Appendix 2. State, Territory, Local, and Tribal Government Requirements and Benefits Data

The information in this appendix was generated from a total of 363 questionnaire responses received from all 50 States, Puerto Rico, and the Virgin Islands and a sampling of local and tribal governments and nongovernmental organizations. The online questionnaire was directed at content experts and managers within these organizations. Respondents were asked to detail their highest priorities in applications and requirements for improved elevation data and to estimate the expected programmatic benefits that would result if these requirements were met. The State agencies participated in workshops and had the opportunity to edit, consolidate, and validate their requirements and benefits data. In a significant number of cases, it was not possible for State agencies to assign an approximate expected dollar benefit associated with improved elevation data for their applications. In addition, there was considerable variability (actual or apparent) in benefits reported among States. Data collected from local (county, city, and regional) and tribal governments were also collected by online questionnaires, but not reviewed and validated in workshops, and are included in this report as received. Local and tribal government information was limited, and it was not possible to estimate benefits for these groups on a national basis.

Alabama

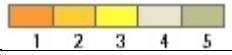
The State of Alabama has requirements for accurate, reliable elevation data that serve the widest use of all government agencies. Uses for the data include economic development, emergency planning and response, flood map modernization, geologic mapping, groundwater modeling and management, highway planning, and urban and suburban infrastructure engineering. The collection and maintenance of these data have taken place through individual, uncoordinated actions that often result in duplicated efforts at various levels of government using different standards and specifications. The majority of this data collection has taken place at the local level with varying levels of access to the data. A centrally coordinated collection effort would solve a few key issues that have been seen within the State. It would provide a dataset collected with consistent standards, make the data easily accessible for all levels of government and the public, and reduce acquisition costs through economy of scale; it could also fill gaps in funding at the local and State level.

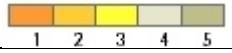
It is also apparent that local officials with intimate knowledge of local conditions are the best stewards of the data layers associated with their jurisdictions. State agencies typically collaborate with Federal agencies, but before the 2010 flying season, these three groups did not collaborate, particularly at the local level. As budgets are being strained at all levels of government, the logical solution is to develop a system of partnerships across the three groups to share costs and ease the burden of funding. Large collaborations also have the added benefit of reduced costs per square mile of data, thereby stretching those funds further. Funding data during the past 5 years show that the sums of those amounts are nearly equal to the cost of a total statewide acquisition during the same period. Acquiring data in this piecemeal fashion has resulted in local light detection and ranging (lidar) in 16 counties, all with varying specifications, age, accuracy, and with a very small percentage of those data in the public domain, which means that it cannot be widely used across all levels of government.

There are many benefits in developing a statewide program to acquire enhanced elevation and lidar with very few disadvantages. In other States and within the State of Alabama at regional levels, this has repeatedly been proven. One confirmed advantage is the reduction of overall costs. This can be accomplished in several ways, including reducing duplication of data, utilizing economies of scale, and leveraging costs among participants. Additionally, there are benefits derived from having standard information. These include uniform accuracy and generally greater accuracy, better decisionmaking capability, and better collaboration capabilities. It then becomes easier to manage resources in business and land development, environmental management, and emergency management.

The U.S. Geological Survey (USGS) has recently released lidar standards in anticipation of increased data acquisitions that will be absorbed into the National elevation dataset (NED). Lidar data acquired through this project will be collected using the USGS standards as a minimum, with the Federal Emergency Management Agency (FEMA) standards and additional break line collection determined on a project-by-project basis or as funding permits. The primary intent of this specification is to create consistency across all lidar collections, in particular those undertaken in support of the NED. Unlike most other “lidar specs,” which focus on the derived bare-Earth digital elevation model (DEM) product, this specification places emphasis on the handling of the source lidar point cloud data. This is to assure that the source data collected remains intact and viable to support the wide variety of non-DEM science and mapping applications and derivatives that can benefit from lidar technology.

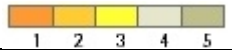
State Functional Activities

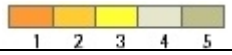
Program: Alabama Department of Economic and Community Affairs Office of Water Resources	**Business Use:** 14. Flood Risk Management
 **Quality Level:**  **Update Frequency:** 4–5 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** Yes, adjoining States where watershed boundaries cross	Modernizing and Updating FEMA Flood Risk Maps: The Alabama Department of Economic Community Affairs Office of Water Resources (OWR) administers programs for river basin management, river assessment, water supply assistance, water conservation, flood mapping, the National Flood Insurance Program (NFIP), and water resources development. Further, the OWR serves as the State liaison with Federal agencies on major water resources related projects and conducts any special studies on instream flow needs as well as administering environmental education and outreach programs to increase awareness of Alabama's water resources. **Estimated Annual Operational Benefits:** Major; $5,000,000 The data would allow users to create datasets for analysis with minimal time and effort. **Estimated Annual Customer Service Benefits:** Major; $3,000,000 Good elevation data statewide would further reduce acquisition costs and the amount of time required to complete certain phases of the project and would improve the quality of the data from studies and analyses. Overall this would give the public a better sense that the department is more efficient by reducing the cost and time to take a project to completion. **Estimated Strategic Benefits:** Major Accurate elevation data are a benefit across the enterprise geographic information system (GIS) user community including social benefits, environmental benefits, strategic and political benefits.

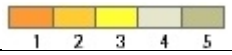
Program: Alabama Department of Environmental Management—Water Program	**Business Use:** 2. Water Supply and Quality
 **Quality Level:**  **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** Yes, all watersheds that extend outside of the State.	**Assessing Water Quality and Managing Effects:** The Alabama Department of Environmental Management (ADEM) adopts and fairly enforces rules and regulations to protect and improve the quality of Alabama's environment and the health of all its citizens. The ADEM monitors environmental conditions in Alabama and recommends changes in State law or revises regulations as needed to respond appropriately to changing environmental conditions. **Estimated Annual Operational Benefits:** Major; $250,000 The data would allow fast and accurate creation of watersheds for determining stream health and quality. Analyses would be consistent across all areas. **Estimated Annual Customer Service Benefits:** Major; $15,000 The data would allow users to create datasets for analyses with minimal time and effort. Would use lidar data across all the ADEM. **Estimated Strategic Benefits:** Major Most of the benefits center around environmental benefits. Water quality improvements would touch all other areas.

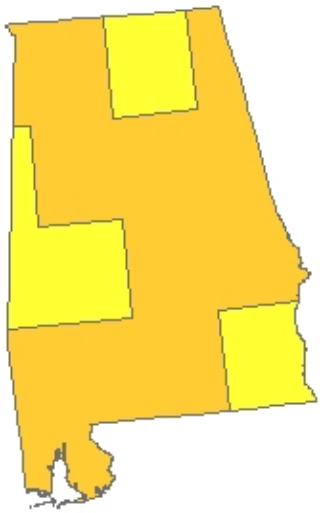
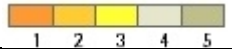
Program: Alabama Department of Transportation	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Occasionally, when projects come to a State line	**Planning, Investigation, and Preliminary Design of Roadway Projects:** The data would allow the Planning, Investigation, and Preliminary Design of Roadway Projects office to provide a safe, efficient, environmentally sound intermodal transportation system for all users, especially the taxpayers of Alabama and would also facilitate economic and social development and prosperity through the efficient movement of people and goods and to facilitate intermodal connections within Alabama. **Estimated Annual Operational Benefits:** Major; $2,000,000 New operational benefits would be reduced costs to acquire data on a project by project basis, quicker evaluation of proposed projects, and the overall improvement in the data resulting from studies and analyses using good data statewide. This will reduce the cost and time to take a project from conception to construction. **Estimated Annual Customer Service Benefits:** Major; $3,000,000 Good elevation data statewide would further reduce acquisition costs and the amount of time required to complete certain phases of the project and would improve the quality of the data from studies and analyses. Overall the public would benefit from a department that is more efficient by reducing the cost and time to take a project to construction. **Estimated Strategic Benefits:** Moderate A good statewide lidar dataset would provide more data for evaluating existing roadway conditions and identify needs for safety projects. Statewide lidar data would benefit environmental efforts by providing more detailed information over larger areas on all projects. This would provide a more complete picture of the study area and how the proposed construction would affect those habitats.

Program: Auburn University—Alabama Precision Agriculture	**Business Use:** 8. Agriculture and Precision Farming
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Design and development of site-specific management strategies and geospatial technology to implement these strategies:** The goal of the Alabama Cooperative Extension System's Precision Agriculture Program is to facilitate the adoption of geospatial technologies and site-specific management strategies. The use of these technologies positively affects agriculture by helping farmers reduce application overlap and target crop inputs to where they are needed. This approach allows farmers to increase their efficiency in the field, maximize crop yields, and improve environmental stewardship. **Estimated Annual Operational Benefits:** Major; $100,000 Expanding the effect of such data by having them available to more producers at an affordable cost in which they can then use then improve their land and crop management. **Estimated Annual Customer Service Benefits:** Major; $500,000 These benefits would be the result of not only the farming (produce) side of it, but also the timber management side of it. Lidar can be used to measure and model growth (forest and crop), determine suitable land for crop production, and improved machine control since they will "know" the ground surface model. **Estimated Strategic Benefits:** Major It is a continuing process to educate the public and decisionmakers that farmers and ranchers are managing lands and producing food in a much more safe and sustainable way.

Program: Alabama Forestry Commission	**Business Use:** 16. Wildfire Management, Planning, and Response
 **Quality Level:** 	**Forest Resources Management:** The Alabama Forestry Commission (AFC) is committed to protecting and sustaining forest resources using professionally applied stewardship principles and education. The AFC will ensure Alabama's forests contribute to abundant timber and wildlife, clean air and water, and a healthy economy.
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Major; $2,500,000 Ability to determine vegetated and non-vegetated area for measuring tree canopy coverage and estimate timber volumes for forested areas.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; $5,000,000 Ability to provide terrain information for analyses with minimal time and effort and could be used across all Departments.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Integration of imagery and lidar produces valuable information for forest management, and also has application for carbon accounting to understand the ecosystem services of forests. Lidar is a critical component for more accurate measurement of logging practices and emission and carbon sequestration calculations.
Data Outside State Needed: Yes, fires, destructive insects do not stop at State boundaries	

Program: Geological Survey of Alabama	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 	**Geologic Mapping and Analysis:** The Geological Survey of Alabama (GSA), established in 1848, provides service and information to Alabama and its citizens as a natural resource data gathering and research agency. As part of its mission, the GSA explores and evaluates the mineral, water, energy, biological, and other natural resources of the State of Alabama and conducts basic and applied research in these fields.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; $2,240,000 Acquisition of high-resolution elevation data derived from lidar is an opportunity to take advantage of an extremely accurate and consistent base layer that will benefit a wide-ranging user group. Applications for this technology include fast and accurate stream cross-section acquisition and geomorphology mapping.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Major; $2,240,000 Working with the point cloud data also allows experienced geoprofessionals to experiment with different gridding algorithms and parameters with the objective of producing a DEM that is optimized for landform mapping in a particular project area.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Results should provide greater awareness of the value of location of hazards to politicians. When life and property are on the line, timely and accurate data are vital to decisionmakers. With enhanced statewide elevation data available this will help decisionmakers.
Data Outside State Needed: Yes, for project specific	

Program: Alabama Emergency Management Agency	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 	**Emergency Response to a Disaster:** The Alabama Emergency Management Agency, Operations Section is responsible for coordinating support for State and local response in an all hazards concept. These responsibilities include alert and notification, activation of the State Emergency Operations Center, coordination of emergency support functions, establishing priorities for allocating resources, maintaining operational control of the State Emergency Response Team, the Mobile Operations Center, the Disaster Reconnaissance Team, and the communications/State warning point section. The Operations Section also supports damage assessment after an event and assists with the transition to the recovery phase. All these functions are directed toward the one goal of minimizing the risk and affect to people, property, and the environment.
	Estimated Annual Operational Benefits: Moderate; $125,000 Potential of high-quality statewide data would allow emergency management to better prepare for, respond to, and mitigate damages from disasters and the ability to increase efficiency of hazard analyses and the ability to increase efficiency of hazard analyses.
	Estimated Annual Customer Service Benefits: Moderate; $25,000 High-quality statewide data would allow emergency management to better prepare for, respond to, and mitigate damages from disaster.
	Estimated Strategic Benefits: Major Results should provide greater awareness of the value of location of hazards to politicians. When life and property are on the line, timely and accurate data are vital to decisionmakers. Enhanced statewide elevation data will help decisionmakers.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Yes, adjoining States in case of an event close to a State boundary.	

Program: Alabama Department of Conservation and Natural Resources—State Lands Division Natural Heritage Section	**Business Use:** 7. Wildlife and Habitat Management
 **Quality Level:** 	**Wildlife and Habitat Management:**
	Estimated Annual Operational Benefits: Major; dollar value not reported. Lidar data could be used for field-based habitat assessment. Lidar is a source of geospatial data that can provide fine-grained information about the three-dimensional (3D) structure of ecosystems across broad spatial extents.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported. Lidar would save time and funds where data collected manually to quantify understory heights are generally limited in scale due to the labor-intensive and seasonal nature of data collection. However, lidar data can be used to examine a variety of understory height metrics at spatial scales that might not otherwise have been addressed.
	Estimated Strategic Benefits: Major Policymaker decisions are strengthened when current and accurate geospatial datasets are available in support of the informed decisionmaking process.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Yes, all watersheds that extend outside of the State.	

Program: Alabama Department of Economic and Community Affairs—GIS Department	**Business Use:** 3. River and Stream Resource Management

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Yes, all watersheds that extend outside of the State.

National Hydrography Dataset Stewardship: Alabama Department of Economic and Community Affairs GIS Department is the National Hydrography Dataset (NHD) steward for Alabama.

Estimated Annual Operational Benefits: Major; $125,000
Better elevation data would assist in the update of the NHD.

Estimated Annual Customer Service Benefits: Major; $35,000
More efficient in the update process of NHD.

Estimated Strategic Benefits: Major
Results would provide greater awareness of the value of an updated NHD, which could be used to inform politicians of hazards due to flooding. When life and property are on the line, timely and accurate data are vital to decisionmakers. Enhanced statewide elevation data will help decisionmakers.

Program: Alabama Department of Economic and Community Affairs—GIS Department	**Business Use:** 27. Telecommunications

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Yes, would allow to model locations of towers in adjoining States.

Broadband Mapping

Estimated Annual Operational Benefits: Major; $120,000
Having a dynamic 3D model can prove to be a safety, time, and cost saving benefit. The model allows for a multifaceted analysis option where problems and solutions can be discovered and remedied in a quick and efficient manner.

Estimated Annual Customer Service Benefits: Major; $50,000
The integration of technologies such as lidar and 3D computer analysis has proven to be an effective way to complete comprehensive asset evaluations. Lidar surveys can be conducted in a fraction of the time of a conventional survey. The data gathered are considerably more comprehensive, allowing the user to create dynamic 3D computer models. These studies form an integral part of a complete asset management program.

Estimated Strategic Benefits: Major
Policymakers can make better informed decisions when current and accurate geospatial datasets are available.

Local Functional Activities

City Government—City of Huntsville	
Program: New Shelby County Digital Flood Insurance Rate Map (FIRM) Service (DFIRMS)	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $125,000 Contours, orthophotos, and change detection.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; $25,000 Not available; contours, orthophotos, and change detection on demand.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Not available; accurate elevation data are a benefit across the enterprise GIS user community, including social benefits, environmental benefits, strategic and political benefits, and other.

County Government—Mobile County	
Program: Urban Development—Mobile, AL	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood plane management	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported No costly field surveys required; data are openly distributed, which encourages development; cost sharing to improve budget strain.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Major; not reported Not available; contours, orthophotos, and change detection on demand.
Bathymetric Data: Yes **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Accurate elevation data are a benefit across the enterprise GIS user community including social benefits, environmental benefits, strategic and political benefits, and other.

County Government—Montgomery County	
Program: New Montgomery County DFIRMS	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported No costly field surveys required; data are openly distributed, which encourages development; cost sharing to improve budget strain.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Not available; contours, orthophotos, and change detection on demand.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Not available; accurate elevation data are a benefit across the enterprise GIS user community including social benefits, environmental benefitts, strategic and political benefits, and other.

County Government—Shelby County Commission	
Program: New Shelby County DFIRMS	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $125,000 Contours, orthophotos and change detection.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; $25,000 Not available; contours, orthophotos, and change detection on demand.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Not available; accurate elevation data are a benefit across the enterprise GIS user community including social benefits, environmental benefits, strategic and political benefits, and other.

Alaska

The State of Alaska has very little existing high-quality geospatial data. Alaska lacks a statewide elevation dataset of any kind. Alaska does not have statewide imagery of a consistent, usable resolution and quality standard. In short, Alaska lacks the basic geospatial infrastructure that is considered to be essential in the rest of the United States. A consistent statewide DEM based on quality level (QL) 5 interferometric synthetic aperture radar (IFSAR) data are required to serve as a foundation for building a usable set of geospatial data upon. The accuracy and utility of imagery, transportation, hydrography, and other geospatial data will be greatly increased by the creation of a statewide DEM.

State Functional Activities

<table>
<tr><td colspan="2">Program: Aviation Safety and Arctic Ports and Harbors</td><td>Business Use: 20. Aviation Navigation and Safety</td></tr>
<tr><td rowspan="5"> 
Quality Level: 1 2 3 4 5
Update Frequency: >10 years
Bathymetric Data: Yes
Tide-Coordinated: Yes
Data Outside State Needed: No</td><td colspan="2">Aviation Safety, Ports and Harbors, and Synthetic Vision for Terrain Navigation</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; dollar value not reported
The creation of 3D flyable terrain models with poor elevation data is time consuming, and voids must be filled with best guess. Recognizable terrain features in low resolution datasets are not pronounced, which is critical in teaching terrain recognition and situational awareness to pilots. In-cockpit maps are highly unreliable and pose a very serious danger to those who use them in Alaska. Three dimensional flyable datasets for use in aviation simulators are faithful to terrain and an in-cockpit map could save a significant amount of lives each year by blunting the number of controlled flight into terrain (CFIT) fatalities each year. If half the CFIT fatalities were eliminated over the past 10 years, the cost saving in terms of lives would exceed $100 million (the Federal Aviation Administration (FAA) values a human life at $2 million).</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; $10,000,000
The creation of 3D flyable terrain models with poor elevation data is time consuming and voids must be filled with best guess. Recognizable terrain features in low resolution datasets are not pronounced, which is critical in teaching terrain recognition and situational awareness to pilots. In-cockpit maps are highly unreliable and pose a very serious danger to those who use them in Alaska. Three dimension flyable datasets for use in aviation simulators are faithful to terrain and an in-cockpit map could save a significant amount of lives each year by blunting the number of controlled flight into terrain (CFIT) fatalities each year. If half the CFIT fatalities were eliminated over the past 10 years. The cost saving in terms of lives would exceed $100 million (the FAA values a human life at $2 million).</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
Terrain familiarization and situational awareness improves dramatically saving lives. Having faithful and complete elevation data saves time in creation of the datasets. Improved mapping correlates to an accurate moving map in the cockpit, which will save many lives. Products perform a function but are not as true to terrain as needed and data voids require a lot of time to correct. The Alaska NED has demonstrated errors in excess of 300 meters (m) and cannot be relied upon for safe navigation.</td></tr>
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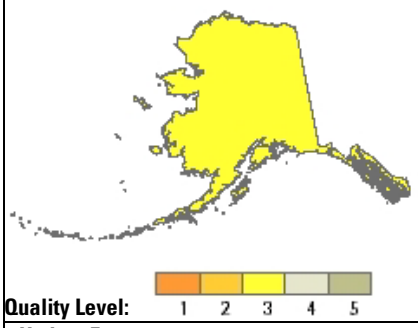
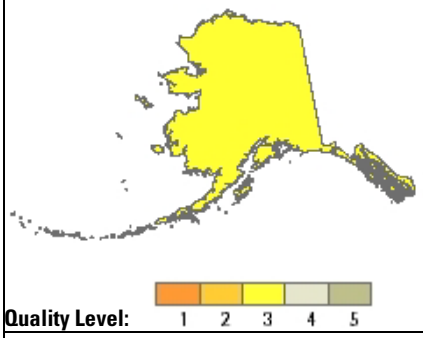
Program: NFIP and Flood Mitigation Assistance Grant Programs	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Hydrologic and Hydraulic Modeling to Produce FIRMs:** Secondary and tertiary functional activities all are related to the flood risk section, from that comes insurance, building codes, regulatory, compliance, risk reduction, mitigation and preparedness. If the State cannot portray correctly the flood risk, within a reasonable error tolerance factor, the ability for the public to accept that risk is diminished. Then their ability to determine their risk tolerance is limited and largely their willingness to act in advance of the next flood is reduced. **Estimated Annual Operational Benefits:** Major; dollar value not reported Refinement of data leading to flood risk reduction decisions on infrastructure development, flood disaster and recovery response, and flood mitigation efforts. FEMA is responsible to communities in the NFIP to produce hydrology and hydraulic studies. The studies produce new or revised flood insurance studies (FISs) and FIRMs. Enhanced topographic information would facilitate the production of these products in a timely (expedited) manner. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Refinement of data leading to flood risk reduction decisions on infrastructure development, flood disaster and recovery response, and flood mitigation efforts. FEMA is responsible to communities in the NFIP to produce hydrology and hydraulic studies. The studies produce new or revised FISs and FIRMs. Enhanced topographic information would facilitate the production of these products in a timely (expedited) manner. **Estimated Strategic Benefits:** Major The public has a high standard for flood risk information, when purchasing a home. They do not understand the complexities of producing flood studies. Tolerance for incorrect information is being tested in an environment of enhanced technological advances. Alaskan residents would have a flood risk picture that is realistic and valid. Reliability of the products and immediate resolution of discrepancies would result from refined information and appropriate topographic information.

Program: Determine potential for metals, minerals, fuels, and geothermal resources; locations/supplies of construction material; and geologic hazards to infrastructure.	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Geologic Mapping** **Estimated Annual Operational Benefits:** Major; $100,000 Time savings equals money savings to assess areas of high-interest infrastructure for geology/hazards. Mission compliance facilitated. Having data available for use instead of having to contract and oversee the collection and provide data dissemination infrastructure ourselves would be a huge time and cost savings. Would greatly facilitate mission compliance by allowing Alaska to work in high-interest areas under short notice in response to immediate needs instead of experiencing delays due to the need to collect the elevation data first. Less likely to have to redo maps later because the base data will be better quality than currently exists. **Estimated Annual Customer Service Benefits:** Major; $100,000 Time savings equals money savings to assess areas of high-interest infrastructure for geology/hazards. Mission compliance facilitated. Having data available for use instead of having to contract and oversee the collection and provide data dissemination infrastructure would be a huge time and cost savings. Would greatly facilitate mission compliance by allowing the State to work in high-interest areas under short notice in response to immediate needs instead of experiencing delays due to the need to collect the elevation data first. Less likely to have to redo maps later because the base data will be better quality than currently exists. **Estimated Strategic Benefits:** Major Having these data provided to Alaska rather than the State producing it will greatly enhance efficiency and work flow. Additional projects would be able to benefit from the data and enhance their output because the information would be readily available statewide instead of limited focus areas. Products are of higher quality, greater accuracy, and more utility for customers. Allow the State to provide services not previously possible (for example, elevation-derived analyses and products). Product timeliness is improved because data are high quality and facilitate more efficient analyses.

Program: Urban Planning, Transportation, Agriculture, Recreation, Energy, and Forestry	**Business Use:** Natural Resources Conservation



Update Frequency: 4–5 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: No

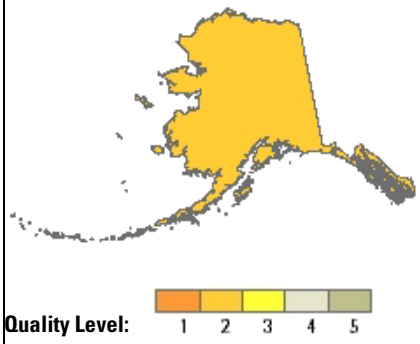
Environmental Change, Effect Monitoring, and Adaptation

Estimated Annual Operational Benefits: Major; dollar value not reported
Benefits description not reported.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Benefits description not reported.

Estimated Strategic Benefits: Not reported.

Program: University Research	**Business Use:** 25. Education K–12 and Beyond



Update Frequency: Event driven—Needs not met by a cyclic data acquisition program

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: No

Environmental, Social and Economic Research

Estimated Annual Operational Benefits: Major; dollar value not reported
High-quality digital elevation data critical to in-situ and remote sensing efforts in many areas of research from coupled climate modeling, climate adaptation strategies, wildlife habitat research, permafrost research, fresh water ecosystem analysis, hazard mapping, resource assessment, and energy systems research. Better and current baseline data at an appropriate scale for ecosystem scale analysis.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
High-quality digital elevation data critical to in-situ and remote sensing efforts in many areas of research from coupled climate modeling, climate adaptation strategies, wildlife habitat research, permafrost research, fresh water ecosystem analysis, hazard mapping, resource assessment, and energy systems research. Better and current baseline data at an appropriate scale for ecosystem scale analysis.

Estimated Strategic Benefits: Major
Better accuracy and the public availability of the data will benefit the public and private sectors. Great public benefit.

