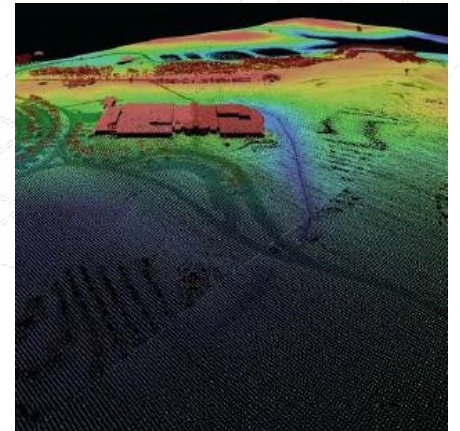
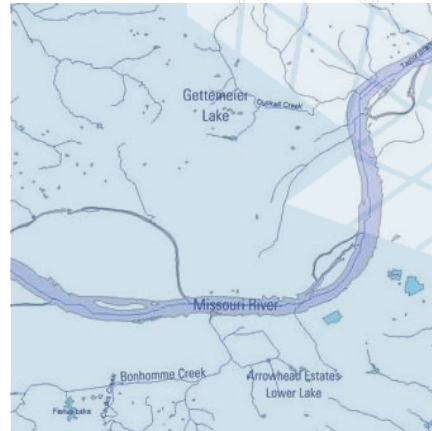
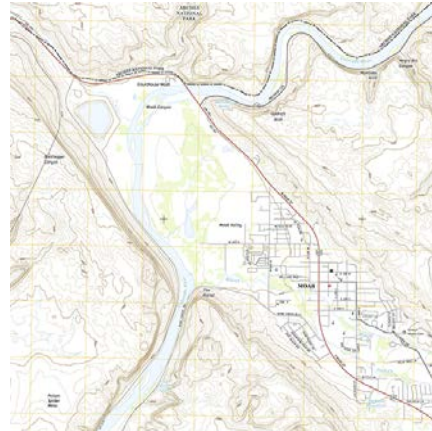


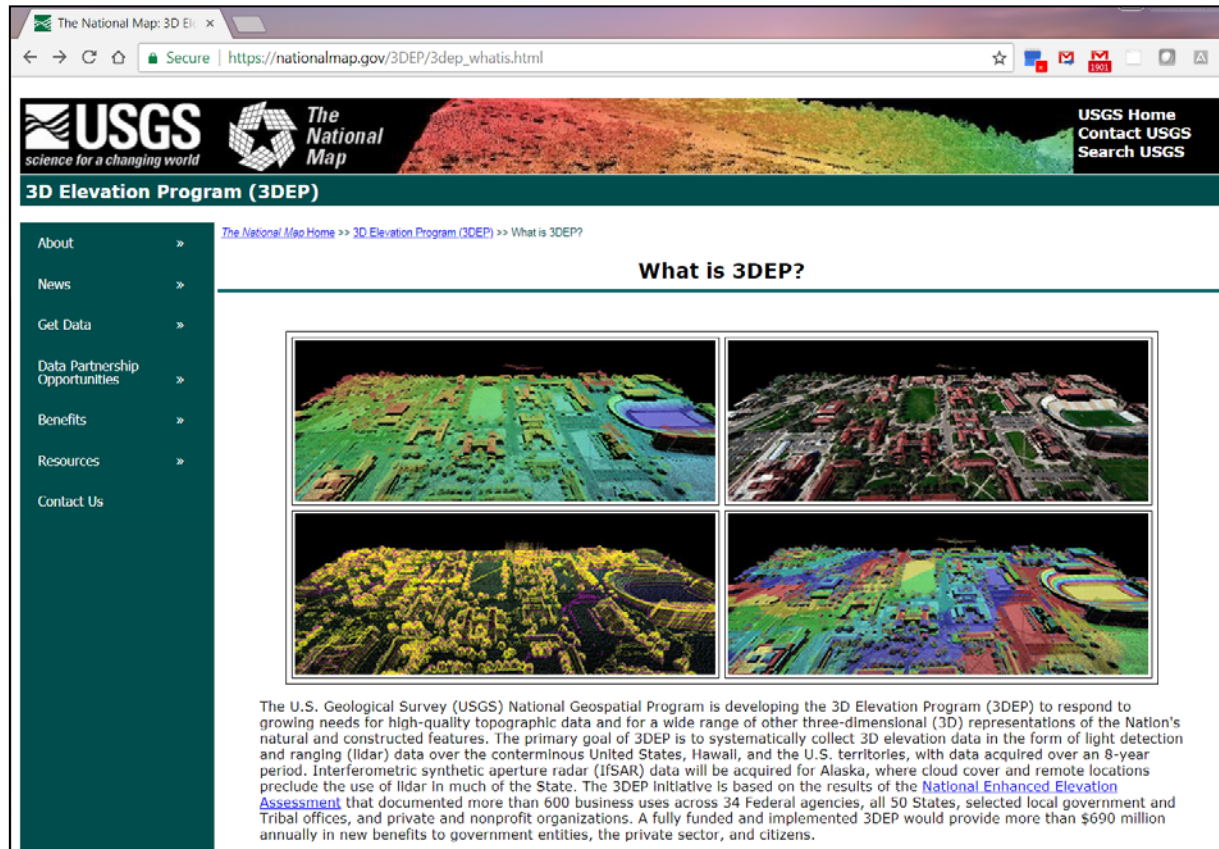
3D Elevation Program- Status and Updates



Claire DeVaughan
South Central Arc User Group Conference
April 11, 2018

+ 3D Elevation Program (3DEP) Goals

- Complete acquisition in 8 years
- Address Federal, state and other mission-critical requirements
- Realize ROI 5:1 and potential to generate \$13 billion/year
- Leverage the capability and capacity of private mapping firms
- Achieve a 25% cost efficiency gain
- Completely refresh national data holdings



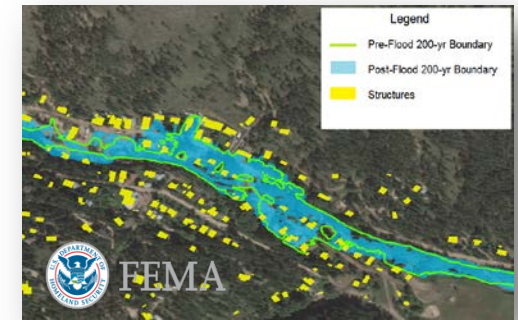
The U.S. Geological Survey (USGS) National Geospatial Program is developing the 3D Elevation Program (3DEP) to respond to growing needs for high-quality topographic data and for a wide range of other three-dimensional (3D) representations of the Nation's natural and constructed features. The primary goal of 3DEP is to systematically collect 3D elevation data in the form of light detection and ranging (lidar) data over the conterminous United States, Hawaii, and the U.S. territories, with data acquired over an 8-year period. Interferometric synthetic aperture radar (IFSAR) data will be acquired for Alaska, where cloud cover and remote locations preclude the use of lidar in much of the State. The 3DEP Initiative is based on the results of the [National Enhanced Elevation Assessment](#) that documented more than 600 business uses across 34 Federal agencies, all 50 States, selected local government and Tribal offices, and private and nonprofit organizations. A fully funded and implemented 3DEP would provide more than \$690 million annually in new benefits to government entities, the private sector, and citizens.

