National Geospatial Program

3D Elevation Program—Federal Best Practices

Introduction

The goal of the 3D Elevation Program (3DEP) is to complete nationwide data acquisition in 8 years, by 2023, to provide the first-ever national baseline of consistent high-resolution three-dimensional (3D) data—including bare earth elevations and 3D point clouds—collected in a timeframe of less than a decade (fig. 1).

Purpose

Successful implementation of 3DEP depends on the development and adoption of a unified Federal approach to acquiring data. The purpose of this document is to outline several best practices to aid the Federal 3DEP community in reaching a higher level of coordinated implementation, maximize Federal data investments, and reduce the number of years it will take to complete national coverage. The best practices are provided to Federal agencies as a checklist to assess the level of their participation and to inspire further adoption of Federal enterprise practices that will advance joint 3DEP coverage goals for the benefit of their missions and the Nation as a whole. It is anticipated that additional best practices will be defined and added as the effort matures.

Acquiring data through a unified approach substantially benefits Federal partners and the Nation's taxpayers in multiple ways:

- reduced unit costs by pooling funding with other partners;
- reduced unit costs through the economy of scale achieved through larger project sizes;
- access to qualified and experienced mapping firms under contract to acquire and process data;
- more consistent data from standardized acquisition and larger project areas;
- the opportunity to "buy up" higher quality data for specialized applications;
- the opportunity to receive 3DEP cost-share funding to acquire light detection and ranging (lidar) data;

- U.S. Geological Survey (USGS) programmatic infrastructure that issues and manages data acquisition contracts and inspects, accepts, and distributes point cloud and derived data products; reduced costs for not replicating the same infrastructure in multiple agencies;
- increased State, local, Tribal, and other data acquisition partnerships through advanced planning and earlier notification of opportunities enabled by a defined, stable Federal acquisition budget; and
- data made publicly available to support countless other uses.

Background

High quality elevation data are critical to flood risk management, resource management, conservation, energy development, agriculture, infrastructure management, critical minerals exploration, and a host of other nationally significant applications. The National Enhanced Elevation Assessment (Dewberry, 2012) documented more than 600 business uses of elevation data across 34 Federal agencies, all 50 States, selected local government and Tribal offices, and private and nonprofit organizations. To respond to these growing needs, the USGS National Geospatial Program is managing the interagency 3DEP on behalf of the community. The primary goal of 3DEP is to systematically collect 3D elevation data during an 8-year period in the form of lidar data for the conterminous United States, Hawaii, and the U.S. territories. Interferometric synthetic aperture radar (commonly referred to as "IfSAR") data have been acquired for Alaska, where cloud cover and remote locations preclude the use of lidar in much of the State. 3DEP is designed based on the National Enhanced Elevation Assessment benefit-cost analysis to conservatively provide a return on investment of 5:1 and new benefits of $690 million per year with the potential to generate $13 billion per year

3D Elevation Program Federal Best Practices

✓ Sign 3DEP governance memorandum of understanding.

✓ Assign agency representatives to 3DEP Executive Forum and Working Group.

✓ Acquire data through the 3DEP data acquisition process and participate in the 3DEP multiyear planning process.

✓ Implement an agency policy to work within the Unified Federal 3DEP plan for data acquisition and sharing.

✓ Coordinate internally to link regional/field offices into 3DEP and data acquisition processes.

✓ Provide input and support to improve the acquisition process.

✓ When datasets are acquired outside of the 3DEP process, ensure that data meet the 3DEP specification, are publicly shareable (unlicensed), and are contributed for ingestion into national holdings.

✓ Participate in 3DEP budget initiatives and establish a 3DEP budget line item.

✓ Report 3DEP investments to budget cross cut (nine participating agencies).

✓ Promote 3DEP to agency constituents to participate in or support the national 3DEP effort.

✓ Participate in assessments and adoption of new technologies to advance national 3DEP goals.

✓ Encourage or require that Federal grant monies used for elevation data acquisition result in the data being collected to 3DEP standards and contributed to the national holdings.

✓ Participate in the 3D Nation Elevation Requirements and Benefits Study and other studies to document needs for the next generations of 3DEP.
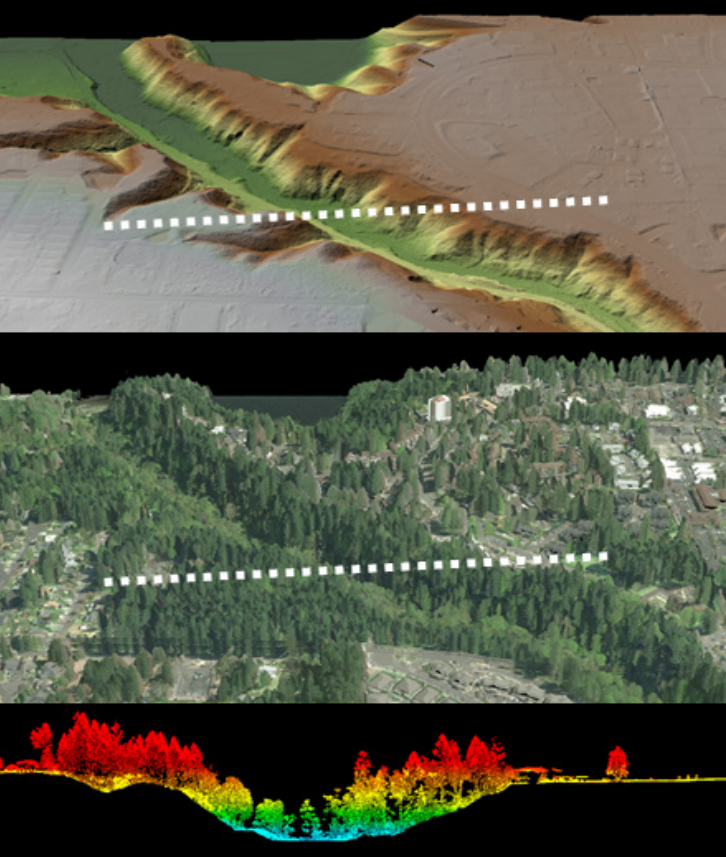
Figure 1. Images from (top to bottom) a derived bare earth digital elevation model, colorized point cloud, and light detection and ranging profile in Olympia, Washington. Trees and above ground features can be seen in the colorized point cloud, whereas stripping away vegetation points allows for detection of features that are not detectable using traditional imagery-based methods. White dotted line represents profile location. Images courtesy of Jason M. Stoker, U.S. Geological Survey.

