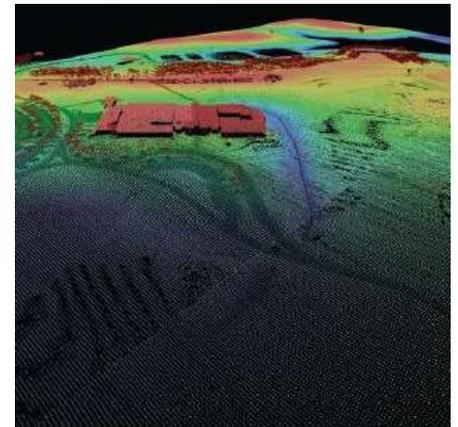
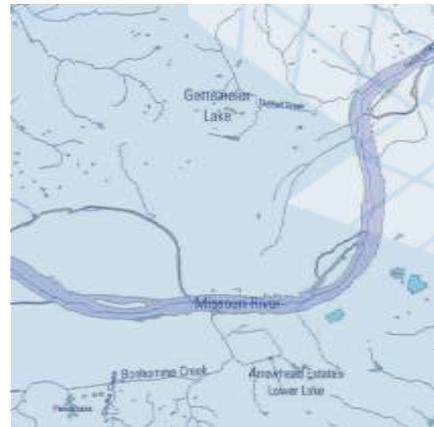
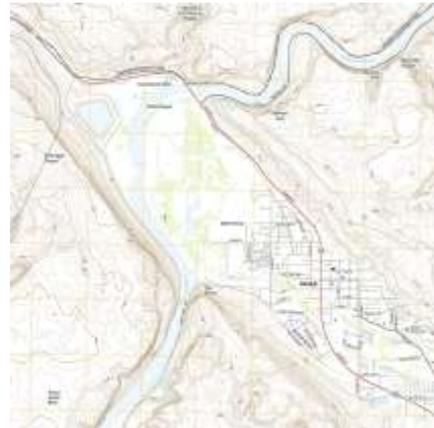




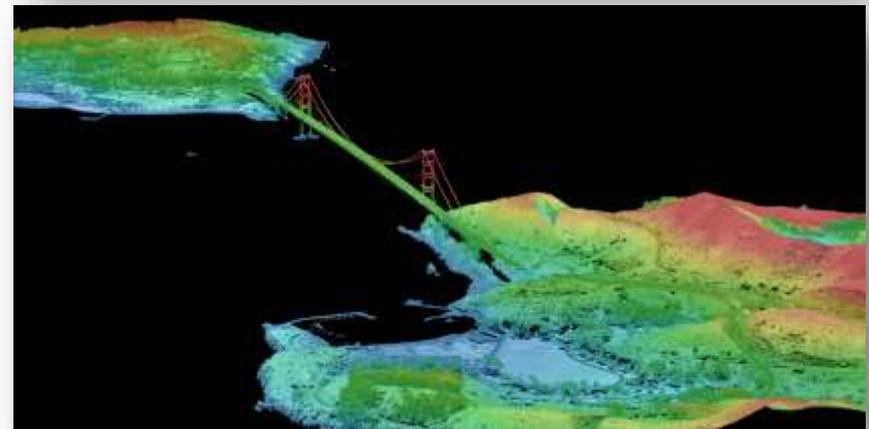
3D Elevation Program (3DEP) and National Hydrography Datasets Update



Vicki Lukas, Chief, Topographic Data Services
September 7, 2017

+ 3D Elevation Program (3DEP)

- Apply lidar technology to map bare earth and 3D data of natural and constructed features; increase the quality level of lidar being acquired to enable more accurate understanding, modeling, and prediction
- Goal to complete acquisition of national lidar coverage with IfSAR in Alaska in 8 years
- Address the mission-critical requirements of 34 Federal agencies, 50 states, and other organizations documented in the National Enhanced Elevation Assessment
- ROI 5:1, conservative benefits of \$690 million/year with potential to generate \$13 billion/year
- Leverage the capability and capacity of private industry mapping firms
- Achieve a 25% cost efficiency gain by collecting data in larger projects
- Completely refresh national elevation data holdings with new products and services

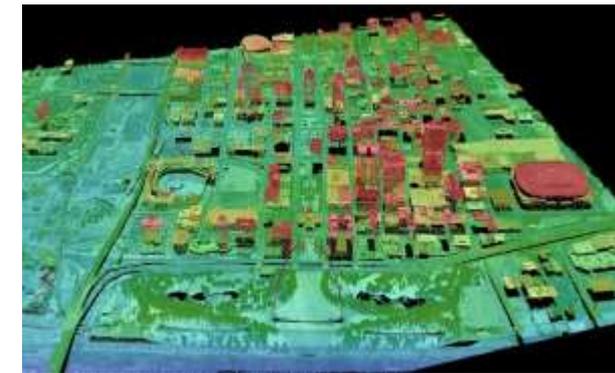




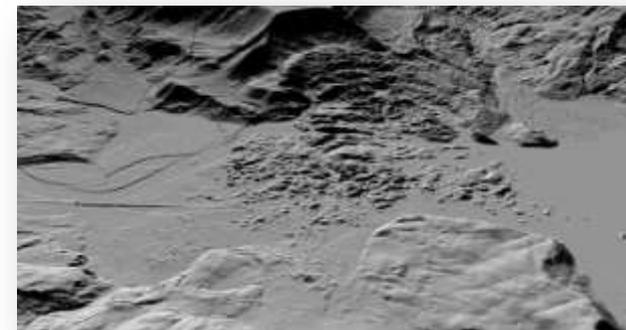
National Enhanced Elevation Assessment (NEEA)