+ 3D Elevation Program

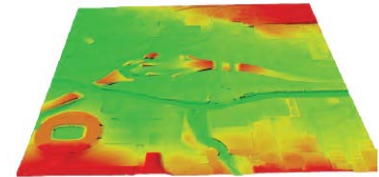
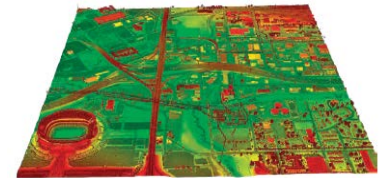
Mission Critical Applications

Documented in the National Enhanced Elevation Assessment (NEEA) of 2012

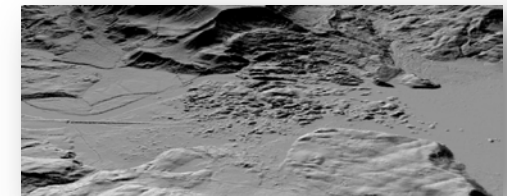
Rank	Business Use	Annual Benefits	
		Conservative	Potential
1	Flood Risk Management	\$295M	\$502M
2	Infrastructure and Construction Management	\$206M	\$942M
3	Natural Resources Conservation	\$159M	\$335M
4	Agriculture and Precision Farming	\$122M	\$2,011M
5	Water Supply and Quality	\$85M	\$156M
6	Wildfire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



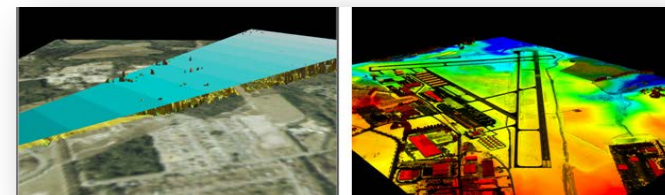
Flood Risk Management



Infrastructure



Geologic Hazards

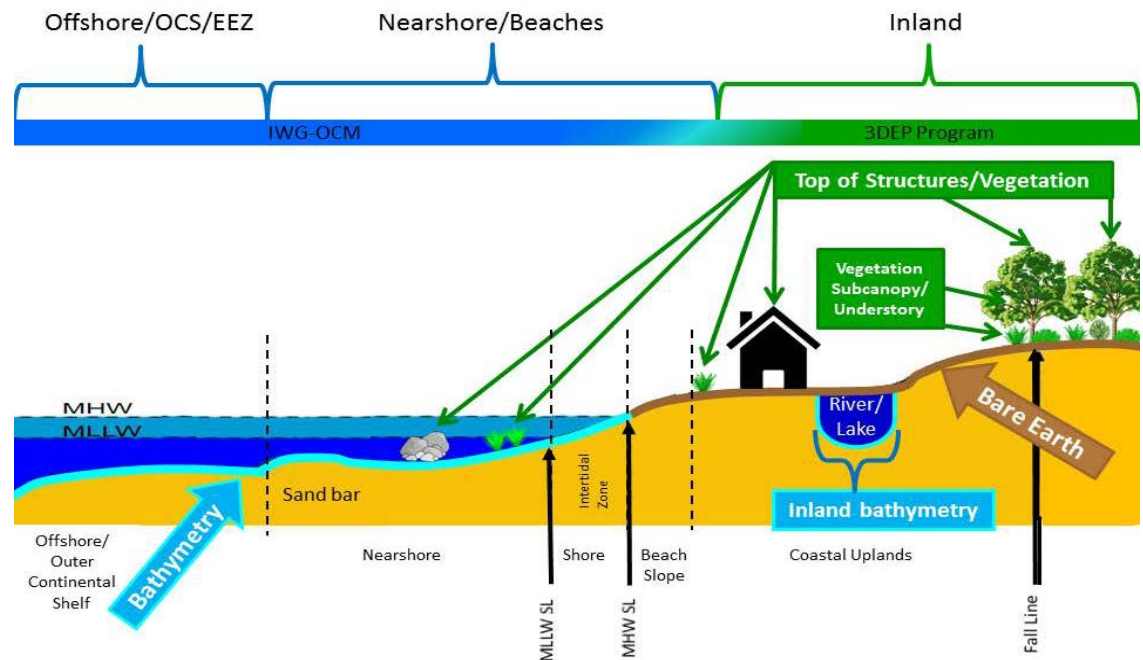


Aviation Safety

+ 3D Nation Elevation

Requirements and Benefits Study - Goals

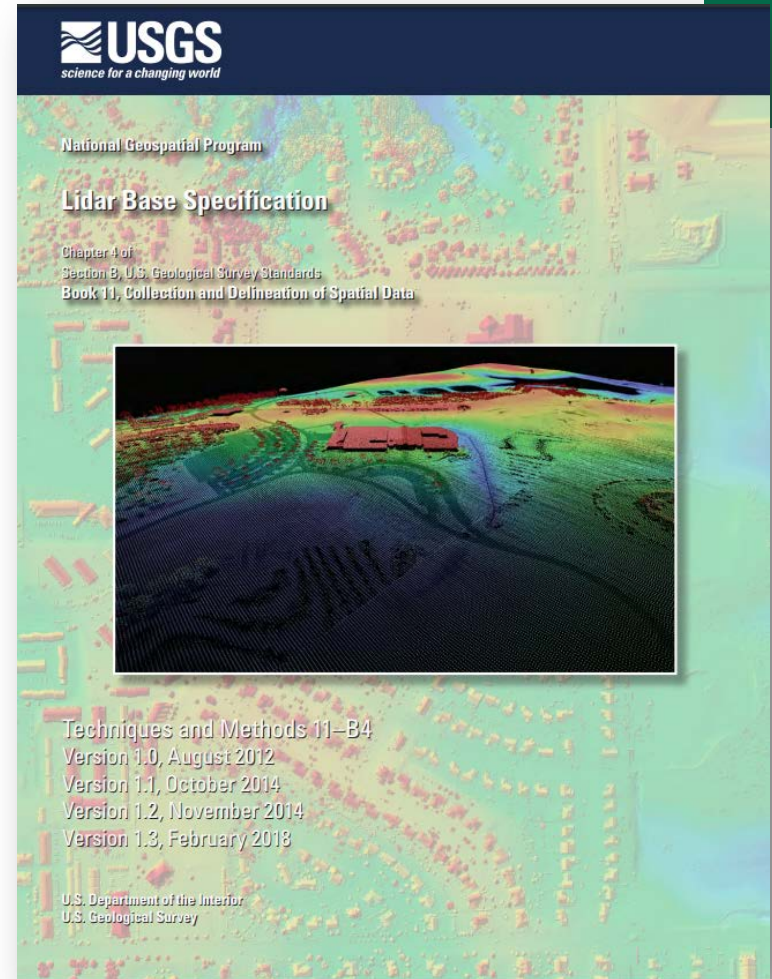
- Understand inland, nearshore and offshore bathymetric data requirements and benefits
- Understand how requirements and benefits dovetail in the nearshore coastal zone
- Plan for the next round of 3DEP after completion of nationwide coverage
- Gather technology-agnostic user information to be able to 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





