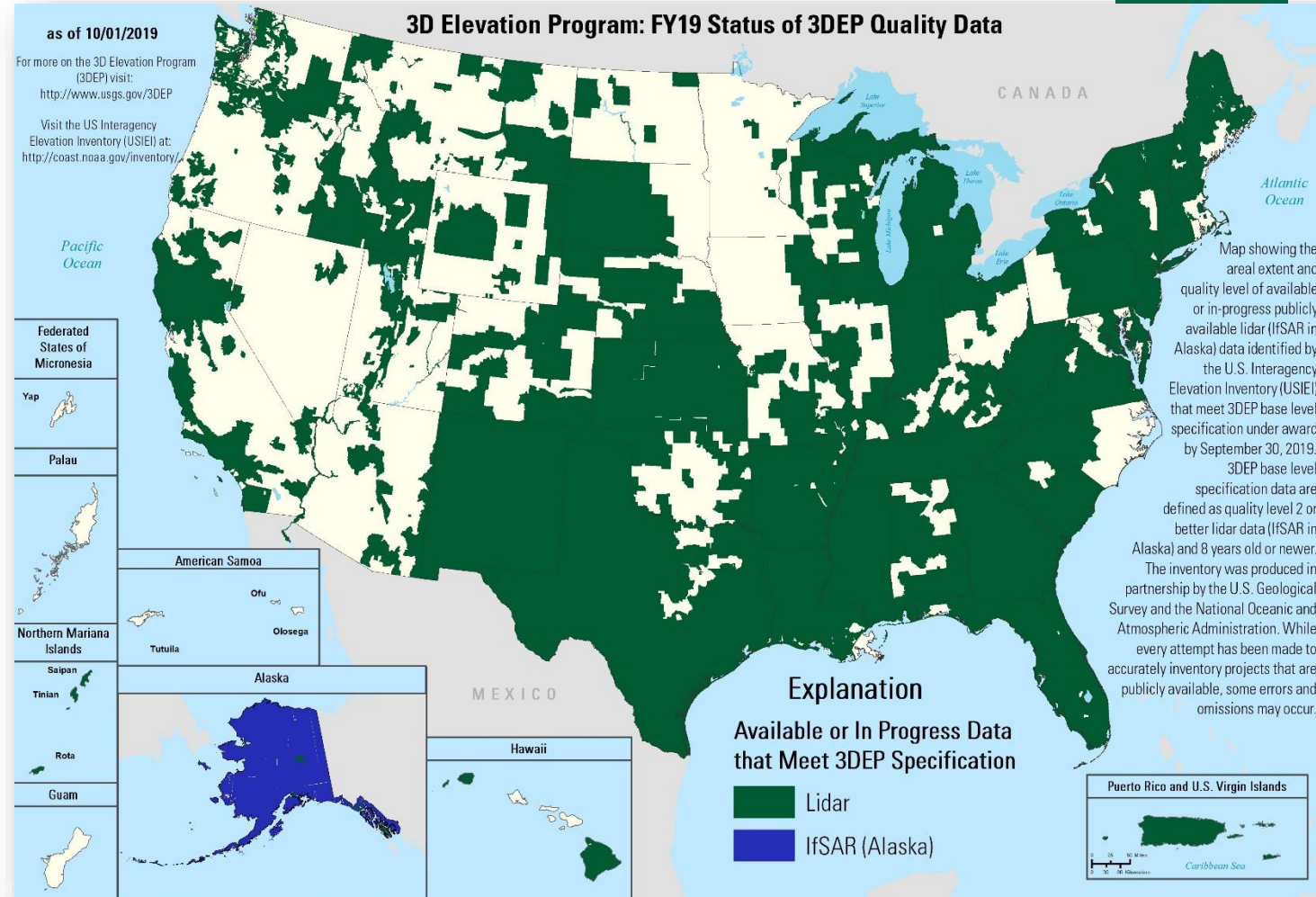
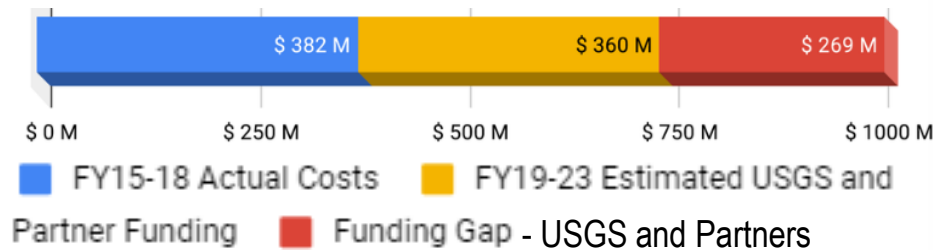
+ 3DEP Status Including FY19 Partnerships

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

*includes lidar and AK IfSAR



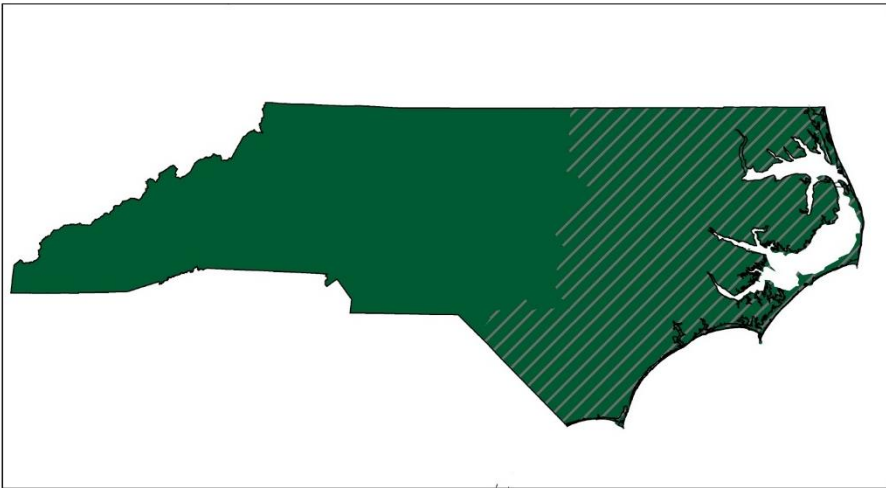
Data acquisition investments by all partners, by fiscal year



<http://usgs.gov/3DEP/numbers>



NC Partnerships



as of October 2019

Explanation

- Planned FY20 3DEP Lidar Partnerships (subject to change)
- Available or In-Progress Data that Meet 3DEP Specification