It is important to note that demands are growing for increasing quality levels, repeat coverage, and new products and services. These needs are being documented in the 3D Nation Elevation Requirements and Benefits Study as the basis for designing the next generation of 3DEP to meet evolving user needs and realize new benefits for the Nation's taxpayers. When completed, the nationwide 3DEP coverage will establish the baseline dataset that will enable ongoing change detection and monitoring. The value of the 3DEP baseline will only continue to grow over time through use and comparison with repeat coverage.

These before-and-after U.S. Forest Service lidar images from the 2014 King fire region in El Dorado National Forest, California, show a small section of the Rubicon River drainage basin, where fire damage was severe. Blue indicates ground level; lighter colors are higher elevations. A road, bordered by dense trees in the before image (top), and part of a bridge are in the center, with the bridge appearing green (image from U.S. Forest Service Rocky Mountain Research Station).

in new benefits through applications that span the economy. The National Geospatial Advisory Council (the advisory committee to the Federal Geographic Data Committee), the National States Geographic Information Council, and more than 40 other national professional organizations as members of the 3DEP Coalition have endorsed 3DEP as a consolidated, national approach to data acquisition. 3DEP presents a unique opportunity for collaboration among all levels of government to leverage the services and expertise of private sector mapping firms that acquire the data and to create jobs now and in the future.

3DEP, by design, is a cooperative program that meets the needs of a broad range of stakeholders and depends on substantial data investments and contributions through Federal, State, Tribal, and private sector partnerships. In the initial years since the inception of 3DEP in 2012, and the first full year of 3DEP production at the USGS in 2016, the infrastructure and governance for managing the nationwide

program have been established. Federal coordination for the program is managed through the 3DEP Executive Forum and the operational 3DEP Working Group, and data acquisition is managed through a Broad Agency Announcement process and Federal data partnerships. Strides have been made to move beyond an ad hoc process that had long primarily emphasized information sharing about agency acquisition plans to one that more fully integrates acquisition investments across all levels of government. As a result, 3DEP-quality data were available or in progress for about 78 percent of the Nation at the end of fiscal year 2020. In spite of this success, developing partnerships and funding for data acquisition in the western United States remains a challenge to meeting the 8-year goal of nationwide data completion by 2023. Continued implementation of a systematic, multiyear plan across multiple Federal agencies is critical to the successful campaign to produce nationwide coverage of modern 3D elevation data.

Reference Cited

Dewberry, 2012, National Enhanced Elevation Assessment final report (revised 2012): Fairfax, Va., Dewberry, 84 p. plus appendixes, accessed June 1, 2020, at https://www.dewberry.com/services/geospatial/national-enhanced-elevation-assessment.

—*By Vicki Lukas and Vanessa Baez*
Learn more at: https://usgs.gov/3DEP
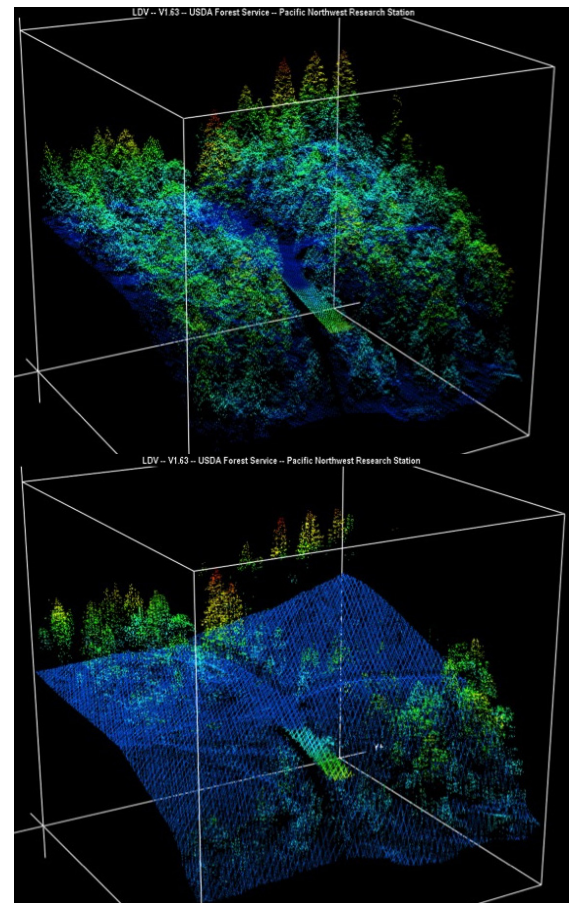Please send questions to:
Director, USGS National Geospatial Program
12201 Sunrise Valley Drive, MS 511
Reston, VA 20192
Email: 3DEP@usgs.gov