Local Functional Activities

Regional Government—Kenai Peninsula Borough	
Program: Coastal Zone Management	**Business Use:** 4. Coastal Zone Management
Functional Activity: Control development in coastal zone	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Avoid development in coastal zone that would adversely affect marshlands and bluff erosion.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; not reported Elevation data aids development decisions that adversely affect the coastal zone.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Avoids costly mistakes developing land along the coast.
Tide-Coordinated: Not reported	

Regional Government—Kenai Peninsula Borough	
Program: Land Planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: New subdivision design	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Cost to acquire elevation and slope data for each proposed subdivision and road right of way.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; not reported Do not know; avoids delays and cost of land survey in order to complete subdivision requirements.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Moderate Better horizontal alignments for new road construction.
Tide-Coordinated: Not reported	

Regional Government—Kenai Watershed Forum	
Program: Wetland Classification	**Business Use:** 1. Natural Resources Conservation
Functional Activity: Wetland classification and hydrological modeling	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $300,000 Lidar low resolution allows delineation of watershed divides in large wetland complexes. Updated data would allow change detection for anthropogenic activities and expanding the area coverage would allow more mapping to be accomplished.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Ability for greater area coverage hydrologic modeling using regional regression curves is very poor. Accurate watershed delinations assist in flow prediction.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Greater area covered flood plain mapping for enhanced hazard mapping.
Tide-Coordinated: Not reported	

Tribal Functional Activities

Alaska Village Initiatives	
Program: Alaska Carbon Exchange, Private Lands Wildlife Management, Tribal Conservation Districts	**Business Use:** 1. Natural Resources Conservation
Functional Activity: Cultural preservation, wildlife habitat management, economic development, natural resource conservation	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $5,000,000 Minimal benefits now as these data are nonexistent or largely inaccessible. New data will allow informed decisions—business and sociopolitical decisions require information not currently available. Conservation and development decisions will be based on accurate data.
Update Frequency: Annually	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Substantial improvement in the conservation services provided, and particularly with the end customer as accurate data will be available to improve the conservation need and effect of programs. Sufficient data not available.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Having appropriate data will greatly improve management of resources and provide for decisionmaking on a level not currently possible. Resource management on public and private lands will benefit from accurate data, and costs for programs and projects will decrease substantially. As data are not not currently sufficient, no benefits are being provided from the quality level.
Tide-Coordinated: No	

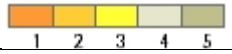
Arizona

The State of Arizona has a variety of requirements for higher quality elevation data. Hazards identification and mitigation is a high priority area of applications in the State where improved elevation data would have value. This includes the Department of Water Resources' (DWR) Dam Safety Program and the ability of the Arizona Geological Survey (AZGS) to more effectively identify potential seismic hazards. A number of the requirements fall into a broad category of water applications:

- DWR needs better elevation data to improve groundwater modeling and land subsidence monitoring
- the Department of Game and Fish needs better data on stream channel characteristics for fish habitat-related work
- the Department of Environmental Quality's water quality modeling and assessment activities would be enhanced with better elevation data

Other applications in the State where improved elevation would have a benefit include habitat inventory and improvement, geologic mapping, air quality monitoring, and transportation planning. In addition, there are some important homeland security- and law enforcement-related requirements in Arizona that were not captured during the questionnaire process, including plume modeling and tactical applications for 3D urban and rural landscapes.

State Functional Activities

Program: Statewide Groundwater Modeling	**Business Use:** 2. Water Supply and Quality
	**Groundwater Monitoring:** More accurate elevation data will allow the DWR to establish more accurate elevations for groundwater wells, resulting in improved depth-to-groundwater values and groundwater elevations. Improved data would help in providing higher quality data to be used by the public and DWR stakeholders in various types of hydrological and geological projects.
Quality Level: 	**Estimated Annual Operational Benefits:** Major; dollar value not reported Having access to a more accurate digital elevation model would allow the DWR to establish more accurate elevations for groundwater wells, resulting in improved depth-to-groundwater values and groundwater elevations.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Customer service will be enhanced through access to more accurate information for various types of hydrological and geological projects.
Bathymetric Data: No	**Estimated Strategic Benefits:** Major More timely and accurate information will be available to the public.
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Water Quality Division	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** >10 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Water Quality—Modeling, Assessment, and Permitting:** Higher quality elevation data will improve understanding of surface water dynamics (such as flow and catchments) that will assist in the assessment of actual and potential water quality issues. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported More accurate data can improve understanding, analysis, results, and decisionmaking based on solid information. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Customer service will be enhanced through access to more accurate information. **Estimated Strategic Benefits:** Moderate More timely and accurate information will be available to the public.

Program: Geologic and Economic Resources, and Environmental Geology	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Geologic Mapping and Analysis:** Lidar data will allow the AZGS to more accurately create geologic maps, assess seismic, debris flow/landslide, and other geologic hazards, and to better assist the public and other State agencies. Lidar will be particularly helpful to understand the geomorphic relationships of surfaces in areas of low relief and to assess hazards from Quaternary faults. **Estimated Annual Operational Benefits:** Moderate; $30,000 QL2 lidar will allow the AZGS to more accurately map the geology and geomorphology of the State, conduct seismic hazard studies, and to assess and provide mitigation information for other geologic hazards such as floods and debris flows. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Lidar data will allow the AZGS to provide better technical advice and assistance in geology to the public and State and local government agencies. **Estimated Strategic Benefits:** Moderate More accurate geologic maps and hazard assessment will provide the public and local and State agencies with better information regarding geologic resources and hazards in the State.

Program: Statewide Dam Safety Program	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Flood Risk Mapping:** Having the data available will greatly improve the State's ability to assist dam owners and local communities in developing accurate flood hazard mapping for emergency action planning. There would be a direct effect on public safety and flood hazard risk reduction through the development of dam failure inundation mapping for emergency action planning and preparedness. **Estimated Annual Operational Benefits:** Major; dollar value not reported Having the data available will greatly improve the State's ability to assist dam owners and local communities in developing accurate flood hazard mapping for emergency action planning. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Provide dam failure inundation mapping service to dam owners and local communities. **Estimated Strategic Benefits:** Major There would be a direct effect on public safety and flood hazard risk reduction through the development of dam failure inundation mapping for emergency action planning and preparedness.

Program: Land Subsidence Monitoring Program	**Business Use:** 15. Sea Level Rise and Subsidence
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Land Subsidence Monitoring:** The DWR uses X-band infrared synthetic aperture radar (INSAR) data in conjunction with 10- and 30-m DEMs to monitor land subsidence. Lidar data would provide a higher quality DEM that would allow the DWR to better use the X-band INSAR in monitoring efforts. **Estimated Annual Operational Benefits:** Major; dollar value not reported The DWR currently uses X-band INSAR data along with 10- or 30-m DEM data to monitor land subsidence. Having higher quality elevation data available, such as a 2-foot (ft) DEM, would result in better use of the INSAR and more accurate subsidence data. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported A higher quality DEM would allow the DWR to provide improved land subsidence products to its stake holders and provide deformation data that would be used by engineers, hydrologists, geologists, land planners, surveyors, and geographic information system professionals. **Estimated Strategic Benefits:** Major Higher quality land subsidence products would be available to the public.

Program: Road Centerline Management and Highway Performance Monitoring System	**Business Use:** 22. Urban and Regional Planning

Quality Level: 1 2 3 4 5

Update Frequency: 6–10 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Not reported

Transportation Planning: Higher quality elevation data will improve road grade reporting accuracy, aid road safety assessments, and enhance road design efforts.

Estimated Annual Operational Benefits: Moderate; dollar value not reported
Improved elevation data would provide better profile representation of roadway data.

Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
Providing customers with more and better data for decisionmaking.

Estimated Strategic Benefits: Moderate
More timely and accurate information will be available to the public.

Program: Fisheries	**Business Use:** 2. Water Supply and Quality

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: Yes

Tide-Coordinated: No

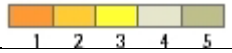
Data Outside State Needed: Not reported

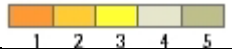
Stream Channel Analysis and Mapping: Lidar data will provide much more precise and complete stream channel characteristics for use in supporting fish habitat identification, restoration, and improvement.

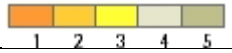
Estimated Annual Operational Benefits: Moderate; dollar value not reported
More accurate information on existing or potential fish habitat. Better data to support habitat restoration and improvement.

Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
More effective interagency planning, improvement, and restoration efforts.

Estimated Strategic Benefits: Moderate
Potential for increased or improved access to fisheries.

Program: Air Quality Division	**Business Use:** 23. Health and Human Services
 **Quality Level:**  **Update Frequency:** >10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Air Quality Modeling—Pollution Issues:** The Air Quality Division currently uses existing 10- and 30-m digital elevation model data to support air modeling analysis. More accurate and current elevation data would improve modeling and enhance the reliability of analyses. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported More accurate data can improve understanding, analysis, results, and decisionmaking based on solid information. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Customer service will be enhanced through access to more accurate information. **Estimated Strategic Benefits:** Moderate More timely and accurate information will be available to the public.

Program: Habitat Evaluation and Protection	**Business Use:** 7. Wildlife and Habitat Management
 **Quality Level:**  **Update Frequency:** 4–5 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Habitat Inventory, Improvement, and Restoration:** High-quality elevation data will help the Department of Game and Fish make more accurate assessments of site characteristics for habitat inventories, improve the ability to identify potential habitat, and more effectively plan improvement and restoration efforts. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Better models, more accurate assessments of site characteristics, better ability to identify potential habitat or make improvements. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More effective interagency planning, improvement, and restoration efforts. **Estimated Strategic Benefits:** Moderate Will improve conservation, enhancement, and restoration of Arizona's wildlife resources and habitats and provide wildlife resources for the enjoyment, appreciation, and use by present and future generations.

Program: Dam Safety	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**  **Update Frequency:** 4–5 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Inventory and Maintenance of Dams:** The Department of Game and Fish is responsible for many reservoirs in Arizona, many of which are small isolated features. Lidar data have the potential to improve their inventory of dam related features while reducing field work and travel costs for inventory efforts. They also have the potential to help make dam maintenance programs more efficient and effective and therefore enhance dam safety. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Reduced field work and travel costs, and improved inventory of facilities. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Potential for a more effective and efficient maintenance program. **Estimated Strategic Benefits:** Moderate Improved dam safety.

Local Functional Activities

County Government—Pima	
Program: FEMA Map Modernazation and Local Flood Plain Studies	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping and analysis	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Having the ability to accurately model flood hazard zones at the local level, using locally accurate elevation data. Having the ability to map areas that are not mapped by FEMA, and to supplement the FEMA flood plain data with localized mapping and analysis.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved visualization, for example, 3D, localized mapping, and analysis. The ability to map previously unmapped areas, and improve subsidence monitoring.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Better and more accurate data and better visualization through online mapping systems; for example, hillshades, better data and visualization for policy decisions.

County Government—Pima	
Program: Roadway Design and Drainage Analysis	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Road infrastructure	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Ability to more accurately evaluate design, construction, and maintenance in 3D. More accurate and effective analysis of drainage. Ability to evaluate temporal changes.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Providing customers with more and better data for decisionmaking.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Ability to provide more detailed views of proposed roadway designs, and effects of construction.

Arkansas

Over the last few years, the State of Arkansas has seen a significant increase in lidar activity due to the availability of Federal funding. With the increasing awareness of the value and benefits of lidar, there has been a growing interest in lidar acquisition. However, it is unobtainable in most cases due to the lack of funding availability.

In 2010, Arkansas completed a State strategic business plan, which included input from State and local stakeholders. Elevation was discussed at all workshops and identified as a high level data theme; however, it ranked below recurring orthophotos, statewide parcel data, political and administrative boundaries, and road data. The business plan was focused toward obtaining and maintaining sustainable funding for framework data layers from State legislators. That being the case, a statewide lidar dataset would have been unattainable in the present economic environment.

The main lidar requirement for counties is to support urban development and flood risk mapping. The State agency requirements include flood risk management, recreation, river and stream resource management, public safety, and natural resource conservation.

There have been numerous lidar projects over the past several years, covering a small portion of the State. The majority of recent projects were small in geographic area with the exception of the federally funded acquisitions that focused on entire drainage basins. However, this still leaves the majority of the State with inadequate elevation data to support critical needs, for example, the necessity for high-resolution elevation data in response to recent flood events.

State Functional Activities

<table>
<tr><td colspan="2">Program: Wildlife Management Waterfowl Program</td><td>Business Use: 1. Natural Resources Conservation</td></tr>
<tr><td rowspan="5"> 
</td><td colspan="2">Modeling of Biological and Ecological Systems</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $250,000
Time and resource savings. Enhanced ability to more accurately model the biological and ecological systems. Improved planning on green tree reservoirs, most soil units and hydrologic and habitat effects of flooding.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; $250,000
This is more of a value added benefit and it is hard to place a true dollar amount on it.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
Flood risk models and mapping would be enhanced. Regulations could be validated as appropriate.</td></tr>
<tr><td>Update Frequency: Event driven—Needs not met by a cyclic data acquisition program</td></tr>
<tr><td colspan="2">Bathymetric Data: Yes</td></tr>
<tr><td colspan="2">Tide-Coordinated: No</td></tr>
<tr><td colspan="2">Data Outside State Needed: No</td></tr>
</table>

Program: National Hydrography Dataset and Stream Bank Assessment Programs	**Business Use:** 3. River and Stream Resource Management

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Yes, should extend to the hydrologic unit boundary.

Stream Channel and Stream Bank Analysis

Estimated Annual Operational Benefits: Major; $100,000
If the entire State of Arkansas were able to receive lidar, the program's mapping efforts would be more efficient. The lidar data would help to better see the features that need studying.

Estimated Annual Customer Service Benefits: Major; $100,000
This is more of a value-added benefit, and it is hard to place a true dollar amount.

Estimated Strategic Benefits: Major
Again, if the entire State of Arkansas were able to receive lidar, the program's mapping efforts would be more efficient. The lidar data would help to better see the features that need studying.

Program: Fisheries Management Program	**Business Use:** 3. River and Stream Resource Management

Quality Level: 1 2 3 4 5

Update Frequency: Event driven—Needs not met by a cyclic data acquisition program

Bathymetric Data: Yes

Tide-Coordinated: No

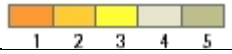
Data Outside State Needed: No

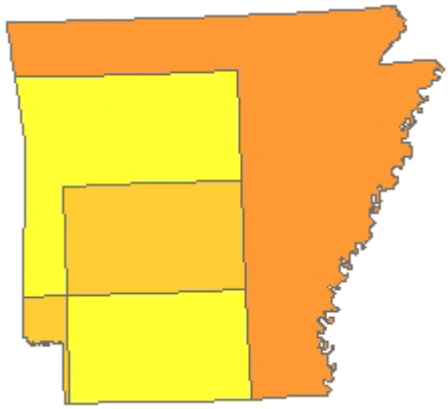
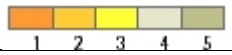
Lakes and Rivers Habitat Management

Estimated Annual Operational Benefits: Major; $50,000
A more comprehensive overview of water resources would be obtainable. Habitat management would be improved, stream bank stabilization could be identified statewide, and planning at watershed level could be achieved. Flood risk modeling and planning. Water control structure planning based on hydrology.

Estimated Annual Customer Service Benefits: Major; $50,000
Angler maps could be created for all lakes which could result in increased traffic and revenue. Time savings on production of products would be increased. Habitat improvements would result in better experience on lakes and rivers for public.

Estimated Strategic Benefits: Major
Map publications which could include underwater hazards, habitat planning at watershed level, response to point and nonpoint source pollutants, identification of critical stream bank stabilization areas. Science-based regulations. Regulations related to defining flood-prone areas and flood inundation predictions.

Program: Education and Information Program	**Business Use:** 26. Recreation
 **Quality Level:**  **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** No	**Mapping and Guides** **Estimated Annual Operational Benefits:** Major; $50,000 Ability to produce water trail maps with water depth. Ability to produce wildlife management area (WMA) and lake maps with elevation and (or) bathymetric data included. **Estimated Annual Customer Service Benefits:** Major; $50,000 Quality of products will improve with inclusion of additional features, which should improve customer experience significantly. Time savings will be realized by data being readily available as opposed to collecting on the ground. **Estimated Strategic Benefits:** Major Lake maps which will include bathymetric data will be a new product. Strategic planning and policy decisions can be made where elevation is a factor. The agency is building additional mobility impaired trails. Elevation data are critical to these types of trails.

Program: Enforcement Disaster Response Program	**Business Use:** 14. Flood Risk Management
 **Quality Level:**  **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Yes, should extend to watershed boundary.	**Flood Inundation Mapping** **Estimated Annual Operational Benefits:** Major; $25,000 This could potentially enhance the ability for emergency response during flooding events and therefore save lives and resources. **Estimated Annual Customer Service Benefits:** Major; $25,000 This is more of a value added benefit and it is hard to place a true dollar amount on it. **Estimated Strategic Benefits:** Major Flood risk models and mapping would be enhanced.

Local Functional Activities

County Government—Benton County	
Program: Urban Development	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Land development and flood risk mapping	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $5,000 Eliminated field work for preliminary design data collection. Allows users to quality control Global Positioning System (GPS) elevation values from their desktop. Allows for vertical profiles to be run for line of sight analysis. Allows for material estimates to be done for laying new pipe, or road survaces to use the z value of the terrain. Allows for more accurate water pressure calculations from points of service. Will allow for better ortho photo rectification, better hydraulic modleing, line of sight can take into account buildings and other surface features. Allows for high-resolution visualization of small drainage features when mapping storm water assets. Allows for more precise excavation volumne calculations when locating new tanks.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Give more accurate information, but very hard to place a dollar value on.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major More accurate information.
Tide-Coordinated: No	

Regional Government—Northwest Arkansas or Benton and Washington Counties	
Program: Not reported	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Data for all local, State, and Federal needs, including transportion, flood risk mapping, storm water, stream flow, and emergency response	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: Not reported	

Regional Government—Pulaski Area GIS	
Program: Pulaski Area Georaphic Information System Consortium	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Land development preliminary design	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Eliminated field work for preliminary design data collection. Allows users to quality control GPS elevation values from their desktop. Allows for vertical profiles to be run for line of sight analysis. Allows for material estimates to be done for laying new pipe, or road survaces to use the z value of the terrain. Allows for more accurate water pressure calculations from points of service. Allows for better ortho photo rectification, better hydraulic modleing, line of sight can take into account buildings and other surface features. Allows for high resolution visualization of small drainage features when mapping storm water assets. Allows for more precise excavation volume calculations when locating new tanks.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Give more accurate information.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major More accurate information.
Tide-Coordinated: Not reported	

California

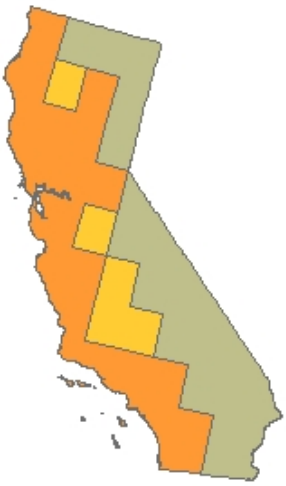
The State of California needs a variety of elevation products at different quality levels, generally coincident with several major land uses and land covers, to serve a number of functional areas. The California coastal zone was seen to have the need for the highest level of data–QL1. This is due to an ever-changing coastline, climate change, large urban populations, geological hazards, infrastructure concentration, and a wide variety of habitat and land cover to analyze. Related functional areas include flood risk mapping, climate change adaptation and modeling, urban and regional planning, and habitat inundation and restoration. The next level of quality concerns the California Central Valley, which needs QL2. The Central Valley is a very flat area with little relief that is subject to both flooding and subsidence, and land use changes that can alter the terrain. Thus a higher level of data is needed. Functional areas include flood risk mapping and assessment, urban and regional planning, wetland mapping, habitat assessment, hydrography mapping, and sea level rise modeling (some parts of the Central Valley are considered coastal). QL3 data were recommended for the remainder of the State, conforming to the scrub and woodlands along with the desert land covers. Between the vegetated (scrub and forest) and desert regions, the vegetated lands were judged to have a greater need for higher resolution elevation data. However, there were enough general statewide functional areas, such as regional planning and infrastructure, along with an increased importance on renewable energy development and utilities to warrant QL3 data for the arid regions. The scrub and forested portions of the State support numerous functional areas, such as fire hazard assessment and investigation, vegetation and forest mapping, and canopy structure and modeling. Regardless of area, State agencies frequently work in these functional areas with the cooperation and coordination of municipal, local, and regional organizations.

Several major points concerning use of elevation data, beyond the general elevation need described above need to be noted. These include elevation data used for modeling and sampling, the need for rapid data production when required, the benefits of collecting high quality imagery with lidar, and the continued use of photogrammetry for detailed infrastructure planning.

For general forest mapping and canopy modeling, a moderate elevation quality level is required. However, there is a need to obtain data samples at a higher quality level to aid in model building. When and where the samples are needed cannot be shown in the study but this occasional need for small areas of higher quality data needs to be noted. Plus the planned use of elevation data for modeling purposes rather than just mapping needs to be documented.

State agencies also need a means to gather elevation data rapidly in case of an emergency or for site-specific applications. These datasets may have a higher unit cost or a rapid turnaround time but the need is present. The California Department of Transportation determined the value of collecting imagery in conjunction with elevation so that a better record of ground features can be seen, especially in gathering higher quality elevation data. The agency will also continue to use photogrammetric methods for elevation data gathering in support of infrastructure projects even if elevation data of the highest quality level become available. The need for photogrametrically generated elevation data and their specialized application need to be taken into account.

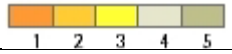
State Functional Activities

Program: Coastal Planning; Delta Levees; Agriculture and Precision Farming	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Flood Risk Mapping and Flood Assessment:** Primary flood risk mapping activities that require elevation data or for which better elevation data would improve functional activities: • identification of low lying areas vulnerable to sea level rise • information about the hydrological processes that occur at a regional scale • characterization of existing shoreline protection devices which will further assist with climate change adaptation planning • assessment of levees **Estimated Annual Operational Benefits:** Major; dollar value not reported Improved operational mapping and defensible science-based decisionmaking for planning purposes, monitoring, restoration, and protection. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved transparency, improved public safety, improved emergency response time, improved water availability, and quality. **Estimated Strategic Benefits:** Major Improved preservation of life and property.

Program: Cost Recovery; Fire Protection	**Business Use:** 16. Wildfire Management, Planning, and Response
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, buffer outside to eight-digit hydrologic unit code (HUC) watershed boundary.	**Fire Response, Fire Behavior Modeling, Post-Fire Damage Assessment and Litigation:** Primary fire-related activities that require elevation data or for which better elevation data would improve functional activities are grouped into three categories: • preburn statewide QL5: used for assessment in most areas in California (excluding the Central Valley and southeast deserts) • preburn statewide QL3: used for determining canopy, vegetation structure, developing fire behavior models (excluding the Central Valley and southeast deserts); • postburn QL1: used for structure and habitat damage assessment; remediation by response teams; litigation and cost recovery; identifying slopes likely to experience landslide or debris flows The California Department of Forestry and Fire Protection (CalFire) makes use of 1-m digital elevation data for most of the fire work currently done in the State. Event-driven collection is critical for subsequent possible loss of life and property due to landslides and debris flows in burned areas, and also for litigation/cost recovery purposes. **Estimated Annual Operational Benefits:** Major; $16,000,000 Increased successful litigation; improved postfire vulnerability assessment (landslides and debris flows) to minimize loss of life and property. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Likely increased protection of life and property. **Estimated Strategic Benefits:** Major Benefits description not reported.

Program: Ecosystem Assessment and Evaluation; Ecosystem Conservation; Coastal Planning; and Fire and Resource Assessment	**Business Use:** 4. Coastal Zone Management

Quality Level:



Update Frequency: 4–5 years

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: No

Coastal Planning and Resource Management; Sea Level Fluctuation; Climate Change Adaption; Habitat Assessment and Purchase; Effects on Oceans: Primary coastal-related activities that require elevation data or for which better elevation data would improve functional activities include:

- monitoring of marine protected areas
- improved models for climate change variability
- characterization of shoreline protection devices, which assist with climate change adaption planning
- improved models for tsunami behavior upon coastlines
- improved storm and tsunami readiness
- improved sediment movement modeling
- management of forest watersheds within coastal zones
- planning for restoration projects and fish passage improvement (coastal stream, beach, water diversions)
- revision of wetland inventory maps
- mosquito abatement programs

Some of the work identified within the coastal-focused functional activities is performed for benefit of and jointly with local coastal counties and communities, so this functional area needs further expansion into more specific local functional activities.

Estimated Annual Operational Benefits: Major; dollar value not reported
High-quality elevation data will result in more defensible sea level rise estimates and better planning decisions for coastal communities. State agencies such as the Ocean Protection Council and Coastal Conservancy have a mission-critical need to provide the best scientifically based scenarios for effects along the coast.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Improved access to tailored information products is a key ideal for the future. Improved access to public beaches and trails.

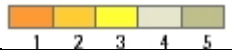
Estimated Strategic Benefits: Major
These data are needed to fuel the science, and the science in turn will help to more effectively inform the public. The State is currently working off so many rough estimations of sea level rise that, politically and socially, the process has ultimately been a disservice. More defensible science needs to be part of the sea level rise story, as well as tools needed for effective planning and decision support would be provided to local governments.