Project Name	FY	Partners	Area (Sq. Mi.)	QL	USGS Mechanism	Acquisition Window
SANDY Lidar (Phase 1)	14	NCDPS, NRCS	9,396	2	GPSC	Spring 2014
Phase 2 Lidar	15	NCEM, NC Geodetic Survey, NCDOT	12,348	2	Contributed	Spring 2014
Phase 3 Lidar	15	NC	10,007	2	Contributed	Spring 2015
Phase 4 Central West NC GEIGER	16	FEMA, NCDOT, NCEM, USGS	3,700	1	Coop	Spring 2016
Phase 4 Lidar	17	NCDPS, USGS	4,143	1	Coop	Spring 2016- Spring 2017
Phase 5 lidar	18	NCDOT, NCFMP, USGS	8,729	1	Coop	Spring 2016- Spring 2017
Hurricane Florence Supplemental	20	USGS	~20,000	1	GPSC	TBD
Hurricane Florence NOAA Topobathy	20	NOAA		1	Partner (Non GPSC/Coop)	TBD

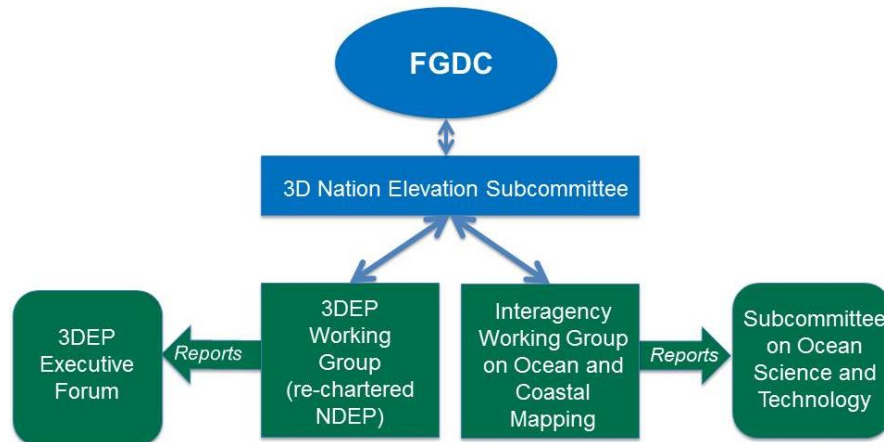




3D Elevation Program (3DEP)

Governance

- USGS and NOAA co-lead the OMB A-16 Elevation Theme
- 3DEP Executive Forum
 - Facilitates executive collaboration on strategies to fund and implement 3DEP for the benefit of all its stakeholders
 - Executive Outreach to Industry Partners and Stakeholder Groups
 - Provides direction to 3DEP Working Group
- 3DEP Working Group - Coordinates implementation of 3DEP



Member Agencies
Bureau of Land Management
Department of Homeland Security
Department of Transportation
Environmental Protection Agency
Federal Aviation Administration
Federal Communications Commission
Federal Emergency Management Agency
US Forest Service
US Fish and Wildlife Service
National Oceanic and Atmospheric Administration
National Park Service
Natural Resources Conservation Service
Office of Surface Mining Reclamation and Enforcement
US Department of Agriculture
US Army Corps of Engineers
US Geological Survey
American Association of State Geologists
National States Geographic Information Council