Flood Risk Management



Infrastructure



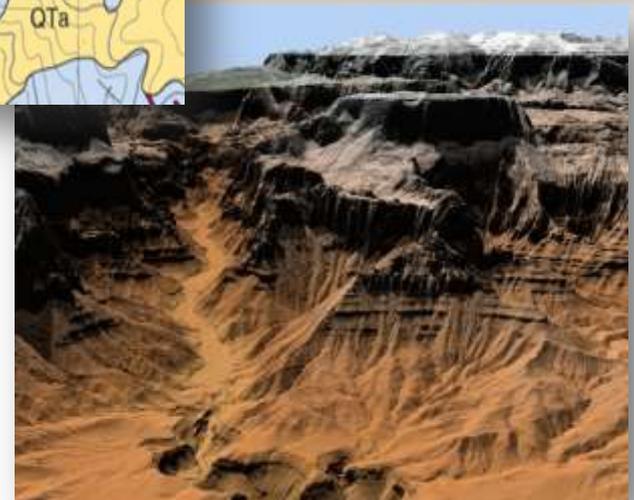
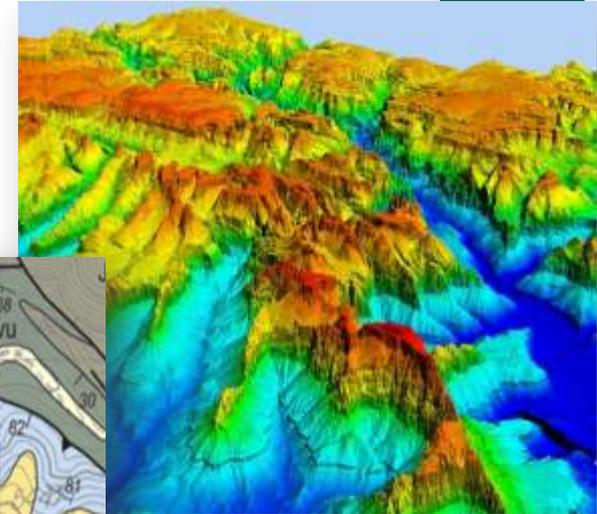
Landslides

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

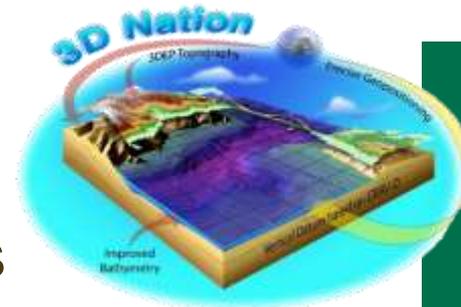
+ 3DEP for Critical Mineral Independence

Lidar is essential for Geologic Resource Assessment

- Critical for mapping young deposits and landforms, which are those most essential to understanding earth resources
- Underpins geologic mapping that guides assessment and development of solid-Earth resources: base and precious metals, sand and gravel, coal, oil, and natural gas
- Supports site-specific engineering studies by the geotechnical industry
- Improves the efficiency of geologic mapping, dramatically improves the spatial precision of geologic maps, and increases the number of units that can be mapped, in some cases doubling them

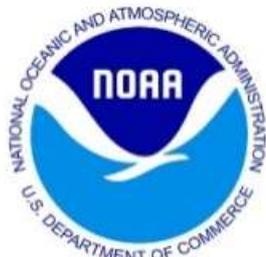
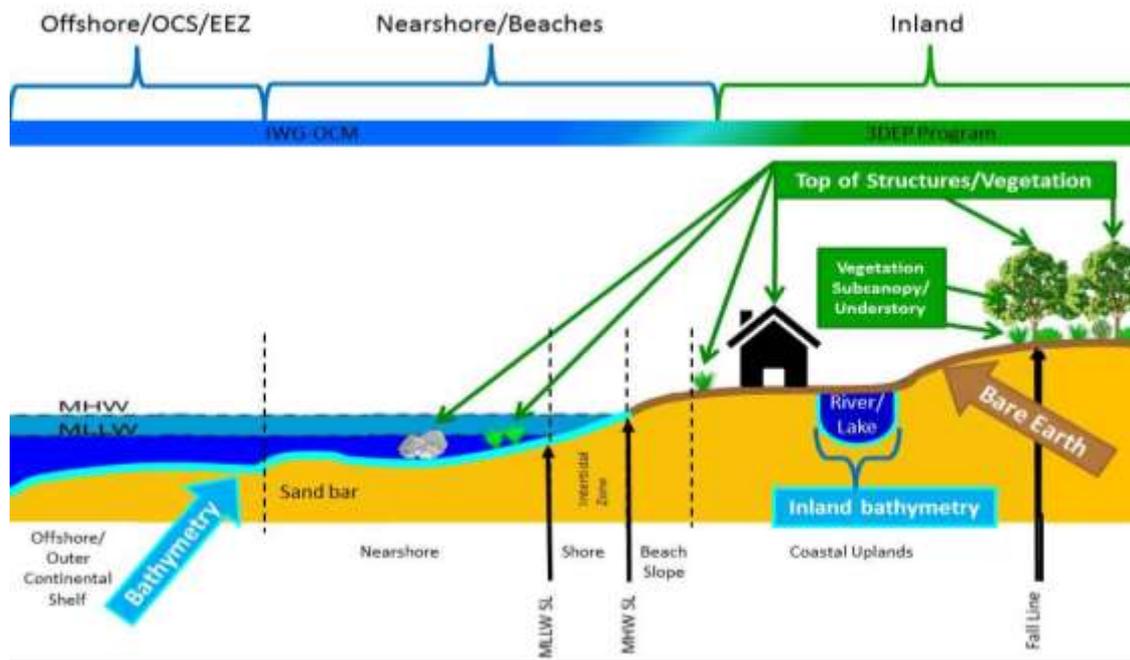