USGS Lidar Base Specification v1.3

- Version 1.3 published in February
- Notable changes:
 - Dropping the requirement for raw, unclassified swath data
 - Clarification on how to represent coordinate reference information
 - Changes to a few classification codes
 - Inclusion of a new guideline for breakline collections
 - New GIS data dictionary to provide a consistent data structure for hydrologic breaklines



nationalmap.gov/3dep

Look in “Resources” on the left navigation bar

+ 3DEP Quality

Quality Level 2 or better

Quality Level	Data Source	Vertical Accuracy RMSEz (cm)	Nominal Pulse Spacing (NPS) (meters)	Nominal Pulse Density (NPD) (points per square meter)	Digital elevation mode (DEM) cell size (meters)
QL0	Lidar	5 cm	≤ 0.35 m	≥ 8 pts/meter ²	0.5 m
QL1	Lidar	10 cm	≤ 0.35 m	≥ 8 pts/meter ²	0.5 m
QL2	Lidar	10 cm	≤ 0.7 m	≥ 2 pts/meter ²	1 m
QL3	Lidar	20 cm	≤ 1.4 m	≥ 0.5 pts/meter ²	2 m
QL4	Imagery	139 cm	N/A	N/A	5 m
QL5	Irsar	185 cm	N/A	N/A	5 m

+ 3DEP Data Acquisition

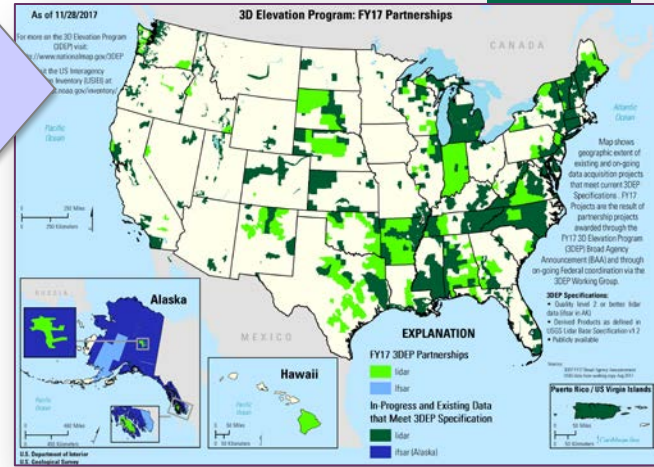
3DEP is built on partnerships

Federal Partners = 3DEP Working Group

Federal Interagency Agreements (IA)

Broad Agency Announcement (BAA)

- Fair and equitable process for non-Feds to partner with Federal Agencies
- Publicly announced
- Competitive, clear criteria
- Can include Federal Agencies
- Partners can propose to use USGS contract (GPSC) or their own contract

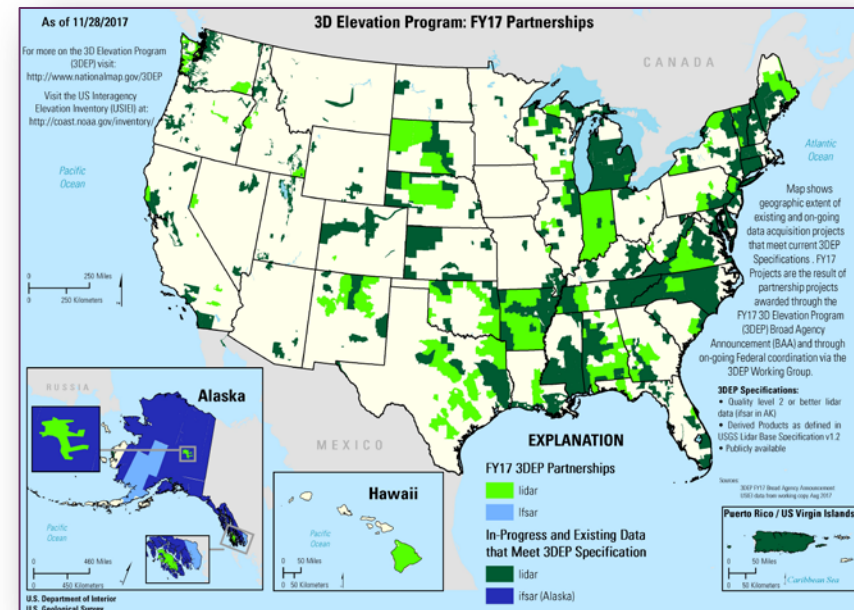


Together determine acquisition plan for the year

+ 3DEP Broad Agency Announcement

Partnerships to acquire high-quality 3D elevation data

- Provides visibility and opportunity to the broadest stakeholder community possible through FedBizOpps.gov and grants.gov
- Federal, state and local governments, tribes, academic institutions, and private sector are eligible
- Partners may propose to use the USGS Geospatial Product and Services Contracts (GPSC) or their own contracting vehicles
- National Map Liaisons can assist partners with the process and coordinating partnerships
- AK IfSAR projects are not included in BAA



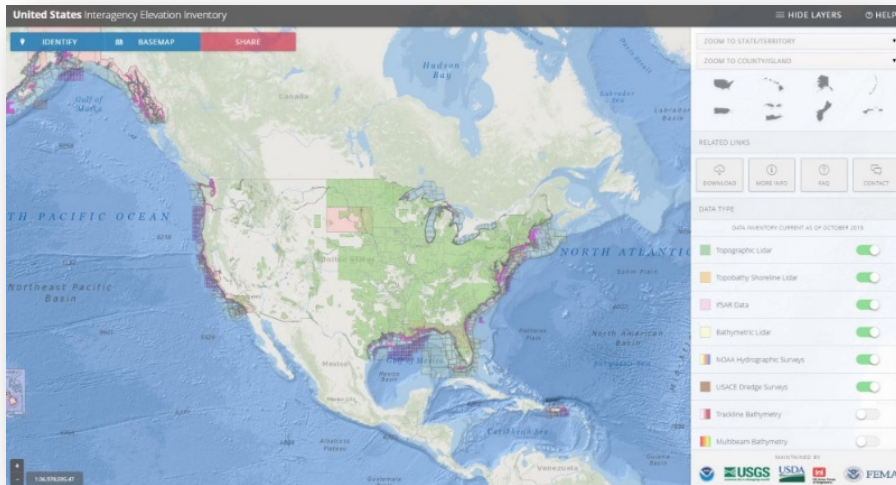
<https://nationalmap.gov/3DEP/index.html>



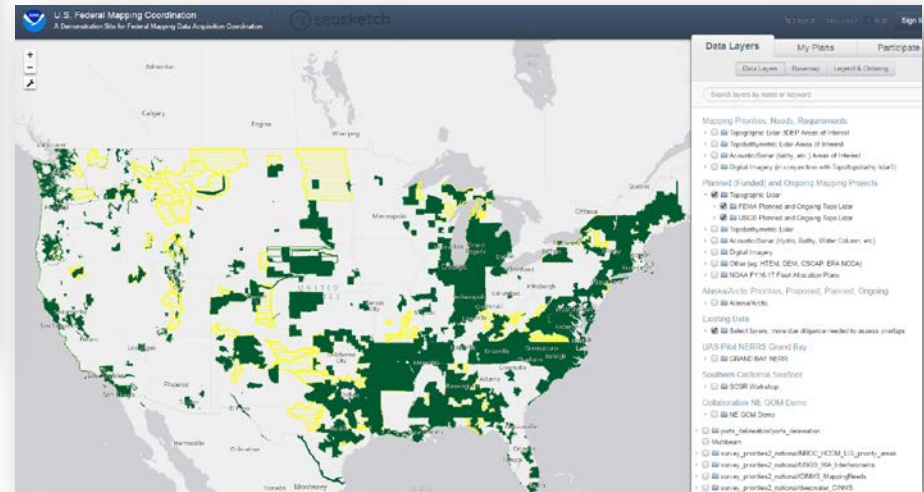
3DEP BAA Selection Criteria

- **Project Location**
 - Areas with no lidar coverage
 - Or areas where existing data is more than 8 years old; QL 3, 4, 5; Significant changes to the landscape have occurred
- **Areal Extent**
 - 3DEP Prefers project between 1500 and 5000 square miles
 - Preference given to larger projects
- **Geographic Overlap with Federal Areas of Interest**
- **Project Cost and Cost Share (funds contributed by applicant)**
- **Maturity of Applicant's Proposal and Maturity of Designated Funding Sources**
- **Technical Approach**
 - Projects making use of the GPSC as the acquisition mechanism receive full score for technical approach
 - Applicants proposing to manage their own contract will be evaluated on the applicant's approach to data acquisition and required project deliverables
- **Past Performance**

