

The 3D Elevation Program—Summary for Wisconsin

Introduction

Elevation data are essential to a broad range of applications, including forest resources management, wild-life and habitat management, national security, recreation, and many others. For the State of Wisconsin, elevation data are critical for agriculture and precision farming, natural resources conservation, flood risk management, infrastructure and construction management, water supply and quality, 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 Wisconsin

The top 10 Wisconsin 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 Wisconsin

3DEP in Wisconsin by the Numbers

Expected annual benefits	\$11.18 million
Estimated total cost	\$18.71 million
Payback	1.7 years
Quality level 1 buy-up estimate	\$11.91 million

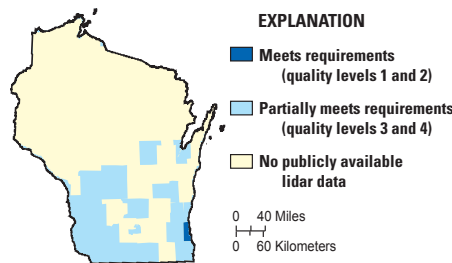


Figure 1. Map of Wisconsin showing the areal extent of planned and existing publicly available light detection and ranging (lidar) data and its quality relative to 3DEP requirements in November 2012, for the 27 business uses in the National Enhanced Elevation Assessment report (Dewberry, 2011). See table 2 for quality levels.

estimated that the national 3DEP initiative would result in at least \$11 million in new benefits annually to the State. The cost for such a program in Wisconsin is approximately \$19 million, resulting in a payback period of 1.7 years and a benefit-to-cost ratio of 4.8 to 1 over an 8-year period. Because monetary estimates were not provided for all reported benefits, the total benefits of 3DEP to Wisconsin are likely much higher. On the basis of the NEEA survey results, all levels of government and many organizations in Wisconsin 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 Wisconsin, approximately 73 percent of the total benefits are realized in agriculture and precision farming and natural resources conservation uses alone, as shown in table 1. The status of publicly available lidar data in Wisconsin is shown in figure 1. By enhancing coordination between the 3DEP and the various government and private organizations in Wisconsin, it may be possible to meet a higher percentage of the needs.

The following examples of how 3DEP data can support business needs

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

in Wisconsin are based on the NEEA interviews and surveys: (1) Approximately 45 percent of the land area of Wisconsin is devoted to agricultural uses. Enhanced elevation data could dramatically improve precision farming (fig. 2). A more accurate depiction of the terrain could help determine a more precise application of agricultural chemicals, thereby likely yielding significant cost savings and a reduction in agricultural pollution. (2) Enhanced elevation data could enable State, regional, and local governments to more effectively implement natural resources conservation practices while providing additional cost savings to the public. If lidar data were available nationally, public and private organizations would expand their use of lidar for planning and site-level engineering to reduce field work for conservation projects such as grade stabilization, ponds, grassed waterways, pipelines, terracing, and wetland restoration.



Figure 2. Enhanced elevation data aids precision farming, which improves crop yields, prevents soil degradation, minimizes groundwater usage, and helps farmers realize a larger return on their investments. Photograph courtesy of U.S. Department of Agriculture—Natural Resources Conservation Service.

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

Rank	Business use	Annual benefits (millions)
1	Agriculture and precision farming	\$5.82
2	Natural resources conservation	2.41
3	Flood risk management	1.08
4	Infrastructure and construction management	0.51
5	Water supply and quality	0.47
6	Forest resources management	0.31
7	Coastal zone management	0.24
8	Geologic resource assessment and hazard mitigation	0.15
9	Aviation navigation and safety	0.12
10	Renewable energy resources	0.03
	Other	0.04
	Total	11.18

References Cited

- Dewberry, 2011, Final report of the National Enhanced Elevation Assessment (revised 2012): Fairfax, Va., Dewberry, 84 p. plus appendices, <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/>.

3D Elevation Program—Continued

The USGS and its partners will acquire high- to medium-quality (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

For Further Information:

Mark DeMulder, Chief, National Geospatial Program
U.S. Geological Survey
511 National Center
12201 Sunrise Valley Drive
Reston, VA 20192
Email: mdemulder@usgs.gov

Ron Wencl, USGS Geospatial Liaison
U.S. Geological Survey
2280 Woodale Drive
Mounds View, MN 55112
Email: rwenc1@usgs.gov

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