Program: Highway Design; Hydraulics; State Transportation	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Roadway, Culvert, and Bridge Design; Hydrologic Modeling; Intrastate, Interstate, and Regional Transportation Modeling and Planning:** Primary infrastructure-related activities that require elevation data or for which better elevation data would improve functional activities include: • road design and engineering • hydraulic modeling for better design of structures (bridges and culverts) to accommodate runoff and flooding from big rain events • assessment of effects of sea level rise on California's infrastructure • assessment of climate-induced ecological effects of fire, heat, and hydrologic changes • assessment of public health effects of altered hydrology, inundation, and heat • transportation planning (highway, transit, high-speed rail, rail, air) Work contained in this functional area reflects preliminary findings for regional and local functional activities and will be further expanded to include regional, county, and urban jointly performed functions. This functional area also needs further development for public utilities, telecommunications, alternative energy deployment, high speed rail initiatives, and other areas of State work. **Estimated Annual Operational Benefits:** Major; dollar value not reported Having data available for the entire State would reduce or eliminate the need to acquire and pay for such data on a project by project basis. Better hydraulic modeling. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Having elevation data available would minimally improve the ability to do pre-design work, and to design projects somewhat more quickly. **Estimated Strategic Benefits:** Moderate A statewide elevation dataset would facilitate communication and interoperability between State, regional, and local transportation organizations. This will result in time and cost savings in project planning, approval and delivery. Working from a shared common elevation dataset will foster cooperation at all levels of government. It will allow for consistent decisionmaking resulting in cohesive implementation in the areas of hydrology, storm water runoff, sea level rise and climate change, and solar policy. It will facilitate enhanced educational opportunities in K–12 and higher geospatial sciences.

Program: California Land Cover Mapping and Monitoring Program	**Business Use:** 5. Forest Resources Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, cover watersheds extending beyond State boundary.	**Forest Mapping and Vegetation Assessment:** Vegetation composition and structure mapping, forest mapping, and habitat assessment. Activities revolve around updating various vegetation mapping extents, which in turn are used to assess habitat, wildlife, and forest cover and fuel loads. Vegetation mapping is strongly tied to land use and land cover mapping (such as The National Land Cover Database) so that land cover change data could be used to guide where detailed vegetation and habitat analysis should be performed. **Estimated Annual Operational Benefits:** Major; dollar value not reported Detailed information on canopy is critical though forest and vegetation mapping covers large areas and highest point cloud densities not necessary. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Pared down cloud could help a lot for improving quality of vegetation structure mapping. Good vertical range of canopy structure is more important that digital elevation data density. **Estimated Strategic Benefits:** Major Public safety benefit of improved vegetation structure maps for fire threat could be major. Mapping of late seral and old growth might also be improved for environmental benefits. One near-future application is carbon credit modeling, where details on vegetation mass and location will be critical.

Program: Fish Passage Improvement; Delta Habitat and Conservation/ Conveyance Plan; Bay-Delta Conservation Plan; FloodSAFE	**Business Use:** 3. River and Stream Resource Management

Quality Level:



Update Frequency: Not reported

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: Yes, need data for watersheds extending into adjacent States and Mexico.

Inland Water Mapping and Stewardship: This functional area concerns general hydrographic and watershed mapping. Coastal and near-coastal hydrographies are in separate functional areas. General hydrographic mapping includes stewardship of NHD, which is being performed by several organizations now and will be more likely to join the effort. Support watershed assessments and evaluate resource management issues in riparian areas.

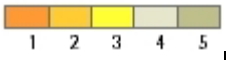
Estimated Annual Operational Benefits: Major; dollar value not reported
Elevation data already needed for watershed and hydrography work. New data will benefit watershed delineation and also location of hydrography for mapping.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Enhanced elevation data would be available to stewardship organizations at State and local levels updating the NHD. Elevation is very useful as accompanying dataset in determining changes to hydrography.

Estimated Strategic Benefits: Major
Lidar would benefit the generation of NHD line work and other alternative methods for NHD improvement.

Program: Seismic Hazards Zonation Program; Regional Geologic Mapping	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation

Quality Level:



Update Frequency: 4–5 years

Bathymetric Data: Not reported

Tide-Coordinated: Not reported

Data Outside State Needed: Yes, buffer appropriate to mapping faults or other geologic features into adjacent States and Mexico.

Geologic Mapping: Geologic applications concerning elevation fall into two groups—general geologic mapping as a base map resource and mapping and modeling of geologic and seismic hazards. General geologic mapping concerns an ongoing need to generate geologic maps across the State as needed. This also supports related applications such as stream channel analysis, water supply source, erosion control, and coastal mapping (sediments, fluvial migration, and coastal terrace elevations). Geologic and seismic hazards are primarily concerned with mapping landslides, faults, and regions affected by seismic hazards (liquefaction, earthquake-induced landslides, and tsunami inundation zones). There are also special coastal geologic hazards to consider including beach morphology studies, monitoring bluff erosion rates and probabilities of failure, and coastal fault mapping. Data are used for modeling in addition to mapping feature locations.
One major note regarding geology and elevation data concerns update frequency. While general elevation update frequency varies by application, should a major earthquake occur then new elevation data will be needed as soon as possible to help assess changes to terrain and elevations.
There are a number of geologic map products available in California though many are concentrated where population is greatest and best base map data exist. Enhanced elevation datasets will help make it easier to develop maps as needed throughout the State.

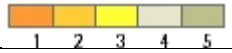
Estimated Annual Operational Benefits: Major; $50,000
For geologic mapping, elevation data provide the ability to measure some geomorphic features in the office rather than through field surveys, which saves time. It has not been cost-effective to obtain lidar data for small project areas, but a larger amount of money to purchase lidar for larger areas has not been available. Geologic project work tends to be focused on relatively small land areas dispersed across the State but most often near populated areas, forested areas, or State park lands and often related to geologic hazards or economic aspects. Improved elevation data will result in higher accuracy of erosion hazard model products.
For geologic and seismic hazard mapping, elevation data in general offer improved accuracy of landslide hazard models, the Alquist-Priolo Earthquake Fault Zone model, and tsunami inundation zone models. Uniform elevation data lead to increased uniformity of map products. Cleaner elevation data without edge effects would reduce time needed to correct artifacts, but higher resolution data may increase model processing time (net effect unknown). Higher accuracy data would greatly help support the regulatory function of the hazard zone maps. Enhanced elevation also increases uniformity in analyses for slope calculations and base map generation.

Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
More accurate erosion hazard maps are more useful to customers when making decisions about their property. Enhanced elevation would allow for these maps to be produced wherever needed. In general, higher accuracy elevation results in greater map accuracy which produces a higher confidence in product. Having a better statewide elevation base may allow State products to better match the base maps in use by different counties.

Estimated Strategic Benefits: Major
For both general geologic mapping and seismic hazards mapping, elevation allows for more accurate mapping of landslides and other geomorphic features, resulting in an increased level of public safety. Environmental benefits include more effective protection of water sources from sedimentation through more accurate predictive modeling of erosion potential. Enhanced elevation would permit more accurate mapping for project areas across the State. Better products increase interagency cooperation through increased appreciation of products from partner agencies. Enhanced elevation data would make it possible to construct more accurate tsunami hazard zone maps and new maps for areas where they currently do not exist. This would be a great benefit to public safety and to the land use and maritime planning communities. Increased interagency cooperation through increased appreciation of products from partner agencies.

Program: Strategic Growth Council Integrated Resource Planning and Decision Support	**Business Use:** 22. Urban and Regional Planning

Quality Level:



Update Frequency: 6–10 years

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Not reported

Land Use Planning: The urban and regional planning functional area includes long-term sustainable economic and environmental planning, land use planning, flood risk mapping, and climate change adaptation. In California, particular attention can be paid to the coastal region which combines a coastline that is always affected by environmental and economic change with the large urban population base. A large component of urban and regional planning is based on land use and land cover data and a major input to that is elevation. Changes in elevation, combined with a move to higher accuracy data, can signal changes affected planning decisions, especially along the coast.

Estimated Annual Operational Benefits: Major; dollar value not reported
Elevation data are used to identify low lying areas vulnerable to sea level rise. The data also provide information about the hydrological processes occurring at a regional scale. Improved elevation data are essential for assessing many effects of sea level rise on California's infrastructure, on climate-induced ecological effects of fire, heat, and hydrologic changes, and on public health effects of altered hydrology, inundation, and heat. Ideally, these new data will also characterize existing shoreline protection devices, which will further assist with climate change adaptation planning efforts.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Ideally, new data will also characterize existing shoreline protection devices, which will further assist with climate change adaptation planning.

Estimated Strategic Benefits: Major
Elevation data are critical in furthering understanding of the coastal zone and its multiple uses. Higher resolution and future elevation data will be critical in improving this understanding and providing more details for coastal change.

Local Functional Activities

County Government—Los Angeles County	
Program: LA County Enterprise GIS Program	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk and tsunami mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported The county provides elevation data to programs within the county that use it for analyses. Reduced work in the field by county staff.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Updated information would be useful to expand the analytical capabilities since existing information is in older formats. The county government has been able to develop a number of derived products (raster buildings, solar models, tree canopy models) from existing data.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major More recent information would help. Elevation data are used for flood modeling, fire fighting, and infrastructure planning.

County Government—Marin County	
Program: Community Development Agency (County of Marin); MarinMap (local agency consortium)	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Delineation of protected stream reaches	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $60,000 As of 2009, the creek mapping progress was on track to provide fair detail countywide by 2019. Now, using terrain-derived hydrologically enforced flow lines, the county is reviewing a draft of complete countywide flow lines below 1,000-square-meter (m^2) catchments (40,000 kilometers of candidate flow-line features in the 1,300-square-kilometer (km^2) county). The countywide draft has been prepared for review at a cost of about $15,000 in 4 months, a very significant time savings and a large improvement in both detail and quality. To the extent that full-waveform lidar might better refine bare-Earth surface through moderately dense tree canopy, the county should be able to position surface flow line features through important areas that are inaccessible due to private ownership. More accurate and defensible creek locations help the county to effectively enforce project setback and review requirements. Accurate creek locations that are not contested could save applicants some project costs related to topographic mapping of project and adjacent parcels.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Project applicants will be able to review online the mapped location of protected creek features in advance of a visit to the planning office. Catchments 1,000 m^2 (0.25 acre) in area have proved useful to inform analysis of proposed construction projects that might increase mud and debris flow to downhill parcels–not always in a straight line. Being able to predict the affected pathways based on surface flow can help with planning and project notification requirements. By deriving creek locations from modeled surface flow lines that are both parcel-scale precise and accurate, creek setbacks will be consistently enforceable countywide. Field visits will be reduced, and the time required to determine creek setback requirements on projects will be known as soon as the project appears, since they will have been precomputed countywide.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Urban- and rural-area creek maps that are highly detailed and accurate serve to reduce project costs and also engage public awareness of the creeks in their midst. Whether as urban flood channel, anadromous fish habitat, attractive natural feature, or recreational site, more mapped creek detail leads to more creek interaction and appreciation. Improved runoff calculations from surface flow line modeling are being used by public works engineers to inform storm drain capacity issues. Improved flood plain delineation reduces the burden on local agencies to file letters of map ammendment, revision, and change with regard to digital FIRMs, because FEMA and the local agency are sharing a common surface model when estimating inundation extent. More accurate flood plain mapping helps local agency public works directors and saves local funds.

County Government—Marin County	
Program: Community Development Agency (County of Marin); MarinMap (local agency consortium)	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Parcel slope analysis	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $35,000 For the specific activity of parcel slope, a parcel average slope (based on contour length) and parcel slope statistics (from the DEM) can be summarized countywide. For each planning occurrence where these data are used, 2 hours of staff time is saved. Improved DEM would provide minor cost savings for parcel slope usage; accurate stream location is a major improvement to mission compliance for creek protections.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported For rural areas, improved (or in many areas, first-time) lidar coverage will greatly increase the accuracy of the existing terrain model. The terrain has supported a significantly enhanced topographic base map at 1:1,200 scale that is most relevant to the parcel-centric concerns of most applicants for permits at the Community Development Agency.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Where new lidar data refines rural areas, accurate delineation of stock ponds, vernal pools, and tidal wetlands will increase the ability to protect natural resources. This is a derivative of terrain that will please both the public and the County Board of Supervisors. Local schools are pleased to see their context in detailed topographic mapping, and the public will be realizing the benefits as the new base maps are more widely released. Community planning projects use topographic base maps when considering redevelopment areas. Improved emergency planning support pleases the County Board of Supervisors.

County Government—Monterey County	
Program: Monterey Peninsula Water Management District—Mitigation Program	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Hydrologic modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Ability to define hydrologic feature and develop a compreshensive surface and subsurface model. Also useful for planning and natural resource projects.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Do not know. These data are being used for the modeling project and provide more relistic predictive forecasts and senario analyses.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Do not know. Provides an ability to leverage information with orthoimagery data collection, watershed analysis, and natural resource monitoring.

Colorado

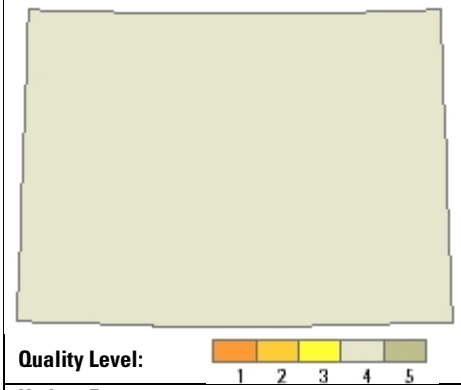
Elevation data that currently exist for the State of Colorado are used to assess wildfire risk, respond to wildfires, plan post-wildfire strategies, identify geologic hazards to life and property, conduct flood plain mapping, and conduct forest inventories. The existing elevation data have been found to be inaccurate. More accurate or enhanced elevation data exist, however, they cover a small percentage of the State, individual datasets have different accuracies, and the data are not widely available.

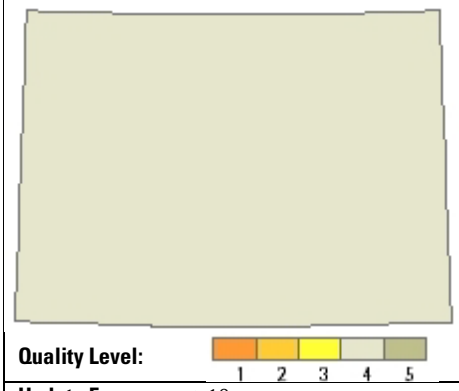
Responses to the survey are a sampling of potential requirements from the State for enhanced elevation data. Overall, State agencies indicated requirements for enhanced elevation data QL1, QL3, and QL4.

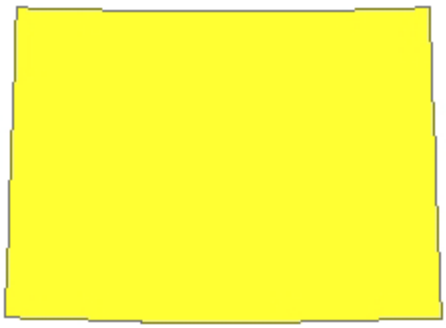
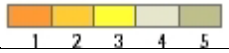
A program to acquire enhanced elevation data would reduce duplication and make data available for stakeholders at a lower cost. Such a program would also provide a mechanism or leverage capabilities to manage this difficult and resource intensive data acquisition.

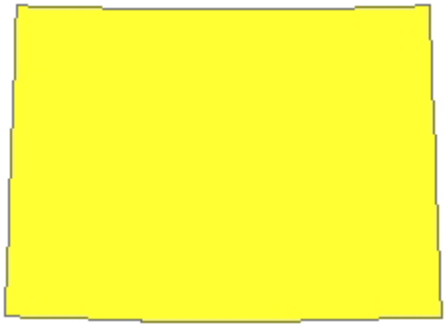
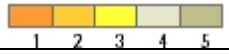
Availability of enhanced elevation data would result in more accurate flood plain mapping, reducing time and expense for forest inventories, new urban forestry analysis, improve wildfire risk assessment for public safety, improve wildfire fuels mitigation, and more cost efficient planning for road construction.

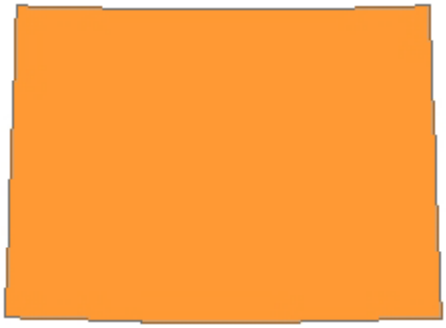
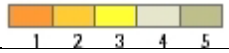
State Functional Activities

Program: Geologic Hazards	**Business Use:** 16. Wildfire Management, Planning, Response
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** >10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Post Wildfire Debris Flow Susceptibility:** **Estimated Annual Operational Benefits:** Major; dollar value not reported Topographic data and DEMs allow digital interpretation of debris flow channels and fans. The imagery exists. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported The data already exist. Topography and DEM are used to rapidly estimate the debris flow susceptibility even during a wildfire burn. **Estimated Strategic Benefits:** Major Data already exist. Being able to rapidly identify structure vulnerability to post-wildfire debris flows provides potential level of safety for structures and people. DEM also helps to plan reseeding efforts. All this ability helps local governments plan post-wildfire strategies.

Program: STATEMAP	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** >10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Geologic Mapping:** **Estimated Annual Operational Benefits:** Major; dollar value not reported Geologic mapping is placed on topographic base. The geologic contacts are draped on a DEM. Digital elevation data are available at 1:24,000 scale for the entire State of Colorado. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Topographic data are currently available for the entire State. The ability to drape geological data on a digital elevation model enables customers to better understand the geological conditions. **Estimated Strategic Benefits:** Major The data at the level selected already exist. Geologic hazards are able to be identified, thus protecting life and property for the citizenry of Colorado.

Program: Forest Stewardship and Wildfire Protection	**Business Use:** 5. Forest Resources Management
 **Quality Level:**  **Update Frequency:** >10 years **Bathymetric Data:** No **Tide-Coordinated:** No	**Forestry Tree inventory and Identification; Stand Structure; Vertical Arrangement of Vegetation; Forest Fuels Assessment and Topographic Interpretation:** The 30-m NED is not accurate in many locations. However, the 10-m is more accurate but hard to use with a slow personal computer. New lidar data would help in forest inventory, urban forestry canopy assessments and wildfire fuels mitigation. Applications would be mostly for a surface model however a nice terrain model that was highly accurate would be beneficial also. In urban forestry or wildfire, the State would potentially be spending money on a grant to acquire or interpret these data regardless. The State might be acquiring these data anyway. If a central agency already acquired it then there might be a substantial savings to the State.
	Estimated Annual Operational Benefits: Moderate; $50,000 Having data that would enhance forest inventory activities would save a lot of time and expense. It would also greatly contribute to the State's understanding of fuel loading and identification. Some if this will probably be addressed in individual grants or projects that are conducted by contractors. As stated above, some fuels assessments and wildfire risk assessments will be conducted with existing data however forest conditions are changing very quickly. So the State needs fresh data. Some of this is addressed with new projects carried out by contractors.
Data Outside State Needed: Not reported	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported New benefits might include urban forestry applications where the State traditionally has not done any broad based analyses. The State does tree inventories but those are manual. The State does a lot of outreach with a variety of people and organizations.
	Estimated Strategic Benefits: Major The potential to rework wildfire risk assessments with better quality and timely data are a critical public safety need. Using these data in urban forestry tree canopy assessments would be a new direction. This would allow the State to simply do its core mission areas better like forest inventory or wildfire risk assessment.

Program: FEMA Map modernization now known as Risk Map.	**Business Use:** 14. Flood Risk Management
 **Quality Level:**  **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Flood Risk Mapping:**
	Estimated Annual Operational Benefits: Moderate; $100,000 Topography is needed for providing new or updating hydrologic and hydraulic analyses as part of the State's flood mapping Program. If the topography is provided, consultants do not have to add it to their scope of work. In addition, the topography would only cover the project area, so it was very limited in order to keep costs down. The projects would be better planned by knowing there is topography in the area of interest. In addition, larger areas could be studied since a large portion of the budget would not have to go towards obtaining topography as part of the project.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Would allow for more accurate water surface elevation to be provided instead of approximate flood zone.
	Estimated Strategic Benefits: Moderate Local communities would benefit from having the lidar data available to them. Homeowner pays $3,000 to $5,000 for a survey to determine if their home is in flood zone. Instead, they could use elevation data to determine if their property is outside of the flood zone and therefore do not pay insurance.

Program: Department of Transportation Project Development	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**  	**Water, Sewer, and Power Line Planning and Analysis; Storm Water Modeling; Cut and Fill Analysis for Earth-Moving; Building Site:** State transportation infrastructure was not addressed as a core business use; this was not offered as a choice for either a business use or functional activity.
	Estimated Annual Operational Benefits: Major; dollar value not reported Project development is done through computer aided design software to widen roads for example. The State must design the changes to the roads. Elevation data from lidar would allow designers to be more accurate with their designs with respect to the actual surface of the Earth.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Will enhance contract bidding companies' understanding of the project scope and thus improve their cost estimates. The State needs more realistic cost estimates.
	Estimated Strategic Benefits: Moderate Could be used for environmental stewardship of right of ways.
Update Frequency: Annually	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

County Government—Mesa	
Program: GIS and Flood Administration	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $100,000 Essential to map flood waters for emergency management and law enforcement. Law enforcement uses this information to use 911 in reverse and notify potentially affected property owners of flood potential. More accurate elevation data would allow the County to build maps and better predict flood potential that would be used for public safety. Also would use it for wildfire fighting and mapping.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; $30,000 Use of elevation data increased the accuracy for mapping of flood waters and therefore improved the map.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Mesa State College uses elevation data in their hydrolics classes and mapped a major basin that is a public safety issue. The basin was analyzed and identified as a place where flash floods are likely to occur.

County Government—Park County	
Program: Park County Land Use Regulations	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Planning activites	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $100,000 The county has no elevation data to support needs required for planning activities. Currently, contour data are limited to 40- or 20-ft resolution. Ability to produce 1- to 2-ft contours would enhance planning activities for staff and citizens for construction site development. Could also be used for hazard mitigation planning and recreation planning.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Citizens (customers) would no longer need to hire a surveyor or engineer to comply with land use regulations. Citizens could use elevation data to help in the home site development process. Outdoor recreation users could have access to much improved tourism/recreation maps and data. None.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Reduced costs to developers and citizens. Better stewardship of natural resources and hazard planning and mitigation.

County Government—Pueblo County	
Program: Community Planning and Design	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Comprehensive plan development	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $50,000 Improved decisionmaking ability for large urban design projects, urban revitalization and new subdivision activity.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; $150,000 3D modeling of urban environment, viewshed mapping ability, highly accurate digital orthophotography, additional data collected that could not be collected in other ways.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major 3D modeling of urban environment, viewshed mapping ability, highly accurate digital orthophotography, additional data collected that could not be collected in other ways.

County Government—Pueblo County	
Program: Emergency Services	**Business Use:** 16. Wildfire Management, Planning, and Response
Functional Activity: Fire risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $300,000 Improved accuracy for wildfire mitigation planning, wildfire response, and wildfire recovery efforts.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; $250,000 Improved mapping within wildland urban interface.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Enhanced public safety, better environmental management practices.

County Government—Pueblo County	
Program: Geographic Information Systems	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $50,000 Flood plain mapping, flood levee certification, urban planning, subdivision processes. Flood height determination, line of sight and 3D modeling, police and special weapons and tactics teams (SWAT).
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; $40,000 Improved accuracy of data for subdivision processes for private developers, shortened engineering timeframes.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Improved accuracy and shortened engineering and construction timeframes for public utility and streambed projects.

Regional Government—San Luis Valley (6 counties)	
Program: The San Luis Valley GIS and GPS Authority	**Business Use:** 22. Urban and Regional Planning
Functional Activity: GIS and GPS services	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $50,000 Much better flood plain designation, solar site locations. Having access to this type of data for the first time.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The ability to offer that data and the various analyses; these data currently are not available.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Minor The benefits come from having the data to offer in all areas; these data are currently not available.

Regional Government—San Luis Valley GIS and GPS Authority	
Program: Not reported	**Business Use:** 5. Forest Resources Management
Functional Activity: GIS and GPS services	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Not reported ; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Not reported Benefits description not reported.

Tribal Functional Activities

Southern Ute Indian Tribe	
Program: Not reported	**Business Use:** 1. Natural Resources Conservation
Functional Activity: Erosion change detection	
Quality Level: Not reported	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Not reported.
Update Frequency: Annually	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know
Tide-Coordinated: No	Not reported.

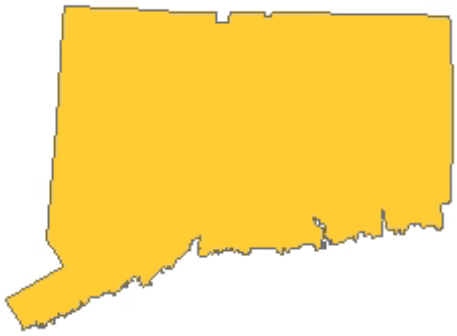
Southern Ute Indian Tribe	
Program: Department of Natural Resources, Water Resources Division Program	**Business Use:** 2. Water Supply and Quality
Functional Activity: Pine River Indian Irrigation Project water delivery and management	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Improved decisionmaking with quality data without actually going to the field.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Obtaining lidar data that is ready to use with GIS software would increase the performance and use of the product. Since lidar data have not been available before, it is hard to determine how much or how little they would actually be used.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** None
Tide-Coordinated: No	Do not know; none.