+ U.S. Interagency Elevation Inventory and Seasketch: Find data and partners



USIEI
coast.noaa.gov/inventory



NOAA sponsored Seasketch site
fedmap.seasketch.org



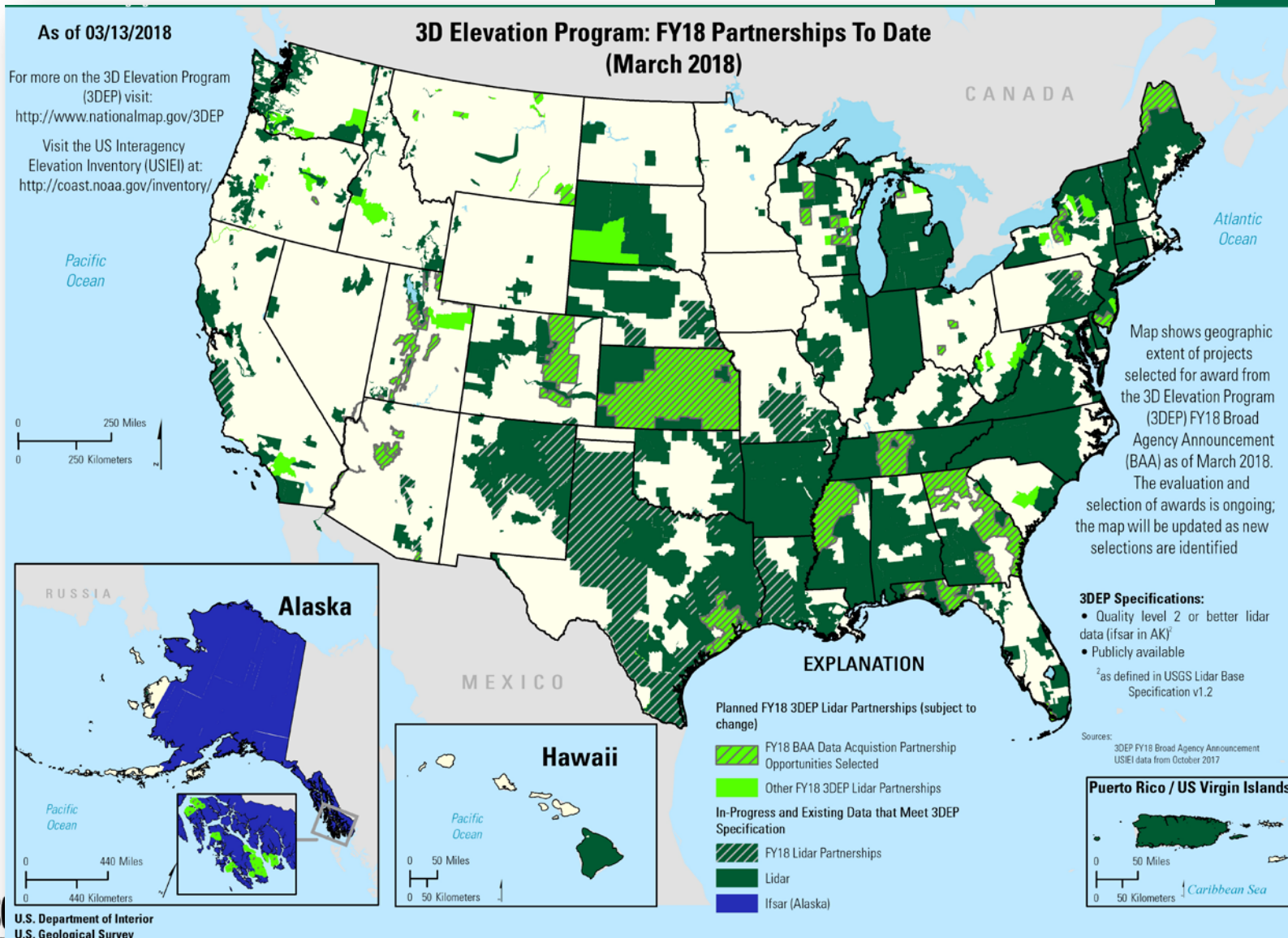
Get Involved in 3DEP Acquisition

Checklist

1. Check if data already exist - Use the US Interagency Elevation Inventory (IEI) <https://coast.noaa.gov/inventory/>
2. Coordinate and form partnerships
 - For Federal agencies, contact your 3DEP Working Group member
 - Contact state and local agencies
 - Use the Seasketch site to identify potential partners
 - Contact your National Map Liaison
3. Submit a BAA proposal to receive 3DEP funding for the project

+ FY18 3DEP Partnerships to Date

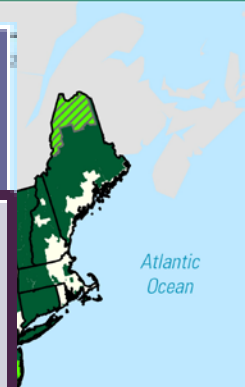
Oct 2017– March 2018



+ FY18 3DEP Partnerships to Date

Oct 2017– March 2018

Status	Description	Sq Miles	Project Costs
Awarded	FY17 Federal investments to support FY18 projects	205K	\$40.0M
Planned / Funded	BAA – 22 projects in 18 states	175K	\$27.2M
	Federal partnerships	50K	\$10.5M
	Total planned	225K	\$37.7M
TOTAL		430K	\$77.7M



Map shows geographic extent of projects selected for award from the 3D Elevation Program (3DEP) FY18 Broad Agency Announcement (BAA) as of March 2018. The evaluation and selection of awards is ongoing; the map will be updated as new project locations are identified.