+ 3D Nation Elevation



Requirements and Benefits Study - Goals

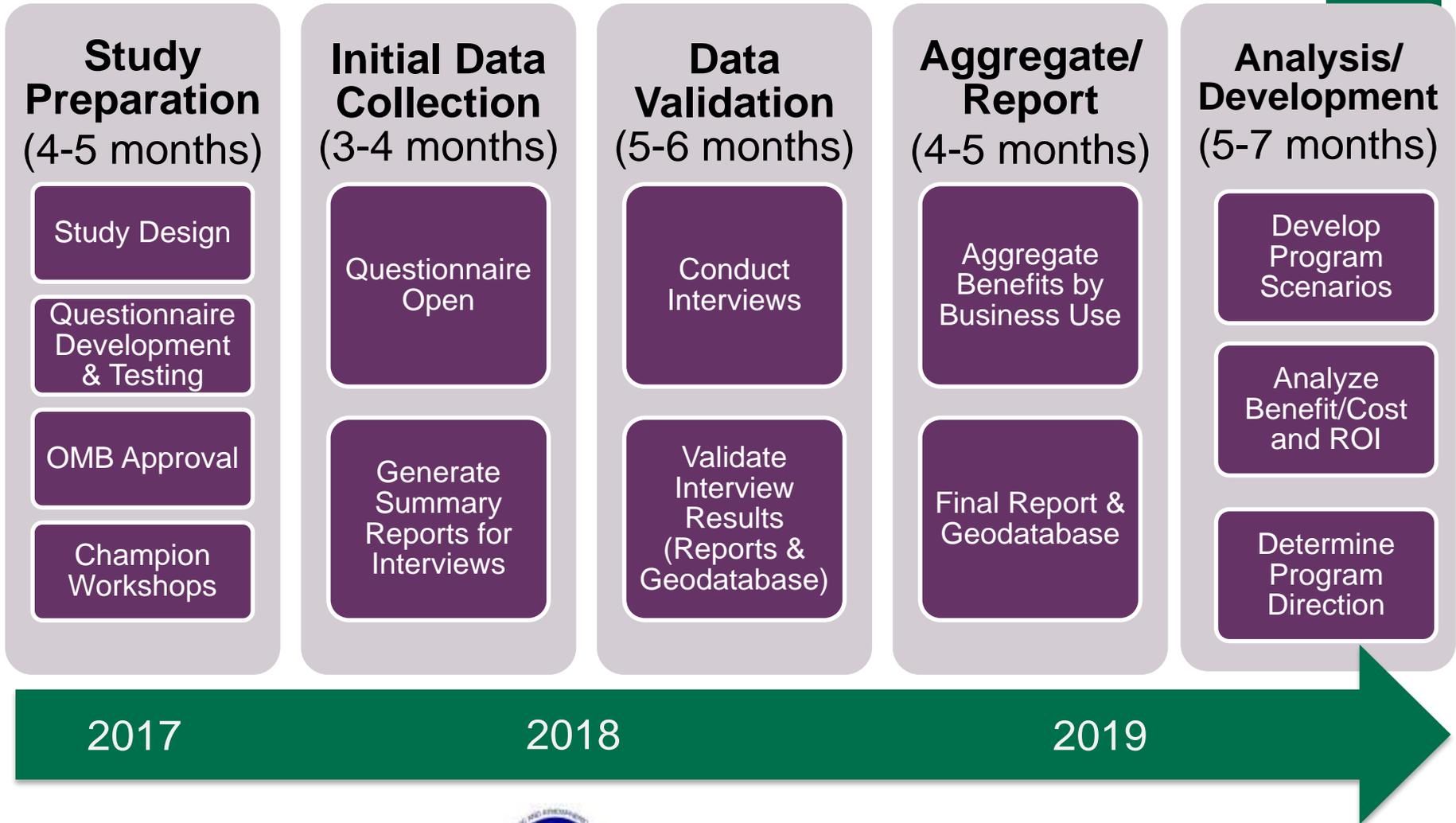
- Understand inland, nearshore and offshore bathymetric data requirements and benefits
- Understand how requirements and benefits dovetail in the nearshore coastal zone
- Plan for the next round of 3DEP after completion of nationwide coverage
- Gather technology-agnostic user information to be able to assess new technologies against requirements and identify the tradeoffs between different approaches
- Improve our understanding of needs to guide development of the next generation of 3DEP Products and Services



The National Map
Your Source for Topographic Information



Study Phases - Draft Timeline

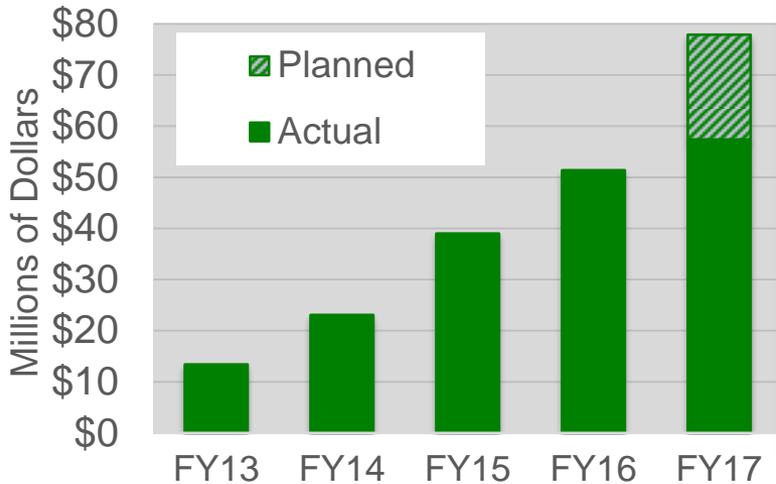


+ 3DEP FY17 Partnerships To Date

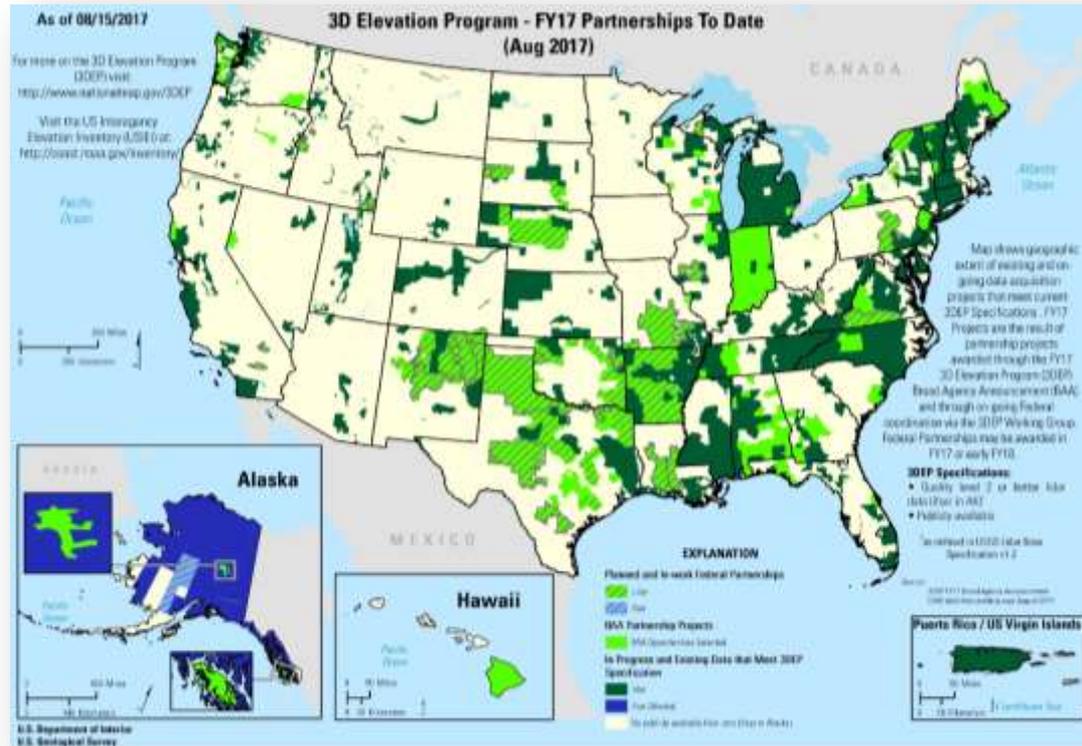
10.7%* of the Nation has been contracted

