3D Elevation Program

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User Engagement
USGS National Geospatial Program
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.
## 3DEP Goals
- Complete acquisition of nationwide lidar (IfSAR in AK) 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

### 3DEP Status 2023

<table>
<thead>
<tr>
<th>Rank</th>
<th>Business Use</th>
<th>Conservative</th>
<th>Potential</th>
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<tbody>
<tr>
<td>1</td>
<td>Flood Risk Management</td>
<td>$295M</td>
<td>$502M</td>
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<tr>
<td>2</td>
<td>Infrastructure and Construction Management</td>
<td>$206M</td>
<td>$942M</td>
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<td>3</td>
<td>Natural Resources Conservation</td>
<td>$159M</td>
<td>$335M</td>
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<td>4</td>
<td>Agriculture and Precision Farming</td>
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<td>5</td>
<td>Water Supply and Quality</td>
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<td>6</td>
<td>Wildfire Management, Planning and Response</td>
<td>$76M</td>
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<td>7</td>
<td>Geologic Resource Assessment and Hazard Mitigation</td>
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<td>8</td>
<td>Forest Resources Management</td>
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<td>River and Stream Resource Management</td>
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<td>Aviation Navigation and Safety</td>
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<td>Land Navigation and Safety</td>
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**Total for all Business Uses (1 – 27)**

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<tr>
<th></th>
<th>Conservative</th>
<th>Potential</th>
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</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1.2B</strong></td>
<td><strong>$13B</strong></td>
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</table>
3DEP Partnerships

Taking stock

- 3DEP is managed by USGS on behalf of a broad partner community that includes state, Federal, and local agencies, as well as the private sector and non-profit groups.
- Since the beginning of FY15:
  - Over 200 partners – including 16 Federal agencies and state and local governments from 44 states and territories – have contributed funding for 3DEP data acquisition across the Nation.
  - USGS and partner investments totaling $299.6M supported acquisition of 1.5 million square miles of data.
  - The total coverage of 3DEP data available or in progress (lidar and AK IfSAR) is approaching 50% of the Nation.
  - Demands for higher quality, repeat coverage, new products and services continue to grow.
- Areas lacking coverage include Federal lands and other areas in the West.

3DEP Status 2023

Goal to provide ROI 5:1 with potential to generate $13B/year
3D Elevation Program (3DEP)

Data are available or in progress for approaching 50% of the Nation

*includes lidar and AK IfSAR

Data acquisition investments by all partners, by fiscal year

As of 08/29/2018

For more on the 3D Elevation Program (3DEP) visit: http://www.nationalmap.gov/3DEP
Visit the US Interagency Elevation Inventory (USEI) at: http://coast.noaa.gov/inventory

3DEP Specifications:
- Quality level 2 or better lidar data (IfSAR in AK)
- Publicly available
- Details in USGS LiDAR Bom Specification v1.2

EXPLANATION
Planned FY18 3DEP Lidar Partnerships (subject to change)
In-Progress and Existing Data that Meet 3DEP Specification
- FY18 Lidar Partnerships
- FY18 IfSAR Partnerships (AK)
- Lidar
- IfSAR

Map shows geographic extent of existing and on-going data acquisition projects that meet current 3DEP Specifications. FY18 Projects are the result of partnership projects awarded through the FY18 3D Elevation Program (3DEP) Broad Agency Announcement (BAA) and through on-going Federal coordination via the 3DEP Working Group.

Source: 2018 FY18 Broad Agency Announcement (BAA) Amendment 02.
3DEP Coverage by State

As of September 2018
3DEP For America’s Infrastructure

The significant challenge of improving the Nation’s infrastructure depends on high-quality elevation data

Conservative annual benefits estimated at $170M

- Route, grade, line-of-sight, and utility surveys and corridor mapping
- Terrain and other obstruction identification
- Dam, levee, and coastal-structure failure modeling and mitigation
- Hydraulic and hydrologic modeling
- Evaluations of geologic, coastal, and other natural hazards, and geotechnical evaluations
- Permit application and construction plan development and evaluation
- Drainage issues and cut-and-fill estimate requirements
- Vegetation, topographic, and geomorphologic feature analysis
- As-built model development
- Preliminary engineering, estimate development, and quantity estimation activities
- Bridge site selection
- Base-map and elevation model creation
Transportation Projects
Planning and Development

- Economically site new or relocate existing infrastructure facilities and make final design plans
- Dramatically reduces the amount of time needed to understand the area in 3D compared to surveying
- Provides greater safety over other traditional surveying methods because it reduces the number of surveyors in traffic
- Reduces intrusion into private properties

- Common uses include:
  - Calculate cut and fill, culvert sizing, amount of vegetation removal, grade calculation and more
  - Height clearances
  - Right of way and surface conditions
  - Identification of cultural and sensitive sites

The Kentucky Transportation Cabinet realized tremendous savings from compressed design timeframe and reduced fieldwork, including the identification of previously unknown prehistoric and historic earthworks and mounds and other cultural and sensitive sites.
Infrastructure: Risk Assessment

New Jersey Transit: Preparing for Extreme Weather Events

FfARS – Data Flow

1. Real-Time NOAA Storm Forecast Water Elevations (SFWE)
2. NY Harbor Observation and Prediction System (NYHOPS)
3. Schneider Electric (Telvent) Wind, Storm Track, and River Information
4. Storm Surge Warning System (SSWS) (pending)

Image from Mittul Patel, BEM Systems
Infrastructure: Risk Assessment
California Highways and Flood Risk

- Lidar was used to model risks to highways from storm surge, extreme tides, and sea-level rise.
- High resolution elevation data are critical to predict which areas are most vulnerable to flooding in the San Francisco Bay area.
- Results will be used to help plan billions of dollars in road repairs and upgrades in the Bay area.