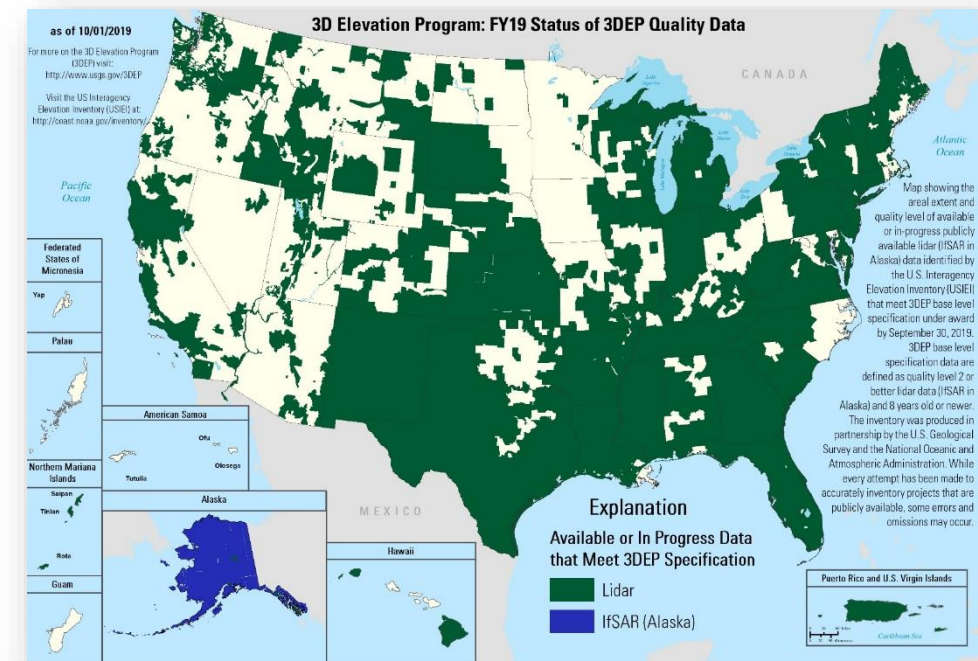




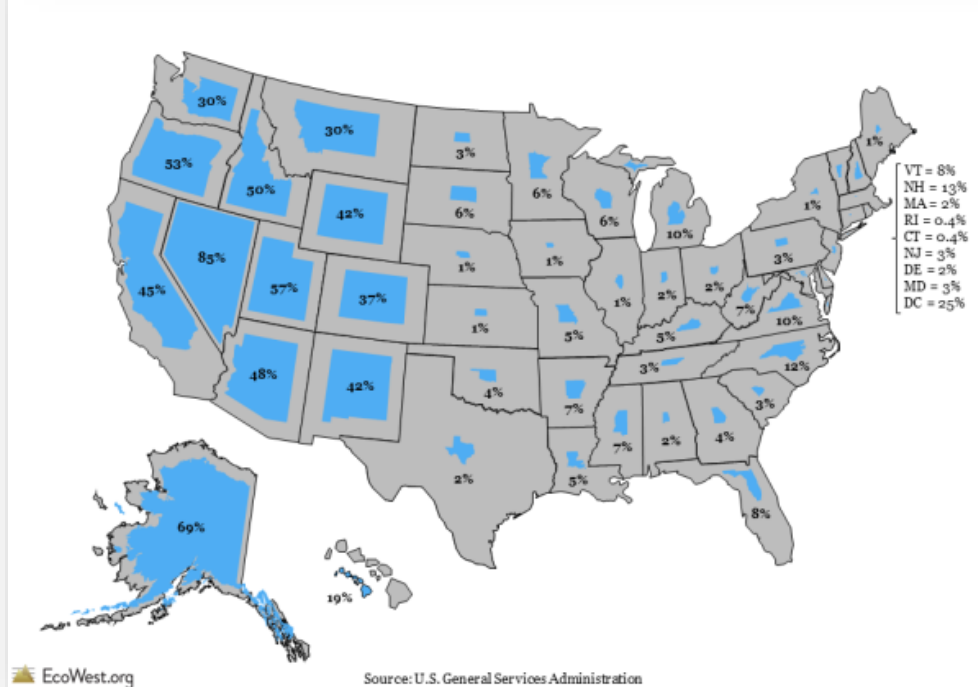
Funding Challenges and Strategies

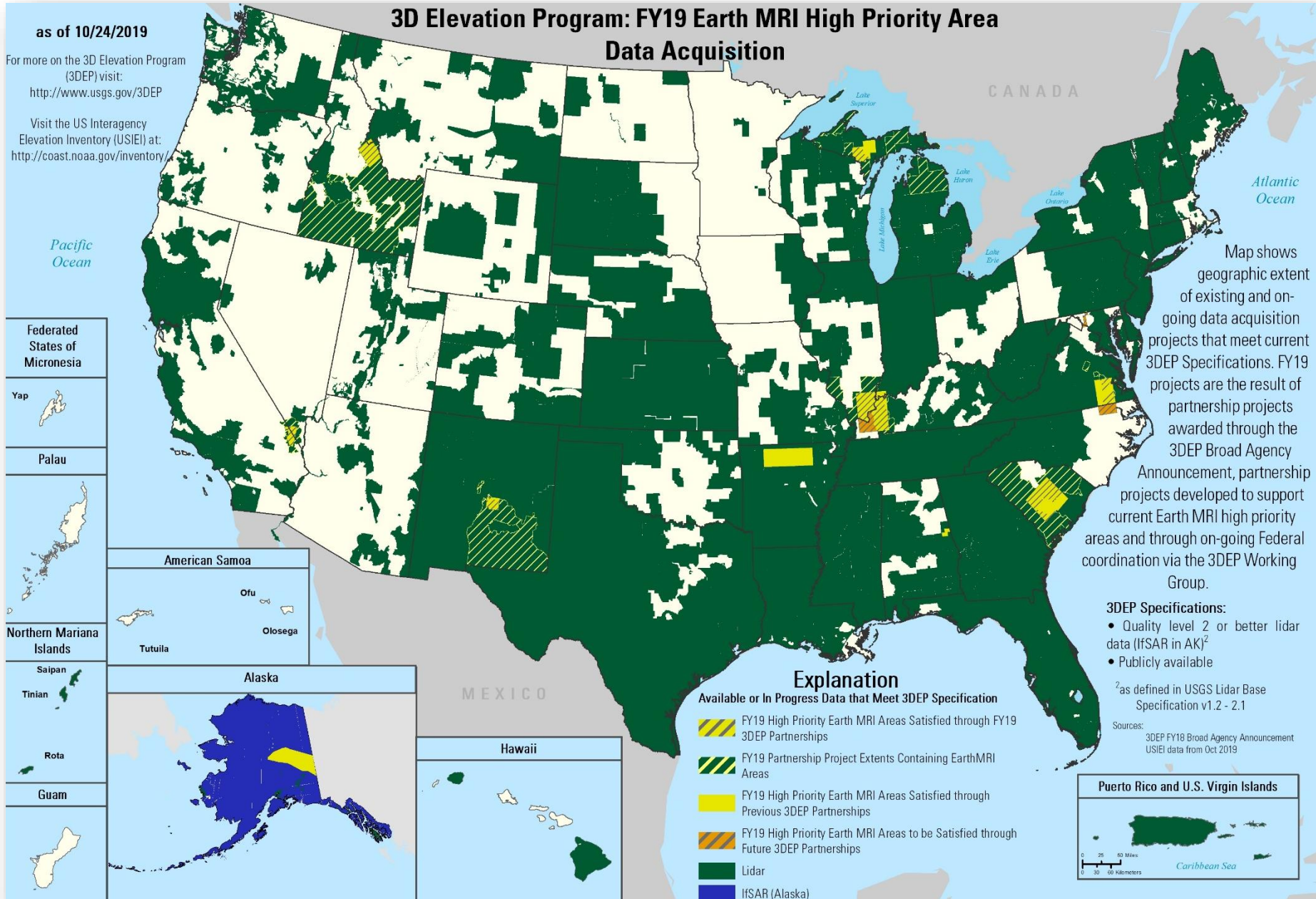
Completion of 3DEP nationwide coverage

- 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?
 - Doing an analysis of costs for Federal land under 3DEP Executive Forum
 - 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







Stakeholder Funding Support - 3DEP Coalition

Alliance of Crop, Soil, and Environmental Science Societies
American Bankers Association
American Council of Engineering Companies
American Geosciences Institute
American Institute of Professional Geologists
American Petroleum Institute
American Property Casualty Insurance Association
American Public Works Association
American Society for Horticultural Science
American Society of Agronomy
American Society of Civil Engineers
American Society of Farm Managers and Rural Appraisers
American Water Resources Association
American Water Works Association
Association of American State Geologists
Association of Environmental & Engineering Geologists
Association of State Floodplain Managers
Crop Science Society of America
Insurance Institute for Business & Home Safety
International Association of Emergency Managers

International Code Council
Interstate Council on Water Policy
Irrigation Association
Land Improvement Contractors of America
National Agricultural Aviation Association
National Apartment Association
National Association of Development Organizations
National Association of Realtors
National Association of Tower Erectors
National EMS Pilots Association
National Flood Association
National Ground Water Association
National Multifamily Housing Council
National Society of Professional Surveyors
National States Geographic Information Council
National Wildlife Federation
Rural & Agriculture Council of America
Society for Range Management
Soil and Water Conservation Society
Soil Science Society of America