* does not include all projects under development

- Including FY17 planned data, 3DEP data have been contracted for nearly 37% of the entire US
- Alaska IfSAR –estimate 91% by end of the FY



Total FY17 3DEP investments from all partners





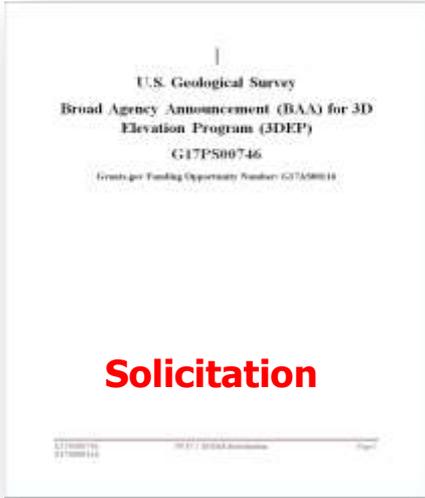
3DEP Data Acquisition

FY18 Broad Agency Announcement (BAA)

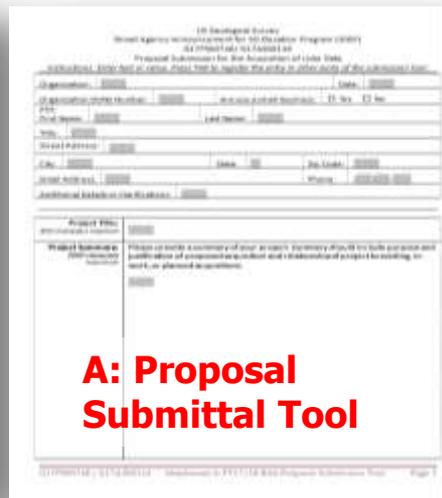
Posted August 16
Proposals due October 20

FedBizOpps: G17PS00746

Grants.gov: G17AS00116



Solicitation



A: Proposal Submittal Tool



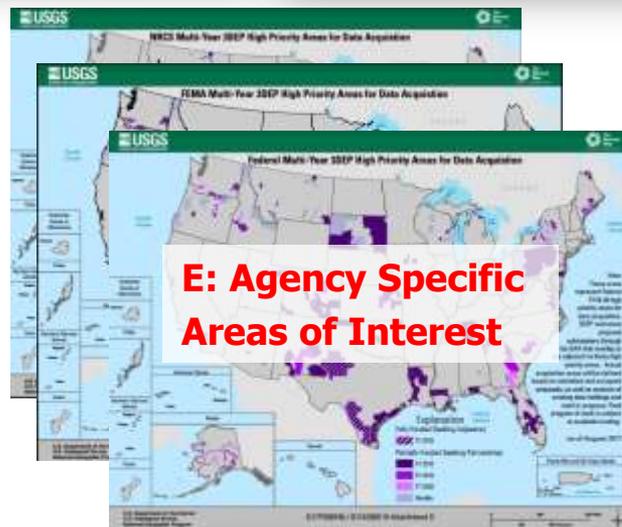
B: Validation of Funding Partners



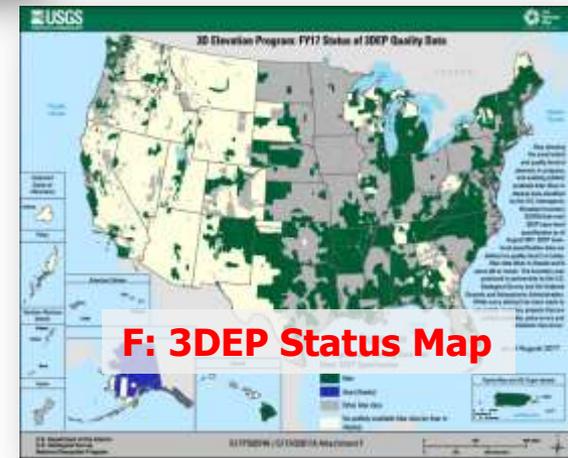
C: Consolidated Federal Areas of Interest