Image from Fraser Shilling, Road Ecology Center, University of California, Davis
3DEP for Transportation Planning

Use of lidar for transportation planning and risk assessment at Tennessee DOT

- Lidar-based DEMs are used in hydraulic analyses for bridge design
- High-resolution elevation data is required for more sophisticated hydraulic models and software
- Other benefits: reduced labor requirements, improved visualization of model outputs, and improved classification of vegetation, buildings, and other objects on the landscape.
3DEP Projects with State DOTs

Recent Examples

- Alabama Department of Transportation
- Maine Department of Transportation
- North Carolina Department of Transportation
- Tennessee Department of Transportation
- Virginia Department of Transportation
- Wisconsin Department of Transportation

Vermont Transportation (VTrans) has been a lead agency, contributing to state projects since 2008 for uses including:

- Preliminary construction surveys
- Line of sight issues such as trees growing into the right of way and blocking sight at stop signs
- Land slide clean up and remediation - used lidar to estimate which equipment was needed and overtime costs for cleanup
- Accident recreation and prevention
- Hydrography issues such flooding and hazardous material spills
- Airport planning and maintenance
- Dock maintenance for Lake Champlain ferry system
- Cell phone coverage for emergencies

2018 Middle Tennessee Lidar BAA Project: The Tennessee Dept. of Transportation in cooperation with 3DEP, will acquire QL2 lidar data for 19 counties. Partners include USDA/NRCS, state partners, and county partners. The elevation layer is needed for transportation planning, land management, floodplain mapping, forest inventory, ortho photo processing, and economic development.
3DEP Governance

- **3DEP Executive Forum**
  - Facilitates executive collaboration on strategies to fund and implement 3DEP for the benefit of all its stakeholders
  - 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
3DEP Data Acquisition Partnership Process

Federal Partners = 3DEP Working Group

Federal interagency agreements

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

USIEI
cost.noaa.gov/inventory

NOAA sponsored Seasketch site
fedmap.seasketch.org
3DEP Data Acquisition – What’s Ahead

Broad Agency Announcement (BAA)

- BAA basics
  - Open, transparent, competitive process for partnership funding for 3DEP projects
  - 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

- FY15 – FY18 a total of 119 proposals funded
- Continued growth in partners – in FY18 over 95 different Federal, state, regional, local, private and non-profit participants
- BAA was announced in September, with proposals due Nov 9
3DEP Data Acquisition – What’s Ahead

Working toward Federal Multi-Year Plan

The goal of 3DEP is national coverage. This map reflects current near-term federal agency areas of interest for lidar data acquisition. Overlap or adjacency with these near-term federal agency areas of interest is encouraged and is one of several evaluation criteria defined within the SAA; however, 3DEP welcomes proposal submissions over the entire United States in pursuit of national 3DEP coverage. All proposals will be reviewed against the full set of evaluation criteria. Final FY18 acquisition areas will be defined based on submitted and accepted proposals, as well as analysis of existing data holdings and work in progress. Final program of work is subject to available funding.
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

Move from this...

...to something more like this
3DEP Data Acquisition – What’s Ahead

State 3DEP plans

- Advancing towards a unified, national multi-year plan
  - Facilitate greater investments and leveraging through longer planning lead times
  - Allows for improved reporting and justification of investments
  - Presents a plan for nationwide coverage

- 3DEP State Plans are a key ingredient to multi-year planning
  - NSGIC project to develop a template and best practices
  - MAPPS members are key players in developing your state’s plan!
Opportunities for Collaboration

- Participate in 3DEP partnership projects to increase coverage and support multiple needs
- Participate in development of state plans
- Help spread the word about the program and leveraging of funds
- Promote collection of 3DEP-quality data that can be added to the national holdings
Geospatial Products and Services Contracts (GPSC)

- Architecture and Engineering (A&E) Indefinite Delivery/ Indefinite Quantity (IDIQ) Contract for professional mapping services
- $750 Million delegated procurement authority for 5 years
- Competitive qualification based selection (QBS) process for contractors
- Preferred method for acquiring 3DEP data because it ensures quality and consistency of data

Value added service
- Coordinate funding and partnerships
- Handle all contracting functions
- Help you develop specifications
- Project planning, tracking, and management
- Quality review and delivery
USGS Lidar Base Specification v1.3

- All 3DEP projects are required to adhere to the specification
- All GPSC task orders reference the specification
- Specification covers
  - Definitions of Quality Level
  - Vertical Accuracy
  - Classification Scheme
  - Ground conditions
  - MUCH MUCH MORE!
- Version 1.3 released in 2018; moving specifications to an online database in the future

nationalmap.gov/3dep
Look in “Standards and Specifications” on the left navigation bar
Contact Your National Map Liaison
https://www.usgs.gov/core-science-systems/ngp/user-engagement-office/
3DEP Products

- Standard DEMs
  - Nationally Seamless
    - 2 Arc Second
    - 1 Arc Second
    - 1/3 Arc Second
  - Project-based (seamless within collection 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)

Previously referred to as the National Elevation Dataset (NED)
Access 3DEP Data:
https://nationalmap.gov/3dep/
Thank you!