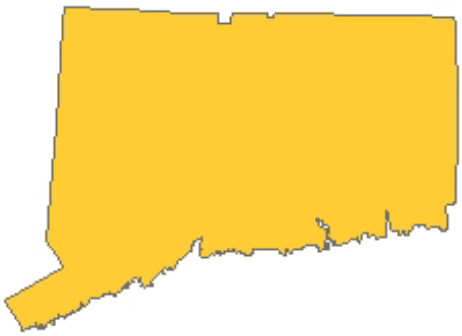
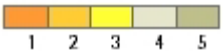
Connecticut

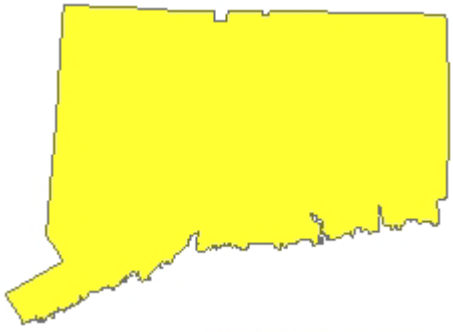
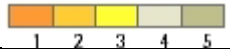
Currently, the State of Connecticut has statewide lidar coverage that was collected in 2000. The U.S. Army Corps of Engineers (USACE) collected data in 2004 along the Connecticut River flood zone. FEMA collected coastal lidar for the approximate extent of the 100-year coastal flood plain in 2006 and for the Quinnipiac River watershed during fall 2010. The Natural Resource Conservation Service collected lidar data east of the Connecticut River in fall 2010. The New England Lidar Project (NELP) has collected data for southeastern and southwestern Connecticut. The southeastern Connecticut data should be available in September 2011; however, the southwestern Connecticut area needs to be reflown this fall.

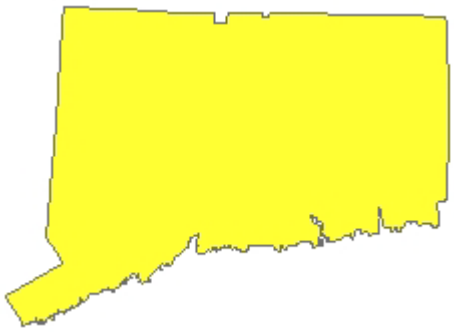
The State of Connecticut needs QL2 lidar data to include full point-cloud, digital elevation models, with and without hydro processing, and breaklines to be used for watershed and other environmental analyses including flood frequency analyses. The State also needs the ability to generate accurate digital terrain and surface models as well as accurate 2-foot contours. Also, slope and aspect data layers are necessary components of watershed analysis used to evaluate the effects of land use/land cover and climate change.

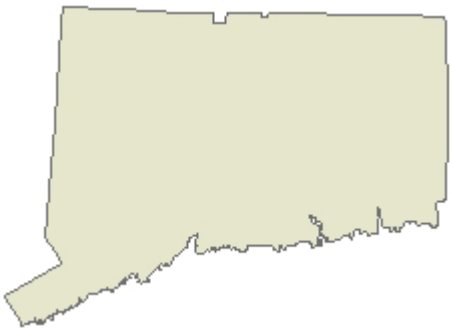
State Functional Activities

Program: Land Use and Land Cover	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Land Cover Evaluation:** Provide information, education and assistance to land use decisionmakers in support of balancing growth and natural resource protection by conducting remote sensing research, develop landscape analysis tools and training, and conduct outreach education programs. The availability of good elevation data increases the quality of the land cover products. It is hard to place a dollar benefit value to good data. **Estimated Annual Operational Benefits:** Major; dollar value not reported Addition of elevation data with spectral information could make creating and updating land cover data more efficient and faster. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Land cover, especially high resolution land cover, would be more accurate and have more detail that would increase the number of users and applications. **Estimated Strategic Benefits:** Major If enhanced land cover was available for the entire State, it would have many social and environmental benefits. Many groups use the current land cover and the user base would likely grow if this new information was available and included.

Program: Office of Long Island Sound Programs	**Business Use:** 4. Coastal Zone Management
	**Coastal Storm and Sea Level Rise Erosion/Inundation Mapping:** Coastal storm and sea level rise erosion and inundation mapping would use high accuracy topography data to generate surfaces used to base various inundation scenarios on (static sea level rise, event driven inundation). The same surfaces would be used to identify and quantify areas of erosion hazards. Utilities of such activities range from providing better hazard related data to managers and end users, extending the ability of planners to assess longer term effects of natural processes, and to better define and develop local and regional sediment management plans for the State. Regarding the hydroflattening and enforcing question, Connecticut would prefer the approach that retains high-level details under coastal waters recently developed for the USGS northeast lidar project.
	Estimated Annual Operational Benefits: Moderate; $80,000 (assumes 2 percent cost savings based on overall program budget) Ability to address project level issues relating to coastal hazard analysis, monitoring, mapping, and modeling; ability to perform advanced site level assessment remotely. Ability to reduce additional aspects of field work by using remote sensing data.
Quality Level: 	**Estimated Annual Customer Service Benefits:** Major; $3,500,000 (assumes a 2:1 to 4:1 benefit-to-cost ratio based on State of Nebraska analysis using collection costs of $1.15 million for Connecticut coastal areas (approximately 950 square miles at $125 per square mile)) Ability to provide project level data relating to coastal hazard analysis, monitoring, mapping, and modeling to organizations that need it but could not otherwise afford it. Ability to address project level issues relating to coastal hazard analysis, monitoring, mapping, and modeling.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Capturing data that could extend to the approximate limit of the localized drainage basins would be beneficial to hydrologic modeling. This includes the small area of the Connecticut watersheds in Canada.	**Estimated Strategic Benefits:** Moderate Higher degrees of flood plain management and coastal hazard assessments, both of which address benefits to the environment and public safety. Additionally the ability to share or provide more accurate and better resolution products to other organizations provides a measure of strategic political benefit.

Program: University Extension Forestry—Forest Stewardship	**Business Use:** 5. Forest Resources Management
	**Management Plans and Prioritization of Resources**
	Estimated Annual Operational Benefits: Major; dollar value not reported Allow for more localized analysis for smaller areas, such as landowners. Current data are more appropriate at the regional level.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Improved data allows for higher quality results at the local level leading to better management of forested properties.
Quality Level: 	**Estimated Strategic Benefits:** Major Vast improvement in analysis at the local level focusing on land owners of forested property.
Update Frequency: 4–5 years	
Bathymetric Data: Not reported	
Tide-Coordinated: Not reported	
Data Outside State Needed: Not reported	

Program: Environmental Protection	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5	**Geologic Resource Mapping:** The availability of accurate elevation data are critical for most environmental applications and decisions that result from them. However, calculation of an accurate dollar benefit is very difficult.
	Estimated Annual Operational Benefits: Major; dollar value not reported Better resolution of geologic mapping issues, research needs, scientific publications, and educational products.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Enhancements to mapping capabilities, products, land management reviews, and resource estimates.
	Estimated Strategic Benefits: Major Better collaboration with neighboring States on joint hazards and environmental projects.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: Not reported	
Data Outside State Needed: Not reported	

Program: Geographic Information Systems Unit	**Business Use:** 27. Telecommunications
 **Quality Level:** 1 2 3 4 5	**Exclusive Jurisdiction Over the Siting of Power Facilities, Transmission Lines, Hazardous Waste Facilities and Telecommunication Sites Within the State of Connecticut**
	Estimated Annual Operational Benefits: Moderate; $5,000 Could be used to produce more accurate telecommunications coverage modeling for cities and towns throughout the State.
	Estimated Annual Customer Service Benefits: Minor; $10,000 A more accurate and comprehensive product delivered on a timely basis.
	Estimated Strategic Benefits: Minor; There are always benefits to enhanced capabilities for accuracy within the State's siting work.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

<table>
<tr><td colspan="2">City Government—Town of Newington</td></tr>
<tr><td>Program: Planning, Zoning, and Community Development</td><td>Business Use: 1. Natural Resources Conservation</td></tr>
<tr><td colspan="2">Functional Activity: Steep slope analysis</td></tr>
<tr><td>Quality Level: QL2 elevation data from lidar</td><td>Estimated Annual Operational Benefits: Major; dollar value not reported
The elevation data allow the city to evaluate land that would be suitable for developement, increasing the overall town fiscal assets. It eliminates the need to spend time on general data collection, and increases the accuracy of the data used for evaluation and analysis. An increase in accuracy and updated currency of the elevation data through lidar would add a level of substantiation to claims based on the analysis of those data.</td></tr>
<tr><td>Update Frequency: 4–5 years</td><td>Estimated Annual Customer Service Benefits: Major; dollar value not reported
The new data would raise the accuracy of existing elevation mapping and allow for a more accurate product overall. This increase in accuracy would have benefit to the applicant in community development proposals. It would also allow the town planner to make decisions with more supporting data. Currently, maps are developed and concerns are addressed with existing elevation data. This is done with a caveat that the analysis is only as good as the data used. The data used are a few years old and have not been adjusted for changes that have occurred.</td></tr>
<tr><td>Bathymetric Data: Not reported</td><td rowspan="2">Estimated Strategic Benefits: Major
It is difficult to evaluate relative to the program budget, as a return on investment in this area is difficult to document. The environmental benefits from the use of good elevation data are significant. The current zoning regulations stipulate that no structure or development can take place in an area of greater than 15 percent slope. This helps to prevent drainage issues, washouts, and landslides.</td></tr>
<tr><td>Tide-Coordinated: Not reported</td></tr>
</table>

Reference Cited

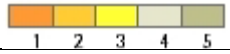
New England Chapter of the Urban and Regional Information Systems Association, [undated], Overview of the northeast lidar project webinar: New England Chapter of the Urban and Regional Information Systems Association, accessed April 4, 2012, at http://www.neurisa.org/NE_lidar_Project.

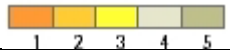
Delaware

The most active and continuous elevation activity in the State of Delaware takes place in the Department of Natural Resources and Environmental Control (DNREC), the State agency responsible for enacting FEMA flood studies and understanding sea level rise effects on coastline and coastal habitats. The DNREC was not one of the respondents to this survey, but the DNREC is most likely the most intense user of lidar data in the State. The Delaware Department of Transportation's use of lidar is expected to increase dramatically during the next 3 to 5 years. The State does not have lidar point-cloud data (.las data), which is their most pressing need at present. The data for Sussex County exist, but in the experimental advanced airborne research lidar Airborne Lidar Processing System data format. The data could be processed to ASCII points at least. The DNREC could use the point cloud to model vegetation and habitat especially. Other parts of State Government would benefit from infrastructure extraction. Point-cloud data were not a deliverable for Kent or New Castle Counties either, because the agency most vocal for deliverable data was the Delaware Geological Survey, which had wanted statewide 2-ft contours; 2-ft contours from lidar exist statewide and are downloadable from the Delaware Data Mapping and Integration Laboratory.

State Functional Activities

<table>
<tr><td colspan="2">Program: Sediment and Stormwater Program</td><td>Business Use: 3. River and Stream Resource Management</td></tr>
<tr><td rowspan="5"> 
Quality Level: 1 2 3 4 5
Update Frequency: 6–10 years
Bathymetric Data: Yes
Tide-Coordinated: No
Data Outside State Needed: No</td><td colspan="2">Hydrologic and Hydraulic Modeling for Storm Water Management Regulatory Compliance: The Delaware Department of Transportation uses lidar data to monitor and model total daily maximum loads of road runoff into streams, rivers, and ditches.</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $150,000
Modeling storm water runoff from desktop instead of site survey will be more efficient and reproducable. Identifying and analyzing changes in conditions are improved in watershed effects.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
Communicating results to local communities, residents, and regulators will be easier.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
High-resolution elevation data will help residents visuize the issue, and help with environmental compliance of storm water and sediment loading from roadways.</td></tr>
<tr><td colspan="2"></td></tr>
</table>

Program: Geologic Mapping	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 	**Geologic Mapping:** Mapping coastal change and coastal resources is key for the tourism based economy especially in Sussex County.
	Estimated Annual Operational Benefits: Moderate; $5,000 Updated contours have been excellent to add to new geologic mapping products.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Citizens occasionally ask for contour data to check elevation above sea level or flood plain.
	Estimated Strategic Benefits: Moderate As inundation events increase in frequency and extent, a need for better, or more recent data will be considered.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: No	

Program: Aviation Navigation and Safety	**Business Use:** 20. Aviation Navigation and Safety
 **Quality Level:** 	**Aviation Hazards and Safety for Commercial and Private Airstrips:** Leaf-on lidar data are strongly preferred.
	Estimated Annual Operational Benefits: Do not know; dollar value not reported The use of lidar data for this application is too new to assess the value at this time.
	Estimated Annual Customer Service Benefits: Minor; dollar value not reported Improved updating of aeronautical charts, higher safety margins for civil and commercial aviation at and around low-level flight operations.
	Estimated Strategic Benefits: Do not know Potential is high to identify existing or future hazards to air safety.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Florida

As a low-lying coastal State with a population that ranks fourth in the Nation, Florida has a critical requirement for current and accurate high-resolution topographic and bathymetric elevation data. Priority applications for this fundamental geospatial data layer include natural systems management, infrastructure development, and emergency response programs.

The State's five water management districts and the Florida Department of Environmental Protection require high-accuracy, lidar-derived elevation datasets to support fresh water quality and quantity programs, which have a direct affect on Florida's almost 19 million resident population. The Florida Department of Transportation relies on precise ground surface and structure measurements derived from lidar to meet mounting demands associated with transportation network expansion. Given its unique location, Florida is extremely vulnerable to the devastating effects of seasonal hurricanes tracking across both the Atlantic Ocean and warm waters of the Gulf of Mexico. In preparation for the next inevitable severe weather disaster, the Florida Division of Emergency Management recently completed a statewide project to collect coastal lidar data in support of storm surge modeling and evacuation route planning.

While lidar coverage now exists for approximately 65 percent of Florida, improved standardization associated with fundamental product characteristics, such as accuracy and data format, would better enable the State to leverage its investment in this critical geospatial dataset. Florida supports a national enhanced elevation program to better meet the increasing demand for current and accurate elevation data.

State Functional Activities

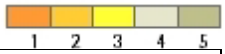
<table>
<tr><td colspan="2">Program: Comprehensive Everglades Restoration Program, Natural Estuary Conservation Program, Florida Department of Transportation Mitigation Program, Upper St. Johns River Restoration Program</td><td>Business Use: 1. Natural Resources Conservation</td></tr>
<tr><td rowspan="4"> 
Quality Level: 1 2 3 4 5
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program
Bathymetric Data: Yes
Tide-Coordinated: Yes
Data Outside State Needed: No</td><td colspan="2">Natural Systems Conservation/Restoration: This includes assessment, inventory and restoration of the State's river and wetland systems.</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $3,400,000
Increased quality of modeling and analysis are achieved by having high accuracy topographic information derived from lidar. Increased ability to identify the extent of hydrologic alteration in areas of dense canopy allow improved estimation of project scope and costs. In some remote areas lidar is the only feasible option for obtaining high-accuracy surface elevation data.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; dollar value not reported
Customer benefits have been identified for the Florida Department of Transportation as it pertains to their habitat restoration activities. The availability of lidar data has facilitated efficient identification of natural resource conservation and restoration opportunities and requirements. Customer benefits also include expansion of improved recreational opportunities within the State.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
Protection of natural environments that are important for water resource management activities; improved water quality; increased habitat for game and non-game wildlife; increased opportunities for cooperative environmental education ventures with elementary and secondary schools to areas where data are not currently available.</td></tr>
</table>

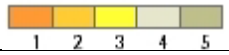
Program: State Mandated Water Supply Planning, Central Florida Coordination Area	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Protection of Surface and Groundwater Supplies:** Includes planning and modeling activities associated with identifying and protecting surface and groundwater supplies and sources. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Approximately 90 percent of the statewide water supply is derived from groundwater. The primary benefits of lidar-derived elevation data are associated with construction of reservoirs for surface water supplies and evacuation planning activities in the event of a reservoir failure. The lidar data also supports development of integrated ground and surface water models used to identify effects to aquifers from pumping as well as water distribution systems. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Current and accurate high-resolution elevation data directly contributes to programs designed to ensure a sustainable water supply which the public can depend upon. **Estimated Strategic Benefits:** Moderate The ability to more accurately model water use and ensure sustainability of supplies.

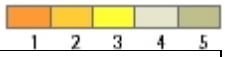
Program: Surveying and Mapping in support of Transportation Infrastructure Development	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Transportation Design, Construction, and Maintenance:** This includes the use of lidar point cloud as well as derived digital surface models (DSMs) and digital terrain models (DTMs) for planning and construction of roads, overpasses, bridges, and other transportation features. **Estimated Annual Operational Benefits:** Major; $500,000 Use of high accuracy elevation data derived from lidar results in improved intermodal planning, safety and management of statewide resources. Reduction in on-site field survey activities results in significant operational cost savings. **Estimated Annual Customer Service Benefits:** Major; $150,000 The availability of current and accurate statewide vertical dataset would significantly improve quality of agency products and services to the citizens of Florida in terms of timely project completion at a reduced cost to the taxpayer. **Estimated Strategic Benefits:** Moderate Enhanced public safety and efforts to minimize negative effects of construction projects in and around environmentally sensitive areas are strategic goals supported by readily available high accuracy lidar-derived elevation datasets.

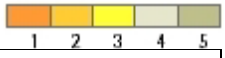
Program: Environmental Resource Permitting	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Soils and Wetland Conservation:** The Environmental Resource Permit (ERP) Program regulates activities involving the alteration of surface water flows. This includes new activities in uplands that generate storm water runoff from construction, as well as dredging and filling in wetlands and other surface waters. Enhanced elevation data facilitates the ERP Program's soils and wetland conservation by improving the accuracy and precision of wetland delineations. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Lidar-derived enhanced elevation datasets would allow the ERP Program to more accurately establish elevations for the seasonal high of a wetland or mean or ordinary high of a surface water, which could in turn be used to better map the landward extent of the system, determine the historic elevation of a wetland before events, or what it should be when restored and to better track sheet flow across an area. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Lidar-derived elevation datasets improve the ERP Program's ability to evaluate the effect of a proposed project on uplands and wetlands and communicate this to permit seekers. This will result in the expediting of the permitting process and serves the public in that it helps to assure that lands are either protected or allowed to be used for appropriate purposes according to a correct wetland or upland classification. **Estimated Strategic Benefits:** Moderate Through improved wetland delineations, the availability of an enhanced elevationdataset products will limit, indicate the need for mitigation or prevent unwantedenvironmental effects of projects that alter the terrain and (or) wetlands.

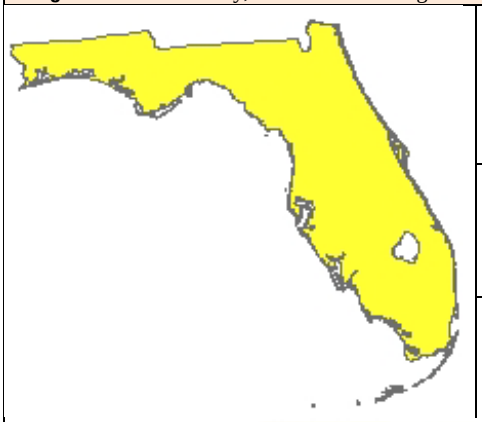
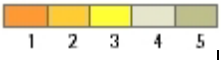
Program: Federal and State TMDL Program	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** HUCs that are hydrologically connected to Florida in Alabama and Georgia	**Hydrologic Modeling of Surface Waters for TMDL Purposes:** The use of high-accuracy lidar-derived elevation datasets will improve implementation of Florida's TMDL Program by providing more resolute elevation data for pollutant loading models than currently exist for large gradually sloped areas and and by supporting decisions aimed at collectively and effectively reducing pollution. **Estimated Annual Operational Benefits:** Major; $33,000 Lidar enhanced elevation data will permit a greater degree of precision in the development of pollutant loading models. It will permit model inputs to be developed more quickly and accurately. This results in a faster completion of model runs with an elevated confidence level in the outcomes. Improved bathymetric and stream cross section information will allow many expensive field based activities to be performed in the office in addition to improving model accuracy. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Basin management action plans (BMAP) are "blueprints" designed to reduce pollutant loadings to meet allowable limits established in a TMDL. These plans are developed with local stakeholders and successful outcomes resulting from implementation of these plans rely upon stakeholder input and commitment. Stakeholder confidence in the accuracy of data sources and model outputs is key in solidifying their commitment. Use of lidar enhanced elevation data improves the State of Florida's ability to assess the effectiveness of remediation projects, which then contributes to lower implementation costs, greater stakeholder confidence and an improved overall commitment to collectively reducing pollution and serving public health and safety. **Estimated Strategic Benefits:** Major The use of high-accuracy lidar-derived elevation datasets improves the TMDL Program's ability to meet requirements of the Federal Water Pollution Control Act and the Florida Constitution, and in doing so, allows Florida's waters to more readily meet their intended designated uses (potable water supplies, aquatic life support, recreational, and other uses).

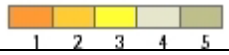
Program: Emergency Management	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 	**Landform Evaluation to Support Disaster Response:** Lidar-derived elevation data improves support efforts to predict and reduce risk and respond to damage resulting from natural and anthropogenic hazards that threaten life and property in the State, including but not limited to the following: floods, hurricanes and coastal storms, severe storms and tornadoes, wildfire, erosion, dam and levee failures, sinkholes, seismic events, and tsunamis.
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Lidar-derived elevation data allows emergency management staff to produce regional evacuation study recommendations, which more closely match real world phenomena. Study recommendations may be improved in that they rely upon analyses which benefit from the creation of grid rasters with a more detailed horizontal pixel resolution than currently exist for a large portion of the State. This is important in determining which critical facilities might be harmed by hazards, population clearance times in advance of predicted events like hurricanes, and demographic analyses that indicate what resources need be provided to support citizens.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Lidar-derived elevation data will improve the accuracy of community vulnerability study recommendations by providing local and State emergency management officials data that more realistically and currently models real world conditions. Lidar-derived elevation data facilitates the effective and efficient distribution of resources in response to natural and other public disasters. This reduces waste and alleviates risks to human health and safety.
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: No	**Estimated Strategic Benefits:** Moderate Lidar-derived elevation data enhances emergency responder's ability to protect citizens and provide for thier needs.

Program: Fish and Wildlife Conservation	**Business Use:** 15. Sea Level Rise and Subsidence
 **Quality Level:** 	**Scientific Support of Fish and Wildlife and their Habitats** This includes assessment, inventory, and management of fish and wildlife habitats with a focus on model species distribution and habitat change over time and space
	Estimated Annual Operational Benefits: Major; dollar value not reported Many species and habitats of interest are elevation dependent and reside within low-lying coastal areas sensitive to changes in sea level. Elevation data enhances ability to accurately measure and model effects of changes in sea level as it pertains to sensitive wildlife habitats.
Update Frequency: >10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Better support public education and tourism through improvement of fish and wildlife conservation programs.
Bathymetric Data: Yes	
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Current and accurate lidar-derived elevation data supports improved models for forecast, emergency response, and essential habitat management.
Data Outside State Needed: Not reported	

Program: Geologic and Hydrogeologic Investigations	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 	**Geologic Mapping and Karst Evaluation:** High-accuracy lidar-derived elevation data supports the establishment of a geologic framework through detailed mapping of areas determined to be vital to the economic, societal, and (or) scientific welfare of Florida. Geologic mapping is a fundamental activity of the Florida Geologic Survey (FGS) and support many land-use decisions. Florida's low topographic relief makes it all the more necessary to have accurate elevation data
	Estimated Annual Operational Benefits: Major; $10,000 Accurate digital elevation data allow more accurate geological maps to be created especially in Florida where topography is limited. The FGS continues to produce geological cartographic products that will require the mapping of features that can only be resolved through the use of higher accuracy lidar-derived elevation data.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Coastal geologic and bathymetric mapping will be a critical component of Florida's future due to the potential threat of sea level rise. Accurate elevation maps can also help with hurricane damage mitigation. Highly accurate geologic maps are valued products that the FGS produces. They support many other State agency and private company missions. Environmental resource protection and public outreach and education are both greatly enhanced by having accurate elevation data.
Update Frequency: 2–3 years	
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major Florida's karst regions and coastal areas are vulnerable to hurricane activity and sinkhole development. It is of great benefit to society to show the distribution of these vulnerable areas and construct probability maps showing where land areas have the highest probability of effects due to natural processes With these data more accurate geologic maps can be created and more types of maps, in addition to surficial bedrock geology, can be constructed. With accurate elevation data the State can construct vulnerability maps for karst areas and for drinking water aquifers.
Tide-Coordinated: Yes	
Data Outside State Needed: Yes, at least 50 miles into Georgia and Alabama	

Program: Regional Evacuation studies, water management operations	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 	**Hydologic and Hydraulic Modeling, Flood Control Operations, and Storm Surge Analysis:** With the availability of current and more accurate lidar-derived elevation data the Florida Division of Emergency Management (FDEM) can continue to revise storm surge models as erosional and depositional and land-use changes occur. Florida's Water Management Districts (WMDs), particularly those in the very large flat portions of the peninsula, rely on accurate and highly precise elevation data to effectively plan and execute flood control activities through hydrologic modeling efforts.
	Estimated Annual Operational Benefits: Major; dollar value not reported Sea, lake, and overland surges from hurricanes (SLOSH) GIS models run by the FDEM rely on topographic data as input layers to create accurate elevation grid cells which are in turn used to derive depth of storm surge over land surfaces. Lidar-derived DEMs may be used to improve the resolution and currency of SLOSH model outputs.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Lidar-derived higher accuracy elevation datasets benefit communities, which are required to obtain flood insurance. Benefits include lowered rates for citizens and businesses who are living or work in areas which have been erroneously classified as being within flood zones. Benefits to WMDs include model output scenarios, which more closely match real-world hydrologic conditions, improving the ability to more effectively store water in drought conditions and move water through pumping, and other control activities in advance of predicted storms.
Update Frequency: 2–3 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: No	**Estimated Strategic Benefits:** Major High-accuracy lidar-derived elevation datasets will be used in the protection of property and lives, in the determination of lowered costs to citizens associated with property and elevation surveys required for flood insurance purposes, and for future planning to avoid development in flood prone areas. Extension of these benefits to a broader geographic area.

