

# The 3D Elevation Program—Summary for Texas

## Introduction

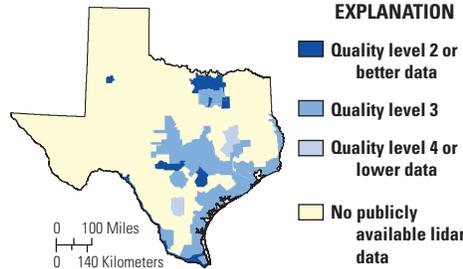
Elevation data are essential to a broad range of applications, including forest resources management, wildlife and habitat management, national security, recreation, and many others. For the State of Texas, elevation data are critical for natural resources conservation; wildfire management, planning, and response; flood risk management; agriculture and precision farming; infrastructure and construction management; water supply and quality; and other business uses. Today, high-quality light detection and ranging (lidar) data are the source 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 Texas

The top 10 Texas conservative business use benefits for 3D elevation data, which are based on the estimated annual benefits of the 3DEP initiative, are shown

### 3DEP in Texas by the Numbers

Expected annual benefits	\$53.09 million
Estimated total cost	\$88.62 million
Payback	1.7 years
Quality level 1 buy-up estimate	\$56.38 million



**Figure 1.** Map of Texas showing the areal extent of planned and existing publicly available light detection and ranging (lidar) data in November 2012 (Dewberry, 2011). Quality level 2 or better lidar data meet 3DEP requirements. See table 2 for quality level information.

in table 1. The National Enhanced Elevation Assessment (NEEA; Dewberry, 2011) survey respondents in the State of Texas estimated that the national 3DEP initiative would result in at least \$53 million in new benefits annually to the State. The cost for such a program in Texas is approximately \$89 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 the 3DEP to Texas are likely much higher. On the basis of the NEEA survey results, all levels of government and many organizations in Texas could benefit from access to statewide high-resolution elevation data.

The NEEA evaluated multiple data-collection options to determine the optimal data quality and data replacement cycle relative to cost to meet the stated needs. For Texas, approximately 75 percent of the total benefits are realized in natural resources conservation; wildfire management, planning, and response; and flood risk management uses alone, as shown in table 1. The status of publicly available lidar data in Texas is shown in figure 1. By enhancing coordination between the 3DEP and the various government and private organizations in Texas, it may be possible to meet a higher percentage of the 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.

The following are examples of how 3DEP data can support business needs in Texas: (1) The Texas Wildfire Risk Assessment is used to help prioritize areas in the State where tactical analyses, community interaction and education, or mitigation treatments might be necessary to reduce risk from wildfires. Up-to-date lidar data can enable the mapping of wildland fuels, wildland-urban interface areas, and aerial hazards, thereby providing the vegetation profile and structure information vital for wildfire safety. (2) From 1960 to 2008, Texas ranked first in the Nation in casualties, second in flood damage claims, and fourth in property damage due to flooding (fig. 2). The State of Texas enacted legislation to support floodplain mapping in 2007 and has invested significant resources, including State funding and technical resources, to address priorities for elevation mapping, primarily floodplain mapping and risk management. The State based its technical specifications on USGS standards and has worked cooperatively and in partnership with Federal, State, and local governments to coordinate elevation mapping needs and optimize funding availability. 3DEP would build on



the progress of these cooperative projects and provide additional coordination and planning inputs to advance technical and policy priorities. With more accurate and complete elevation data, Texas could more accurately (and more rapidly) determine flood risk to the population and implement remedial measures to improve the safety of dams, thereby reducing the risk of loss of life as well as the expenses associated with property damage.

## 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.** Barton Creek flooding over Lost Creek Boulevard in Austin, Texas, on November 17, 2004. From USGS Texas Water Science Center photograph collection.

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

Rank	Business use	Annual benefits (millions)
1	Natural resources conservation	\$13.79
2	Wildfire management, planning, and response	13.28
3	Flood risk management	12.70
4	Agriculture and precision farming	7.08
5	Infrastructure and construction management	2.57
6	Water supply and quality	1.39
7	Geologic resource assessment and hazard mitigation	0.50
8	Aviation navigation and safety	0.42
9	Coastal zone management	0.39
10	Sea level rise and subsidence	0.33
	Other	0.65
	Total	53.10

## 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 (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, 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.

## For Further Information:

Mark DeMulder, Director, National Geospatial Program  
 U.S. Geological Survey  
 511 National Center  
 12201 Sunrise Valley Drive  
 Reston, VA 20192  
 Email: [mdemulder@usgs.gov](mailto:mdemulder@usgs.gov)

Claire DeV Vaughan, USGS Geospatial Liaison  
 U.S. Geological Survey  
 1505 Ferguson Lane  
 Austin, TX 78754  
 Email: [cdevaugh@usgs.gov](mailto:cdevaugh@usgs.gov)

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