Stakeholder Funding Support - MAPPS

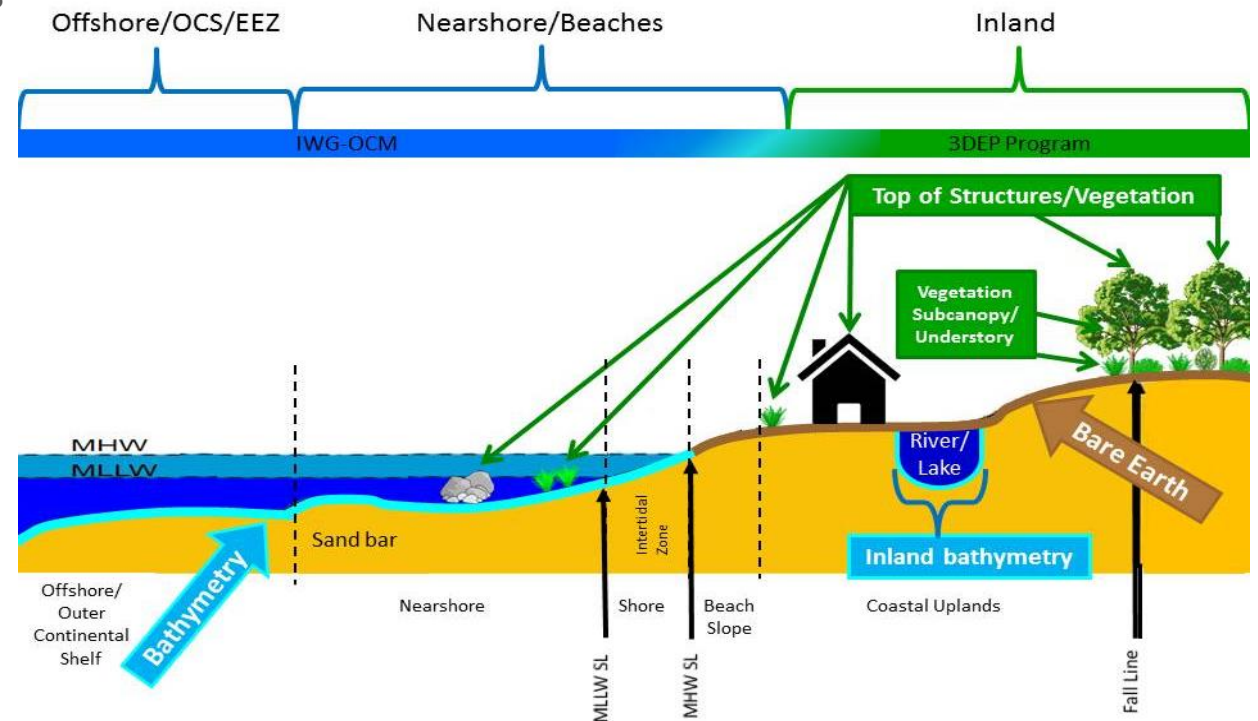
- A public/private partnership
 - The inherently governmental responsibility of maintaining a lean core competency, while leveraging the expertise and capacity of the private industry
 - The essential USGS role in acquiring critical public domain data that can be accessed, value-added, and underpin a host of new and evolving uses and technologies
 - The role of the private industry in provisioning the data, maintaining the operational expertise and capacity, developing future technology, and supporting new applications
 - The USGS role as the lead Federal agency for elevation to create a National program that results in quality and consistency while reducing/eliminating duplication
- Together we have crafted and are implementing 3DEP as a model public/private partnership and good government story



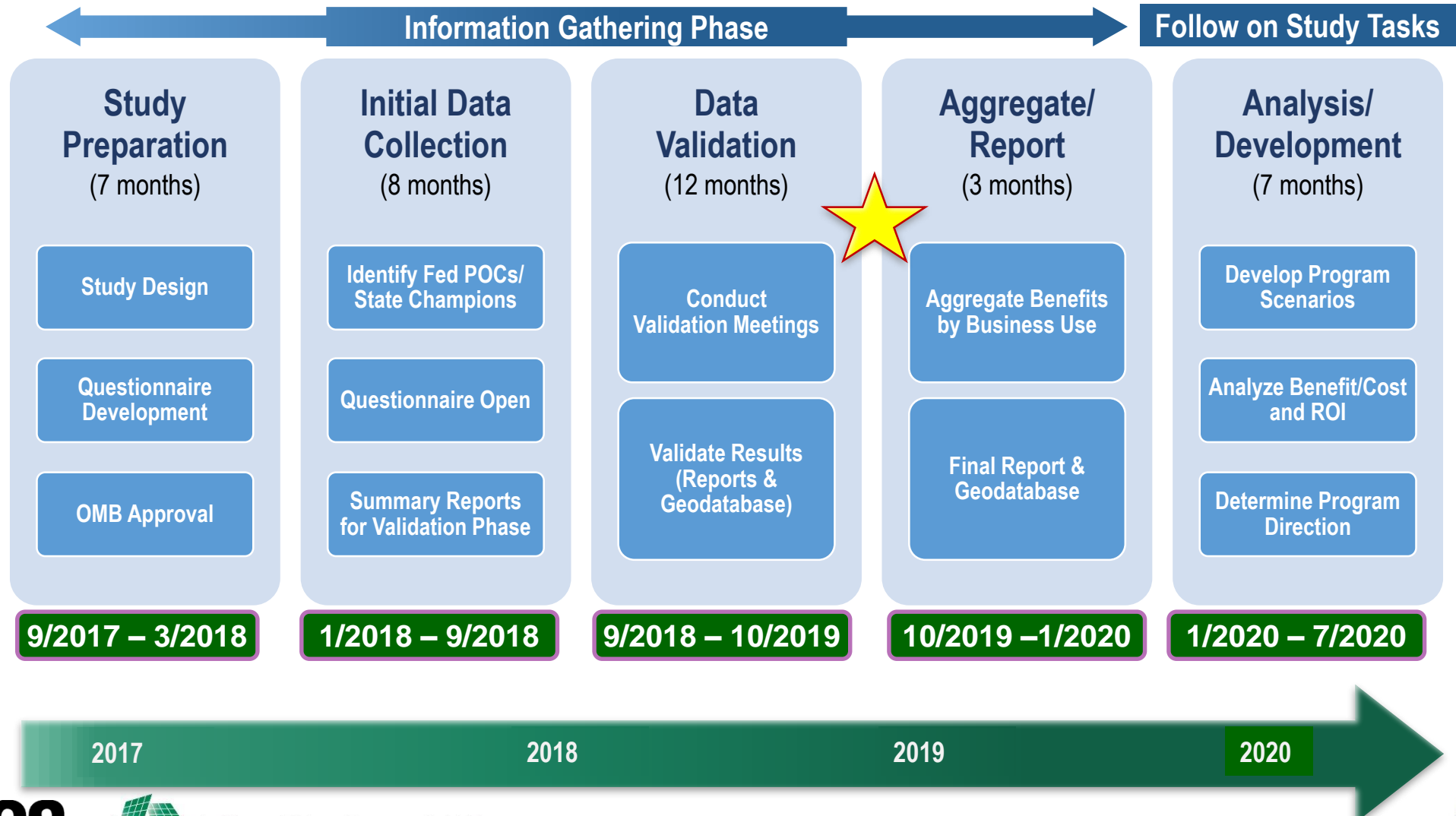
+ 3DEP Future Generation Just Around the Corner