Program: Urban Forestry, State Lands management, Wildfire Mitigation	**Business Use:** 16. Wildfire Management, Planning, Response
 **Quality Level:** 	**Canopy Closure, Canopy Base Height, and Fuels:** Estimates of surface fuels and canopy closure are important variables in complex wildfire behavior models and provides information that assists in the restoration of wetlands in State lands and urban forestry effect studies. Enhanced elevation information improves the Department of Agriculture and Consumer Services (DACS) ability to correctly respond to wildfires and improve the siting of trees in urban areas.
	Estimated Annual Operational Benefits: Major; $1,280,000 Canopy and fuel volume information are variables used in fire behavior models. Lidar-based elevation products, specifically point cloud datasets and bare-Earth models, will allow analysts to estimate this information more accurately and with a higher degree of confidence.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Urban forests are important in flood control programs, reducing utilities consumed and other community related activities. Enhanced lidar-derived data leads to higher detailed and improved effect and planning studies. Improving the siting of forest resources in urban planning activities leads to reductions in utility costs for individual citizens and communities. Accurate wildfire models reduce the loss of life and property.
Update Frequency: 4–5 years	**Estimated Strategic Benefits:** Moderate Lidar based elevation products will improve DACS wildfire and flood prediction and control operations. This will enhance the ability of the DACS to meet its mission of protecting citizens and property.
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Yes, at least 50 miles in Alabama and Georgia	

Program: Public Lands Archaeology	**Business Use:** 13. Cultural Resources Preservation and Management
 **Quality Level:** 	**State Lands Archaeological Evaluations and Site Preservation:** Archeological evaluations and preservation programs rely on lidar processed to bare-Earth data as a key data source in determining site locations. The greater the accuracy of the lidar, the better the chances for accurate site identification; 3-ft or coarser resolution data cannot be used except for very large archaeological sites.
	Estimated Annual Operational Benefits: Major; dollar value not reported High-resolution lidar bare-Earth data allow the State to locate archaeological targets of significance. Subsequent field ground truth activities have been shown to yield a site identification accuracy exceeding 95 percent at this point. The type of sites being identified are prehistoric middens and mounds as well as historic earthworks, stone structures, and other features hidden under tree canopy.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Customers that would benefit include all State agencies that are responsible for managing resources on Florida lands as well as the general public. Lidar greatly facilitates cost-effective survey and assessment of a State property that has never been surveyed though traditional land management.
Update Frequency: >10 years	**Estimated Strategic Benefits:** Major With high-resolution lidar, the State can more accurately and efficiently locate and understand the cultural resources, providing significant opportunities for public education, strategic site preservation needs, and in some cases, State park creation.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Lidar	

Local Functional Activities

County Government—Leon County, City of Tallahassee	
Program: Local Government GIS Analysis	**Business Use:** 14. Flood Risk Management
Functional Activity: Multidisciplinary topographic analysis	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Current, high-detail, high accuracy elevation data provided many benefits from elevation determination, drainage delineation, hydrologic analysis, to aquifer vulnerability. Detailed topography for all areas contributing drainage to Leon County would improve drainage analysis and flood simulation capabilities.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The ability to map regional watersheds would improve hydrologic analysis capabilities. Due to the heavy vegetation landcover, lidar has provided the best terrain mapping solution for this region.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Public safety enhanced as a result of more accurate flood plain maps, flood control. Enhanced ability to manage public water supply resources.

County Government—Volusia	
Program: Drainage Task Team—Stormwater Management Program	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Allows the county to better manage the flow of water during and immediately after a rainfall. Elevation data derived from lidar is used reduce flooding, to control pollutant runoff and assit with planning for future development. Volusia has improved the quality of information for the maintained storm water assets, including 173 miles of canals, 450 miles of roadside ditches, more than 11,800 drainage structures, 66 miles of storm and sewer pipe, 424 retention areas. Recently received hurricane storm surge data will be supplemented with updated FIRM data both generated in part from lidar data acquision and will greatly enhance storm water planning and management as well as supporting emergency management applications.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported These data will continue to be employed for storm water planning and mitigation, primarily in regard to storm water infrastructure, for example, canals, ditches, and retention areas, and provide managers the ability to quickly create crossections of these assets for analysis. The lidar product acquired and paid for by Volusia County Public Works in 2006–2007 has been widely employed not just by the storm water management program, but by multiple county departments. The same data have also been provided at no charge and are used extensively by the local surveying and engineering community. The data have also been used by regional and State agencies to further their own programs.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Provides the ability to monitor landform changes over time to better serve the public use requirements. Further, improved data handling tools and improvements in local expertise in employing this type of data will open a range of additional benifits as the data are compared to other GIS datasets. A variety of green initiatives have been discussed (solar and wind) but as yet have not been acted upon locally. These data have been used to confirm or replace historic data regarding runoff models, by the local engineering community to reduce costs or as a preliminary resource before conducting detailed surveys, as evidence in court cases regarding runoff, including local flooding, and benefited the environmental community in regards to monitoring pollutant runoff.

Georgia

The State of Georgia has an area of 59,425 square miles (159,909 km^2). It embraces parts of varying physiographic regions, including the Appalachian Blue Ridge Mountains in the north, the central Piedmont, and the extensive continental coastal plains. The U.S. census for 2010 reported 9,687,653 residents, making Georgia the ninth most populous State. The U.S. Census Bureau ranked it eighth in population projections, growing by 46.8 percent from 2000 to 2030, to more than 12 million residents.

The State's administrative division into 159 counties and 535 cities is a particular challenge for the coordination of interagency projects to compile statewide geospatial data. Even so, during recent decades, the State has been a particularly active partner in various Federal mapping initiatives.

In 1995, Georgia's GIS Coordinating Committee (GISCC), now the State's longest standing interagency technical body on the subject, identified several core base maps for development and set about the work in partnership with the State's university system and several Federal agencies. Georgia was one of the first States to acquire complete coverage under the National Digital Orthophoto Program, which immediately supported 1:24,000-scale digital line graph prototype projects for transportation and hydrography. Georgia was one of the first States to complete its digital National Wetlands Inventory. These rich framework layers proved indispensable to the State's early participation in the U.S. Census Bureau's Master Address File (MAF)/Topologically Integrated Geographic Encoding and Reference (TIGER) Accuracy Improvement Project, which in conjunction with its long-standing support of the U.S. Census Bureau's Annual Boundary and Annexation Survey and near complete local government participation in the decennial Local Update of Census Addresses Program, has provided some of the most accurate census maps in the Nation. Georgia has also actively contributed to the National Geospatial-Intelligence Agency's (NGA) Homeland Security Infrastructure Program maps. Although the GISCC had identified improved elevation data as one of the critically needed core base maps, it remains to date the single such identified layer with which the State has made the least progress to completion.

During 2010, a legislatively created Georgia Geospatial Advisory Council conducted a statewide survey of assets and needs. In its 2011 report to the State legislature, statewide lidar acquisition to provide enhanced elevation data for detailed flood studies was identified as one the State's principal needs. However, to date, lidar data have been collected in only 55 of Georgia's 159 counties. During 2011, the GISCC formed the Technical Working Group for Enhanced Elevation, which is developing statewide program of education, promotion, and support for a multiyear interagency contracting mechanism to acquire aerial photography and lidar. This is the first statewide effort in Georgia to coordinate the local acquisition and standards for these geospatial products. Hopefully these alignments between local acquisition efforts with similar State and federal requirements and resources will provide mutual value in lower project costs and improved standard products to all partners.

State Functional Activities

Program: Watershed Protection	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5	**Watershed Delineation, Reservoir Siting**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported Not sure what the time and cost benefits would be but the improved mission compliance would greatly benefit from more accurate and defensible source data.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Minor; dollar value not reported Customer service benefits would improve.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Environmental and political benefits would be affected in that the State would have much more accurate and defensible source data. Public safety in relation to environmental emergencies would greatly benefit public safety.
Data Outside State Needed: Yes	

Program: Georgia Department of Transportation Survey Team	**Business Use:** 13. Cultural Resources Preservation and Management
 **Quality Level:** 1 2 3 4 5	**Cultural Resource Mapping**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported As technology is advanced and incorporated into the overall Georgia Department of Transportation (GDOT) business practice, then operational benefits are anticipated to further increase.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Making data a standard operating procedure will streamline the transportation planning process.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Savings in taxpayer dollars will be realized with better data and a streamlined transportation planning process.
Data Outside State Needed: Not reported	

Program: Georgia Southern University, Department of Sociology and Anthropology	**Business Use:** 13. Cultural Resources Preservation and Management

Quality Level: 1 2 3 4 5

Update Frequency: >10 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Not reported

Archaeological Site Recordation and Preservation

Estimated Annual Operational Benefits: Not reported; dollar value not reported
Benefits description not reported.

Estimated Annual Customer Service Benefits: Not reported; dollar value not reported
Benefits description not reported.

Estimated Strategic Benefits: Not reported
Benefits description not reported.

Program: Comprehensive Planning	**Business Use:** 22. Urban and Regional Planning

Quality Level: 1 2 3 4 5

Update Frequency: Event driven—Needs not met by a cyclic data acquisition program

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Yes

Comprehensive Planning

Estimated Annual Operational Benefits: Major; dollar value not reported
Better planning, protection and enforcement of planning rules with respect to protected mountain areas, wetlands, protected river corridors.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Better planning, protection and enforcement of planning rules with respect to protected mountain areas, wetlands, protected river corridors.

Estimated Strategic Benefits: Major
Better planning, protection and enforcement of planning rules with respect to protected mountain areas, wetlands, protected river corridors, better flood plain management.

Local Functional Activities

City Government—City of Savannah	
Program: Not reported	**Business Use:** 14. Flood Risk Management
Functional Activity: Provide eductional outreach information to citizens calling for flood plain information	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: No	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: No	

County Government—Bibb County	
Program: Local Government	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Not reported	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: No	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: No	

County Government—Newton County	
Program: Watershed and Water Resource Management	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Whole watersheds need to be modeled and analyzed for effect. Data credibility is key. Engineering acceptance and data availability speed compliance.
Bathymetric Data: No	**Estimated Strategic Benefits:** Major Unknown but necessary. Assisting community with flood plain management issues. Resource sharing and planning with neighboring communities. Coordination of "greenspace" requirements and flood plain management.
Tide-Coordinated: No	

Regional Government—Atlanta Regional Commission	
Program: Regional planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Aging, environmental, transportation and geographic support for local constituents	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; Dollar value not reported Benefits description not reported.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: No	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: No	

Hawaii

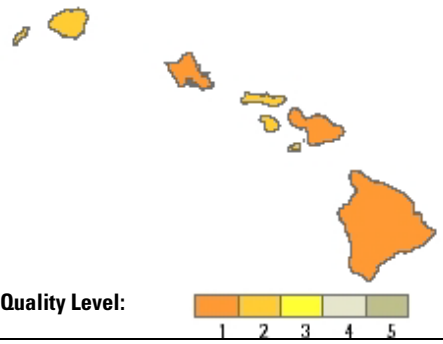
Hawaii is unique among the States by being the only tropical and completely island State. There are eight main Hawaiian Islands, divided up into five counties. The capitol and population center is Honolulu on the Island of Oahu. Hawaii's 2010 total State population of 1.36 million increased by 12 percent from 2000. It has a land mass of 16,637 km^2.

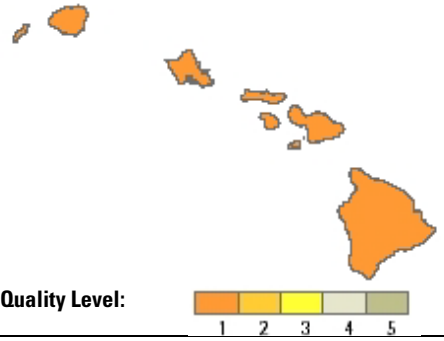
While a small sized State, Hawaii has various landforms and ecosystems that are unique. From tropical beaches to the 13,000 snow covered alpine volcanic peaks, there is a great need for accurate and current elevation models. The uses of elevation data are many; for the purposes of the enhanced elevation study, six categories were identified as priority: risk management, disaster response, construction and engineering, natural resource management, law enforcement, and planning and permitting.

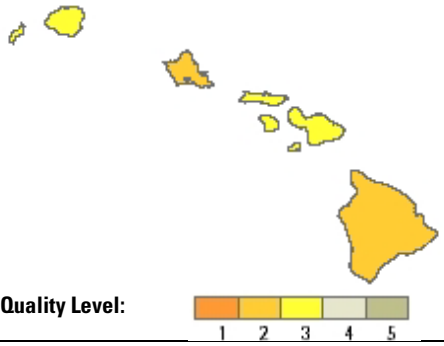
Each of the six identified areas is important. A statewide survey was conducted for input. Critically important projects are reflected in the broad topics summarized in this report. Projects such as solar and wind energy projects, tsunami mitigation planning and recovery, dam safety, a new rail rapid transit system, and height modernization are just some of the practical applications enhanced elevation data would be used for, and is critically needed. Hawaii has the USGS 10-m DEM, an IFSAR 5-m DEM, and a handful of uncoordinated and discontinuous lidar datasets. There is a real need for a current and comprehensive enhanced elevation dataset in the 1-m resolution scale to meet the State's needs as a whole.

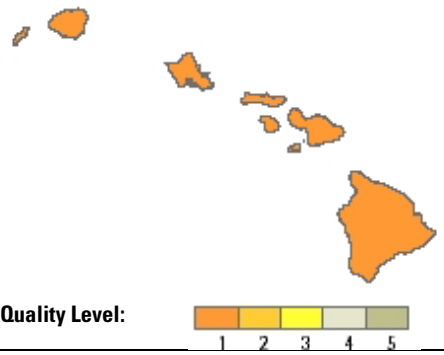
Currently, most of the data collection for high-resolution elevation data is done by various entities and are most often not coordinated. There is duplication of efforts and limited data access or sharing. Having a comprehensive approach by a single agency and then distributed out statewide would be the best use of limited resources and to the public benefit.

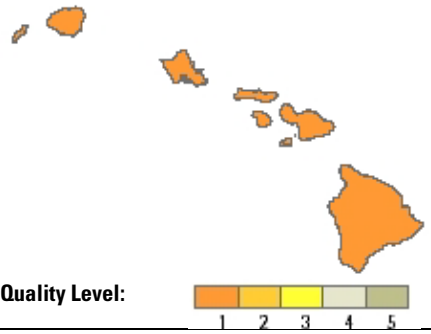
State Functional Activities

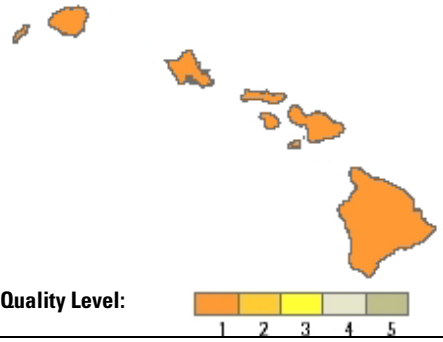
Program: Height Modernization	Business Use 21 Infrastructure and Constructin Management
	**Infrastructure and Construction:** Lack of accurate elevation data restricts development and engineering projects statewide.
Update Frequency: 4–5 years	**Estimated Operational Benefits:** Major; $5,000,000 Enhanced elevation data will improve survey and engineering accuracies. It will enable the State to use the North American Vertical Datum of 1988 (NAVD88).
Bathymetric Data: Yes	**Estimated Customer Service Benefits:** Moderate, dollar value not reported Height modernization is foundational to providing customer services in areas including sea level rise and tsunami mitigation planning, airport safety, major constuction such as mass transit, and alternate energy projects.
Tide-Coordinated: Yes	**Estimated Strategic Benefits:** Major Hawaii has no modern elevation (vertical) datum. Large-scale projects and navigation are hampered tectonic movement. Groundwater measurements, inter-island energy corridors, aviation instrument landing, and rail transit all require a standard and accurate elevation base. Height modernization is the foundational task for many of the other business and program needs.
Data Outside State Needed: No	

Program: Highway Performance Monitoring System	**Business Use:** 22. Urban and Regional Planning
 **Quality Level:** 1 2 3 4 5	**Highways lidar Collection and Data Integration with Roadway Condition and Performanc4insite e Information** **Estimated Operational Benefits:** Major; dollar value not reported All district offices would benefit instead of just Honolulu (present) and Hawaii County (lidar late 2012). **Estimated Customer Service Benefits:** Major; dollar value not reported All district offices would benefit instead of just Honolulu (present) and Hawaii County (lidar late 2012). **Estimated Strategic Benefits:** Major All district offices would benefit instead of just Honolulu (present) and Hawaii County (lidar late 2012).
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: *Miconia* Survey and Control	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5	**Invasive Species Control** **Estimated Operational Benefits:** Moderate; dollar value not reported Improve the efficiency and safety of field operations by increased accuracy when planning areas to search for *Miconia* by ground and air. Modeling to check for *Miconia* in areas not surveyed yet. **Estimated Customer Service Benefits:** Moderate; dollar value not reported Improve the efficiency and safety of field operations by increased accuracy when planning areas to search for *Miconia* by ground and air. Modeling to check for *Miconia* in areas not surveyed yet. **Estimated Strategic Benefits:** Moderate Improve the efficiency and safety of field operations by increased accuracy when planning areas to search for *Miconia* by ground and air. Modeling to check for *Miconia* in areas not surveyed yet.
Update Frequency: 4–5 years	
Bathymetric Data: Not reported	
Tide-Coordinated: Not reported	
Data Outside State Needed: Yes, topographic and bathymetric lidar is need from Pacific Basin islands	

Program: Shoreline Change / Sea Level Rise	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5	**Shoreline Change and Coastal Geomorphology** **Estimated Operational Benefits:** Major; $50,000 Allow shoreline variability in the short term to be monitored and quantified. Sand resource management is of great concern within specific littoral cells around the island. **Estimated Customer Service Benefits:** Major; dollar value not reported Customers (planners, local decisionmakers, and engineers) would benefit from having improved, repeated surveys that provide a more complete picture of beach morphology and sand volume change to both identify existing resources and active sand budgets and help site new construction out of harm's way. **Estimated Strategic Benefits:** Major New product development for identifying sand budgets in decline, which pose threats in the form of increased erosion and endangerment of infrastructure, property, and lives. Development plans could be drafted with this knowledge in hand to change setbacks along the coastline, adapting to eroding shoreline.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, topographic and bathymetric lidar is need from Pacific Basin Islands	

Program: Spatial Data Analysis Labs at University of Hawaii at Hilo	**Business Use:** 25. Education K–12 and Beyond
 **Quality Level:**	**Spatial Data Analysis Education for Undergraduates and Master Degree Candidates**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Operational Benefits:** Major; $500,000 Building geospatial capacity through higher education for Hawaii ecosystem research and spatial data analysis techniques.
Bathymetric Data: No	**Estimated Customer Service Benefits:** Major; dollar value not reported Hawaii's customers are students and researchers. The results of their efforts will be greatly improved and most likely new concepts will be derived from their work. The students will enhance the capability of the local workforce, and the researchers will be able obtain additional grant dollars improving the economy of the State.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major A geospatial technology savvy workforce capable of producing the highest caliber work and able to fulfill the requirements of employers in the natural resource conservation community, throughout the State.
Data Outside State Needed: Yes, topographic and bathymetric lidar is needed from Pacific Basin islands	

Program: Risk and Vulnerabiltiy Assessmnet	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:**	**Disaster Management—Hazard Modeling and Risk Assessment**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Operational Benefits:** Major; dollar value not reported Higher accuracy DEMs yield better flood, tsunami run-up, landslide, and other maps.
Bathymetric Data: No	**Estimated Customer Service Benefits:** Moderate; dollar value not reported Higher accuracy DEMs yield better flood, tsunami run-up, landslide, and other maps.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Higher accuracy DEMs yield better flood, tsunami run-up, landslide, and other maps.
Data Outside State Needed: Yes, topographic and bathymetric lidar is needed from Pacific Basin islands	

Local Functional Activities

County Government—City and County of Honolulu	
Program: Subdivision, Building, and Infrastructure Permitting	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Subdivision, Building, and Site Development	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Depending on the quality, elevation data could assist greatly in reducing permit review times and in saving both the applicant and government significant amounts of funding.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Ability to technologically enhance site development and facility construction plan reviews.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Will improve the data quantity and quality to make informed decisions.
Tide-Coordinated: Not reported	

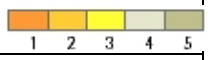
County Government—County of Kauai	
Program: Dam and reservoir evacuation analysis and flood analysis	**Business Use:** 14. Flood Risk Management
Functional Activity: Risk mapping in regards to flooding—Reservoir dam evacuation analysis	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Currently, only a relatively small part of the island has lidar coverage. Having more complete or more accurate elevation data would increase analysis accuracy, which in turn could help save property and lives during a possible dam breach. More accurate elevation data could also be useful in overall flood mapping and used by the certified flood plan managers (CFPM) in the building permit process. Having more complete or more accurate elevation data would increase analysis accuracy, which in turn could help save property and lives during a possible dam breach. More accurate elevation data could also be useful in overall flood mapping and used by the CFPM in the building permit process.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Having more complete or more accurate elevation data would increase analysis accuracy which in turn could help save property and lives during a possible dam breach. More accurate elevation data could also be useful in overall flood mapping and used by the CFPM in the building permit process. This could help speed up the permitting process for the citizens of Kauai. Currently, only a small part of the island has lidar is coverage. Having more complete or more accurate elevation data would increase analysis accuracy, which in turn could help save property and lives during a possible dam breach. More accurate elevation data could also be useful in overall flood mapping and used by the CFPM in the building permit process.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Moderate Having more complete or more accurate elevation data would increase analysis accuracy which in turn could help save property and lives during a possible dam breach. More accurate elevation data could also be useful in overall flood mapping and used by the CFPM in the building permit process. This could help speed up the permitting process for the citizens of Kauai.

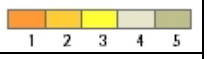
County Government—Maui County	
Program: Countywide geographic services for government agencies including police, fire and civil defense.	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
Functional Activity: Spatial analysis for emergency services planning, risk assessment and response	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Line of sight modeling for location of communication towers for emergency services. Calculation of burn areas for wildfires. Improved orthorectification of aerial imagery. Ability to generate more accurate 3D models and renderings. Improved ability to accurately analyze geographic issues without staff or consultants having to do field work.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Extend flood inundation risk modeling to areas not covered by FEMA FIRMs. Improved site selection for communications towers. Elevation calculation and obstruction height estimates for site specific incident response—for example, mountain rescue, police special response unit activities. Better visualization and analysis through 3D modeling. More accurate surface area calculations.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Improved inundation risk assessment improves and facilitates political decisionmaking, as well as, pre-planning by emergency services agencies such as police, fire and civil defense. 3D modeling being used in public safety. Also, 3D modeling being used in meetings and hearings which provide for more informed decisions.

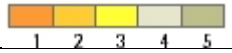
Idaho

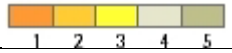
The State of Idaho has requirements for high-resoulution elevation data for land resource management and research on the vast amounts of public lands, private forest lands, and grazing lands in the State. The State also needs high-quality data for transportation planning projects and hazard mitigation planning (floods and fires). Idaho also needs improved elevation data in order to improve the resolution and accuracy of its hydrography data.

State Functional Activities

Program: Public and Private Timber Management. Land Resource Management, and Hazard Mitigation	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 	**Biomass Mapping:** Mapping of forest, sagebrush, grasslands, and estimating timber stocks, monitoring growth rates, land cover changes, and estimating fire fuel loads.
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Benefits description not reported.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Moderate Benefits description not reported.
Update Frequency: 2–3 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, all adjacent States.	

Program: Geologic Mapping Program	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 	**Geologic Mapping, Active Fault Mapping, and Landslide Mapping:** Geologic mapping
	Estimated Annual Operational Benefits: Major; dollar value not reported Enhanced elevation data will allow the State's organizations to improve the quality of geologic mapping and begin to accuarately map the location of active faults and landslides.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Enhanced elevation data will allow the State to produce much more accurate mapping products as well as active fault and landlside inventories. This will allow Idaho to meet its needs and users of the data.
	Estimated Strategic Benefits: Moderate These data will enable the State to generate more accurate assessments of geologic hazard potential.
Update Frequency: >10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Risk Mapping, Assessment, and Planning	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 	**Flood plain Mapping:** Hydraulic modeling and mapping in support of flood plain mapping.
	Estimated Annual Operational Benefits: Major; dollar value not reported Increased government efficiency associated with cost savings realized from bulk acquision, local flood plain managment, watershed based studies, risk assessment, digital FIRMs.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Acquiring lidar at higher resolutions satisfies innovation in all levels of Government, private and not for profit sectors, for example, engineering, preliminary plats, viewsheds, locating untaxed outbuildings, U.S. Environmental Proteciton Agency (EPA) remediation efforts (Silver Valley), USACE studies, flood stages established by the National Weather Service, deformations of the Earth measured by the USGS, Idaho Bureau of Homeland Security, landslides, Idaho Department of Water Resources, mapping flood hazards, and ad hoc analyses.
	Estimated Strategic Benefits: Major A strong case can be made to FEMA for increasing the number, quality, and extent of Risk Mapping, Assessment, and Planning (MAP) activities in Idaho because of the partnership (Risk MAP appropriation legislation identifies 25 percent of Risk MAP funds being dedicated to cooperating technical partners that can show a match).
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, watersheds that cross State lines into adjacent States.	

