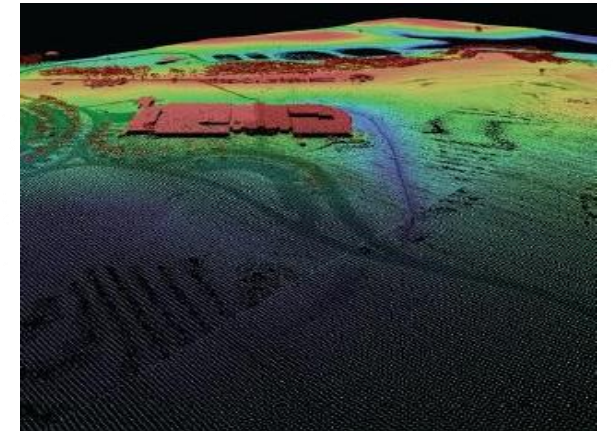
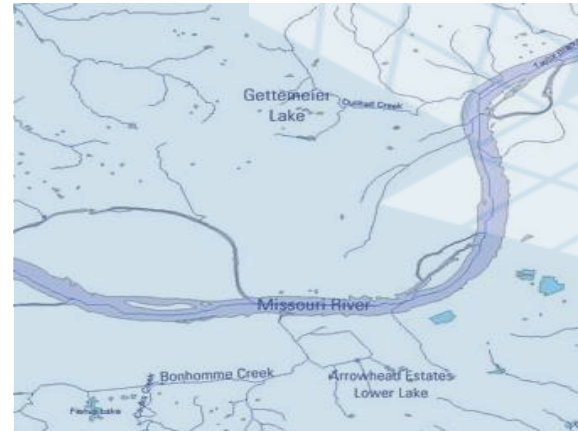
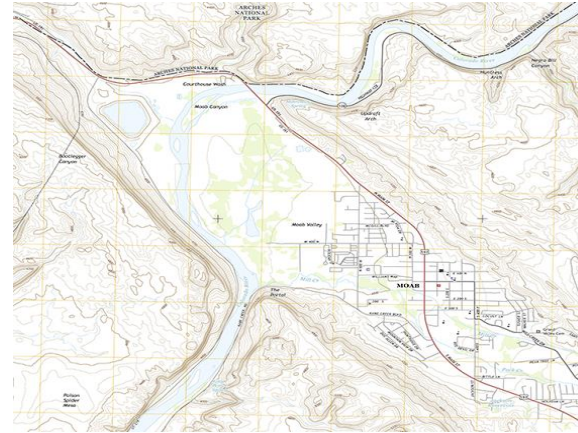




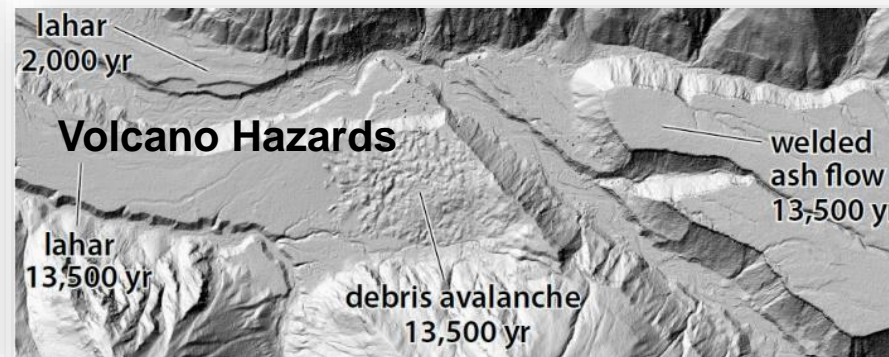
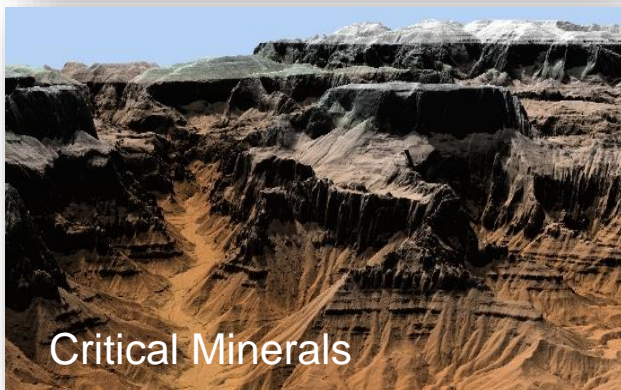
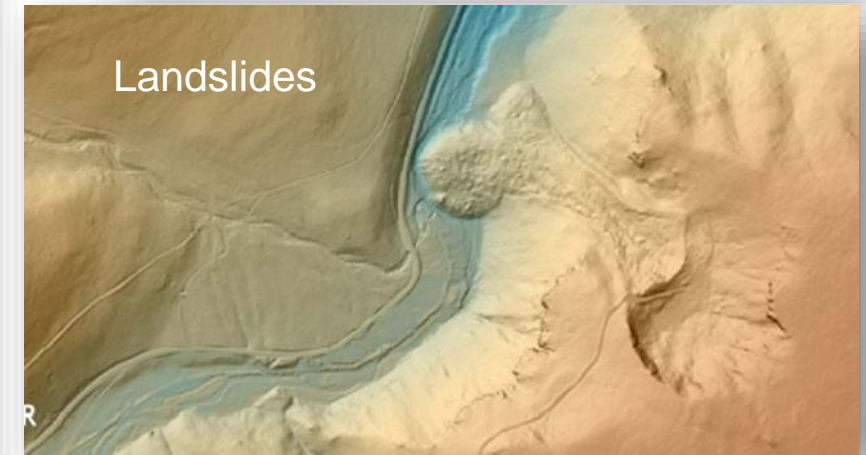
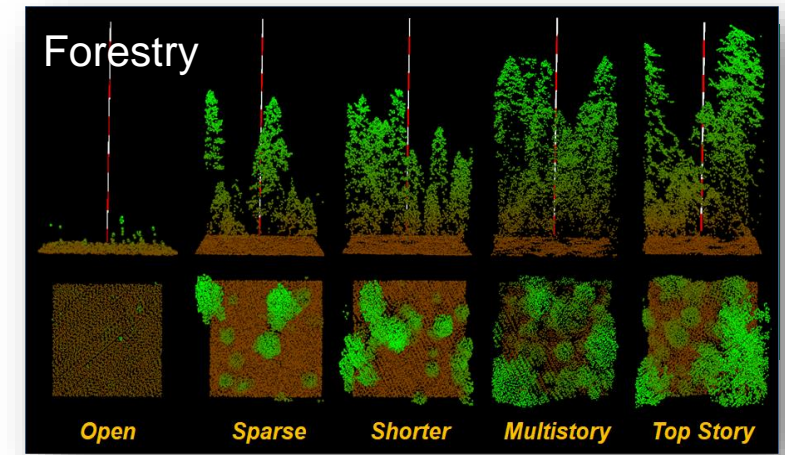
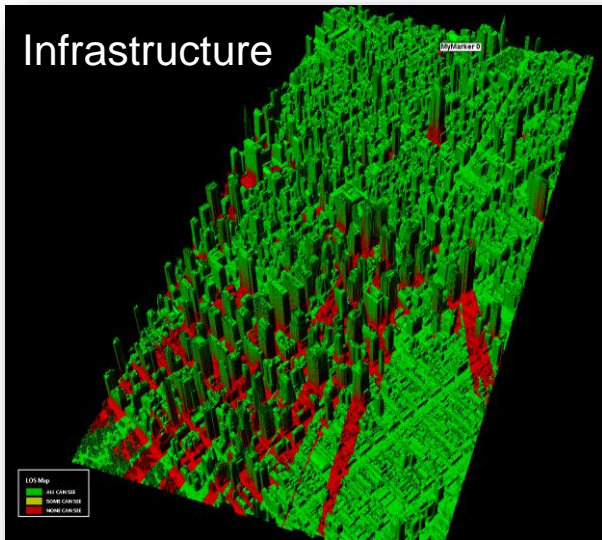
3D Elevation Program Introduction, Update, and Future Direction for NGAC