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



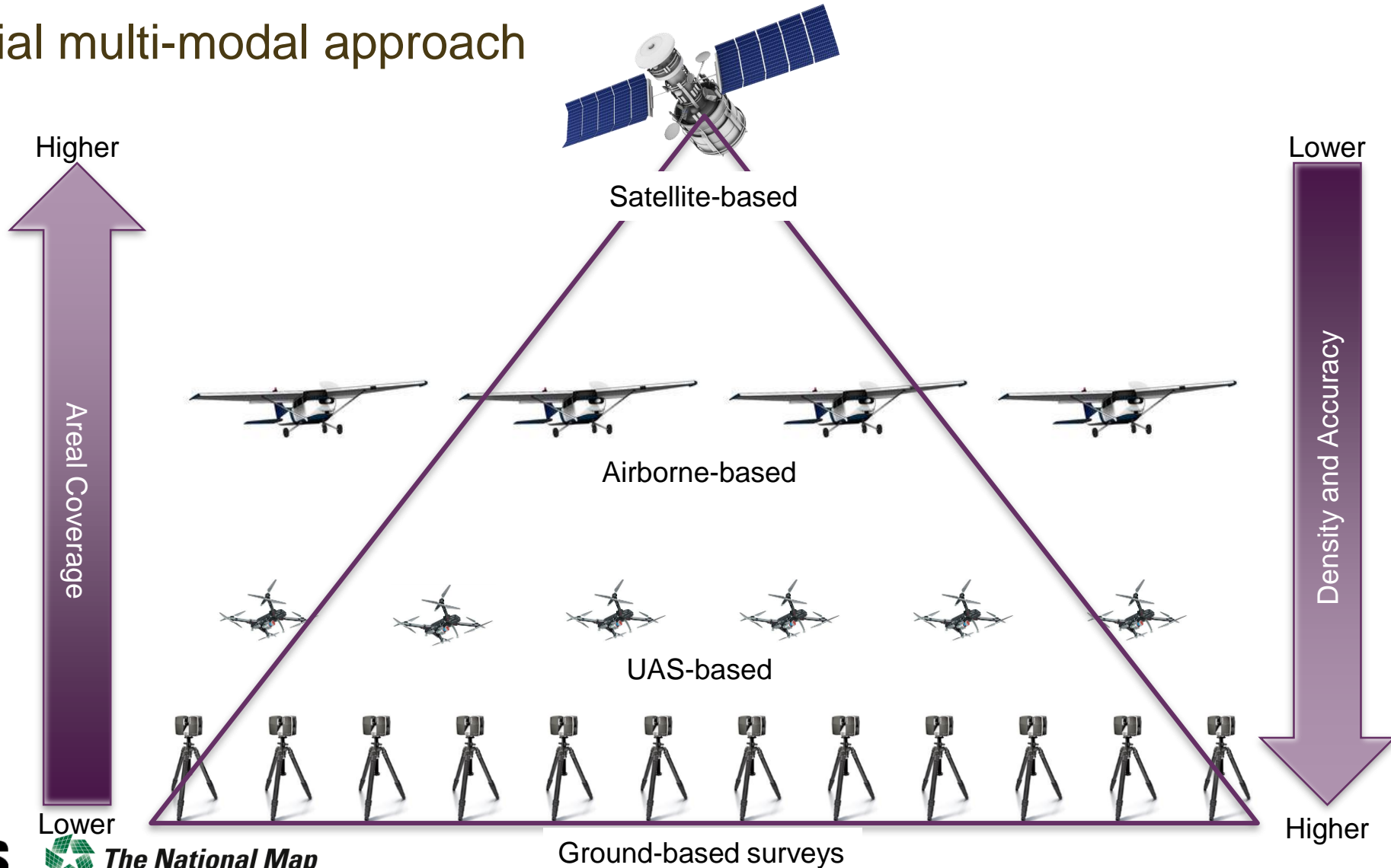
+ Study Phases and Timeline



+

3DEP Future Generation Just Around the Corner

Potential multi-modal approach



+ Inland Bathymetry for 3DEP

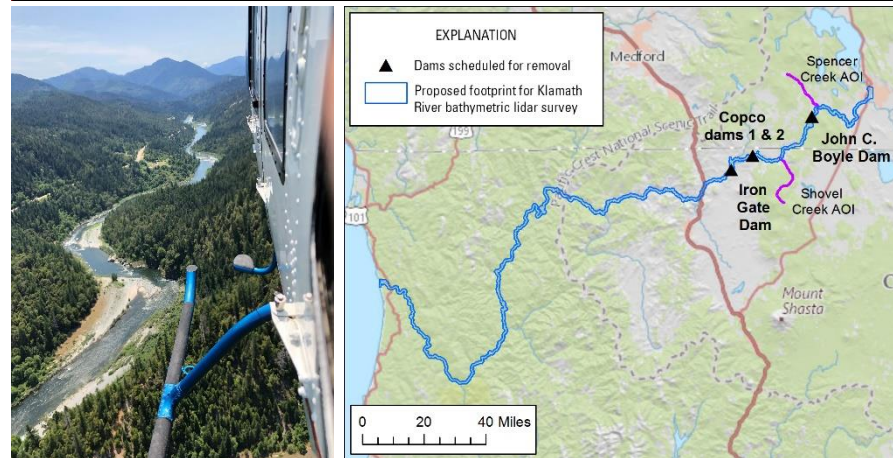
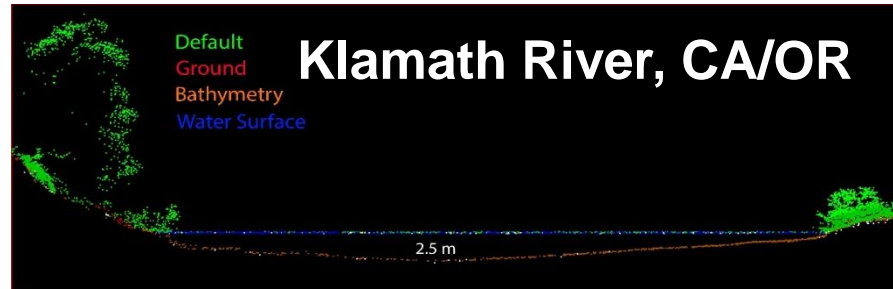
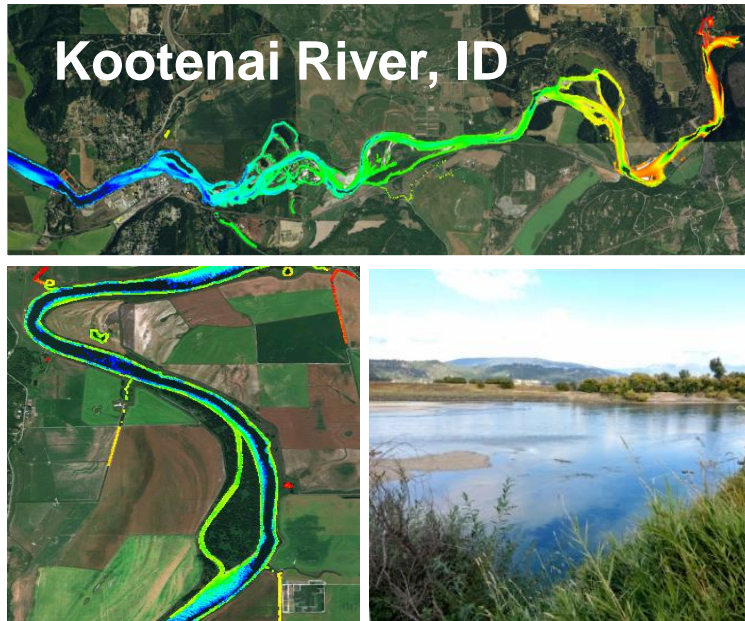
3DEP pilot projects help inform