Program: State Transportation Department Road Construction and Maintanance	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 	**Manage Transportation Corridors: Manage Transportation Corridors**
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Benefits description not reported.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Moderate Benefits description not reported.
Update Frequency: >10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Tribal Functional Activities

<table>
<tr><td colspan="2">Coeur D’Alene</td></tr>
<tr><td>Program: GIS</td><td>Business Use: 27. Telecommunications</td></tr>
<tr><td colspan="2">Functional Activity: Determine line of site model for broadband</td></tr>
<tr><td>Quality Level: QL3 elevation data from lidar</td><td>Estimated Annual Operational Benefits: Moderate; dollar value not reported
Minimize on ground survey need for initial planning. New data would be great since the last flight was in 2005. Trees and other obstacles have grown and new lidar will be more needed by 2015.</td></tr>
<tr><td>Update Frequency: 6–10 years</td><td>Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
Real-time assessment is possible with lidar data where otherwise a ground survey would have to be conducted.</td></tr>
<tr><td>Bathymetric Data: Not reported
Tide-Coordinated: No</td><td>Estimated Strategic Benefits: Moderate
Better environmental planning is possible. and having better data allows the tribe to avoid political and strategic conflicts.</td></tr>
</table>

Illinois

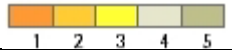
The Illinois Department of Transportation (IDOT) began acquiring lidar data on a systematic basis in 2008, and the use of the this enhanced elevation data is resulting in dramatic time savings for hydraulic surveys as well as making it possible to precisely locate previously unidentified hydraulic problems. As lidar data are collected for additional IDOT districts, the agency anticipates the applications and cost benefits will expand significantly.

Illinois regional planning departments (RPCs) across the State use lidar enhanced elevation data to evaluate new development projects. For example, when used to support hydraulic bridge surveys, lidar elevation information reduces the cost of a single bridge replacement study by approximately $15,000 to $20,000. The RPCs also use this enhanced elevation data to inventory tree canopy height to ensure airport clear zones are not violated, as an aid to archeological research in detection of ancient burial mounds and road traces, and in direct line of sight analysis for positioning mobile cell phone repeaters.

Enhanced elevation information would:

- Provide more precise measurement of levee heights to improve flood prediction, modeling, management and control, and serve as a key component to real-time flood forecasting.
- Support the Illinois portion of the FEMA Floodplain Modernization Program by greatly simplifying and accelerating the map production for the State's 100-year flood plains.
- Significantly reduce surveying costs of construction sites for new homes and businesses, highways, and streets, and of maintenance of drainage canals and engineered structures.
- Dramatically improve precision farming. Variations in local relief affect the variable rate application of agricultural chemicals, thereby yielding significant cost savings and reduced agricultural pollution. Approximately two-thirds of the land area of Illinois is devoted to agricultural uses.
- Improve the accuracy of aerial photography orthorectification.
- Assist in positioning of erosion control structures and be a valuable tool for determining where wetland and other types of habitat can be restored.
- Validate surface mine maps by measurement of extent of settlement and drainage diversion in surface mined areas, as well as subsidence and surface drainage disruption associated with subsurface mined areas.
- Be a support component involving simulations of contaminant dispersal in surface waters, as well as in selection of suitable staging areas for evacuation and emergency relief.

State Functional Activities

Program: Natural History Survey/Department of Military Affairs	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 	**Natural Resource Management:** Soils and wetland conservation; modeling of biological and ecological systems.
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Moderate; $90,000 Centralized procurement, having information that the State may not be able to afford but could share.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Moderate; $100,000 Be able to properly review new and proposed actions, determine changes from previous data, and facilitate the National Environmental Policy Act (NEPA). Soldier training, review of infrastructure, and natural resource development.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Cost sharing, reducing dollars, reduction of data redundancy.
Data Outside State Needed: No	

Program: Natural History Survey, NEPA, Integrated Resource Management Plans, and Recreation Districts	**Business Use:** 7. Wildlife and Habitat Management

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: No

Improving Vegetation Characterization and Mapping of Wildlife Habitats: Environmental Mitigation, Resource Conservation, NEPA, Integrated Resource Management Plans, Park and Recreation Sustainability, Management and Mitigation of Species and Habitat

Lidar-based bare-Earth and surface elevation models provide excellent tools for woodland patch description, allowing for the estimation of biophysical properties, such as canopy height and biomass. Such information will become increasingly important.

Estimated Annual Operational Benefits: Moderate; $154,000

Current effort to predicted species distribution with traditional remote sensing data (for example Landsat) indicate that the distribution of many wildlife species likely has been overestimated due to the incapability of incorporating information (that is constraints) about vegetation structure. This information is useful but contains some level of uncertainty or error which affects species conservation and management decisions. Being able to identify habitat structure variables and important topographic features (that is rocky outcrops), which can be obtained from lidar data, would greatly improve the predicted species distributions for species with these kind of habitat preferences and in turn help the State to make better management decisions.

Estimated Annual Customer Service Benefits: Major; $156,000

Be able to properly review new and proposed actions, determine changes from previous data, and facilitate enforcement of NEPA. Soldier training, review of infrastructure, and natural resource development. The State would be able to provide users with better predicted distribution maps for species with habitat structure preferences.

Estimated Strategic Benefits: Minor

High quality data with complete coverage will allow the existing public, social, and (or) political benefits to extend across the entire area of interest and would also create additional opportunities for wide area studies.

Program: Water Resources, FEMA Risk MAP	**Business Use:** 14. Flood Risk Management

Quality Level: 1 2 3 4 5

Update Frequency: 6–10 years

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Yes, to include watershed boundaries that cross over into surrounding States

Flood Risk Mapping: Flood inundation modeling, more accurate delineation of flood plain boundaries, better watershed delineation assume QL2 on bathymetry.

Estimated Annual Operational Benefits: Major; $21,100,000

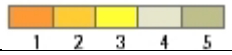
Bare-Earth lidar allows field surveys to be limited and analyses to be performed in a more timely fashion. Illinois has also developed new GIS applications related to mapping river forecasts and distributing to flood responders in advance of a flood. The GIS applications related to mapping river forecasts and distributing to flood responders in advance of a flood will be expanded to most rivers with lidar and hydraulic modeling exist. Hydraulic analyses in general will improve by providing accurate topography over a larger area than the State could have acquired by traditional land surveys.

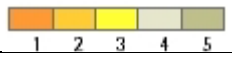
Estimated Annual Customer Service Benefits: Major; $10,520,000

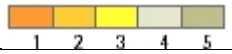
The mapping results are greatly improved and more accurate when lidar is available. The State produces inundation maps for emergency responders. Lidar where available is used for this mapping. Improved public trust from better mapped products. Improved public trust from better mapped products.

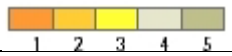
Estimated Strategic Benefits: Major

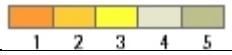
If lidar was available in more areas and hydraulic modeling exists, the State plans on expanding the river forecast mapping to more rivers in the State. Illinois maps the depth and extent of flooding before and during flood events for emergency responders on a small number of rivers. Emergency responders use the inundation depth maps to locate sand bags. Improved public trust from better mapped products. Improved public trust from better mapped products.

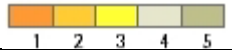
Program: Transportation-Highways	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 	**Road Infrastructure:** Studies and for planning purposes to support engineering projects.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Moderate; $62,500,000 Not necessarily new benefits, but benefits that would be available to all district offices.
Bathymetric Data: Not reported	**Estimated Annual Customer Service Benefits:** Moderate; $2,500,000 Not necessarily new benefits, but benefits that would be available to all district offices.
Tide-Coordinated: Not reported	**Estimated Strategic Benefits:** Moderate Not necessarily new benefits, but more widespread benefits that would be available to all district offices.
Data Outside State Needed: Yes, the roadway network does not end at the State line, and the bridges cross rivers connecting Illinois to other States; Illinois can benefit from an overlap into every surrounding State—a few thousand feet to 1 mile	

Program: The St. Louis Area Regional Response System ()	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 	**Homeland Security:** Illinois State Police Megahertz Program, Department of Military Affairs, Fire Departments-Pagers, Illinois Terrorism Task Force.
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Major; $3,200,000 Telecommunications (emergency), line of site analysis.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; $3,200,000 Emergency communications.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Emergency communications.
Data Outside State Needed: No	

Program: State Geological Survey	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 	**Geologic Mapping Program:** Geologic resource assessment and hazard mitigation, resource mining, renewable energy resources, and oil and gas resources.
	Estimated Annual Operational Benefits: Major; $500,000 Increased horizontal and vertical accuracy that is essential for providing additional scientific information regarding near surface processes.
	Estimated Annual Customer Service Benefits: Moderate; $200,000 Improved mapping accuracy for large-scale geologic maps.
	Estimated Strategic Benefits: Minor Improved mapping accuracy will help expand mapping program budgets when discussing annual budgets with congressional officials.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Land Development	**Business Use:** 3. River and Stream Resource Management
 **Quality Level:** 	**Impervious Surface Water Runoff:** Field crews will be better prepared to assess plans as they do inspections.
	Estimated Annual Operational Benefits: Major; $10,000 (this budget is an example for one county in the State) Control of storm water runoff. Assessment of developer plans for controlling storm water funoff in new developments.
	Estimated Annual Customer Service Benefits: Major; $2,000 (this budget is an example for one county in the State) Mitigation of storm water runoff.
	Estimated Strategic Benefits: Major Better assessment of plans for storm water runoff and mitigation strategies as development proceeds to protect the waterways, streams and creeks.
Update Frequency: 6–10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, watersheds that reach beyond the boundaries of the State	

Program: Water Quality	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 	**Lake Management**
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Moderate; $62,000 A regular update cycle for this data layer would help in all aspects; change detection, quality, and accuracy.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Moderate; $43,000,000 Predict potential effects from nutrients and pollutants entering water resources.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate Aids in a more accurate, informed delineation of watersheds and runoff concerns.
Data Outside State Needed: Yes, watersheds that extend beyond the boundaries of the State.	

Program: Planning	**Business Use:** 22. Urban and Regional Planning
 **Quality Level:** 	**Regional Planning:** Feature mapping, regional transportation planning, hazardous mitigation planning, and soil info for taxing farmland (rural info also important).
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Major; $55,000 Assistance with engineering construction and design, data available for flood analysis.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Major; $117,500 Better able to provide municipalities and engineering firms with accurate data.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate Cost sharing, reducing dollars, reduction data redundancy, informed decisions.
Data Outside State Needed: No	

Local Functional Activities

County Government—Lake	
Program: Internal Day-to-Day Operations (county departments)	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood inundation modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $294,000 Contours and more specifically the DEM developed from lidar data allow the agency to produce accurate flood inundation models for affected areas within the county as well as create more accurate reports on potentially affected properties and structures. A regular update cycle would be beneficial, not only for change detection but also because of the technological advancements in the derivative products and accuracy.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; $129,000,000 More accurate delineation of flood plain boundaries. More accurate flood inundation models.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Same as above but with a more regular update cycle. Better watershed delineation, septic system placement, flood inundation models and more efficient permit review.

County Government—Lake	
Program: Internal Day-to-Day Operations (county Departmentartments)	**Business Use:** 2. Water Supply and Quality
Functional Activity: Lake management	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $62,000 Map watersheds of lakes an ponds. A regular update cycle for lidar data capture would help in all aspects; change detection, quality, and accuracy.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; $4,000,000 More accurately do the above. This information is used to predict potential effects from nutrients and pollutants entering water resources in the county. It also assists in refining recommendations to land and water resources managers.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate More accurately do the above. Aids in a more accurate, informed delineation of watersheds and runoff concerns.

County Government—Sangamon County	
Program: Information Systems	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: New bridge location planning, new county highway corridor planning, flood risk mapping	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $60,000 Reduce the need to have survey crews cross-section river and stream for a hydrology study to support the planning of a new bridge at a desired location. The data would help research areas where homes have been previously labeled as being within the flood plain and having to carry the additional insurance.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; $30,000 Customers are internal but the county highway department would be able to plan for new bridges and higway improvements with less need of sending survey crews out.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate The information would be used to identify homes at risk to flooding and those that far removed from the risk but are identified as being within the flood zone by the most recent FEMA flood mapping. Used a triangulated irregular network TIN surface model that was created from lidar information to identify a portion of the old Edward's Trace Trail through Sangamon County.

County Government—St. Clair County	
Program: Zoning/Development Permitting	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Impervious surface water runoff	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $10,000 There are no data to realize existing operational benefits for controlling storm water runoff. Elevation data would allow the county to accurately assess developer plans for controlling storm water runoff in new residential and commerical developments.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; $2,000 If allowed to license the data, the county sees a major effect and improvement in the plans the county requires and receives for new development construction and the mitigation of storm water runoff. Elevation data to provide customer service benefits are not available.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major The county will be able to better assess plans for storm water runoff and mitigation strategies as development proceeds to protect the waterways, streams, and creeks of St. Clair County. There are no elevation data to realize public, social, or political benefits.

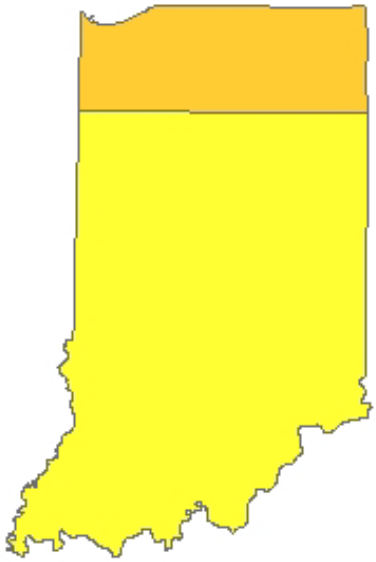
Regional Government—Champaign County Regional Planning Commission	
Program: Champaign County GIS Consortium	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Feature mapping, regional transportation planning, hazardous mitigation planning	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $1,000,000 Data for contour generation, assistance with engineering construction and design, accurate DEM generation, data available for flood analysis.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; $600,000 None at this time; ablility to provide customers (municipalities and engineering firms) with accurate data for their desired uses.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Minor None at this time; hazardous mitigation planning, flood analysis, engineering construction and design.

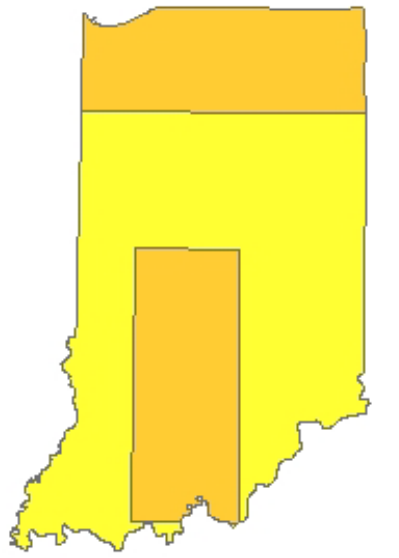
Indiana

The State of Indiana has requirements for QL2 and QL3 lidar acquistions, including collection of bathymetric data for stream channel cross-sections. Lidar-derived enhanced elevation data will support hazard flood inundation mapping, FEMA risk flood plain mapping, Indiana statewide road development, surface water and groundwater quality and assessments, and geologic mapping. During the 3 years beginning in 2011, Indiana will be collecting lidar-derived elevation data, as QL3 (at an average post spacing of 1.5 m, which supports a 2-ft contour interval), for the entire State. During the State's 3-year acquisition period, individual cities, towns, and counties have the option to buy-up to an increased average post spacing of 1 m, which will support a 1-ft contour interval.

State Functional Activities

<table>
<tr><td colspan="2">Program: Statewide lidar Program</td><td>Business Use: 14. Flood Risk Management</td></tr>
<tr><td rowspan="5"> 
</td><td colspan="2">Flood Plain Mapping and Flood Event Modeling: Estimate of total damages (combining losses from residential, commercial, infrastructure and agriculture) caused by flooding events in Indiana are $270 million and $126 million for 2003 and 2008, respectively (Hicks and Burton, 2008). Based on a 10 percent reduction in flood loss through preventive and predictive measures, using the benefits of enhanced elevation data, then a savings of $27 million and $12.6 million for the flood events in 2003 and 2008, respectively, could be realized. Alternatively, a 5 percent reduction would provide a savings of $13.5 million and $6.3 million respectively, which is double to quadruple the cost of a statewide lidar acquisition.</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $19,800,000
This amount is the potential savings associated with the value of statewide lidar data for two major flooding events (based on a conservative 5 percent savings). Enhanced elevation data will allow more accurate flood plain and inundation mapping, which will provide the State better flood predictions, response, and mitigation, thereby reducing costs and saving lives associated with flooding.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; dollar value not reported
Free access to accurate statewide data to a completely new user community. Storm water quality permitting and pollution control studies are produced from these data for customers.</td></tr>
<tr><td colspan="2" rowspan="2">Estimated Strategic Benefits: Major
With universal access to Indiana's new 2011–2013 statewide lidar and orthorectified data, Indiana expects an even greater return on investment (ROI) than the 2005 Ortho project. The 2005 orthoimagery was calculated to support a 34:1 ROI (Saligoe-Simmel, 2008). Indiana expects an even greater ROI from lidar because it will greatly enhance statewide activities, such as hydrologic modeling and flood inundation mapping, associated with flood mitigation, preparedness, response, and recovery. In addition, having all of the data in one location makes it easier to share with customers, saving them time and money and promoting business.</td></tr>
<tr><td>Update Frequency: 2–3 years</td></tr>
<tr><td>Bathymetric Data: Yes</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Tide-Coordinated: No</td></tr>
<tr><td>Data Outside State Needed: Not reported</td><td colspan="2"></td></tr>
</table>

Program: Surface and Ground Water Quality and Resource Assessments	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Yes, for edgematching, to maintain continuous watershed delineation, and to provide surface-water flow connectivity.	**Surface Water and Groundwater Quality and Assessments:** In some cases, QL2 may be needed in small areas (in the range of square miles) to capture stream channel bathymetry and (or) in heavily forested steep sloped areas and in Great Lakes coastal areas containing complex hydrography and hydrology. **Estimated Annual Operational Benefits:** Major; dollar value not reported Enhanced digital elevation data would allow current (or recent) ground conditions to be modeled with greater accuracy. The need to travel to study areas with survey-grade equipment would be greatly reduced, along with associated costs, risks, and inefficiencies. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Enhanced digital elevation data would allow current (or recent) ground conditions to be modeled with greater accuracy; currently, modifications to the lanwedscape such as new construction, ditch dredging or widening, or mine reclamation land sculpting have to be estimated, ground-surveyed, or ignored in a given project. The availability of accurate data would enhance all modeling and derivative products. **Estimated Strategic Benefits:** Major Enhanced relevance and usefulness would be achieved with better (and more recent) base topographic data for the purpose of watershed hydrologic modeling for nonpoint and point-source applications. Highly accurate elevation data would also allow features that currently appear spurious in elevation datasets to be identified and employed in a given project, such as wetland function or wetland mitigation studies.

Program: Geologic Mapping	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Geologic Mapping:** A major program is to automate the identification of impervious surfaces and of structures. Lidar will validate data from other sources and improve the overall accuracy of the product. In some cases, QL2 may be needed in small areas (in the range of square miles) to capture the ground in heavily forested steep sloped areas and in the complex geologically and hydrologically Great Lakes coastal region and to capture stream channel bathymetry. **Estimated Annual Operational Benefits:** Major; dollar value not reported Currently do no have enhanced elevation data statewide. Geologic features and contacts could be identified with precision, rather than the degraded scale currently used. Enhanced elevation data would negate the need to take survey-grade equipment to the field to accurately locate geologic contacts or faults, and bathymetric data availability would allow contacts to be extrapolated across the landscape with greater certainty. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported The quality of products delivered would increase by using lidar data. More accurate geologic maps will support many different customer needs with respect to natural or industrial resources assessment, aquifer sensitivity evaluation, seismic hazards analyses, mine reclamation studies, geologic framework modeling, and karst hazards analyses. **Estimated Strategic Benefits:** Major Public safety will have improved response times, potentially saving lives. Many public safety benefits could be realized by improved geologic maps; however, the mere presence of improved topographic data does not mean that the geologic maps would be produced in an automated way. The improved precision for maps completed using the improved topographic base would enhance the uses and users of the products. Many accurate surficial geologic derivative products could be developed that would be protective of the near-surface environment, such as groundwater and wetlands protection.

Program: State Road Infrastructure	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, in some cases (for example, bridge construction).	**Road Development** **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Large project areas are better managed, and higher accuracy in cut and fill calculations and estimates is achieved. Enhance elevation data could allow for standardization of practices in hydraulic engineering and earthwork design by using a standard data source across the State on all size projects. Smaller projects that may not be able to afford full topographic studies could also enjoy the benefit of statewide, highly accurate elevation and surface data. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Benefits to larger projects that have a separate lidar contract could be realized on many more of the smaller projects that currently rely on traditional survey methods or older existing datasets. **Estimated Strategic Benefits:** Moderate Could show more statewide savings on smaller projects as well as larger design and construction projects.

References Cited

Hicks, M.J., and Burton, M.L., 2008, Preliminary flood damage assessments—Indiana flood of 2008: Muncie, Indiana, Ball State University, June, 3 p., accessed April 5, 2012, at http://cms.bsu.edu/Academics/CentersandInstitutes/BBR/CurrentStudiesandPublications/~/media/DepartmentalContent/MillerCollegeofBusiness/BBR/Publications/disasterStudies/indianaFloodDamage08.ashx.

Saligoe-Simmel, Jill, 2008, 34:1 return on investment—IndianaMap orthophotography proves its worth as good investment of public funds: IndianaMap, fall, p. A3, A5. (Also available at http://igic.org/projects/indianamap/IndianaMapNews.pdf.)

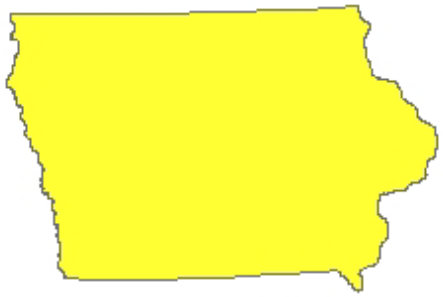
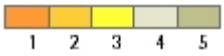
Iowa

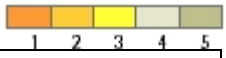
The State of Iowa's statewide lidar program was completed within last year, with contracting assistance from the USGS Mid-Continent Mapping Center in Rolla, Missouri. Iowa's lidar program was funded with $4.3 million from the Iowa Department of Natural Resources, the Iowa Department of Agriculture, the State office of the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service and the Iowa Department of Transportation. Nominal horizontal resolution was 1.4 m with a vertical accuracy of 18.5 cm root mean square error (RMSE; QL3), covering an area of 56,000 square miles, acquired over a 4-year period.

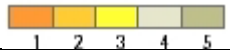
Beginning in 2006 when the project began, users have been steadily increasing their use of lidar elevation data and seeing significant benefits. The raw data and derivative products are freely shared with any user, including city, county, State, and Federal agencies and private engineering firms. Benefits and cost savings have been seen in numerous areas, including reducing the cost of planning topographic surveys for designing construction projects, county planning for wind farm and industrial siting, city water and sewer improvement projects, and emergency and disaster management. The savings are being realized by State and Federal project partners, county engineers and other county offices, transportation agencies, and private businesses. These benefits are backed up by a recent ROI study done by the Iowa Geographic Information Council that showed an estimated benefit of $5 million per year. Iowa's lidar data are being used as the basis for new approximate flood plain maps for the entire State, sparked by the massive damage from the 2008 floods.

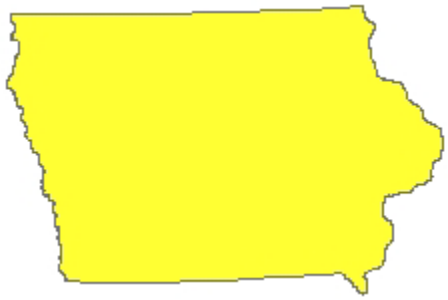
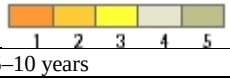
While QL3 lidar is adequate for most users in the State at this time, many users in the future will likely desire higher accuracy and a denser point cloud, especially for construction surveys and urban infrastructure design. For State projects, communication with the data contractor and quality control were the main issues affecting the project. The State of Iowa urges close attention to establishing good communication between State and local partners, the contractor, and the Federal partners when setting up a national enhanced elevation program, especially to avoid data quality issues during the acquisition and processing of the data.