Mike Tischler, Ph.D.
Director, National Geospatial Program
May 18, 2022

+ 3D Elevation Program (3DEP) Goal

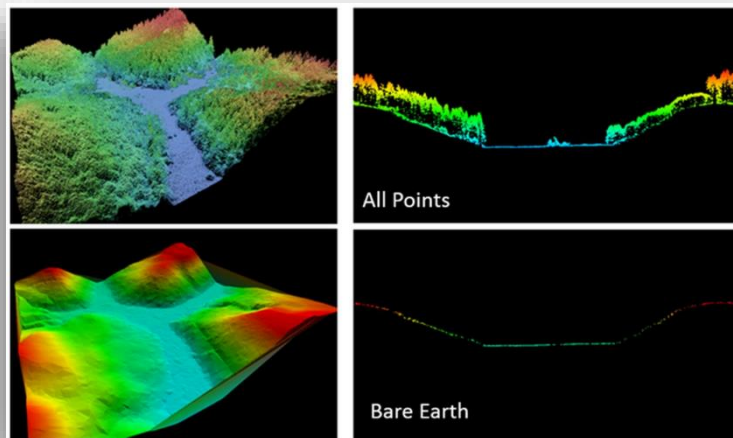
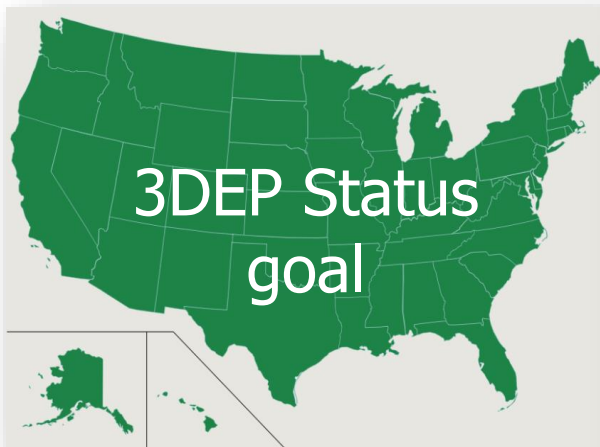
Complete acquisition of nationwide lidar (IfSAR in AK) to provide the first-ever national baseline of consistent high-resolution elevation data collected in a timeframe of less than a decade



+ 3D Elevation Program (3DEP) Goal

- Complete acquisition of nationwide lidar (IfSAR in AK to provide the **first-ever national baseline of consistent high-resolution elevation data – both bare earth and 3D point clouds**)
- 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



4

+ 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

```

graph TD
    FGDC([FGDC]) <--> S[3D Nation Elevation Subcommittee]
    S --> WG[3DEP Working Group]
    S --> IWG[Interagency Working Group on Ocean and Coastal Mapping]
    WG -- Reports --> EF[3DEP Executive Forum]
    IWG -- Reports --> OST[Subcommittee on Ocean Science and Technology]
  
```

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

Over 300 3DEP partners including 18 Federal agencies and >250 state and local governments

(Partial listing)

Bureau of Indian Affairs
 Bureau of Land Management
 DOD - AZ National Guard
 Department of Energy
 Federal Emergency Management Agency
 Fish and Wildlife Service
 National Geospatial-Intelligence Agency
 National Oceanic and Atmospheric Agency
 National Park Service
 Natural Resources Conservation Service
 Tennessee Valley Authority
 U.S. Navy
 US Army Corps of Engineers
 US Bureau of Reclamation
 USDA-ARS
 US Forest Service
 USGS
 AK Dept. of Natural Res.
 AK North Slope Borough
 City of Gustavus
 Fairbanks North Star Borough
 Golden Valley Electric Authority
 Matanuska
 Metlakatla
 Municipality of Anchorage
 Organized Village of Kake
 Sealaska
 The Nature Conservancy
 AL Department of Economic and Community Affairs
 AL Department of Transportation
 Chilton County, AL
 Cullman County, AL
 Franklin County, AL
 Huntsville, City of
 Russell County, AL
 Town of Thorsby, AL
 Tuscaloosa County, AL
 Walker County, AL
 AR Game and Fish Commission
 Northwest AR Regional Planning Commission
 Pulaski County Area GIS, AR
 Coconino County, AZ
 Pima Association of Governments, AZ
 C A Department of Water Resources