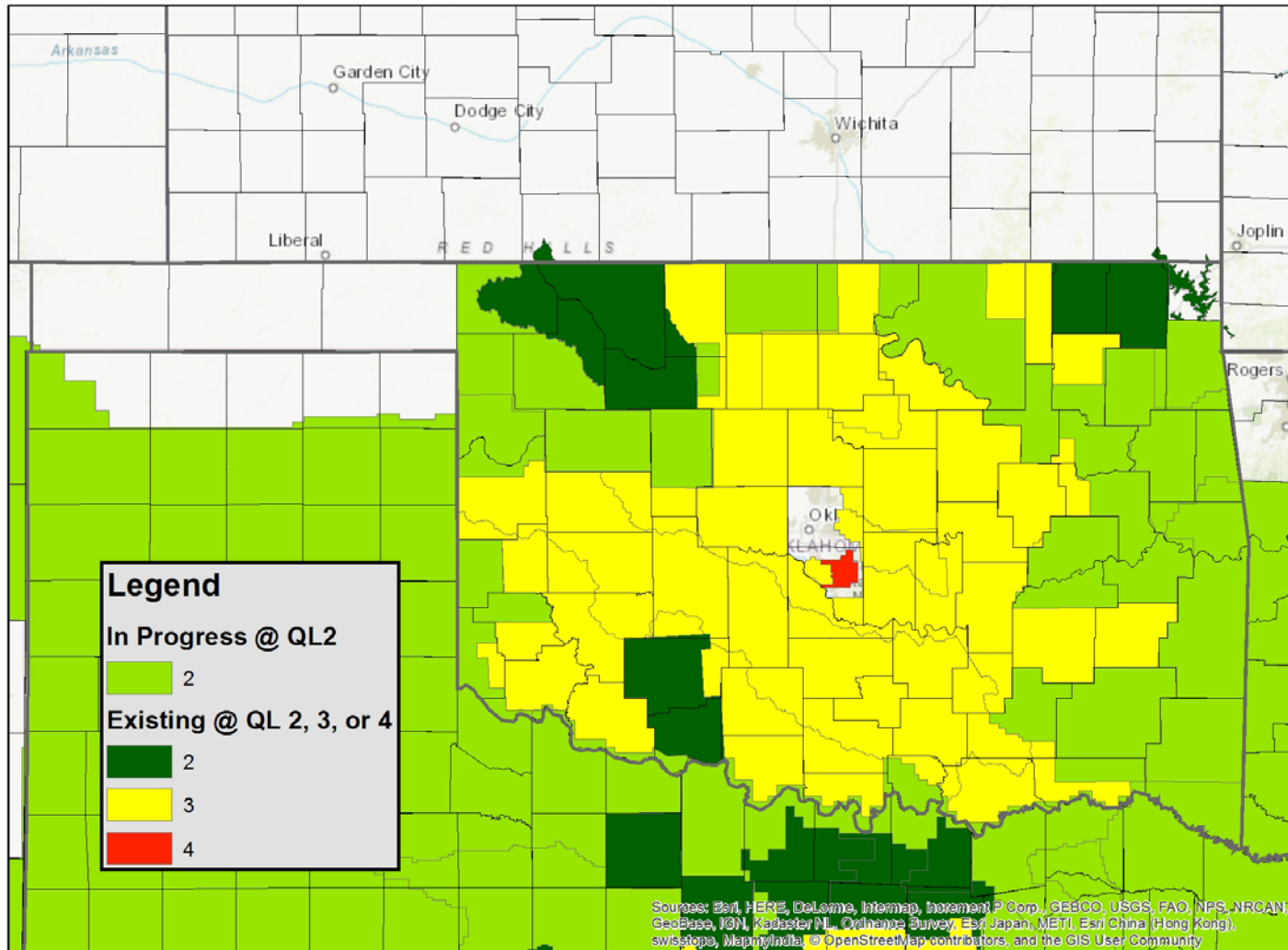
Specifications:
 Accuracy level 2 or better lidar
 (not available in AK)
 Data publicly available
 Defined in USGS Lidar Base
 Specification v1.2