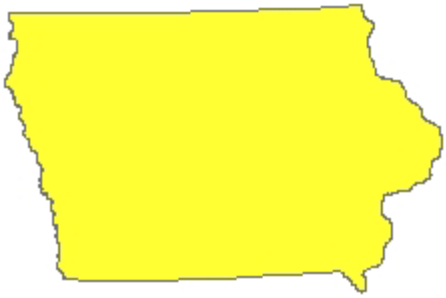
State Functional Activities

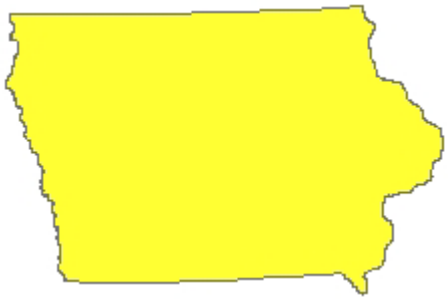
Program: Emergency Preparedness	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 	**Flood Risk Mapping:** lidarIowa is completely revising its flood plain mapping program, which will provide millions in benefits from lives and property not lost during future flooding events.
	Estimated Annual Operational Benefits: Minor; dollar value not reported None of the programs see a monetary benefit from the lidar data in Iowa. Iowa uses what is available.
	Estimated Annual Customer Service Benefits: Minor; dollar value not reported State decisionmakers and operations staff benefit greatly from the best "products" available.
	Estimated Strategic Benefits: Minor Better products aid improved decisionmaking.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

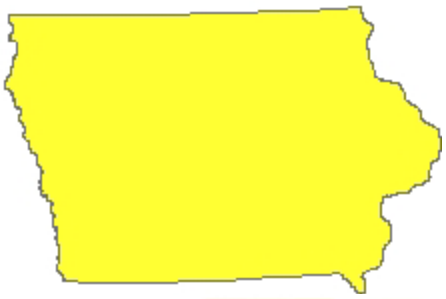
Program: Transportation—Office of Location and Environment	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 	**Bridge Replacement Cultural Survey and Wetland Mitigation: The** Iowa Department of Transportation Office of Location and Environment (OLE) studies factors affecting bridge replacements. Bridge replacements require cultural surveys (archeaology) that cost $25,000 or more. The OLE does wetland mitigation studies as well. Lidar is used to replace construction surveys on 8 to 10 projects per year.
	Estimated Annual Operational Benefits: Major; $150,000 On weekly basis, the OLE uses lidar to determine the need for a cultural survey. Using a minimum of $2,500 per survey by 50 weeks equals $125,000 minimum savings due to lidar. Wetland mitigation ground surveys cost about $2,500 per site at 10 sites surveyed per year equals about $25,000 savings.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Not reported Benefits description not reported.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Transportation—Office of Design	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 	**Various Planning Studies:** Corridor studies done by the Iowa Department of Transportation Office of Design, Planning Section; borrow designs by the Soils Section; rush projects for the Road Design Section; and hydraulic studies for the Bridge Section.
	Estimated Annual Operational Benefits: Major; $100,000 Lidar replaces standard photogrammetry products for corridor studies at savings of $70,000 per year, digital orthos for borrow studes at savings of $6,000 per year, rush projects at savings of $1,800 per year, and hydraulic studies at savings of $20,000 per year.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Not reported Benefits description not reported.
Update Frequency: 6–10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: County and City Government for 90 Small Rural Counties	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 	**Road Maintenance, Planning, and Design (County Engineer); Flood Plains, Wind Farms, and Other Zoning Applications (County Planning and Zoning); and City Engineers**
	Estimated Annual Operational Benefits: Major; $2,250,000 For 90 smaller counties, estimate $2,250,000 per year savings. Broken down at $10,000 for road design, gravel grading, culvert design, and other projects; $10,000 each for flood plain permiting, windfarms, and other zoning; and $5,000 for small cities doing water treatment improvements and streets.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Not reported Benefits description not reported.
Update Frequency: 6–10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: County and City Government for Nine Large Counties	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Road Maintenance, Planning, and Design (County Engineer); Flood Plains, Wind Farms, and Other Zoning Applications (County Planning and Zoning); and City Engineers** **Estimated Annual Operational Benefits:** Major; $1,035,000 For large counties, estimate $1,350,000 per year savings with the following breakdown for 9 counties: $90,000 each for road design, gravel grading, culvert design, and other projects; $25,000 each for flood plain permiting, windfarms, other zoning, and large cities doing water treatment improvements and streets. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Not reported Benefits description not reported.

Program: Natural Resources	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Flood Plain Permitting, Construction Surveys, and Other Natural Resources Applications** **Estimated Annual Operational Benefits:** Major; $452,500 Using lidar to determine elevations in flood plains for permits (saves permittee surveyors costs of $250 each for 50 permits per year); replace topographic surveys for Iowa Department of Natural Resources construction projects (130 per year at $3,000 each); miscellaneous uses would save $50,000 per year. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Not reported Benefits description not reported.

Program: Agriculture and Soil Conservation Agencies	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Construction Projects:** Terraces, water retention structures, farm ponds, culverts, and other projects requiring a topgraphic survey. **Estimated Annual Operational Benefits:** Major; $1,000,000 Benefit calculated at 1 percent of total construction cost of $100 million per year. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Not reported Benefits description not reported.

Kansas

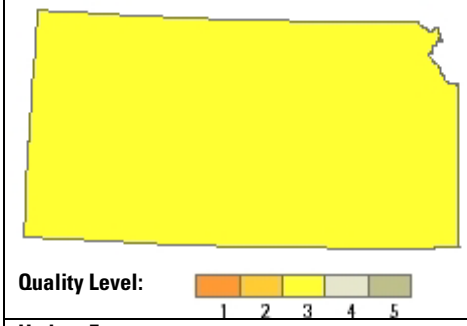
The State of Kansas has focused on enhanced elevation data for several years. High-resolution digital elevation data were identified as the highest programmatic goal in the Kansas GIS strategic plan. In 2008, the GIS Policy Board adopted a business plan for improved elevation data for statewide applications. The Kansas GIS Policy Board Elevation Team also recently completed a State of Kansas lidar implementation plan.

Kansas has been successful in creating several multiagency partnerships among State, Federal, and local governments to acquire lidar data. To date, lidar data acquisition is underway or completed for 34 full counties and 7 partial counties for a total of 24,957 square miles or approximately 30 percent of the State.

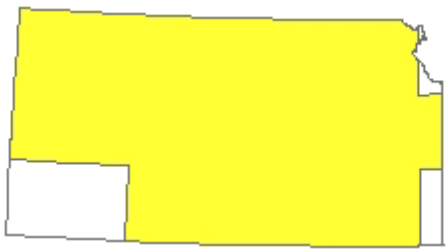
All the lidar data in Kansas are at least QL3. The moste recent and current projects are done to the vertical accuracy of USGS lidar specification (version 13), which specifies a 12.5-cm RMSE in open terrain. While seven of the nine business uses listed in this report indicate that QL3 would be adequate, Kansas would prefer a vertical accuracy that falls between QL2 and QL3 to match the USGS specification.

The nine functional activities provided by several State agencies demonstrate the current and future applications of lidar throughout Kansas and show the continued need for statewide, high-resolution elevation data.

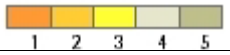
State Functional Activities

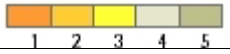
<table>
<tr><td colspan="2">Program: Emergency Management, Flood Plain Management, Flood Inundation Mapping, Bridge and Road Design</td><td>Business Use: 14. Flood Risk Management</td></tr>
<tr><td rowspan="4"> 

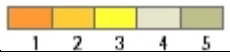
Update Frequency: 4–5 years
Bathymetric Data: No
Tide-Coordinated: No</td><td>Flood Risk Mapping, Hazard Identification, and Hydrologic Analysis: This includes flood risk mapping for FEMA as conducted by the Kansas Department of Agriculture, flood inundation mapping by the Kansas Biological Survey, hazard analysis by Emergency Management, and hydrogic analysis for roads and bridges by the Kansas Department of Transportation. Hydrologic analysis includes the determination of watershed characteristics in support of highway drainage and structure sizing, identification of channel alignment changes (with surveys at regular intervals), and identification of potential flooding locations.</td></tr>
<tr><td>Estimated Annual Operational Benefits: Moderate; $2,000,000
Having updated and enhanced elevation data statewide has the potential to increase the efficiency of hazard analysis. The State hazard mitigation plan currently costs the State 2.5 million every 5 years; with better data, it might be possible to save the majority of that cost. More accurate maps will allow for the development of more timely and accurate post-flood damage assessments. Additionally, lidar is well suited for hydrologic analysis in support of transportation infrastructure design, dam breach analysis, and flood inundation mapping.</td></tr>
<tr><td>Estimated Annual Customer Service Benefits: Major; dollar value not reported
High-quality statewide data would allow State agencies to better prepare for, respond to, and mitigate damages from disasters and improve products derived from hydrologic modeling.</td></tr>
<tr><td>Estimated Strategic Benefits: Major
With enhanced elevation statewide, crucial decisions can be made with accurate, current data, allowing for better protection of life and property. Accurate data help minimize the economic and environmental effects of disasters.</td></tr>
<tr><td colspan="2">Data Outside State Needed: Yes, for bounding watersheds</td></tr>
</table>

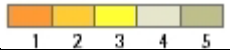
Program: Federal Reservoir Sustainability Initiative	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5	**Watershed Assessment:** This includes assessment of watersheds above Federal reservoirs for reservoir sustainability as led by the Kansas Water Office. Watershed assessment includes wetlands identification, streambank stabilization, soil erosion, and reservoir volume analysis.
	Estimated Annual Operational Benefits: Major; dollar value not reported Lidar provides more presise methods for analysis that will extend the life of reservoirs used for public water supply.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Enhanced elevation data will be used to evaluate and prioritize watershed restoration, stream bank restoration, and wetland area enhancement projects. The result will be policies and programs that improve the quality of Kansas water supply and ensure that the State has the quantity of supply needed to meet the needs of customers (composing about 75 percent of the State's population).
Update Frequency: 6–10 years	
Bathymetric Data: No	
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate Results should bring greater awareness of the value of Federal reservoirs and a greater sense of individual responsibility in treatment of the watersheds above the reservoirs.
Data Outside State Needed: Yes, for bounding watersheds	

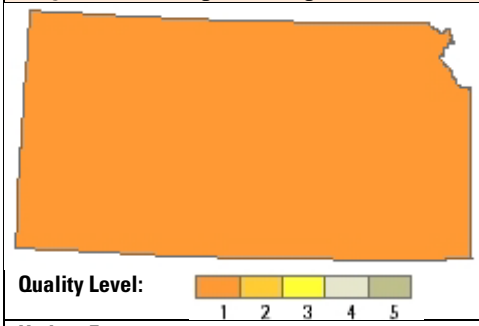
Program: Training, Safety, and Readiness	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 1 2 3 4 5	**Geographic Visualization:** Geographic visualization includes line-of-sight analysis and creation of 3D models for homeland security, training, and disaster response activities conducted by the Kansas Adjutant General's Department, the Kansas Division of Emergency Management, and the Kansas National Guard.
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Enhanced elevation would be used to provide more realistic data for training, increased ability to analyze safety concerns, perform line-of-sight analysis based on real world conditions, map obstacles to flying, and create 3D models of an area.
	Estimated Annual Customer Service Benefits: Minor; dollar value not reported Enhanced elevations gives the State the ability to visualize and analyze a better model of the real world, which leads to better products, training, and understanding.
Update Frequency: 4–5 years	**Estimated Strategic Benefits:** Moderate With improved safety and 3D visualization there is less potential for accidents. 3D visualization can also be used to help respond to and prepare for potential terrorist threats.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, the Kansas City metropolitan area includes Jackson, Cass, Clay, and Platte counties in Missouri	

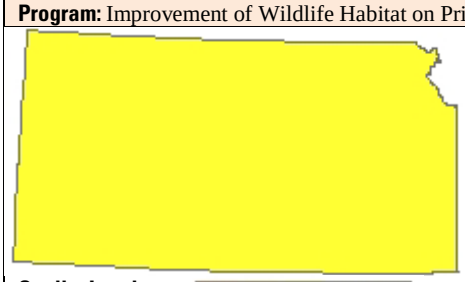
Program: Wetlands	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:**  1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No	**Wetland Resource Inventory and Management:** This includes wetland identification and inventory for ecological function, hydrological function, and resource management for the Kansas Biological Survey. The importance of high-quality, high-resolution elevation data for wetland identification cannot be overstated. Existing wetland inventory data for Kansas are widely known to be highly incomplete and inadequate for reliable research sampling design in field studies. In addition to being a rich source of biodiversity, wetlands serve a wide variety of important ecological and hydrological functions, including runoff filtering, groundwater and aquifer recharge, and floodwater storage during flood events. These functions and others cannot be properly understood and evaluated without more complete and more accurate wetland data, and the most reliable and efficient way to improve the State's wetland inventory is using lidar-based elevation data. **Estimated Annual Operational Benefits:** Major; $50,000 High quality data greatly facilitate wetland identification and inventory development, ecological analysis and assessment, and hydrological analysis and assessment. Most of these benefits are only realizable using data with at least the specified quality level.
Data Outside State Needed: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported High-quality data improve the accuracy and detail of inventory tabulations and ecological and hydrological analyses, increasing the utility of (and confidence in) these products for end users. Most such benefits are only realizable using data with at least the specified quality level. **Estimated Strategic Benefits:** Major High quality data with complete coverage will allow the existing public, social, and political benefits to extend across the entire area of interest and would also create additional opportunities for wide area studies. These wide area studies will improve citizen awareness and also increase educational opportunities for students in ecology, biology, and environmental studies. Statewide assessments will facilitate improved wetland management decisionmaking at the State level and will also help the State better understand the role of wetlands in groundwater recharge and floodwater storage for flood mitigation.

Program: Infrastructure Planning	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**  1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Infrastructure Planning and Design:** This includes highway planning and preliminary design for the Kansas Department of Transportation and construction and facilities mangement for the Kansas National Guard. **Estimated Annual Operational Benefits:** Moderate; $524,000 Accurate elevation data can be used for preliminary highway alignment and design, estimation of earthwork quantities, and potential environmental effects on construction projects. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Lidar allows for more cost effective work in the office and less costs for surveying contracts. **Estimated Strategic Benefits:** Moderate Lidar improves the ability to predict enviromental effect and remediation.

Program: Geologic Mapping and Geotechnical Services	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 	**Geologic Mapping and Geotechnical Evaluation:** This includes geologic mapping, geologic hazard identification, and geotechnical evaluation for highway construction by the Kansas Geological Survey and the Kansas Department of Transportation.
	Estimated Annual Operational Benefits: Moderate; $5,000 Elevation data reduces the time required to generate data features for mapping products and improves overall data quality. It also provides enhanced feature detection capabilities for identification of areas of subsidence near salt mines, karst formations, and other areas of interest.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Reduction in time for local surveys and field data collection. Allows for high-resolution derivative products (such as hillshade and contour lines) to enhance the quality of cartographic products.
Update Frequency: 6–10 years	**Estimated Strategic Benefits:** Moderate Improvements to the quality of geologic databases and maps would provide better information to the scientific community as well as policymakers. Enhanced feature detection of geologic hazards could also provide valuable information to emergency management personnel and public safety. Improve public safety by identifying hazardous ground subsidence that could lead to highway embankment failure.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Forest Inventory for Resource Management and Wildlife Habitat Improvement	**Business Use:** 5. Forest Resources Management
 **Quality Level:** 	**Forest/Native Vegetation Management:** This includes assessment, inventory, and management of forest resources and grassland by the Kansas Forest Service and the Kansas Biological Survey. Lidar-based bare-Earth and surface elevation models provide excellent tools for woodland patch description, allowing for the estimation of biophysical properties, such as volume and woody biomass, density, age, percent canopy cover, canopy height, and areas of forestland. Such information will become increasingly important as resource management and carbon budgeting become more pressing matters at various levels of government. Woody encroachment on grassland can also be identified in support of rangeland management planning.
	Estimated Annual Operational Benefits: Moderate; $100,000 Lidar would provide the ability to assess forest resources across a much larger geographic area than could be accomplished manually, and has the potential to provide local data at a level that do not currently exist through traditional inventory and assessment methods.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, seamless lidar coverage across State boundaries is needed to address regional issues.	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported High-quality data improve forest inventory estimates and land cover change assessments, which faciliate the development of more accurate forest resource managment decisions by State officials and land owners.
	Estimated Strategic Benefits: Major The ability to more accurately and regularly quantify the size, condition, and issues associated with forest and agroforestry resources is important for environmental assessment. Wide area studies will improve citizen awareness and increase educational opportunities for forestry and ecology students and will foster improved forest management decisionmaking at the State level.

Program: Fire Management Program	**Business Use:** 16. Wildfire Management, Planning, Response
 **Quality Level:** 1 2 3 4 5	**Wildland Fire Management:** This includes determination of wildland fire risk and occurance based on fuel loading within wildland urban interface areas by the Kansas Department of Wildlife, Parks, and Tourism.
	Estimated Annual Operational Benefits: Major; dollar value not reported Lidar has the potential to help identify areas of extreme wildland fire risk based on fuel loading data.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Moderate Allows the State to be proactive in reducing fuel loads where fire risk is significant due to fuel loading (eastern red cedar).
Update Frequency: Annually	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, for partnerships across State boundaries.	

Program: Improvement of Wildlife Habitat on Private and Public Lands	**Business Use:** 7. Wildlife and Habitat Management
 **Quality Level:** 1 2 3 4 5	**Wildlife Habitat Management:** This activity includes improving wildlife habitat based on vegetative structure on private and public lands for the Kansas Department of Wildlife, Parks, and Tourism.
	Estimated Annual Operational Benefits: Not reported; dollar value not reported Kansas has not used lidar data yet, so is not sure about program effect. It is hoped that lidar point cloud data or digital surface model would provide the ability to determine existing vegetation for wildlife habitat. Lidar has not yet been used for this activity, so the State is not sure of the benefit amount.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Lidar would improve the ability to target types of wildife habitat needed in certain areas of the State.
Update Frequency: >10 years	**Estimated Strategic Benefits:** Not reported Lidar would improve understanding of existing wildlife habitats.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Local Functional Activities

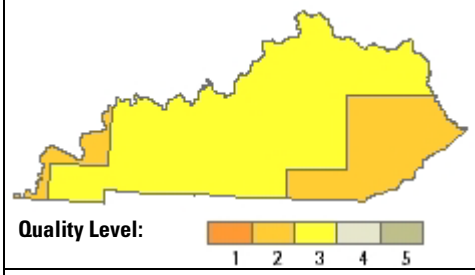
City Government—City of Wichita	
Program: Storm Water Management	**Business Use:** 14. Flood Risk Management
Functional Activity: Storm water management, flood modeling, and levee certification	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $750,000 Lidar has become and indispensable tool for daily operations in Wichita storm water management and engineering. Flood modeling for 300 detailed miles at $2,500 per mile saves $750,000 in surveying costs.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; $275,000 Wichita responds to approximately 400 drainage complaints per year. Most complaints are now resolved in the office saving 4 hours of surveying at $110 per hour, saving $176,000. Additionally, approximately 300 flooplain determinations are done for citizens. Lidar saves 3 hours of surveying at $110 per hour, totaling $99,000.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Lidar was used to certify levees that protect $6 billion in property. The potential insurance cost had the levees not been certified is unkown.

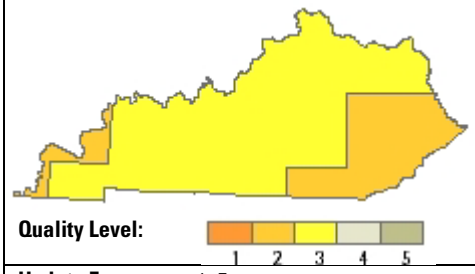
<table>
<tr><td colspan="2">County Government—Jefferson County</td></tr>
<tr><td>Program: County Government</td><td>Business Use: 22. Urban and Regional Planning</td></tr>
<tr><td colspan="2">Functional Activity: Orthoimagery procuction</td></tr>
<tr><td>Quality Level: QL3 elevation data from lidar</td><td>Estimated Annual Operational Benefits: Moderate; $13,000
Having lidar data since 2006 has provided a usable DEM for orthoimagery production in 2009 and future acquisitions. Cost savings are approximately $40,000 per acquisition every 3 years.</td></tr>
<tr><td>Update Frequency: >10 years</td><td>Estimated Annual Customer Service Benefits: Major; dollar value not reported
Get customer requests to see elevation data for home buiiding, surveying, utility projects, and quarry activities.</td></tr>
<tr><td>Bathymetric Data: Not reported</td><td rowspan="2">Estimated Strategic Benefits: Major
Providing people with accurate data during a decisionmaking process is always a benefit.</td></tr>
<tr><td>Tide-Coordinated: Not reported</td></tr>
</table>

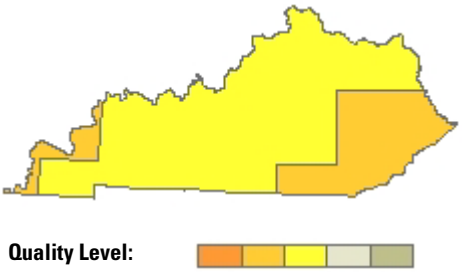
Kentucky

The State of Kentucky has requirements for QL2 (supports a 1-ft contour interval) and QL3 (supports a 2-ft contour interval) lidar acquistions, including collection of bathymetric data for stream channel cross-sections. Lidar-derived enhanced elevation data will support hazard flood inundation mapping, FEMA risk flood plain mapping, transportation mapping, surface water and groundwater quality and assessments, and geologic mapping. During the 3 years beginning in 2012, Kentucky will be collecting lidar-derived elevation data for the entire State.

State Functional Activities

Program: Risk Map	**Business Use:** 14. Flood Risk Management
 **Quality Level:**	**Flood Risk Mapping:** QL2 data will be required in steep forested topographies to capture the ground and possiby to capture stream channel bathymetry and (or) for very flat, hydrologically complex flood plains.
	Estimated Annual Operational Benefits: Major; dollar value not reported Better identification of flood hazards, creation of flood depth grids, improved hydraulic modeling. Enhanced mitigation alternatives.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Provide ranchers on the east side of the State with better plan reviews. Provide the soil and water conservation districts on the east side improved analysis of erosion and sedimentation. Additional coordination between user agencies.
Update Frequency: 6–10 years	**Estimated Strategic Benefits:** Major Increased awareness, enhanced credibility of the Risk MAP Program.
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Yes, for edgematching, watershed delineation, stream flow connectivity	

Program: State Road Infrastructure	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**	**Transportation Infrastructure Development and Management:** QL2 data will be required in steep forested topographies to capture the ground and (or) for very flat, hydrologically complex flood plains.
	Estimated Annual Operational Benefits: Major; dollar value not reported Improves planning, hydrologic modeling, and phase 1 design work for highway design. Expedites design build process.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Detailed elevation data cuts down on time and manpower needed for design build.
Update Frequency: 4–5 years	**Estimated Strategic Benefits:** Major Benefits description not reported
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, for bridge construction	

Program: Geologic Mapping	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:**	**Geologic and Hazard Mapping:** QL2 data will be required in steep forested topographies to capture the ground and (or) for very flat, hydrologically complex flood plains.
	Estimated Annual Operational Benefits: Moderate; $100,000 More accurate landform visualization and analysis for surficial geologic mapping and landslide identification. Improved detail and accuracy of mapped landforms and deposits.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported More accurate and detailed map products, improved efficiency of production.
Update Frequency: 4–5 years	**Estimated Strategic Benefits:** Moderate Improved awareness of geologic hazards, improved knowledge of environmental context, improved basis for policy decisionmaking.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

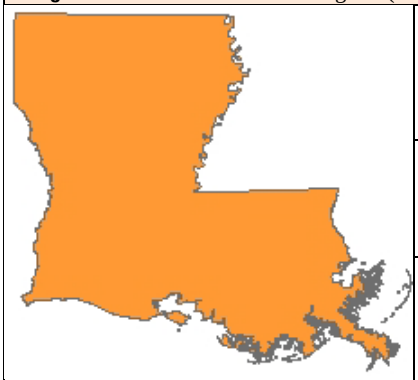
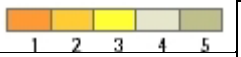
Regional Government—Louisville and Jefferson County Metropolitan Sewer District (MSD), Louisville and Jefferson County Information Consortium (LOJIC)	
Program: Base map Update	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Base map maintenance	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $300,000 Lidar used as control for aerial orthoimagery and replaces photogrammetric compilation of mass points for update of 2-ft terrain contours. Acquisition of lidar and breaklines would allow in-house generation of updated terrain contours. Lidar and terrain data would be available for use by local agencies and consultants for myriad economic development projects as well as transportation and utility infrastructure management.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; not reported Lidar and terrain data could be updated internally more efficiently and made available for use more rapidly than via contracted photogrammetric services. Updated contours and terrain datasets would be accessible to local agencies and the public by Web services. Elevation data are crucial for local storm water management, development review, flood insurance determinations, property assessment, and hazard mitigation activities.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Terrain data are shared with local universities and public schools for GIS and environmental education, as well as the private sector to support economic development, planning and construction operations. Terrain data are and essential part of the community's base map and is available to the public by Web services. Terrain data are crucial to local development, storm water management, and various emergency management operations.