CA Geological Survey
 CA Natural Resource Agency
 CalFire
 City of San Diego OHS, CA
 Los Angeles Regional Imagery Consortium, CA
 San Diego County, CA
 San Diego Association of Governments, CA
 Southwest Wetlands Interpretive Association
 City of Montrose, CO
 CO Division of Rec and Mining
 CO Governor's Office of Information Technology
 CO Water Conservation Board
 Denver International Airport
 Garfield County, CO
 Gunnison County, CO
 Town of Castle Rock, CO
 FL Division of Emergency Management
 State of FL
 Martin County Engineering Dept., FL
 Northwest Florida Water Management District
 Osceola County, FL Office of Emergency Management
 Palm Beach County, FL
 Seminole Tribe of Florida
 St. Johns River Water Management District
 Suwannee River Water Management District
 City of Roswell, GA
 GA Coastal Regional Commission
 GA Environmental Protection Division
 GA Mountains Regional Commission
 IA Department of Agriculture and Land Stewardship
 Nez Perce County, ID
 Cook County, IL
 IL Champaign County GIS Consortium
 IL Department of Natural Resources
 IL State Geological Survey
 Kane County, IL
 Lake County, IL
 McHenry County, IL

Marion County GIS, IN
 Hamilton County, IN
 Wayne County, IN
 KS Department of Agriculture
 KS GIS Policy Board
 KY Commonwealth Office of Technology
 KY Division of Water
 LA Coastal Protection and Restoration Authority
 LA Department of Transportation and Development
 Arlington, MA
 State of MA
 MassGIS
 Baxter State Park, ME
 Bureau of Parks and Lands, ME
 Clayton Lake Woodland Holdings, LLC
 Cooperative Forestry Research Unit. ME
 Drinking Water Commission, ME
 King Pine Win, ME
 ME Bureau of Parks and Lands
 ME Department of Transportation
 ME Office of Information Technology
 Seven Islands Land Company
 Washington County, ME
 Charlevoix County, MI
 Gratiot County, MI Drain Commission
 Little Traverse Bay Band Odawa Indians
 The Southeast Michigan Council of Governments
 State of MI
 Boone County MO
 Metropolitan St Louis Sewer District
 MS Environmental Quality Department
 NC Department of Transportation
 NC Department of Public Safety
 NC Floodplain Mapping Program
 City of Blair, NE
 City of Fremont, NE
 City of Lincoln-Lancaster County, NE
 City of Omaha, NE
 Douglas County, NE
 NE Office of the Chief Information Officer
 Papio Missouri River Natural Resources District

Sarpy County, NE
 NH Department of Environmental Services
 NH Department of Transportation
 NJ Department of Environmental Protection
 DE Valley Regional Planning Commission
 City of Henderson, NV
 City of Las Vegas, NV
 Clark County Regional Flood, NV
 Clark County Water Reclamation District, NV
 Clark County, NV
 Lyon County, NV
 Southern NV Water Authority
 Storey County, NV
 University of Nevada Reno
 Washoe County, NV
 City of Buffalo, NY
 International Joint Commission (IJC)
 NY State Information Technology Services
 NY State Office of Information Technology Services
 City of Columbus OH
 Clinton County OH
 Delaware County OH
 Lucas County, OH
 Muskingum Watershed Conservancy District
 OH Department of Administrative Services
 Sandusky County, OH
 Wood County, OH
 City of Hillsboro, OR
 City of Portland, OR
 Coquille Indian Tribe
 Metro Regional Gov, OR
 OR Department of Geology and Mineral Industries
 OR Water Enhancement Board Grant
 OR Department of Forestry
 Umatilla Indian Reservation
 City of Allentown, PA
 PA Turnpike Commission
 PA Department of Environmental Protection
 PA Department of Transportation
 PA Dept of Conservation and Natural Resources
 PA Emergency Management Agency
 Susquehanna River Basin Commission
 Tri-County Regional Planning Commission, PA
 Puerto Rico Planning Board

Alken County, SC
 Anderson County, SC
 Beaufort County, SC
 Charleston County, SC
 City of Aiken, SC
 City of Greenville, SC
 City of North Augusta, SC
 Dorchester County, SC
 Jasper County, SC
 Lexington County, SC
 Newberry County, SC
 Pickens County, SC
 Richland County, SC
 SCANA Public Utility, SC
 South Carolina Lidar Consortium
 911, TN
 Appalachian Electric Co-op, TN
 Arlington, TN
 City of Bartlett, TN
 City of Bristol, TN
 City of Kingsport, TN
 City of Germantown, TN
 Hamilton County, TN
 Johnson City Metro Transportation Planning Organization, TN
 City of Lakeland, TN
 Memphis Chamber of Commerce
 Memphis Light, Gas and Water
 City of Memphis, TN
 Metropolitan Planning Department
 Nashville Davidson County
 City of Millington, TN
 Morristown-Hamblen GIS Group
 Rutherford County, TN
 Shelby County, TN
 Sullivan County, TN
 TN Department of Finance and Administration
 Town of Collierville, TN
 Houston-Galveston Area Council
 San Antonio River Authority
 TX Commission on Environmental Quality
 TX Water Development Board
 Williamson County
 UT Division of Emergency Management
 UT Geological Survey
 UT Forestry, Fire, and State Lands
 Moab City, UT
 Wasatch Ski Resorts
 Tooele Army Depot
 Bryce Canyon History
 Riverdale City, UT
 Park City, UT

Mohave County, UT
 Bear Lake Watch
 City of Tremonton, UT
 City of Logan, UT
 City of Brigham, UT
 Fairfax County, VA
 Henrico County, VA
 University of Virginia
 VA Dept of Environmental Quality
 VA Information Technologies Agency
 City of Williamsburg, VA
 VT Agency of Commerce and Community Development
 Columbia County, WA
 WA Dept of Natural Resources
 Adams County, WI
 Bayfield County, WI
 Calumet County, WI
 Clark County, WI
 Columbia County, WI
 Dane County, WI
 Dodge County, WI
 Fond du Lac County, WI
 Forest County, WI
 Green Lake County, WI
 Jefferson County, WI
 La Crosse County, WI
 Lafayette County, WI
 Langlade County, WI
 Lincoln County, WI
 Monroe County, WI
 Oneida County WI Land Information
 Pepin County, WI
 Portage County, WI
 Price County, WI
 Sawyer County, WI
 Southeastern Wisconsin Regional Planning Commission
 Taylor County, WI
 City of Washburn
 Waupaca County, WI
 Winnebago County, WI
 Wisconsin Coastal Management Program
 Illinois Height Modernization Program
 MI Dept of Environmental Quality
 MI Department of Technology, Management and Budget
 Natrona County, WY
 Capitol Region Council of Governments
 County of Hawaii
 Waushara County, WI