3DEP FY18 Broad Agency Announcement
 USIEI data from October 2017



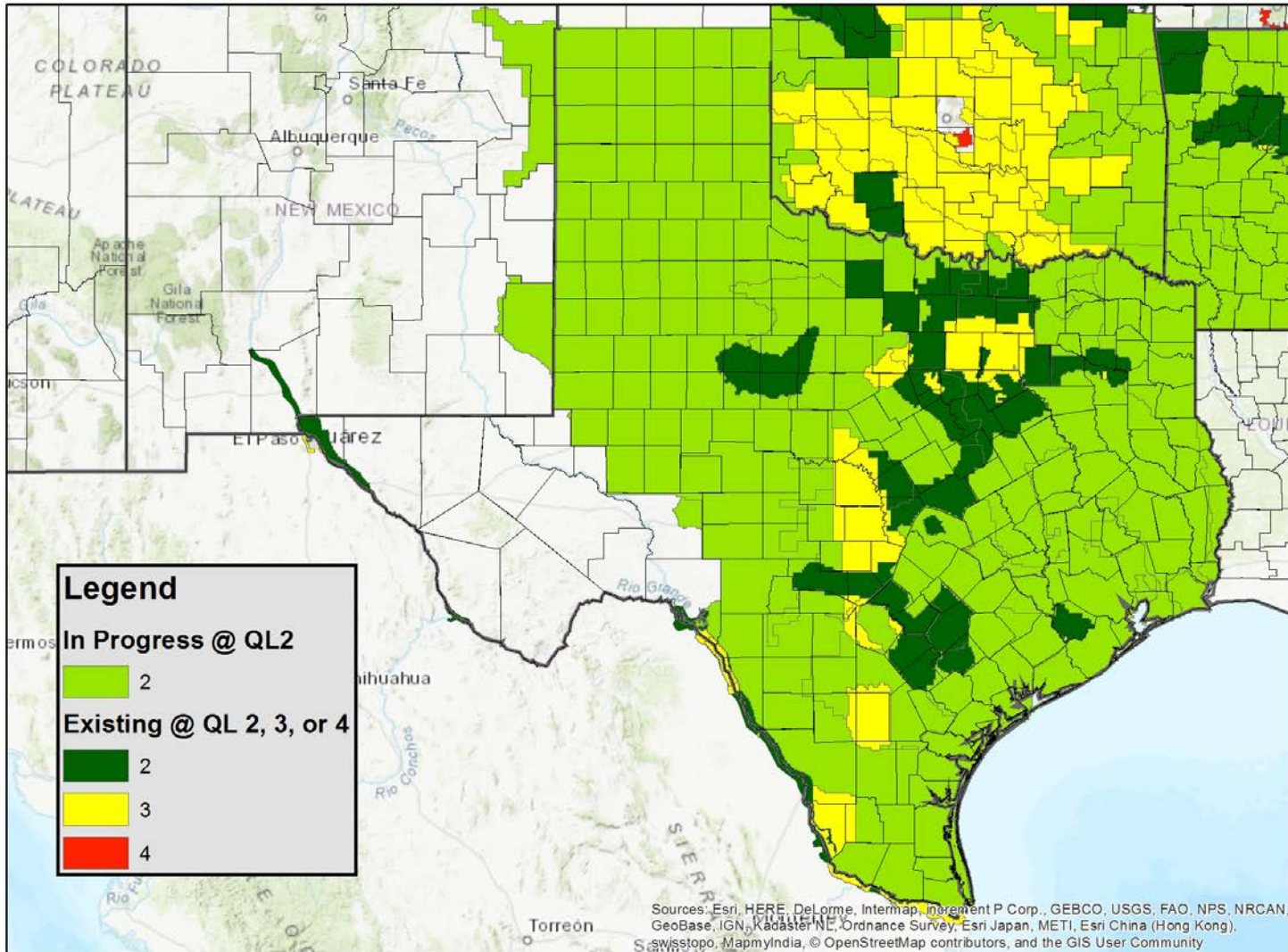
+ 3DEP Status – Oklahoma

Oklahoma Lidar status and Quality Level, as of 3/21/18



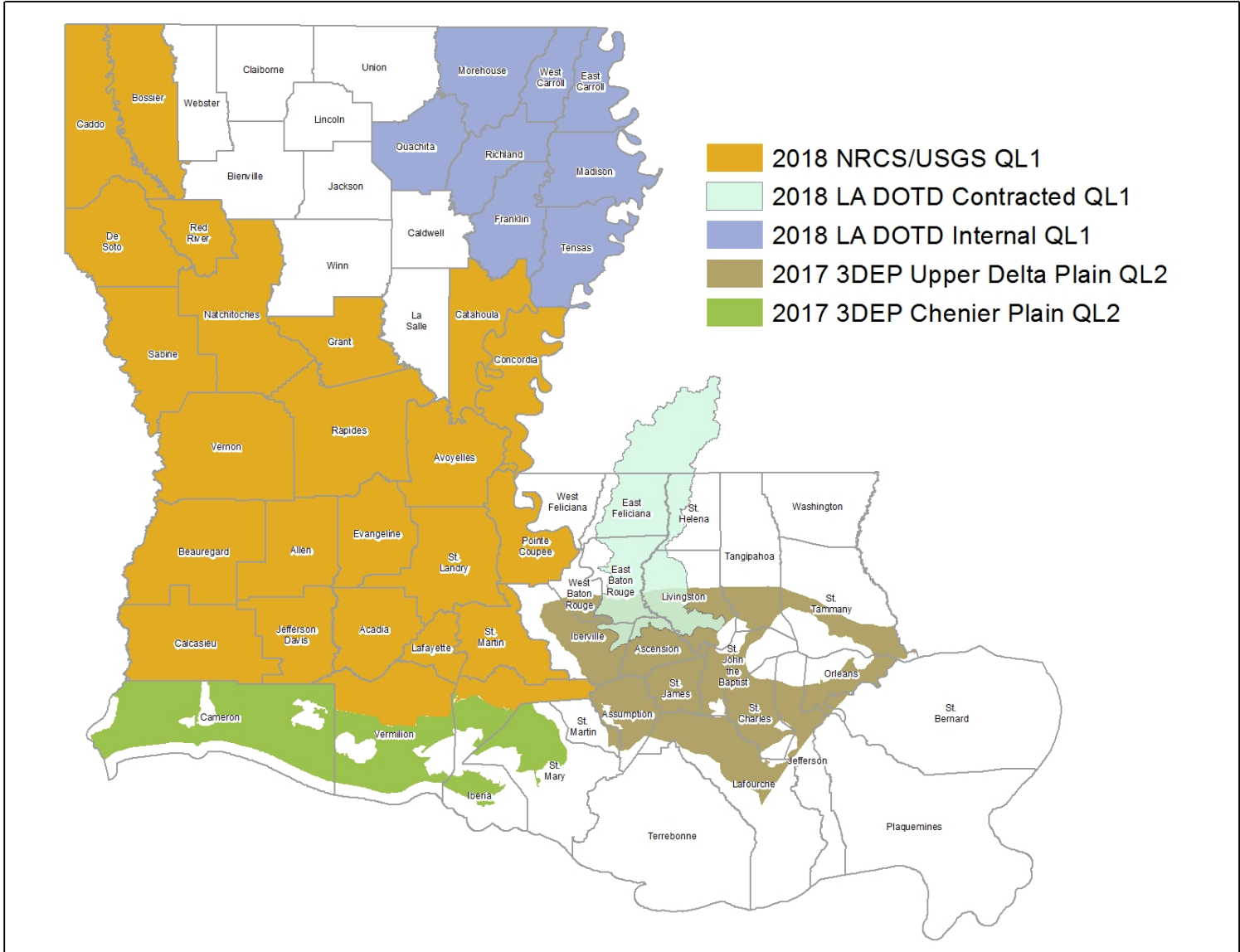
+ 3DEP Status – Texas

Lidar status and Quality Level, as of 3/21/18

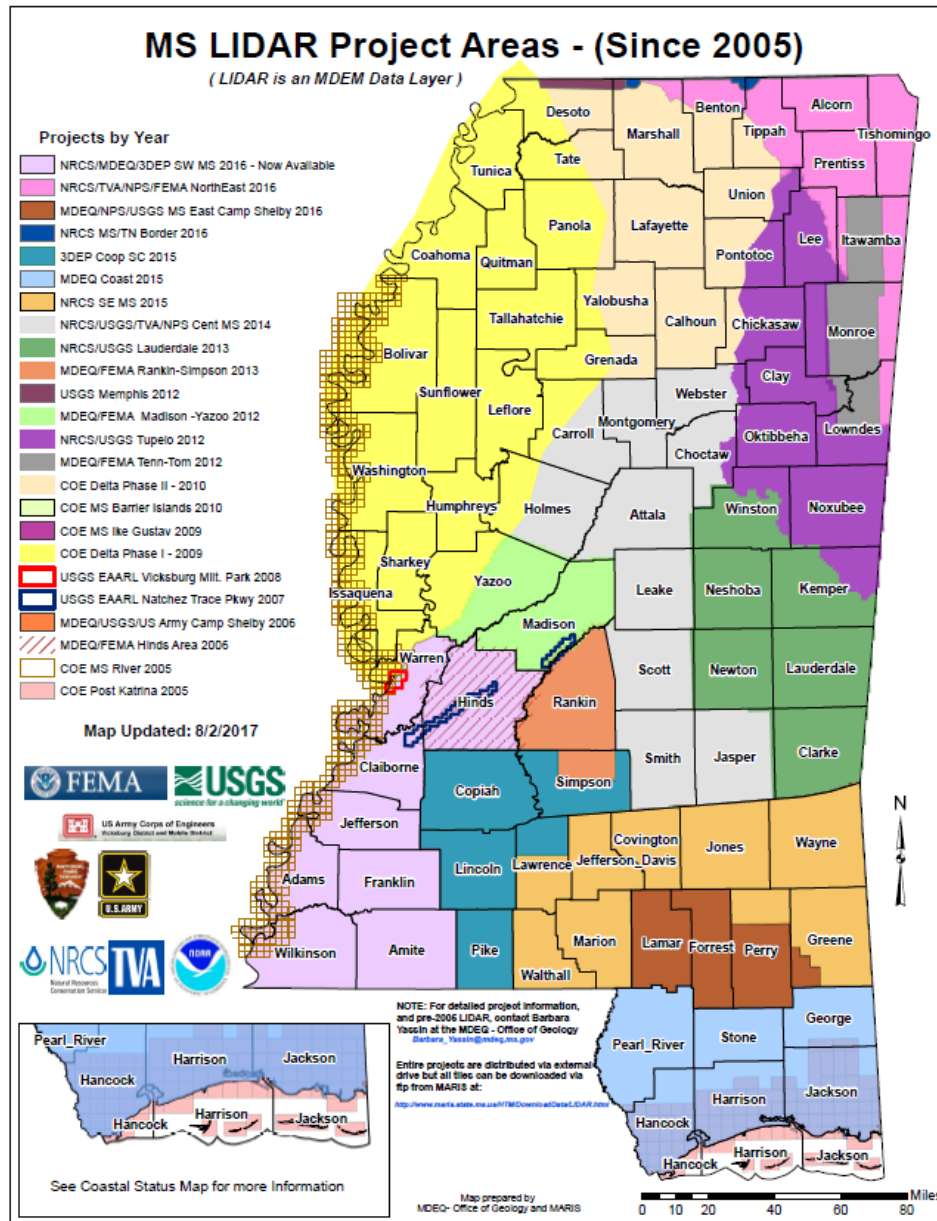




3DEP Status – Louisiana



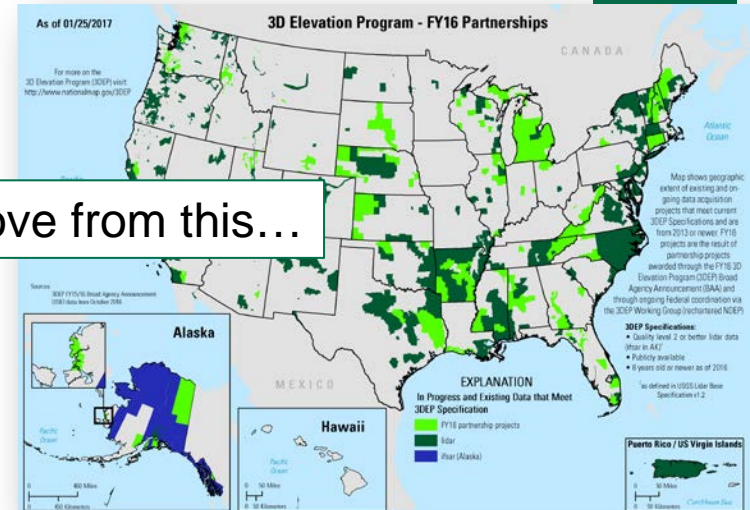
+ 3DEP FY18 – Mississippi



+ 3DEP National Multiyear Plan

Background

- 3DEP Executive Forum tasked the 3DEP Working Group to develop a plan to:
 - Move from an annual, opportunistic process to a unified multi-year plan
 - Move from patchwork irregular acquisition footprints to acquisition following a national tiling scheme
- Benefits
 - Facilitate greater investments and leveraging through longer planning lead times
 - Defined units facilitate planning and understanding costs, allow for improved reporting and justification of investments
 - Presents a plan for nationwide coverage



...to something more like this



+ 3DEP National Tiling Scheme for Lower 49

- **Albers Equal Area projection (EPSG:6350), XYZ units in meters**
- Each tile is **1 square km in area**
- A standard national tiling **naming convention** that represents the XY location for each tile
- Tiles can be **grouped or block nested** by various attributes (counties/states/HUCs), but each tile should be part of one and only one group (1:1 relationship)
- Hawaii and territories use 1 km tile on whatever projection makes sense
- Alaska continues to use 1-degree cells
- Implementing in BAA GPSC projects FY18 and cooperative projects in FY19

Benefits

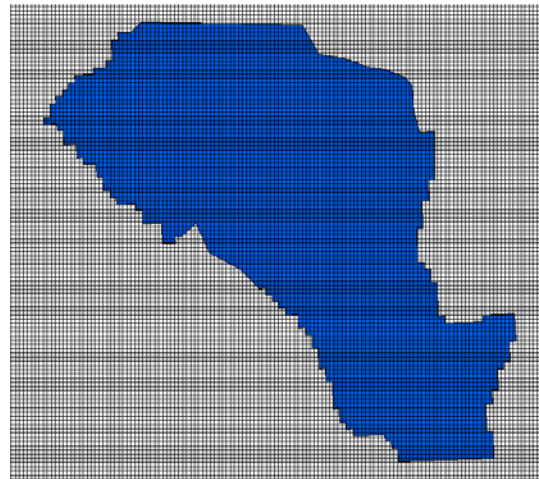
- 1 square km is small enough to approximate watersheds, county and state boundaries, etc., without adding a lot of area to projects
- Tile sizes are equal in area no matter their location in latitude or longitude