D: 3DEP Multi-Year Plan



E: Agency Specific Areas of Interest



F: 3DEP Status Map



+ 3DEP National Multiyear Plan

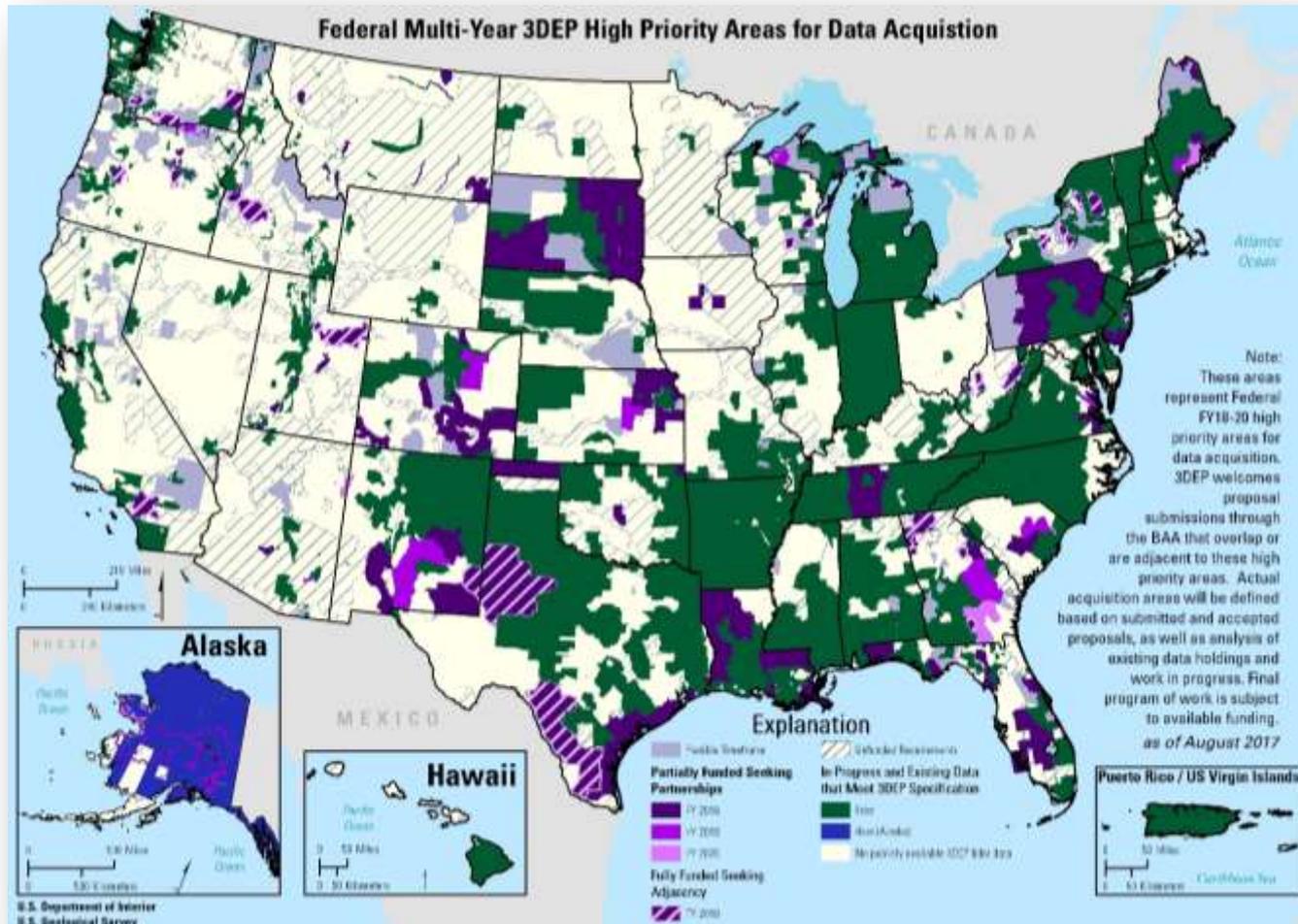
Plan for nationwide completion

- 3DEP Executive Forum tasked the 3DEP Working Group to develop plan to move from an annual, opportunistic process to a systematic multi-year plan using a phased approach
- Primary Ingredients
 - **Federal Investment Plans**
 - **Costshare model**
 - **National Plan made up of 50+ State Plans**
 - **National tiling scheme data acquisition/delivery**
 - **Publicly accessible**
- Benefits
 - Facilitate greater investments and leveraging through longer planning lead times
 - Defined units of data acquisition and delivery facilitate planning and understanding costs, allow for improved reporting and justification of investments
 - Presents a plan for nationwide coverage



+ 3DEP National Multiyear Plan

Federal FY17-FY20 Plan – August 2017



+ 3DEP Funding

USGS Budget Estimates - Includes Alaska IfSAR

	FY15 enacted	FY16 enacted	FY17 enacted	FY18 request
USGS Base budget (includes acquisition and operations)	\$15.2M	\$20.4 M	\$24.7M	\$29.2M
Increase/decrease	+\$5.2M	+\$4.3 M	+\$4.5 M	-\$9.2M
Total USGS 3DEP budget	\$20.4M	\$24.7M	\$29.2 M	\$20.0M

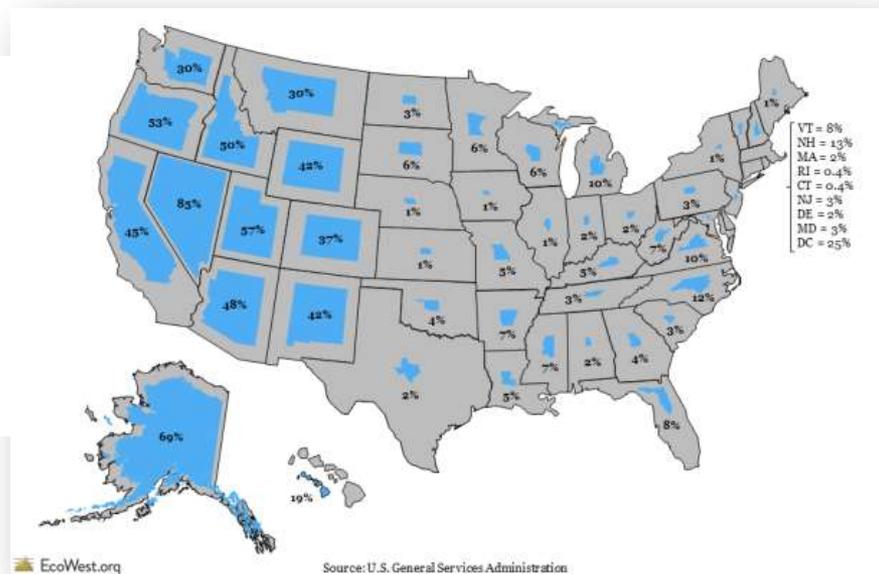
House Mark

Core Science Systems.—The Committee recommends \$114,737,000 for core science systems, of which \$24,397,000 is for the National Cooperative Geologic Mapping program. The recommendation includes \$67,354,000 for the National Geospatial program, of which \$22,500,000 is for 3DEP National Enhancement. Landscape level assessments—Chesapeake Bay, Geospatial Research and 3DEP Technical Support, 3DEP Program Functions, and the Federal Geographic Data Committee Functions are funded at fiscal year 2017 enacted levels.