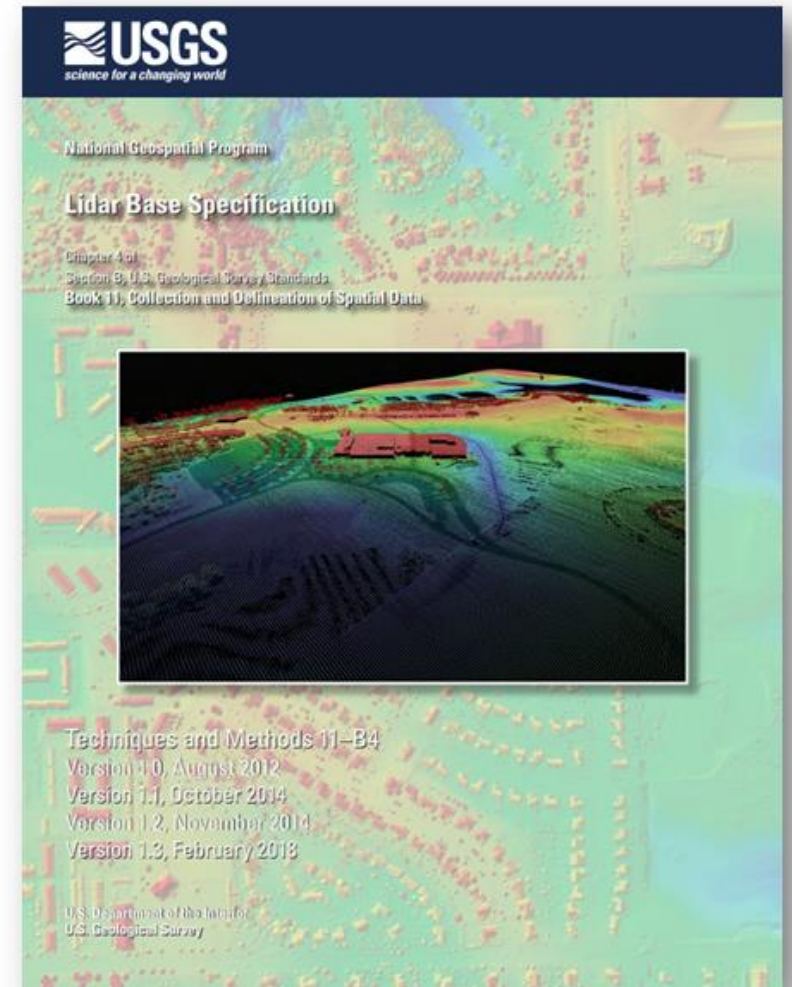




3DEP Operational Infrastructure

Supporting Partner Needs

- **Broad Agency Announcement** - Fair and equitable process for non-Feds to partner with Federal Agencies, announced on sam.gov and grants.gov
- **Geospatial Products and Services Contracts (GPSC)**
 - Preferred method for acquiring 3DEP data because it ensures quality and consistency of data
 - Value added service – GPSC staff coordinate partnership funding; handle contracting; provide project planning, tracking, and management; and provide quality review and delivery
- **US Interagency Elevation Inventory** – Co-managed with NOAA to ensure all publicly available lidar is discoverable and to avoid duplication
- **USGS Lidar Base Specification** – Ensures consistent data across multiple sources
- **The National Map** - Data delivered free to the public via The National Map website
- **Lidar Explorer Application** – Process lidar data within the cloud

