

The 3D Elevation Program—Summary for Rhode Island

Introduction

Elevation data are essential to a broad range of applications, including forest resources management, wildlife and habitat management, national security, recreation, and many others. For the State of Rhode Island, elevation data are critical for flood risk management, natural resources conservation, coastal zone management, sea level rise and subsidence, agriculture and precision farming, and other business uses. Today, high-quality light detection and ranging (lidar) data are the sources for creating elevation models and other elevation datasets. Federal, State, and local agencies work in partnership to (1) replace data, on a national basis, that are (on average) 30 years old and of lower quality and (2) provide coverage where publicly accessible data do not exist. A joint goal of State and Federal partners is to acquire consistent, statewide coverage to support existing and emerging applications enabled by lidar data. The new 3D Elevation Program (3DEP) initiative (Snyder, 2012a,b), managed by the U.S. Geological Survey (USGS), responds to the growing need for high-quality topographic data and a wide range of other three-dimensional representations of the Nation’s natural and constructed features.

3D Elevation Program Benefits for Rhode Island

The top 10 Rhode Island business uses for 3D elevation data, which are based on the estimated annual benefits of the 3DEP initiative, are shown in table 1. The National Enhanced Elevation Assessment (NEEA; Dewberry, 2011) survey respondents in the State of

3DEP in Rhode Island by the Numbers

Expected annual benefits	\$179 thousand
Estimated total cost	\$363 thousand
Payback	2.0 years
Quality level 1 buy-up estimate	\$231 thousand



Figure 1. Map of Rhode Island showing the areal extent and quality level of planned and existing publicly available light detection and ranging (lidar) data in November 2012. 3DEP data (quality level 2 or better) are not publicly available for Rhode Island. See table 2 for quality levels.

Rhode Island estimated that the national 3DEP initiative would result in at least \$178 thousand in new benefits annually to the State. The cost for such a program in Rhode Island is approximately \$363 thousand, resulting in a payback period of 2.0 years and a benefit-to-cost ratio of 3.9 to 1 over an 8-year period. Because monetary estimates were not provided for all reported benefits, the total benefits of the 3DEP to Rhode Island are likely much higher. On the basis of the NEEA survey results, all levels of government and many organizations in Rhode Island could benefit from access to statewide high-resolution elevation data.

The NEEA evaluated multiple data collection programs to determine the optimal data quality and data replacement cycle relative to cost to meet the stated needs. For Rhode Island, approximately 80 percent of the total benefits are realized in flood risk management, natural resources conservation, coastal management, and sea level rise and subsidence uses alone, as shown in table 1. The status of publicly available lidar data in Rhode Island is shown in figure 1. By enhancing coordination between the 3DEP and the various government and

3D Elevation Program

3DEP is a national program managed by the USGS to acquire high-resolution elevation data. The initiative is backed by a comprehensive assessment of requirements (Dewberry, 2011) and is in the early stages of implementation. 3DEP will improve data accuracy and provide more current data than is available in the National Elevation Dataset (NED). The goal of this high-priority cooperative program is to be operational by January 2015 and to have complete coverage of the United States by 2022, depending on funding and partnerships. The new program has the potential to generate \$13 billion/year in new benefits through improved government services, reductions in crop and homeowner losses resulting from floods, more efficient routing of vehicles, and a host of other government, corporate, and citizen activities (Dewberry, 2011).

Benefits of a Funded National Program

- Economy of scale—Acquisition of data covering larger areas reduces costs by 25 percent
- A systematic plan—Acquisition of data at a higher quality level reduces the cost of “buying up” to the highest levels needed by State and local governments
- Higher quality data and national coverage—Ensure consistency for applications that span State and watershed boundaries and meet more needs, which results in increased benefits to citizens
- Increase in Federal agency contributions—Reduces State and local partner contributions
- Acquisition assistance—Provided through readily available contracts and published acquisition specifications

private organizations in Rhode Island, it may be possible to meet a higher percentage of the needs.

The following are examples of how 3DEP data can support business needs in Rhode Island: (1) The Town of South Kingston, which is a well-established user of GIS, is anticipating major cost savings by reducing expensive field work with lidar data and products. On a state-wide basis, analysis of complete watersheds improves stormwater response and greatly benefits the public by helping address flood risk management. The increased availability of accurate imagery, better parcel mapping, and improved planimetric data all improve the customer experience. (2) Even before Hurricane Sandy, Rhode Island communities were engaged in detailed vulnerability planning exercises pertaining to natural resources (fig. 2), transportation infrastructure, buildings, and cultural assets that are at risk from sea level rise and storm surge. This modeling requires up-to-date high-resolution topographic



and bathymetric elevation data to keep current with geomorphological changes along the shoreline that are predicted to occur more frequently with storms of increasing intensity, periodicity, and duration.

References Cited

- Dewberry, 2011, Final report of the National Enhanced Elevation Assessment (revised 2012): Fairfax, Va., Dewberry, 84 p. plus appendixes, <http://www.dewberry.com/Consultants/GeospatialMapping/FinalReport-NationalEnhancedElevationAssessment>.
- Snyder, G.I., 2012a, National Enhanced Elevation Assessment at a glance: U.S. Geological Survey Fact Sheet 2012–3088, 2 p., <http://pubs.usgs.gov/fs/2012/3088/>.
- Snyder, G.I., 2012b, The 3D Elevation Program—Summary of program direction: U.S. Geological Survey Fact Sheet 2012–3089, 2 p., <http://pubs.usgs.gov/fs/2012/3089/>.

Figure 2. Enhanced elevation data aids natural resources conservation. The long-term sustainability of marsh habitats depends on identifying and protecting areas where marshes can move upland as sea level rises, as well as identifying barriers to that movement. Photograph by Edwin D. Booth; used with permission.

Table 1. Conservative benefits for the top 10 business uses of the proposed 3DEP data identified in the National Enhanced Elevation Assessment for Rhode Island (Dewberry, 2011).

Rank	Business use	Annual benefits (thousands)
1	Flood risk management	\$52.95
2	Natural resources conservation	42.41
3	Coastal zone management	23.48
4	Sea level rise and subsidence	23.20
5	Agriculture and precision farming	11.03
6	Infrastructure and construction management	9.28
7	Forest resources management	6.27
8	Aviation navigation and safety	5.80
9	Geologic resource assessment and hazard mitigation	1.96
10	Homeland security, law enforcement, and disaster response	1.31
	Other	0.87
	Total	178.56

3D Elevation Program—Continued

The USGS and its partners will acquire quality level 2 or better (table 2) three-dimensional lidar data over the conterminous United States, Hawaii, and the U.S. territories. Interferometric synthetic aperture radar (ifsar) data are being collected at quality level 5 (table 2) in Alaska. The data will be acquired over an 8-year period and will be made available to the public. A number of high-quality elevation-data products will be created to serve a wide range of business needs in government and the private sector.

Table 2. Data quality levels used in the National Enhanced Elevation Assessment.

[≤, less than or equal to]

Quality level	Nominal pulse spacing (meters)	Vertical accuracy (centimeters)
1	0.35	9.25
2	0.7	9.25
3	1–2	≤18.5
4	5	46–139
5	5	93–185

Next Steps for Implementing 3DEP

Accomplishing the 3DEP initiative’s goal of national coverage in 8 years depends on the following factors:

- Increased partnerships among Federal, State, and local governments
- Partnerships that acquire elevation data to the program’s specifications across larger project areas
- Increased communication about and awareness of the program’s benefits and goals
- Support from government and other stakeholders and users

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