- 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



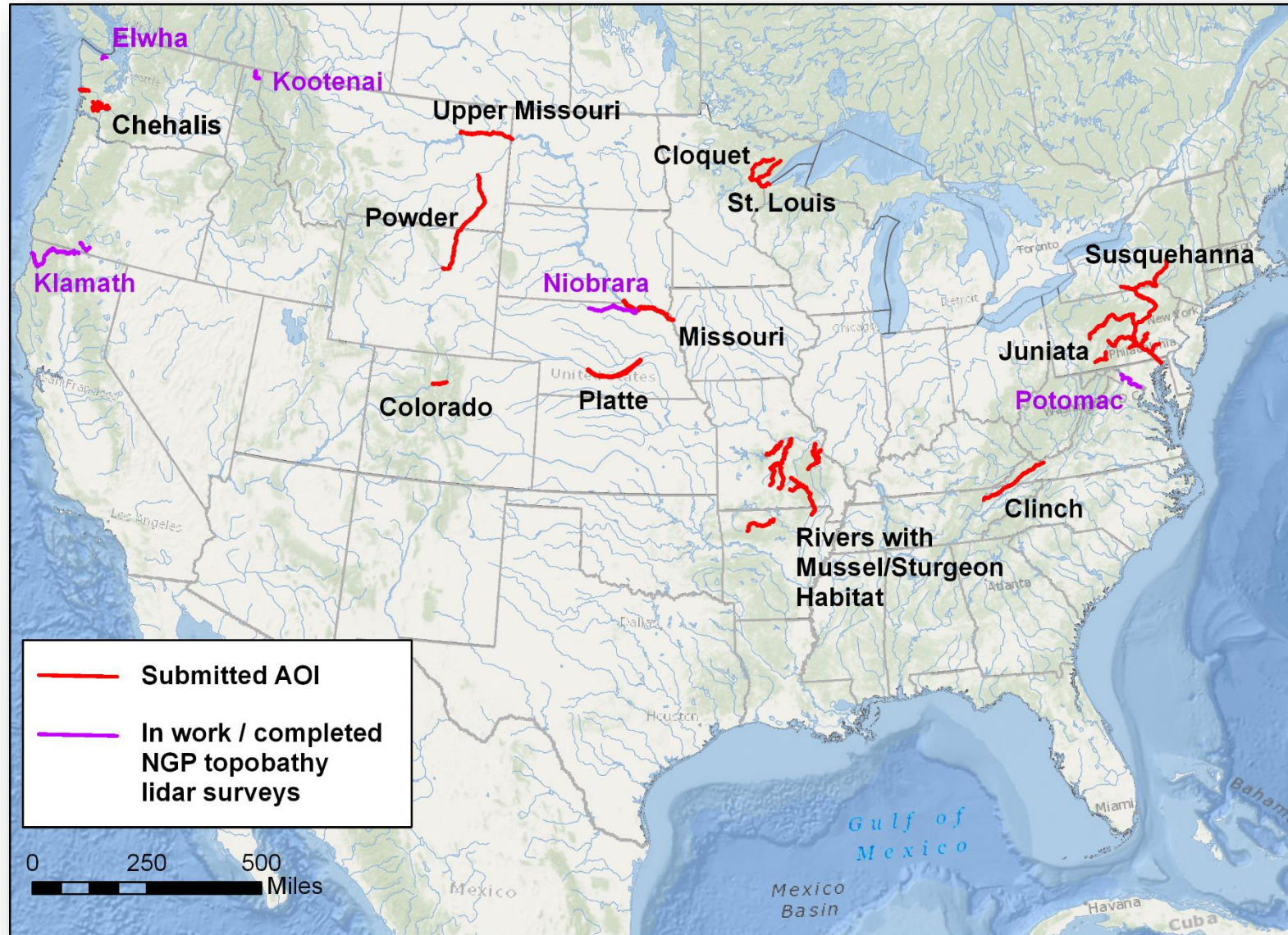
Planned surveys



Image: Quantum Spatial Inc.