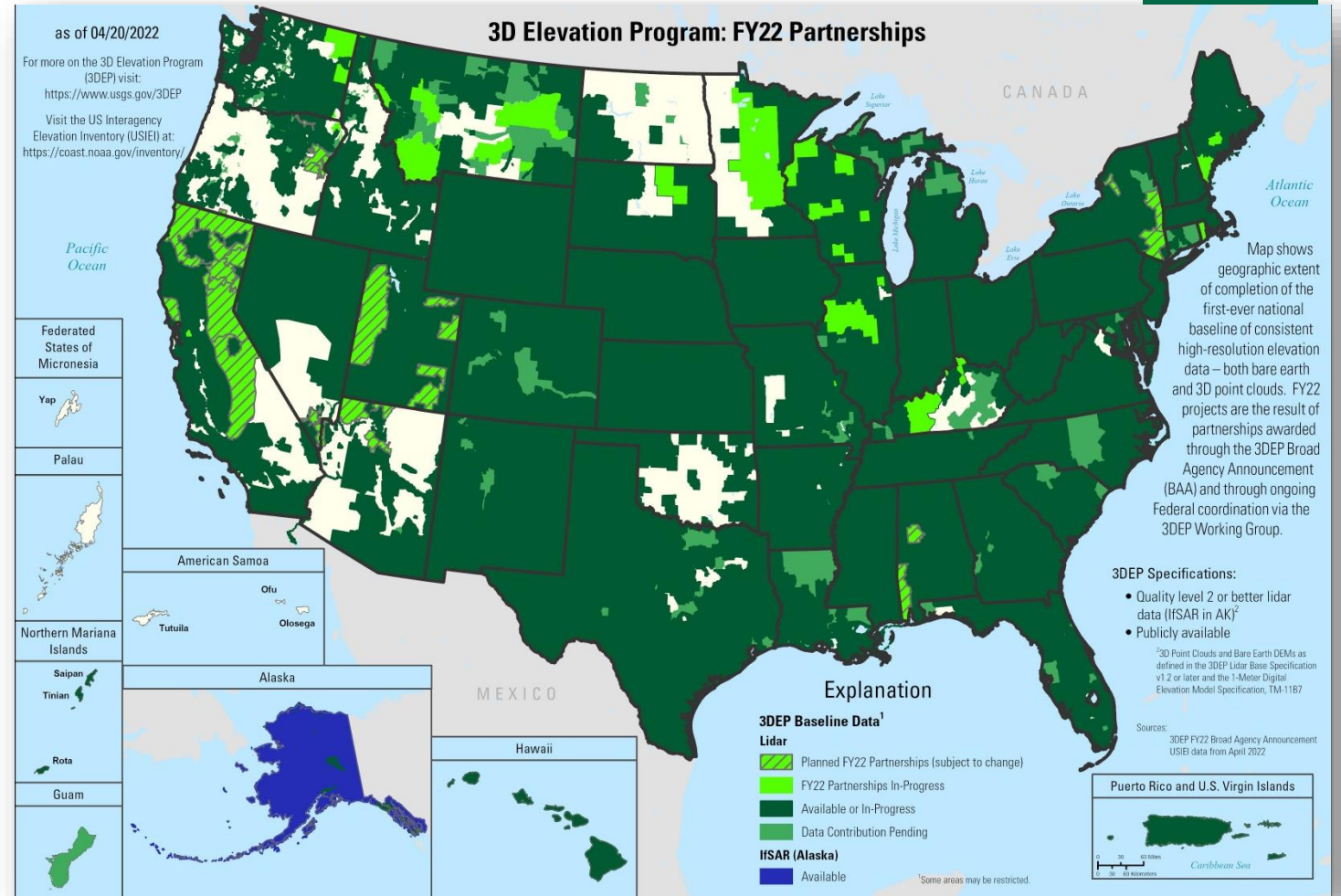




3DEP

Data Acquisition Status

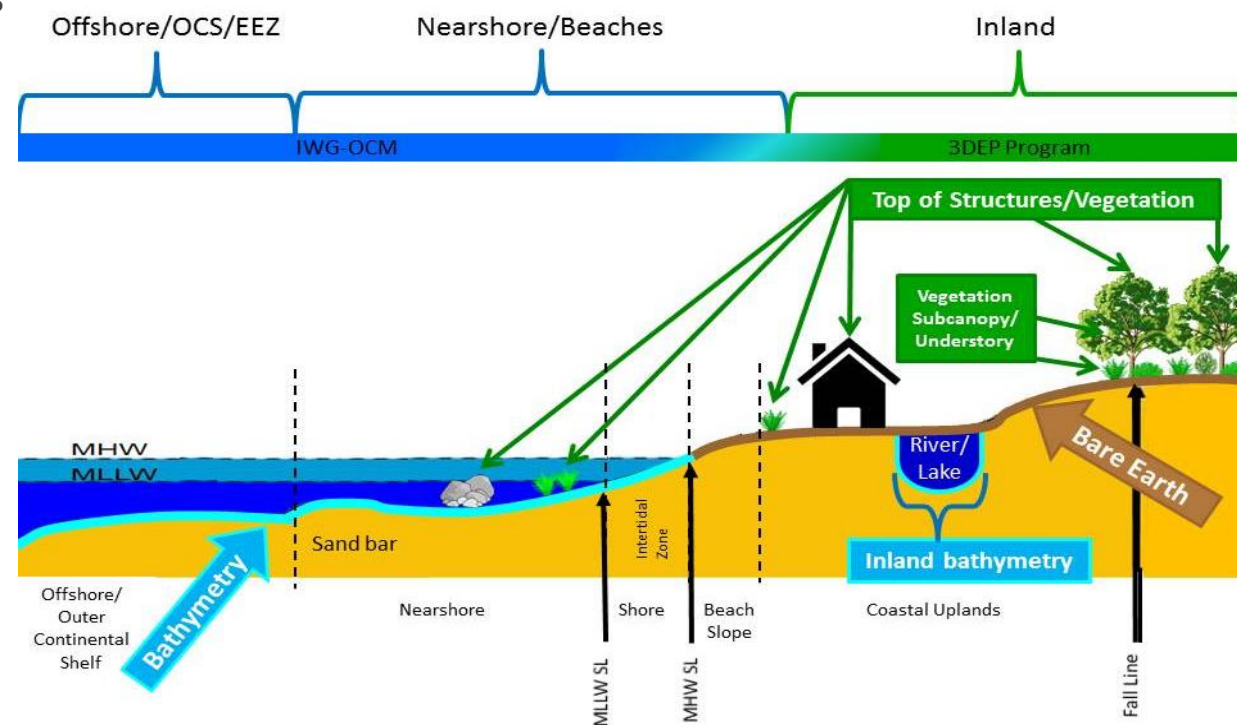
- At the end of FY2021 ~ 84% of the Nation had 3DEP-quality data available or in progress
- FY2022 partnerships to date are shown in bright green
- On track to complete nationwide data acquisition by FY2026



+ 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**



3D National Topography Model (3DNTM)

Topography is defined by elevation and hydrography; elevation shapes hydrography, and hydrography shapes elevation. To support a broad range of applications, the **3D National Topography Model** integrates U.S. Geological Survey (USGS) elevation and hydrography datasets to model the Nation's topography in 3D.



Delivers the terrestrial component of the 3D Nation vision of a continuous data surface from the depths of the oceans to the peaks of the mountains

Enables new and emerging applications

- Multiple vintages enable change detection
- Water-related applications move from the neighborhood to the street-level in accuracy
- Provides universal sharing of water information as the geospatial foundation for the Internet of Water

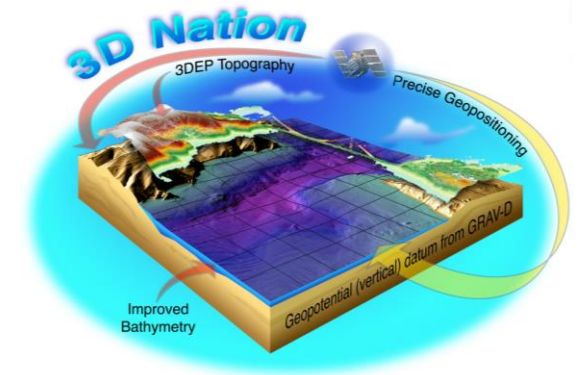
Underpins a broad range of applications including flood risk management, drought management, hazards response and mitigation, infrastructure management, climate change science, and more

Provides foundational data to critical initiatives

- Federal Emergency Management Agency Future of Flood Risk Data and Risk Rating 2.0
- The National Water Model
- The Clean Water Act
- The Earth Mapping Resources Initiative and critical minerals
- National Landslides Preparedness Act

3D National Topography Model (3DNTM)

Topography is defined by elevation and hydrography; elevation shapes hydrography, and hydrography shapes elevation. To support a broad range of applications, the **3D National Topography Model (3DNTM)** initiative integrates USGS elevation and hydrography datasets to model the Nation's topography in 3D. 3DNTM delivers the terrestrial component of the 3D Nation vision of USGS and NOAA to build a modern elevation foundation – from the peaks of our mountains to the depths of our waters.