- Avoids slivers and unnecessary overlap between projects
- More orderly approach to nationwide coverage
- The MASTER 1k x 1k tile scheme will be provided online for public use and download
- Conversion services to be developed in the future

+ 3DEP National Tiling Scheme for Lower 49

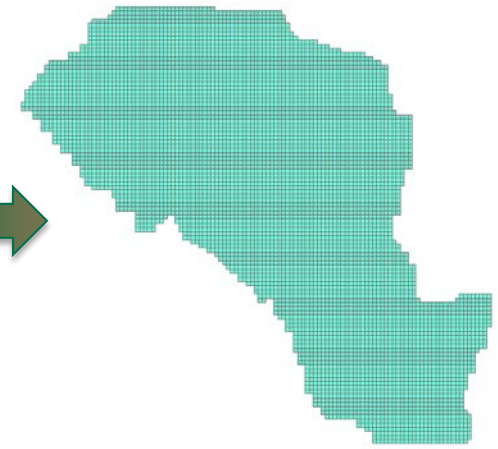
Example



Original Project AOI
2,361 sq miles



Expand out using
the 1 km grid



New Project AOI
2,457 sq miles

+ Access 3DEP Data: <https://nationalmap.gov/3dep/>



USGS Home
Contact USGS
Search USGS

3D Elevation Program (3DEP)

[The National Map Home](#) >> 3D Elevation Program (3DEP)

About

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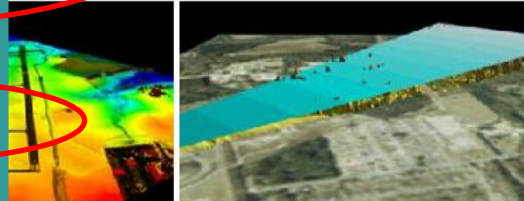
Introduction and Goals

Download Elevation Products

Find Elevation At A Point

Learn About 3DEP Products & Services

Elevation Data From Other Organizations



Lidar is used to detect potential obstacles that present hazards to air navigation.

Lidar is used to detect potential obstacles that present hazards to air navigation.

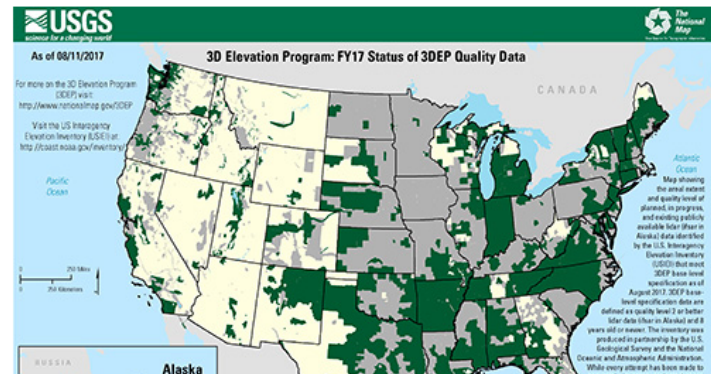
The 3D Elevation Program (3DEP) initiative is being developed to respond to growing needs for high-quality topographic data and for a wide range of other three-dimensional representations of the Nation's natural and constructed features. The primary goal of 3DEP is to systematically collect enhanced elevation data in the form of high-quality light detection and ranging (lidar) data over the conterminous United States, Hawaii, and the U.S. territories, with data acquired over an 8-year period. Interferometric synthetic aperture radar (IFSAR) data will be collected over Alaska, where cloud cover and remote locations preclude the use of lidar over much of the State. The 3DEP initiative is based on the results of the [National Enhanced Elevation Assessment](#).