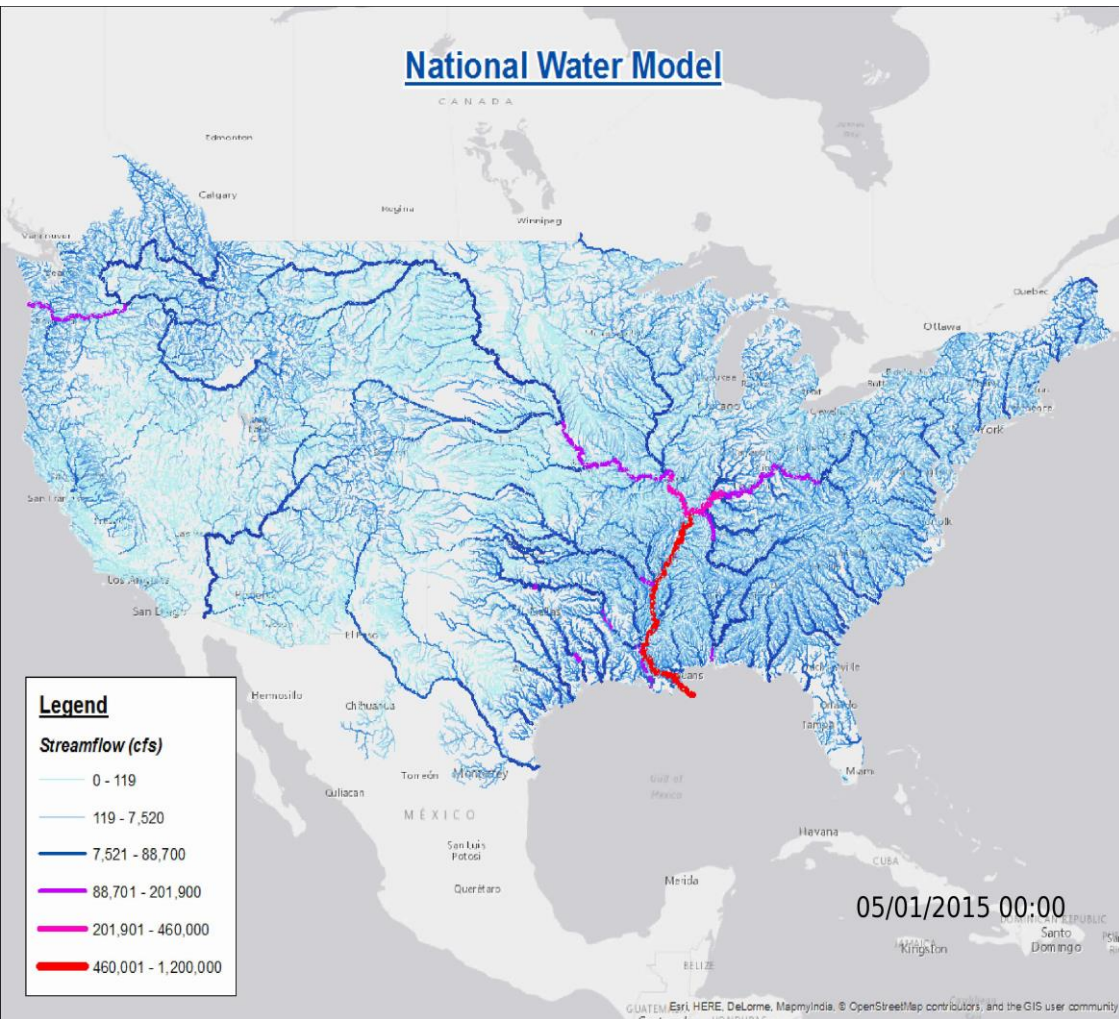
+

Potential for Future Inland Bathymetry Lidar Surveys



+ 3DEP Application

Hydrography derived from lidar



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

Forecasting at neighborhood level

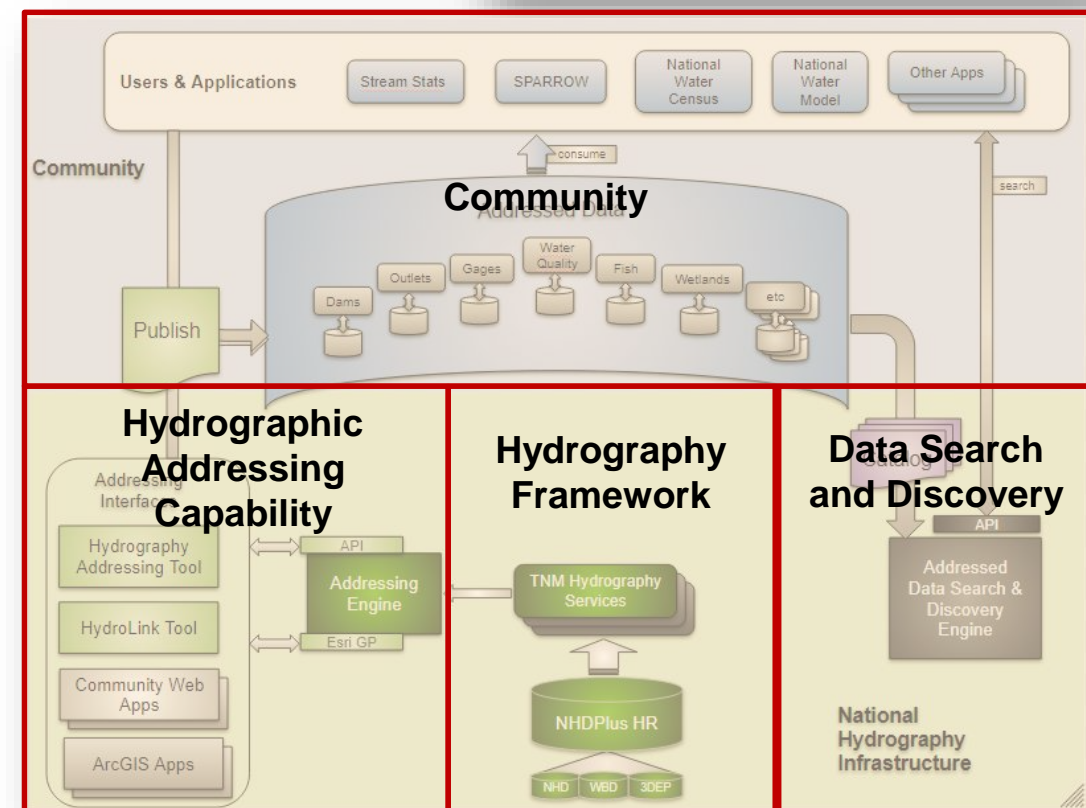
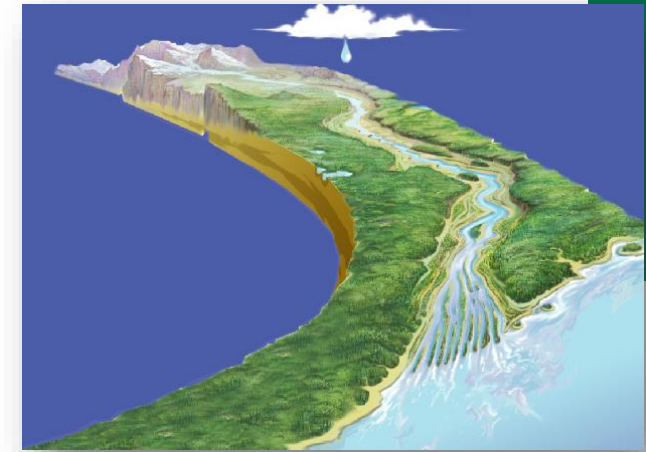
Forecasting at street level