National Baseline Datasets

NHDPlus High Resolution (NHDPlus HR) multiscale hydrography framework

- End of FY21 - 86% of the Nation had beta version data available
- On track to complete by 2029



3D Elevation Program (3DEP) first national baseline of consistent high-resolution elevation data

- End of FY21 - 84% of the Nation had 3DEP data available or in progress
- On track to complete data acquisition by FY26



Ongoing goal

Next Generation Programs

3DNTM Call for Action Part 1: 3D Hydrography Program (3DHP)

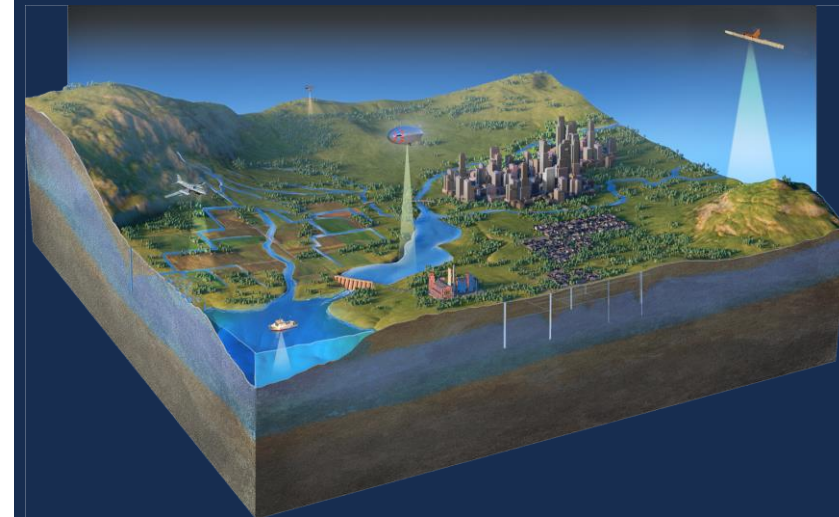
- 3DHP data derived from 3DEP elevation
- Connections to groundwater, wetlands, and engineered hydrography
- 3DHP Infostructure

3DNTM Call for Action Part 2: Next Gen 3DEP

- New quality levels and refresh cycles
- Integration with inland bathymetry

Kick off in near term

Integrated 3D Model



- Research and develop a 3D data model to fully integrate 3DHP and Next Gen 3DEP
- Integrate other data from *The National Map*

Longer-term goal



FY22 Budget

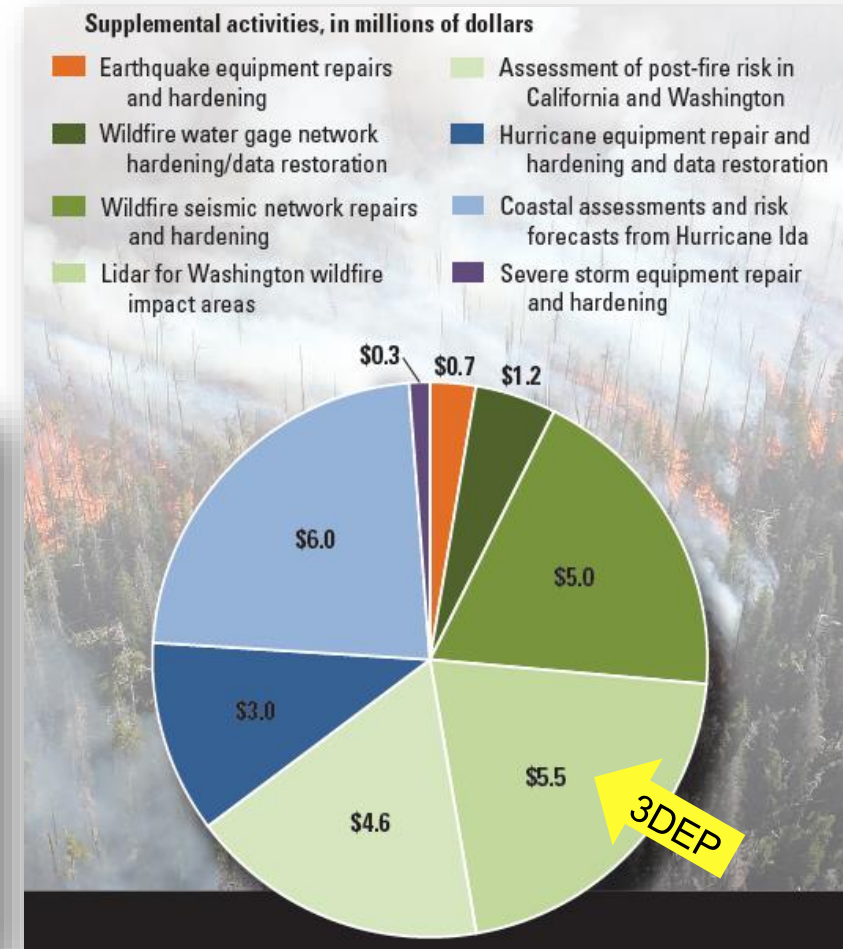
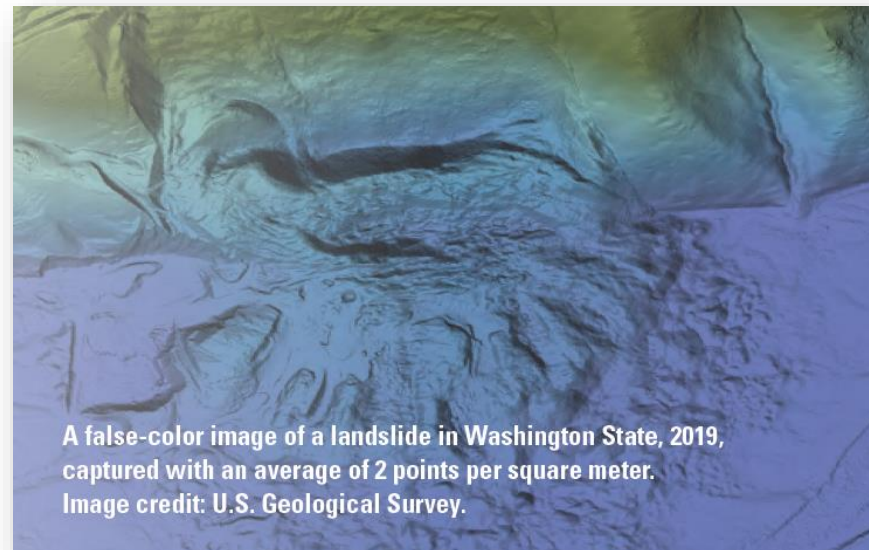
		2021 Enacted	2022 PB Request	2022 Omnibus Funding
Core Science Systems Mission Area				
Subactivity	NGP	79,454	85,598	87,526
Component	Elevation	38,655	39,655	42,905
Subcomponent	<i>3DEP</i>	35,655	35,655	35,655
<i>FY 22 & 23 Put and Take</i>	<i>3DEP: Tribal Lands</i>	0	1,000	1,250
<i>FY22 Omnibus Mark</i>	<i>3DEP: Federal Lands in Western US</i>	0	0	3,000
Subcomponent	<i>Digital Surface Models</i>	3,000	3,000	3,000
Component	Hydrography	17,060	17,060	18,838
<i>FY22 Omnibus Mark</i>	<i>Alaska Mapping and Map Modernization</i>	7,000	7,000	8,778



