# The 3D Elevation Program—Summary for New York

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 New York, elevation data are critical for coastal zone management, natural resources conservation, agriculture and precision farming, flood risk management, infrastructure and construction management, water supply and quality, and other business uses. Today, high-density light detection and ranging (lidar) data are the primary sources for deriving elevation models and other datasets. Federal, State, Tribal, and local agencies work in partnership to (1) replace data that are older 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 National Enhanced Elevation Assessment (NEEA; Dewberry, 2011) evaluated multiple elevation data acquisition options to determine the optimal data quality and data replacement cycle relative to cost to meet the identified requirements of the user community. The evaluation demonstrated that lidar acquisition at quality level 2 (table 1) for the conterminous United States and quality level 5 ifsar data (table 1) for Alaska with a 6- to 10-year acquisition cycle provided the highest benefit/cost ratios. The 3D Elevation Program (3DEP) initiative (Snyder, 2012a,b) selected an 8-year acquisition cycle for the respective quality levels. 3DEP, managed by the U.S. Geological Survey (USGS), the Office of Management and Budget Circular A–16 lead agency for terrestrial elevation data, responds to the growing need for
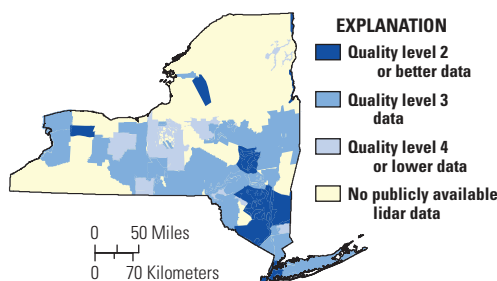
Figure 1. Map of New York showing the areal extent and quality levels of planned and existing publicly available light detection and ranging (lidar) data in August 2013. Quality level 2 or better lidar data meet 3DEP requirements. See table 1 for quality level information.

high-quality topographic data and a wide range of other 3D representations of the Nation's natural and constructed features.

3D Elevation Program Benefits for New York

The top 10 New York business uses for 3D elevation data, which are based on the estimated annual conservative benefits of the 3DEP initiative, are shown in table 2. The NEEA survey respondents in the State of New York estimated that the national 3DEP initiative would result in at least $11.97 million in new benefits annually to the State. The cost for such a program in New York is approximately $16 million, resulting in a payback period of 1.4 years and a benefit/cost ratio of 5.9 to 1 over an 8-year period. Because monetary estimates were not provided for all reported benefits, the total benefits of the 3DEP to New York are likely much higher. On the basis of the NEEA survey results, all levels of government and many organizations in New York could benefit from access to statewide high-resolution elevation data.

For New York, approximately 86 percent of the identified business use requirements will be met in coastal zone management, natural resources conservation, agriculture and precision farming, and flood risk management uses alone, as shown in table 2. The status of publicly available lidar data in New York is shown in figure 1. By enhancing coordination

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 the end of 2022, depending on funding and partnerships. 3DEP can conservatively provide new benefits of $1.2 billion/year and 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). A shared, common elevation dataset would foster cooperation and improve decision-making among all levels of government and other stakeholders.

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.

3DEP in New York by the Numbers

Expected annual benefits	$11.97 million
Estimated total cost	$16.23 million
Payback	1.4 years
Quality level 1 buy-up estimate	$10.33 million

between 3DEP and various government and private organizations in New York, it may be possible to realize more than the cited conservative benefits and attain the higher potential benefits for many business uses.

The following examples highlight how 3DEP data can support business uses in New York: (1) Coastal zone mapping is required by State statute every year. Comprehensive lidar coverage would enable detailed modeling for critical topics, including understanding risks from sea level rise and storm surges and the vulnerability of shallow tidal water habitats to climate change. The need for updated lidar data for coastal areas of New York, for damage assessment and future hazard mitigation, was demonstrated in the aftermath of Tropical Storms Irene and Lee in 2011 and Hurricane Sandy in 2012 (fig. 2). To help with recovery efforts, the Governor created the New York Rising Community Reconstruction Program (http://stormrecovery.ny.gov/), which recognizes lidar data as a critical resource to better manage the impacts of catastrophic weather events. (2) Enhanced elevation data could enable State, regional, and local governments to more effectively implement natural resources conservation

practices such as grade stabilization, dam safety, habitat easements, pipelines, terracing, and wetland restoration, while providing additional cost savings to the public. If lidar data were available, public and private organizations would expand their use of lidar for planning and site-level engineering to reduce field work for conservation projects.

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. Hurricane Sandy devastated Long Island and other coastal areas of New York. To effectively assist with recovery efforts, the Governor created the New York Rising Community Reconstruction Program, which recognizes lidar data as a critical resource to better manage the impacts of catastrophic weather events. Photograph courtesy of New York State Information Technology Services, Geospatial Information Systems Program Office.

Table 2. Conservative benefits for the top 10 business uses of the proposed 3DEP data identified in the National Enhanced Elevation Assessment for New York (Dewberry, 2011).

Rank	Business use	Annual benefits (millions)
1	Coastal zone management	$3.19
2	Natural resources conservation	3.18
3	Agriculture and precision farming	2.23
4	Flood risk management	1.68
5	Infrastructure and construction management	0.55
6	Water supply and quality	0.39
7	Forest resources management	0.35
8	Geologic resource assessment and hazard mitigation	0.16
9	Aviation navigation and safety	0.16
10	Sea level rise and subsidence	0.04
	Other	0.04
	Total	11.97

3D Elevation Program—Continued

The USGS and its partners will acquire quality level 2 or better (table 1) 3D 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 1) in Alaska. The data will be acquired over an 8-year period and will be made available to the public. By using this acquisition scenario, a number of high-quality elevation-data products can be created to serve a wide range of business uses in government and the private sector.

Table 1. Data quality levels used in the National Enhanced Elevation Assessment (Dewberry, 2011).

[≤, 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, Tribal, 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 for the program from government and other stakeholders.

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