+ 3DEP National Multiyear Plan

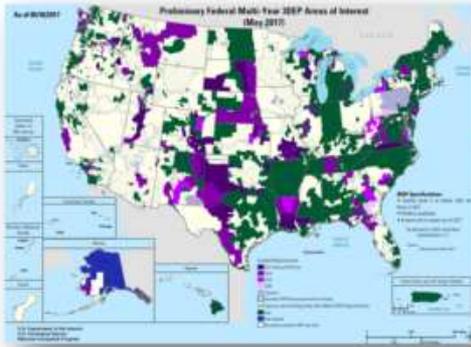
Costshare considerations

- Overall goal 1/3 USGS, 1/3 Other Feds, 1/3 non-Fed, but ratios will vary by state by:
 - Amount of Federal land
 - Amount of private agricultural land – to estimate NRCS cost share
 - Amount of high, moderate and low flood risk areas – to estimate FEMA cost share
- Theoretical/ideal model has been discussed and will be used to help inform and develop an operational model that includes:
 - Expected spending over the next few years by FEMA, NRCS and other agencies
 - Current funding levels for data for Federal lands
 - Prior investments
- USGS investments in each state to be refined to get closer to Federal 2/3 cost share
 - Change in philosophy from opportunistic/annual view to implementing the systematic plan - USGS may need to investment in states where FEMA and NRCS are not

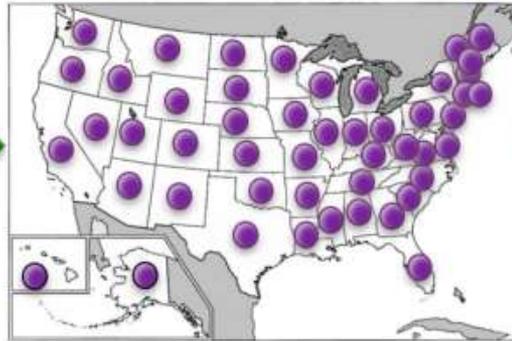


+ 3DEP National Multiyear Plan

National Plan made up of 50+ State Plans



Federal Multi-Year Plan -
Coordinated plans of multiple
Federal agencies



● 3DEP State Acquisition
Plans – Coordinated plans of
state, local, Tribal, Federal and
other partners



National Acquisition Plan –
Made up of 3DEP State
Acquisition Plans for each
state and territory

Concept diagram of proposed workflow to develop a National Plan

+ 3DEP National Multiyear Plan

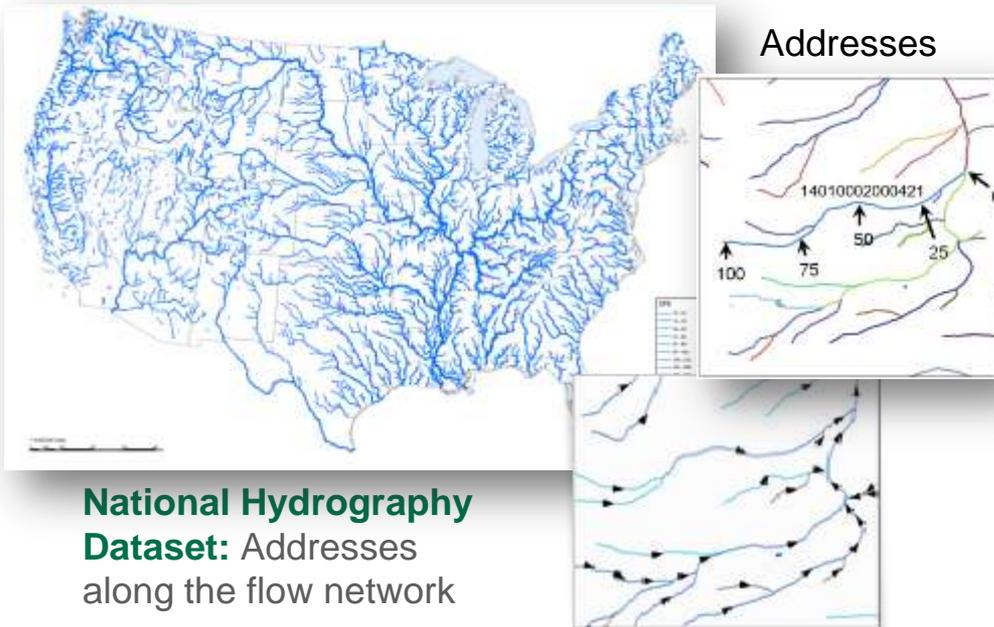
Adoption of Data Acquisition/Delivery Tiling Scheme

- FY18 3DEP collections will be planned using 1 square km tiling scheme (Albers Equal Area projection (EPSG:6350), XYZ units in meters)
 - Same size everywhere
 - Small enough to approximate watersheds, counties, etc.
 - Avoids gaps and overlap in neighboring projects
- Next steps to encourage adoption
 - Provide publicly available tiling scheme geodatabase
 - Convert 3DEP national acquisition status map
 - Provide tools to transform AOI into 3DEP tiles
 - Use for Analysis - Financial, partner, quality, terrain type and other information can be linked to each tile for development of partnership and cost models
 - Categorize tiles into terrain types to develop multiple cost estimates to replace the nationwide cost estimate
 - Communicate expectations with the vendor community

+ National Hydrography Datasets

A common referencing system for the Nation's waterways

- **National Hydrography Dataset (NHD)** - analogous to the addresses along the road network, NHD provides a network, addresses and flow direction for streams
- **Watershed Boundaries Datasets (WBD)** – analogous to zip codes, defines drainage areas
- **NHDPlus** - incorporates features of the NHD, WBD and elevation data to enable estimates of flow volume and velocity





Hydrography Requirements and Benefits Study

HRBS

- Documented 420 mission critical business uses
 - Ecological flows
 - Drought
 - Flooding
 - Spill response
 - StreamStats
 - Modeling and prediction
 - Watershed condition reporting and analysis
 - Resource reporting and analysis
 - And more...