+ FY22 Supplemental Funding

Extending Government Funding and Delivering Emergency Assistance Act

- Public Law 117- 43 provided \$26.3 million in supplemental funding to repair and replace facilities and equipment, collect high-resolution elevation data, and complete scientific assessments to support direct recovery and rebuilding decisions in areas affected by declared disasters—earthquakes, wildfires, hurricanes, and floods—that occurred between 2019 and 2021
- \$5.5M for lidar for Washington wildfire impact areas; leveraging with partner funding
- Lidar data will be used in wildfire risk mapping, Tribal and Federal forest management planning, and other recovery efforts



+ FY23 President's Budget

Core Science Systems Mission Area	2021 Enacted	2022 PB Request	2022 Omnibus Funding	FY 2023 GB Request (Based on 22 CR)
NGP	79,454	85,598	87,526	98,506
Elevation	38,655	39,655	42,905	39,655
3DEP	35,655	35,655	35,655	35,655
3DEP: Tribal Lands	0	1,000	1,250	1,000
3DEP: Federal Lands in Western US	0	0	3,000	0
Digital Surface Models	3,000	3,000	3,000	3,000
Hydrography	17,060	17,060	18,838	17,060
Alaska Mapping and Map Modernization	7,000	7,000	8,778	7,000
Published Maps, Products, and Services	18,580	22,580	19,480	24,080
...				
Geospatial/Geologic Research and Collection on Tribal Lands	0	4,000	230	4,000
3DNTM	0	0	0	1,500





NGAC 3DEP Subcommittee

Potential Focus Areas

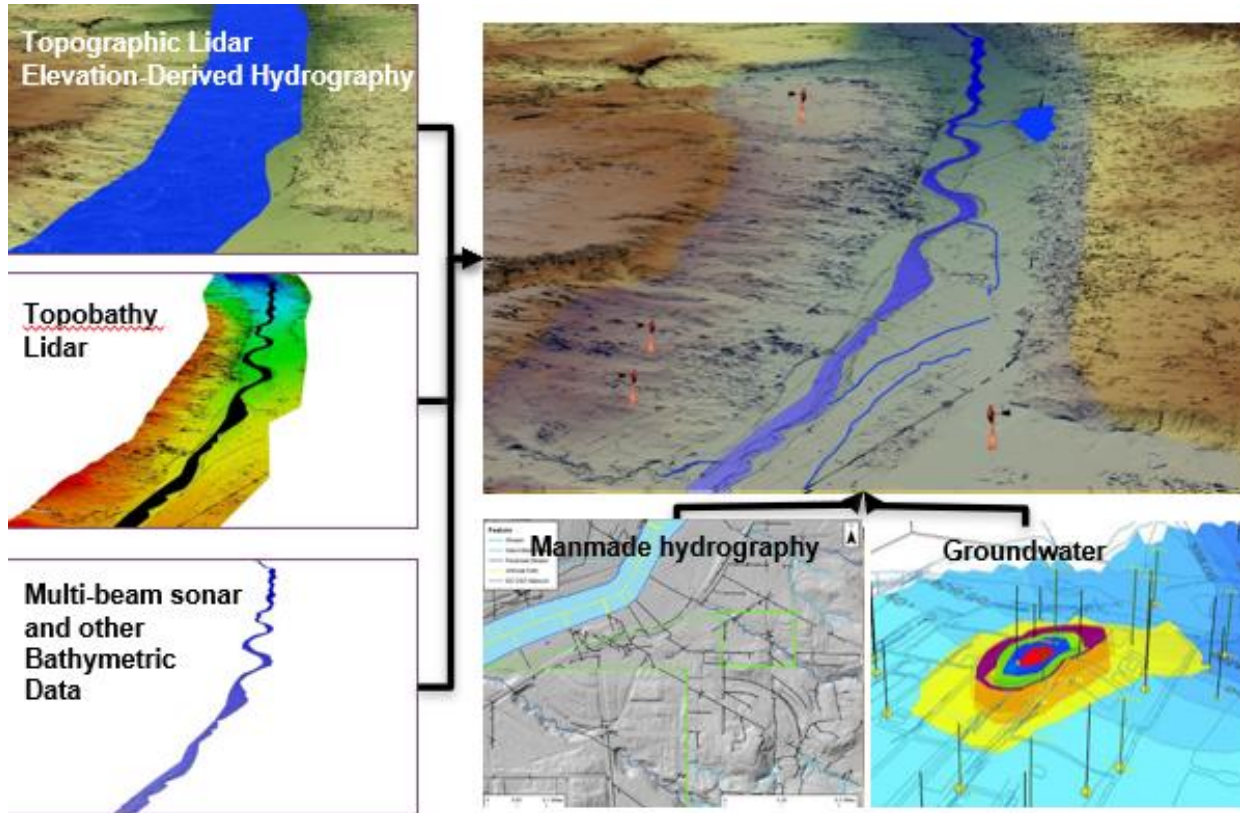
		FY22		FY23				FY24		Ongoing
		Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	
Next generation 3DEP program design	Review program scenario and provide input		Active	Active	Active					
	Provide feedback to Call for Action				Active	Active	Active			
Technology development for next gen 3DEP	Change-based update strategy				Active	Active	Active			
	New platforms, sensors and techniques				Active	Active	Active		Active	
Transition to 3DHP	Provide feedback on timelines and plans for winding down legacy program and shift to 3DHP	Active	Active	Active	Active					
Development of 3DNTM	Feedback on options and plans for governance	Active	Active	Active	Active					
	Feedback and input on 3D data model					Active	Active	Active		
Other topics	TBD		Active	Active	Active	Active	Active	Active	Active	