20

	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

National Hydrography Infrastructure

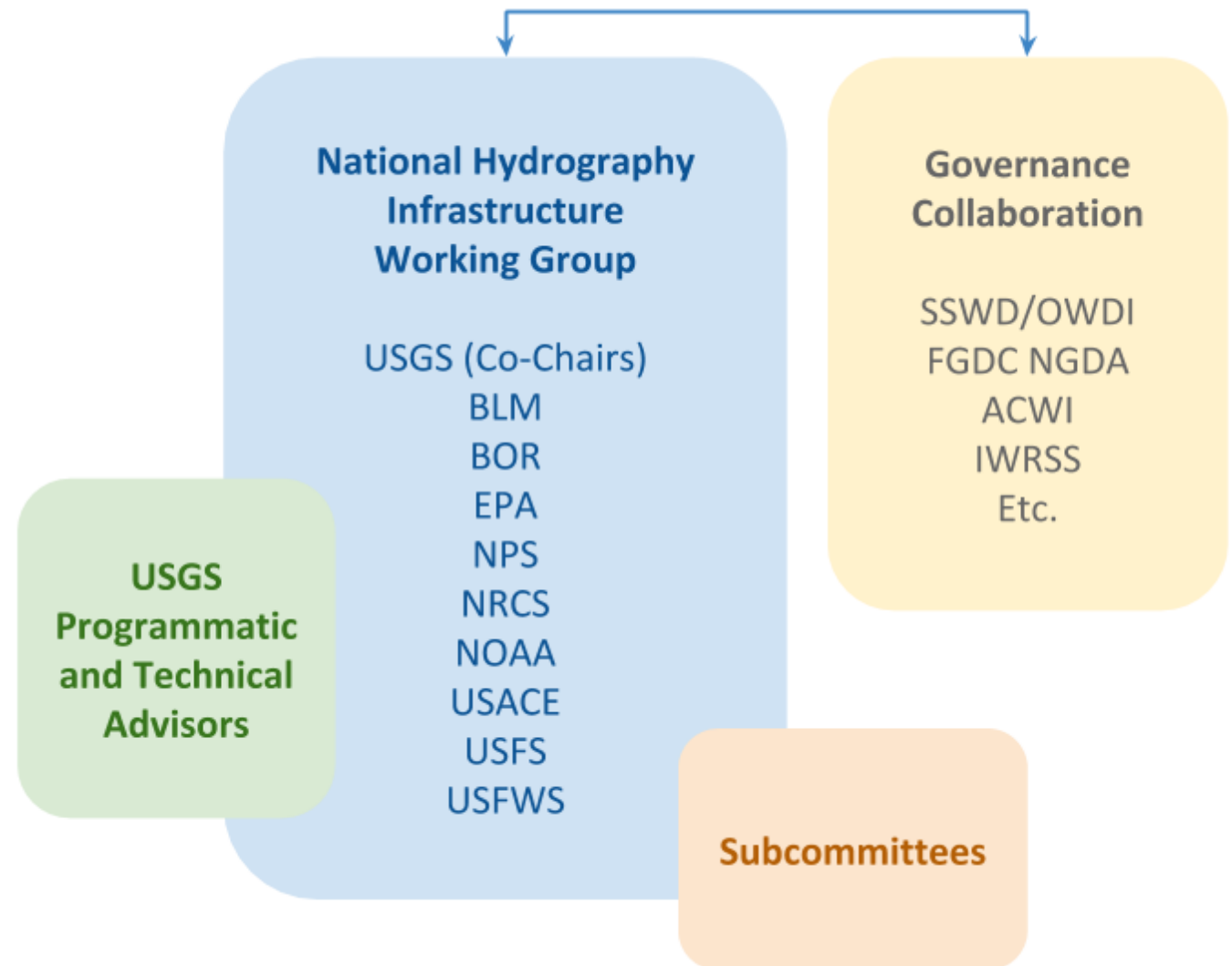
- Combine foundational hydrography datasets with hydrographic addressing, catalog, and search engine functionality
- Provides the universal infrastructure for sharing and discovering limitless sources and types of water information
- Underpins interagency hydrologic observing systems and enable models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



+ National Hydrography Infrastructure

Working Group

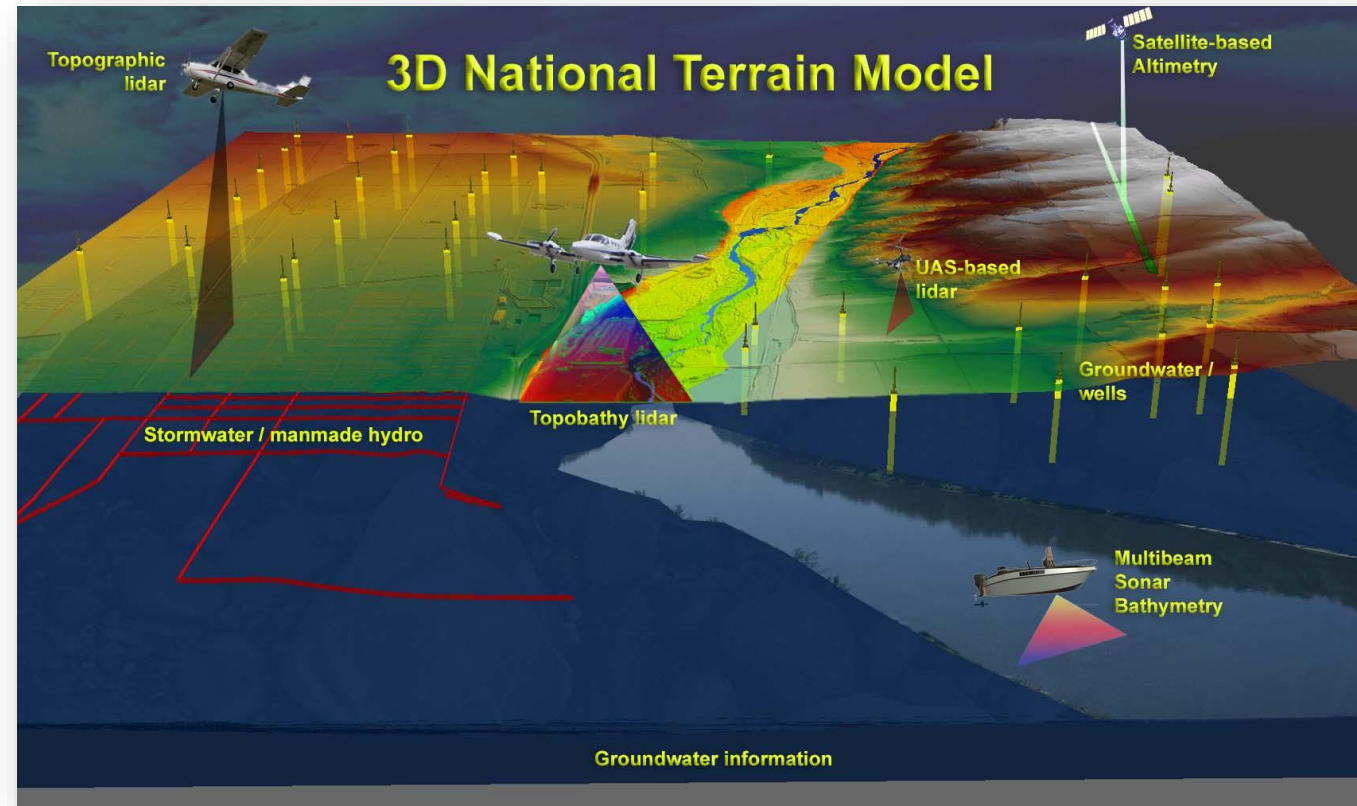
- The NHI WG will advance the NHI to underpin interagency hydrologic observing networks and modeling systems
- Forum for Federal agencies to provide input and collaborate on NHI:
 - Direction
 - Development
 - Priorities
 - Management
 - Technologies
 - Use
 - Resources
- Additionally, USGS and USFWS are OMB A-16 Leads for Inland Water Theme



+ 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!