3DEP Data Acquisition Partnership Opportunities

FY18 USGS Broad Agency Announcement (BAA) for the 3D Elevation Program (3DEP)

Partnership Opportunities

The FY17/FY18 Broad Agency Announcement (BAA) for the 3D Elevation Program (3DEP) was released on August 16, 2017. The BAA provides detailed information on how to partner with the USGS and other Federal agencies to acquire high-quality 3D Elevation data. Information and contacts are available at Fed Biz Opps (Search for Reference Number: G17PS00746) and Grants.gov (Funding Opportunity Number: G17AS00116). Applicants may contribute funds toward a USGS lidar data acquisition



+ 3DEP Products

■ Standard DEMs

■ Nationally Seamless

- 2 Arc Second

- 1 Arc Second

- 1/3 Arc Second

Previously referred to as
the National Elevation
Dataset (NED)

■ Project-based (seamless within projects)

- 1/9 Arc Second (legacy)

- 1-meter

- 5-meter (IfSAR - Alaska)

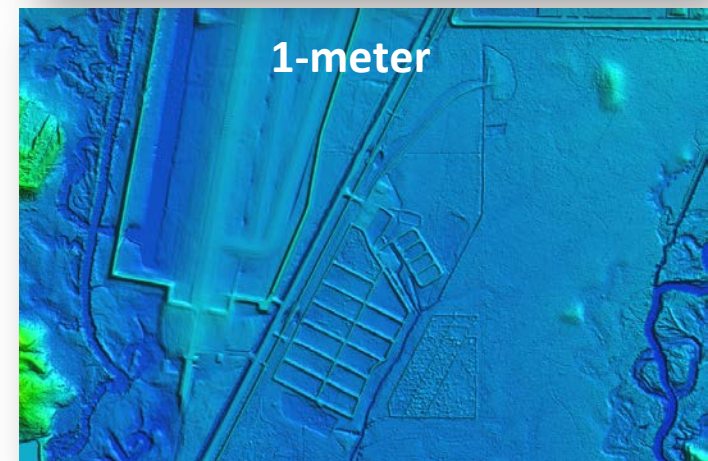
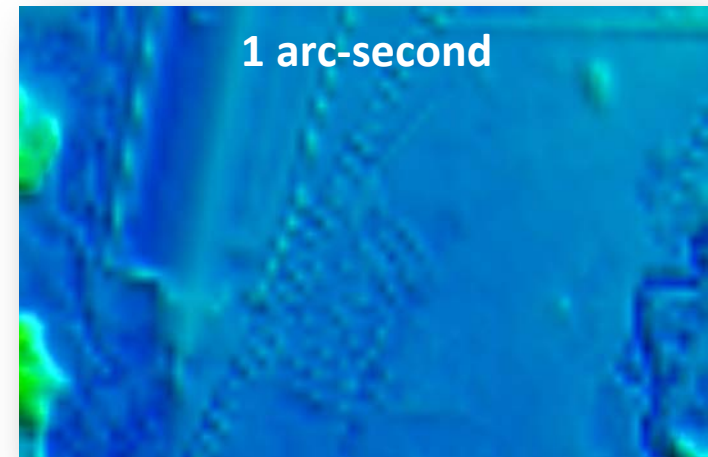
■ Source Data

- Lidar Point Clouds

- Source DEMs (original product resolution)

- Digital Surface Model (IfSAR - Alaska)

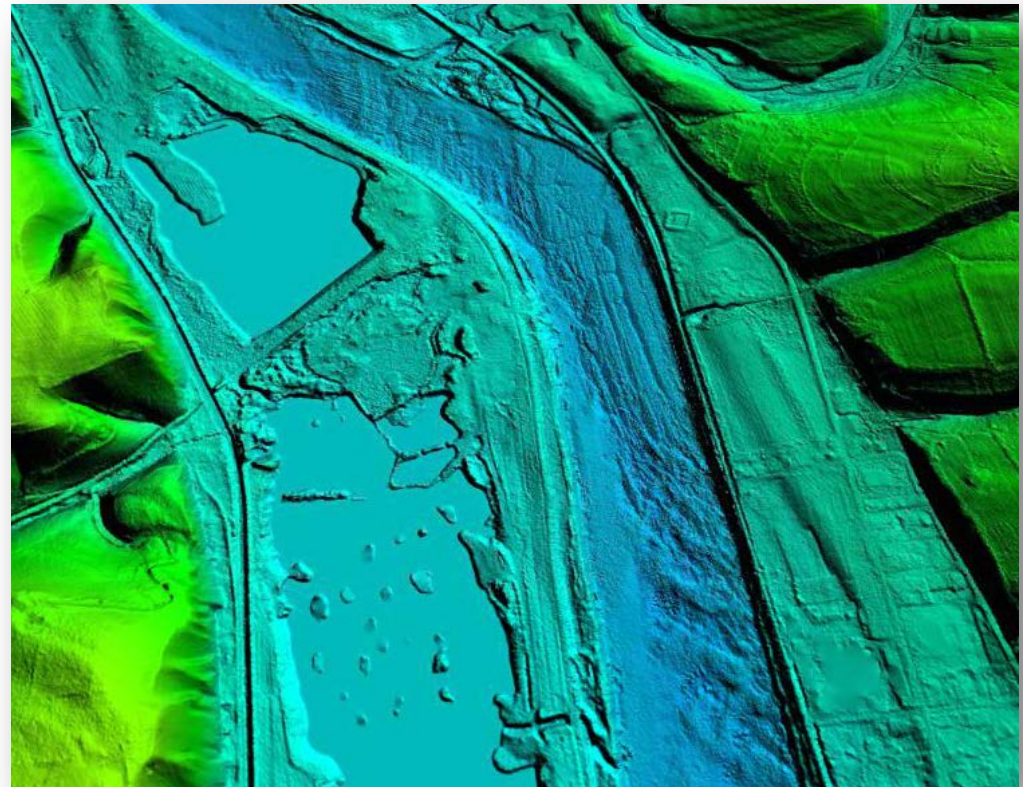
- Orthorectified Radar Intensity Imagery (IfSAR - Alaska)



+ Emerging Technology



- Geiger mode and single photon lidar test
 - Potential to increase quality and/or bring down costs
 - Pilots in NC, SD, IL and HI
- Inland bathymetry
 - Technology proven in coastal areas
 - EAARL-B topobathy lidar survey of Delaware River was promising
 - Commercial sensors are available through GPSC
 - Began assessments of commercial capabilities in FY17



Frenchtown Subregion of the Delaware River, integrated EAARL-B and topographic lidar

+ 3DEP Resources

USGS 3DEP Web Pages

<http://nationalmap.gov/3DEP>

3D Elevation Program (3DEP) FY16/17 Broad Agency Announcement (BAA) Information Sharing Site <https://cms.geoplatform.gov/elevation/3DEP>

BAA Reference Materials Page

<http://nationalmap.gov/3DEP/BAAReferenceMaterials.html>

NOAA sponsored Seasketch site: U.S. Federal Mapping Coordination, A Demonstration Site for Federal Mapping Data Acquisition

<http://fedmap.seasketch.org>

NOAA sponsored US Interagency Elevation Inventory (USIEI) site

<http://www.coast.noaa.gov/inventory>

The 3D Elevation Program Initiative – A Call for Action

<http://pubs.usgs.gov/circ/1399/>

USGS NGP Lidar Base Specification V1.3

<http://pubs.usgs.gov/tm/11b4/pdf/tm11-B4.pdf>



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