- 23 Federal Agencies, 50 States, 8 Tribal governments and 3 national associations

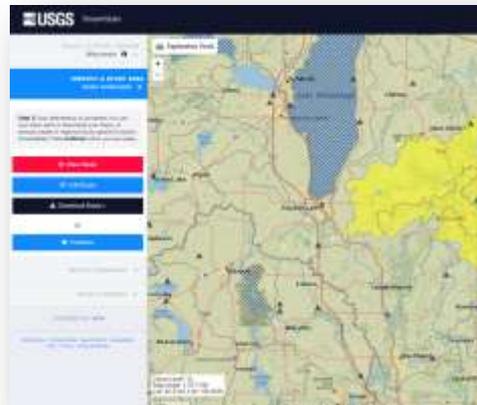
- Current Annual Benefits - \$538M

- Total Potential Annual Benefits for meeting all needs - \$1.14B

- Benefits may be significantly higher - 35% of respondents were not able to provide a dollar value for future benefits



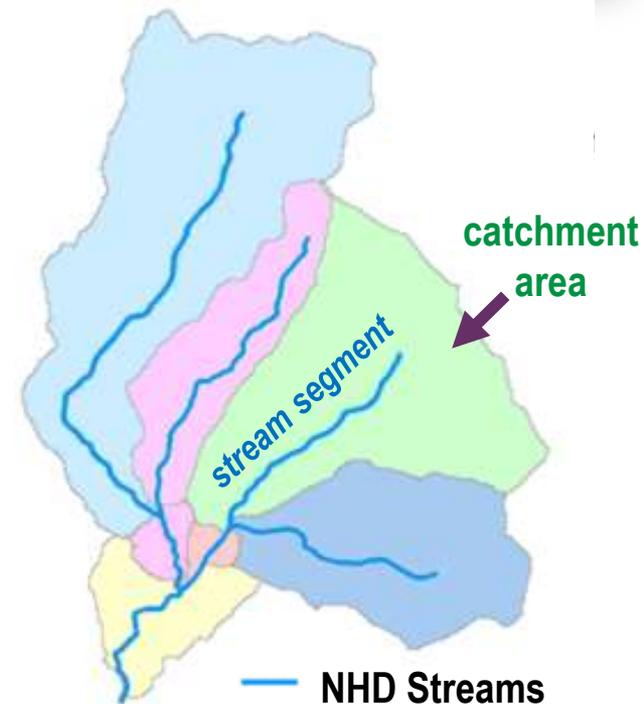
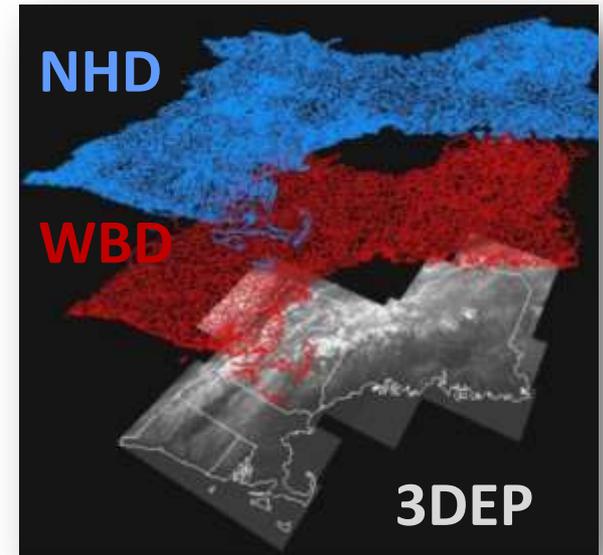
Estimated future annual benefits



+ NHDPlus High Resolution

Combines functionality of NHDPlus and resolution of NHD

- The Hydrography Requirements and Benefits Study showed that ~ 80% of users need the functionality of 1:100,000-scale NHDPlus but **at a higher resolution**
- NHDPlus HR integrates the 1:24,000 or better scale NHD stream network and WBD hydrologic unit boundaries with elevation
- Produces a hydrologically-conditioned surface that enables the delineation of a **catchment (local drainage areas)** for each stream segment, which are used to associate:
 - precipitation, temperature and runoff data with each stream segment for estimating stream flow
 - other landscape attributes, such as land cover, with stream segments
- Elevations along each stream are used to compute stream slope for estimating velocities used in time of travel analyses
- Provides additional value-added attributes, including stream order and attributes that facilitate rapid stream network traversal and query



+ NHDPlus Data Comparison

Medium Resolution versus High Resolution

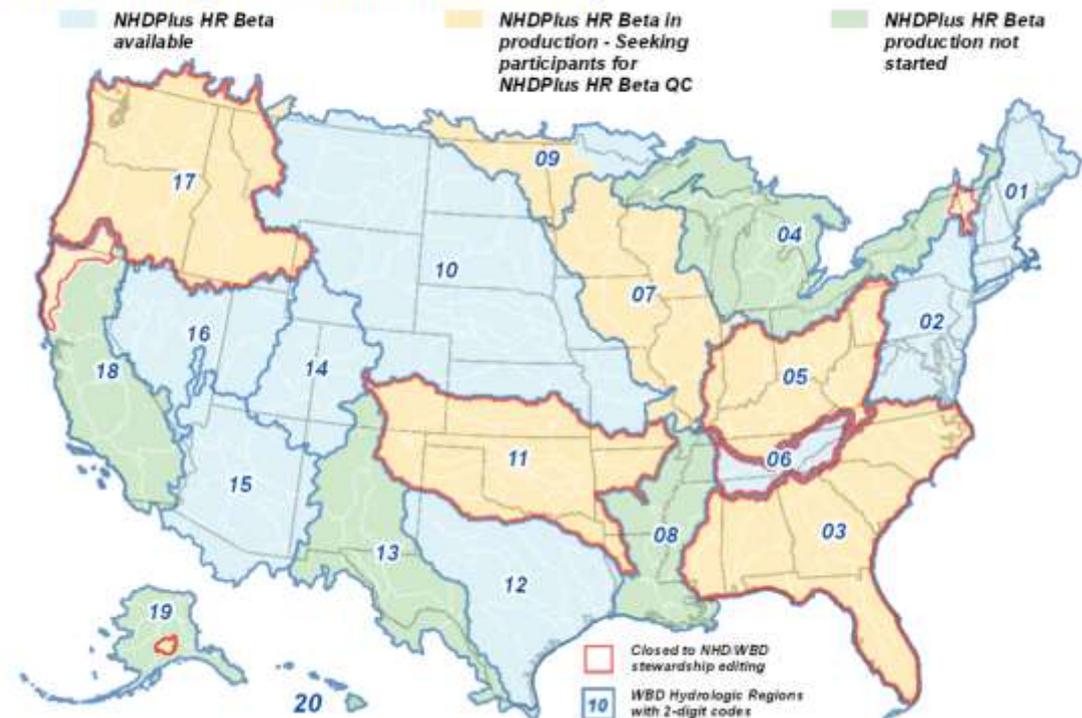
	NHDPlus Medium Resolution (V2)	NHDPlus High Resolution
Number of catchments	~2.7 Million nationally	~26 Million nationally
Elevation Input	National 1 Arc-Second Seamless DEM (30 meters)	National 1/3 Arc-Second Seamless DEM from 3DEP (10 meters)
NHD Input	Medium Resolution NHD 1:100K	High Resolution NHD 1:24K or better
WBD Input	Composite 2010-2012	Updated WBD
Catchment size	Avg. 1.2 square miles	Avg. ~0.2 square miles
Flow estimates	Mean annual, mean monthly	Mean annual