THANK YOU!



3DNTM: Next Generation of Integrated Data

Topography is defined by elevation and hydrography; elevation shapes hydrography, and hydrography shapes elevation. To support a broad range of applications, the **3D National Topography Model** integrates USGS elevation and hydrography datasets to model the Nation's topography in 3D.



Next Generation NHD: 3D Hydrography Program (3DHP)

- Operationalize **deriving hydrography from lidar/lfSAR**
- Enable better accounting of the hydrologic cycle by adding **connections to groundwater, engineered hydrologic systems and wetlands**
- Fully implement the **National Hydrography Infrastructure** as the universal mechanism for sharing and discovering water information

Next Generation 3D Elevation Program (3DEP)

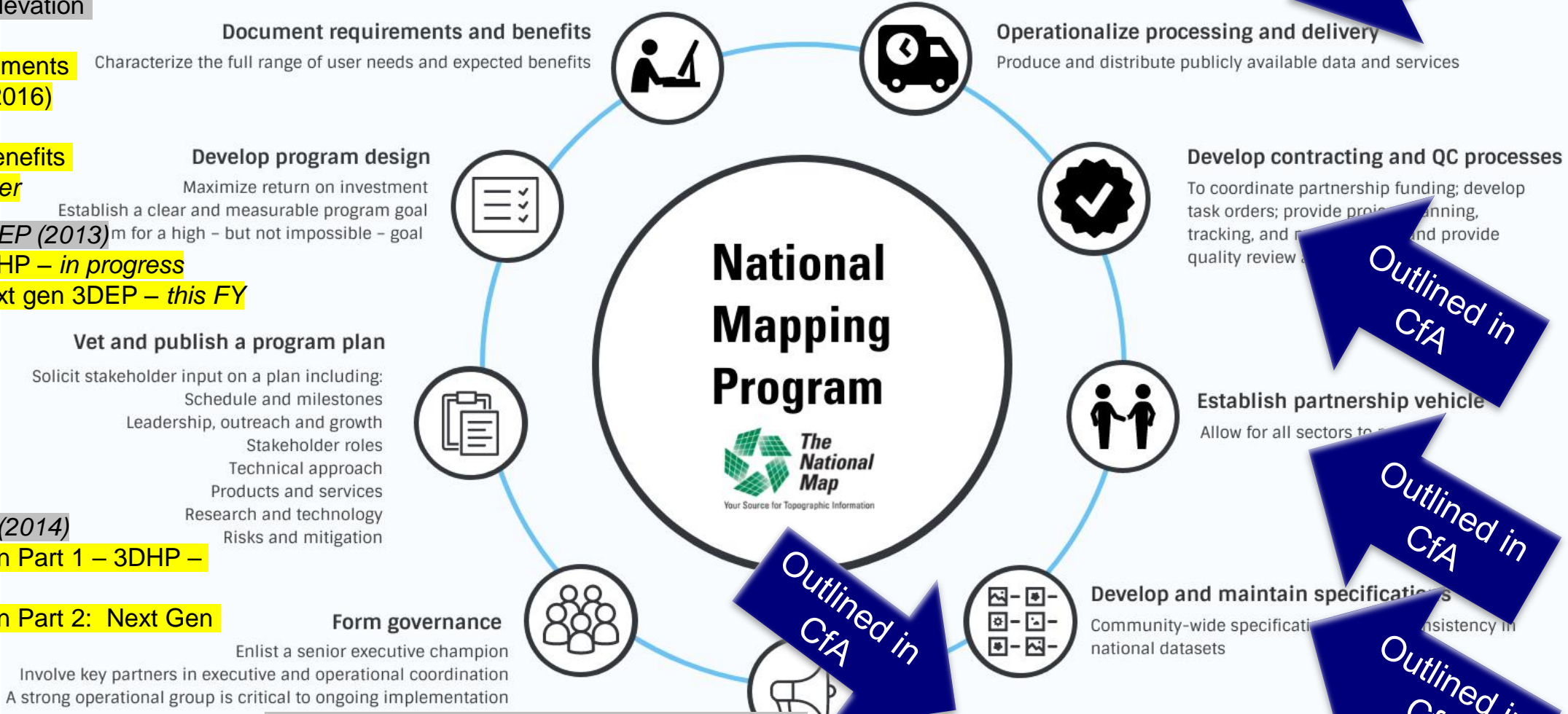
- Operationalize **inland bathymetry**
- Collect new data based on **landscape change, evolving user needs and technology, vegetation structure**
- Enable **monitoring and change detection** by comparing baseline with new vintages of data

+ 3DNTM, 3DHP, and Next Gen 3DEP Development

Steps and Timeline

- National Enhanced Elevation Assessment (2012)
- Hydrography Requirements and Benefits Study (2016)
- 3D Nation Elevation Requirements and Benefits Study – *spring/summer*
- 3DEP (2013)
- 3DHP – *in progress*
- Next gen 3DEP – *this FY*

- 3DEP Call for Action (2014)
- 3DNTM Call for Action Part 1 – 3DHP – *in review*
- 3DNTM Call for Action Part 2: Next Gen 3DEP – *fall/winter*



- 3DEP Executive Forum & Working Group (2015)
- 3DHP Working Group
- Combined Exec governance in the future?