+ NHDPlus High Resolution Beta

First datasets released in April, 2017

- NHDPlus HR Beta will be completed in 2018 for the conterminous U.S., followed by AK, HI, and territories in later years
- Users are invited to review and provide feedback to the Beta version datasets
- Feedback will be used to update and improve the next release, beginning in 2018 and extending through 2019

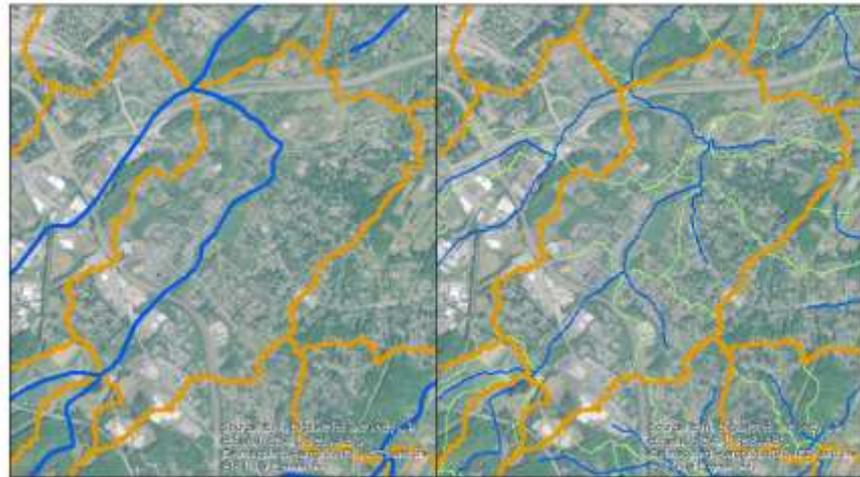
NHDPlus High Resolution Availability



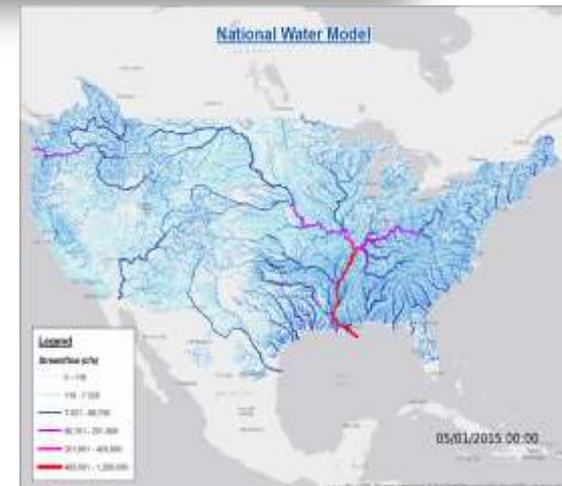
+ NHDPlus HR Applications

The power of a common hydrography framework

- Will enable complex models such as the National Water Model to bring flood forecasting down to the neighborhood level
- Observational data can be linked to NHDPlus HR to supporting limitless applications such as:
 - Predicting the risk, timing, and magnitude of flood events
 - Estimating when and where an event such as a toxic spill will affect downstream populations and ecosystems
 - Enabling property owners to better understand upstream water availability impacts



Comparison of medium (1:100,000, left) and high (1:24,000, right) resolution NHDPlus. Blue lines represent the stream network. Orange lines delineate medium-resolution catchments and green lines are catchments of the streams added at the higher resolution.

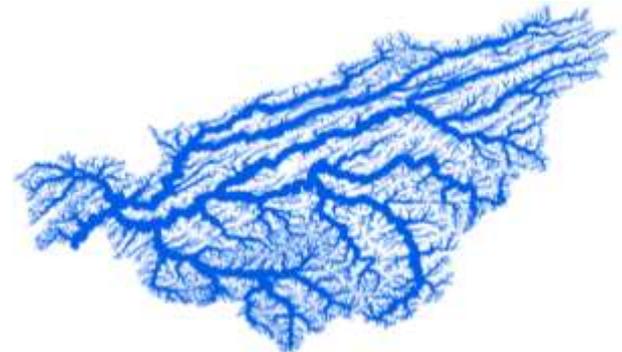


+ Foundational Hydrography Datasets

Future

- HRBS indicates that the most medium to long-term requirements will be met best by deriving hydrographic data from 3DEP data so that the elevation and hydrography are fully integrated
- Pilot projects are underway to determine approaches and associated costs
- In the longer term, develop a plan to operationalize inland topo-bathymetric data acquisition to eventually produce a continuous elevation surface to support a range of 3D applications - pilot project is underway in FY17

	IN USE TODAY: NHDPlus Medium Resolution	IN PROGRESS: NHDPlus High Resolution	FUTURE: Hydrography Derived from Lidar
Number of features nationally	2.7 million	26 million	200-300 million
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
Watershed boundaries source	Composite WBD snapshot of 2010-2012	Updated WBD	Catchments derived from lidar
Tile size	HU2	HU4	HU8 to HU12



+

Thank you!