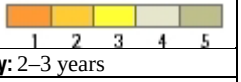
Regional Government—MSD, LOJIC	
Program: LOJIC GIS	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood plain and storm water management	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $600,000 Accurate terrain data from which to derive watershed delineation, flow models, up-to-date flood plain limits, development controls for slope. Update of existing topographic data, development change detection, automated feature extraction, Web-based access to regional terrain data.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Rapid generation of high accuracy local flood models and disimination of information to emergency responders and the public. Updated flood plain delineation toward most effective flood insurance rolls; generation of terrain datasets for ready access to scalable elevation and slope surfaces via the community's shared GIS. Local agency and public access to accurate, up-to-date terrain data for local storm water management and flood plain delineation.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Updated flood plain delineation toward most effective flood insurance rolls; generation of terrain datasets for ready access to scalable elevation and slope surfaces via the community's shared GIS. Accurate terrain data to be shared with local universities and public schools and emergency responders.

Louisiana

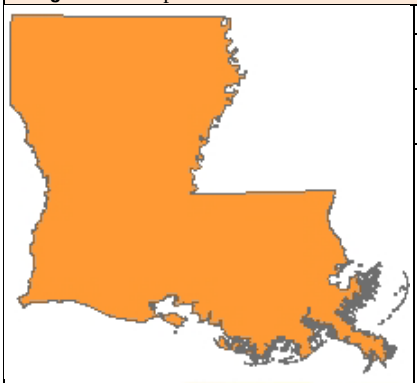
The State of Louisiana has requirements for elevation data that meet the business uses and functional requirements for sectors including oil and gas, homeland security, flood risk mapping, wildlife and habitat mapping, bridge and road design, coastal restoration and management, nonpoint source pollution modeling, and stream management. The major terrain types in Louisiana are wetlands, forested, agriculture, and developed. The terrain type and application of the elevation data must be considered when determining requirements for quality level. Lidar data are used extensively in the energy sector (oil, gas, and minerals) for risk management. Louisiana's statewide lidar project started in 2000, largely in response to the high flood loss rates reported by the FEMA NFIP and the private insurance industry in the State. Following Hurricane Katrina, FEMA used the data to estimate flood damage throughout the affected areas of Louisiana. Lidar data are needed to improve models that predict the capacity of floodways during events such as the spring 2011 floods. The State also has lidar requirements for natural resource applications, including modeling plant and wildlife habitats, modeling forest canopies, and constructing water quality management projects.

State Functional Activities

Program: Technical Assistance Program (Louisiana Oil Spill Coordinator's Office)	**Business Use:** 12. Oil and Gas Resources
 **Quality Level:** 	**Building Geospatial Infrastructure for Oil Spill Prevention, Planning, Response, and Damage Assessment:** Based on the costs associated with damages from Hurricane Katrina, the Louisiana lidar dataset had a 10:1 ROI through cost avoidance. The Louisiana lidar dataset offered FEMA significant cost savings in performing damage assessment and providing timely assistance to citizens.
	Estimated Annual Operational Benefits: Major; dollar value not reported Performing oil spill risk assessment is one of the major operational benefits of the program. Updating of an oil spill risk assessment would provide a moderate (current) benefit by allowing the State to see changes in potential risks.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Updating of an oil spill risk assessment would provide public and private sector entities with quantifiable data, allowing the State to see changes in potential risks, allowing for improved oil spill prevention and contingency planning. On average, an oil spill costs $5,000,000; therefore, alleviating one oil spill by using lidar based topography combined with flood modeling provides a significant positive environmental effect, in addition to the financial benefit.
Update Frequency: 2–3 years	**Estimated Strategic Benefits:** Major Social benefits include improved assessment in hurricane flood modeling leading to improved evacuation planning for citizens. Improved flood modeling allows industry to better understand the oil spill risk from storm surges allowing the public and private sector to avoid (prevent) devastating environmental injury.
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Yes, at the watershed level	

Program: Wildlife Division GIS Program	**Business Use:** 7. Wildlife and Habitat Management
 **Quality Level:** 	**Flood Risk Mapping, Habitat Terrain Evaluation**
	Estimated Annual Operational Benefits: Major; dollar value not reported Ability to gain elevation data without field surveys. Ability to map areas estimated to be flooded by events such as the Mississippi River flooding event of May 2011. Lidar at a higher resolution would allow better habitat terrain mapping and modeling of flood events as well as visualization of textured environments such as forests.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Biologists supported by the GIS program would be better able to manage habitats throughout Louisiana. Customers often request products that include lidar elevation at the existing available resolution, but higher resolution lidar is often requested.
Update Frequency: 2–3 years	**Estimated Strategic Benefits:** Major Additional ability to accurately model, map, and manage public wildlife management areas. Any tool that allows the State to better manage Louisiana public wildlife management areas is an asset to State programs.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Not reported	**Business Use:** 21. Infrastructure and Construction Management



Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Not reported

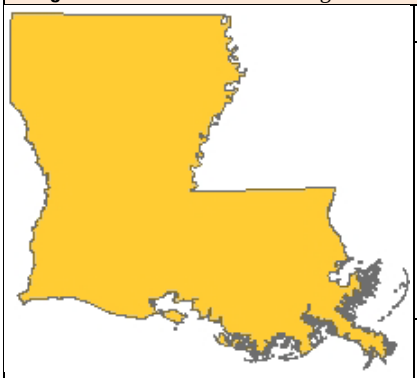
Road and Bridge Design

Estimated Annual Operational Benefits: Not reported; dollar value not reported
Benefits description not reported.

Estimated Annual Customer Service Benefits: Not reported; dollar value not reported
Benefits description not reported.

Estimated Strategic Benefits: Not reported
Benefits description not reported.

Program: Office of Coastal Management	**Business Use:** 4. Coastal Zone Management



Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: Yes

Tide-Coordinated: Yes

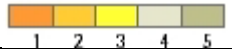
Data Outside State Needed: No

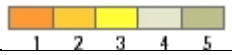
Enforcing Coastal Use Regulations

Estimated Annual Operational Benefits: Major; dollar value not reported
According to Louisiana statute, activities that take place on lands 5 ft above mean sea level do not require a coastal use permit. Lidar is a very useful starting point in determining whether or not coastal use permit applications meet this requirement.
Lidar information is also the starting point for deciding where to construct a water quality management project. Due to the sediment distribution and accumulation during high water events across the Atchafalaya Basin Floodway System, the most effective means of tracking the changes in elevation in this vast freshwater swamp is through lidar. Lidar allows the Atchafalaya Basin Program and its Technical Advisory Group to identify the feasibility and cost effectiveness of proposed projects in a very efficient and effective manner.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Benefits description not reported.

Estimated Strategic Benefits: Major
Benefits description not reported.

Program: Nonpoint Source Pollution Program	**Business Use:** 2. Water Supply and Quality
	**Nonpoint Source Pollution Modeling**
	Estimated Annual Operational Benefits: Not reported; dollar value not reported Benefits description not reported.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Elevation data are used to model nonpoint source pollution runoff in impaired watersheds. The results are included in watershed implementation plans, which are then forwarded on to watershed coordinators and the Department of Agriculture and Forestry for implementation. High-resolution land-use data, including crop type, are being collected. These data, along with the Natural Resources Conservation Service Soil Survey Geographic Database detailed soil data, complement the high-resolution lidar data.
Quality Level: 	**Estimated Strategic Benefits:** Not reported Benefits description not reported.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Homeland Security and Emergency Preparedness	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
	**Homeland Security and Emergency Preparedness:** Developing appropriate geospatial base layers for emergency preparedness, disaster response, and hazard mitigation analysis.
	Estimated Annual Operational Benefits: Moderate; dollar value not reported During operational phases lidar is used to assess potential flood concerns and to support modeling operations.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Provides primary basis for identification of surface elevations needed for all hazard mitigation projects submitted to FEMA.
Quality Level: 	**Estimated Strategic Benefits:** Not reported Benefits description not reported.
Update Frequency: 2–3 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

County Government—Terrebonne Parish Consolidated Government	
Program: GIS Mapping	**Business Use:** 4. Coastal Zone Management
Functional Activity: Hydrologic and hydraulic modeling (used in flood risk mapping)	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Establishing flood zones and base floor elevation data and levee height requirements, improved base floor elevation requirements.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Online elevation data for public use.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Aid in locating roads that flood during hurricanes.
Tide-Coordinated: Not reported	

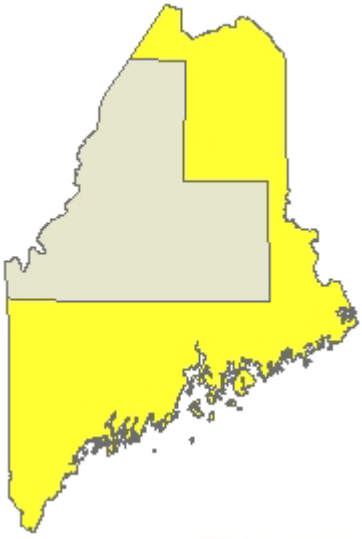
County Government—Terrebonne Parish Consolidated Government	
Program: GIS Mapping	**Business Use:** 14. Flood Risk Management
Functional Activity: Hydrologic and hydraulic modeling	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Data would be used in flood plain mapping.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major;dollar value not reported Updated lidar data could be used for obtaining online data.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Improved levee design.
Tide-Coordinated: Not reported	

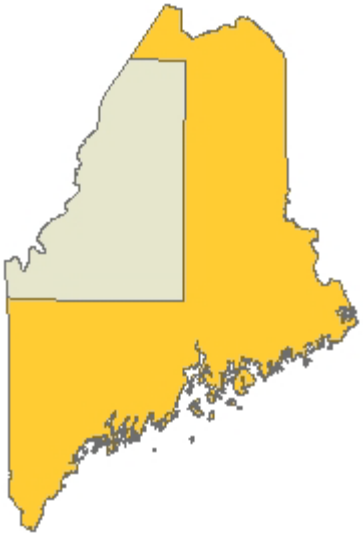
County Government—Terrrebonne Parish Consolidated Government	
Program: Not reported	**Business Use:** 22. Urban and Regional Planning
Functional Activity: FIRM modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: No	

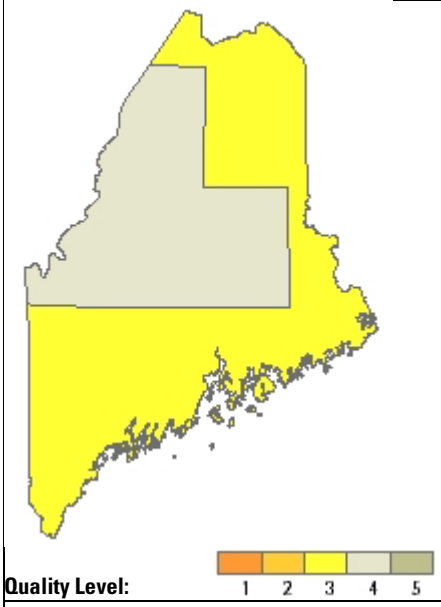
Maine

Maine is 33,215 square miles in size with topography ranging from the western mountains to the sandy southern coastal plain to the rocky shoreline "down east." The highest elevation is Mount Katahdin at 5,268 ft, and the lowest points are at sea level where Maine meets the Atlantic Ocean. The State is rural with approximately 1.3 million residents. About 50 percent of the State consists of unorganized territories with a total year-round population of a little more than 20,000. This area includes the western mountains, and much of the ownership is in the form of very large tracts of land mainly for forestry-related operations. Accurate elevation data are important to many programs, but based on the current priorities, the following activities are the most important: flood risk mapping, watershed delineation and hydrographic mapping, and mapping landslide hazards away from the coast. Currently 10-m DEMs are available for the entire State from the USGS. Statewide, 5-m DEMs are available for purchase (with licensing restrictions) from Intermap. Lidar data at accuracies ranging from 15 to 18.5 cm RMSE are available for approximately 10 percent of the State, primarily as a result of the New England lidar project, funded in part with American Reinvestment and Recovery Act funds. For these areas, 2-m or better DEMs are available. The 2008 Maine GIS strategic plan identified the acquisition of accurate elevation data as a priority.

State Functional Activities

Program: Mapping Hydrography, Watershed Boundaries, Coastline, and Offshore	**Business Use:** 1. Natural resources conservation
 **Quality Level:** 1 2 3 4 5	**Watershed delineation and hydrographic mapping:** Improvements in delineating watersheds and hydrography including very detailed delineations of small watersheds in urban areas for storm water managemnent.
	Estimated Annual Operational Benefits: Major; $500,000 Those benefits are what the State is realizing now for the small areas in which have lidar. Same benefits would be expanded geographically.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported These benefits would continue, but would cover a larger area.
	Estimated Strategic Benefits: Major The benefits would be increased to a larger geographic area.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Need data for watersheds spanning the New Hampshire and Canadian border	

Program: Geologic hazard assessment	**Business Use:** 9. Geologic resource assessment and hazard mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** Not reported	**Geologic hazard mapping:** Assessments of landslide hazards away from coastal areas including more accurate mapping of historic landslides in key areas. **Estimated Annual Operational Benefits:** Not reported; $200,000 Highly improved assessments on landslide hazards away from coastal areas. More accurate mapping of historic landslides in key areas. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Highly improved assessments on landslide hazards away from coastal areas. More accurate mapping of historic landslides in key areas. **Estimated Strategic Benefits:** Major Greater ease of identifying and mapping historic landslides; improved presentation to the public.

Program: Maine Flood Plain Management Program	**Business Use:** 14. Flood risk management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program once nationwide information has been collected once **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** Not reported	**Flood Risk Mapping:** The Maine Floodplain Management Program (MFPM), working with FEMA's Risk MAP Program, is focused on bringing outdated and invalid flood studies into compliance with scientifically proven methodologies, including redelineating flood plain boundaries using high-resolution topographic data. The MFPM will use these new data to not only improve flood plain mapping inventory, but also to develop new interactive mapping products for communities to use when communicating risk. These products require accurate topographic and scientific studies. The FEMA business model quantifies cost versus risk levels to determine how to prioritize new and revised mapping. Historically, when this type of qualifying criteria are used, however, the rates for Maine are lower than those of more densely populated areas of the country. **Estimated Annual Operational Benefits:** Not reported; $1,200,000 If lidar products were available off the shelf to support the MFPM, the program would likely leverage $12,000,000 of FEMA money during 10 years for remapping. This would improve Maine's ability to produce flood maps, protect lives, and minimize property and public infrastructure damage. **Estimated Annual Customer Service Benefits:** Not reported; $720,000 to $3,600,000 Experience shows that 25 percent of properties receiving disaster relief are not in mapped flood plain. Maine has nearly 9,000 flood insurance properties and the average home value is $160,000 in today's [2012] market. 2,250 properties across the State are estimated to be at risk in the event of a 100-year flood (that is, an average of 22.5 homes per year). Structure damage the costs of which range from 20 to 100 percent of property values are possible, resulting in losses of $72 million to $360 million during 100 years. Mortgage, real estate, and insurance companies use better data to make better decisions. **Estimated Strategic Benefits:** Not reported Having reliable data to make sound economic development and planning decisions is the key to building a sustainable community. Currently [2012], thousands of acres of land are mistakenly identified as being in a mapped flood plain when they are not. Conversely thousands more are not mapped in when they should be, and development activity is allowed in these high risk areas. Knowing the flood risk mitigates potential loss of life and property damage.

Local Functional Activities

City Government—Town of York	
Program: Town of York Comprehensive Plan	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Storm water mapping and modeling for low-effect development analysis	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; not reported Good elevation data have a much greater use than the original intent and are integral to assisting people with visualizing what maps are trying to demonstrate. Increased relevance and credibility in the methods of analysis.
Update Frequency: >10 years	**Estimated Annual Customer Service Benefits:** Major; not reported The ability to remain relevant and credible. In general, the reaction received when the customer realizes that the town has elevation data is enthusiastic surprise, which shows that the town is serious and professional about GIS.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Again it is the ability to remain relevant and credible. The ability to do analyses in-house has increased the ROI on the GIS because the GIS provides better data for decisionmaking processes.

County Government—Hampden	
Program: Comprehensive plan	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Municipal mapping—Tax parcels, zoning, building footprints, impervious	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; not reported There are no data of high enough quality available. Better data would help businesses moving to town with site plan purposes as well as other town planning.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; not reported Engineers and surveyors requesting elevation data would actually be able to receive some; currently, there are no data of high enough quality available.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Would help with site plans for developments; currently, there are no data of high enough quality available.

Regional Government—Greater Portland Council of Governments	
Program: Regional Sustainable Communities Planning Grant	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Transportation planning, transit planning, resource conservation, watershed management, coastal hazard evacuation planning, zoning, and land use identification	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; not reported This is a regional comprehensive planning effort which include York and Cumberland Counties. The planning and analysis will integrate land use, transportation, infrastructure, watershed, natural resource preservation, housing, and other land data to develop policies for sustainable development. Comprehensive regional datasets would reduce the time required for gathering the base data and conducting the analysis.
Update Frequency: >10 years	**Estimated Annual Customer Service Benefits:** Major; not reported All towns in York and Cumberland Counties will benefit from analyses and policy recommendations based on accurate data.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Visual planning and mapping tools that could be created to display existing and or future conditions would be very useful for informing and gathering plan support from the general public and elected officials.

Tribal Functional Activities

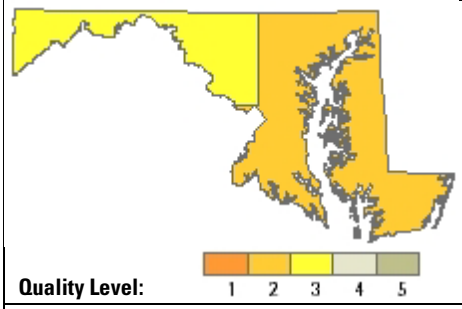
Penobscot Indian Nation	
Program: Forest Resource, Water resource, Wildlife, Fisheries, Air Quality	**Business Use:** 5. Forest Resources Management
Functional Activity: Forest resources management, water quality monitoring	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Forest management planning, water quality monitoring design, and sampling management.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Timber type inventory, harvest management, water quality monitoring, and remediation.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Hunting mapping, camp mapping, student delivery, tribal event management, and clinic visitor locating.

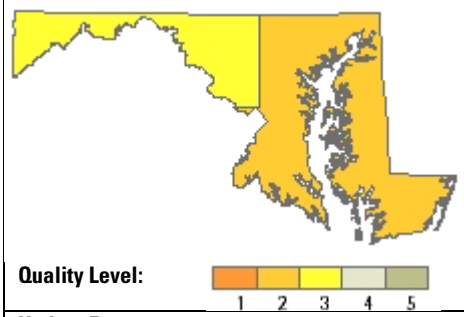
Maryland

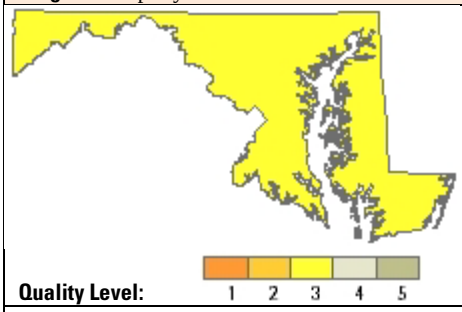
The two main applications for lidar use are to manage, identify, analyze, monitor living resources especially with regard to the Chesapeake Bay; and flood risk mapping associated with FIRM and educating elected officials, planners, and code enforcement officers on the effects of possible sea level rise in coastal communities. Understanding flood hazards includes mapping natural features and manmade structures that may be affected by sea level rise.

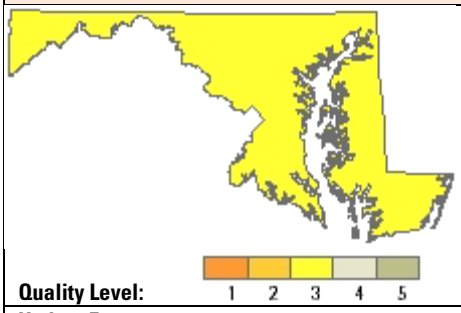
State Functional Activities

Program: Highway Storm Water Modeling	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5	**Storm Water Management and TMDL:** Storm water management, TMDL monitoring, transportation planning. The State Highway Administration has never funded lidar acquisition. Fastest growing user of lidar in Maryland.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Not reported; $200,000 Benefits description not reported.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Not reported Benefits description not reported.
Data Outside State Needed: Yes	

Program: Chesapeake Bay Critical Area	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5	**Natural Resources Management:** Programs of the Maryland Department of Natural Resources supported fisheries, submerged aquatic vegetation, sea level rise, near-shore critical area, coastal zone management, and State lands management. The Department of Natural Resources is the largest investor to date in lidar, acquiring nearly all counties with tidal waters. No funds to identify a second maintenance collection are identified.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Benefits description not reported.
Tide-Coordinated: Yes	**Estimated Strategic Benefits:** Moderate Benefits description not reported.
Data Outside State Needed: Yes	

Program: Flood Risk	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5	**Digital FIRM Generation:** FEMA flood risk mapping includes short and long term coastal inundation and change. Lidar is now a standard component of digital FIRM content. It is essential to have lidar data to have an approved digital FIRM.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; $40,000 Maintenance of FIRMs and digital FIRMs.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Mitigation of flood damage, insurance claims.
Tide-Coordinated: Yes	**Estimated Strategic Benefits:** Minor Flood losses in Maryland are not significant in the past 10 years. However, flood losses may increase over the next several decades as sea level rise compounds flooding events.
Data Outside State Needed: No	

Program: Property Value Assessment	**Business Use:** 22. Urban and Regional Planning
	**State Land Use and Regional Planning: The** Maryland Department of Planning is interested primarily in parcels and the value of structures on property. Lidar is a great source for structures and buildings. Statewide planning issues are vetted here, such as base realignment and closure planning at Aberdeen Proving Ground. Lidar was used to plan for new residential areas.
Quality Level:	**Estimated Annual Operational Benefits:** Moderate; $200,000 Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; $200,000 Benefits description not reported.
Bathymetric Data: No	**Estimated Strategic Benefits:** Major Benefits description not reported.
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Maryland Emergency Manangement Agency	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
	**Emergency Response Applications:** The Maryland Geospatial Information Officer (GIO) sits in the Department of Information and Technology. The GIO sees the many uses within the State and local government, including the economic development and opportunity (wind power) and increasingly the emergency response sector.
Quality Level:	**Estimated Annual Operational Benefits:** Major; dollar value not reported Benefits description not reported.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Benefits description not reported.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Minor Benefits description not reported.
Tide-Coordinated: Yes	
Data Outside State Needed: Yes	

Local Functional Activities

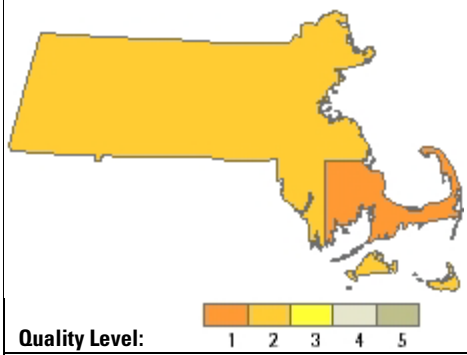
County Government—Anne Arundel County	
Program: Watershed, Ecosystems, and Restoration Services	**Business Use:** 2. Water Supply and Quality
Functional Activity: Resource management for water quality and development review	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; not reported Better deliniation of drainage areas, better data for water quality modeling, and planning of restoration projects. Each acquisition data quality has improved.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; not reported Better data available will decrease processing time of requests. Periodic updates will descrease staff time messaging data and explaining results that do not make sense when modeled with 5-year-old elevation data. Timeliness
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate
Tide-Coordinated: Yes	Development review and emergency response of spills. Data already used for these purposes since 1995.

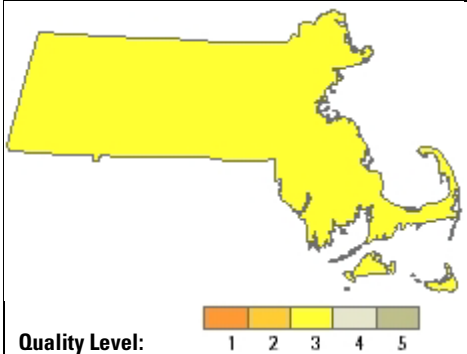
Regional Government—Baltimore Metropolitan Council	
Program: Baltimore Metropolitan Council	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Transportation, including long range transportation planning and transportation improvement programs	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; not reported Benefits description not reported.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Do not know; not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know
Tide-Coordinated: Not reported	Benefits description not reported.

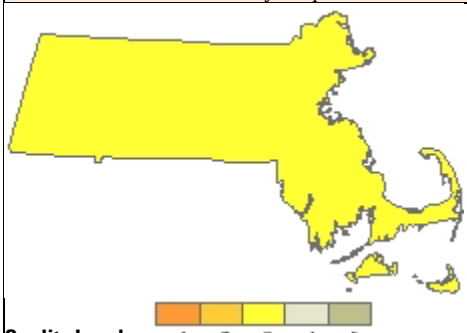
Massachusetts

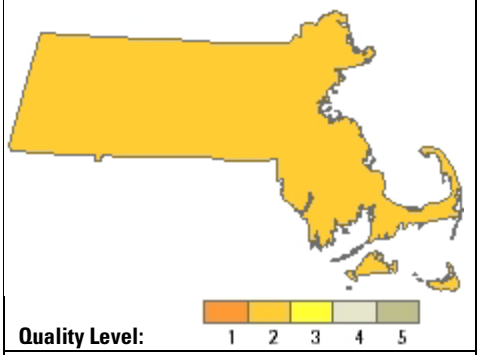
Massachusetts is 10,555 square miles in area with topography ranging from the Atlantic coastal lowland to the Connecticut River to the Berkshire Hills and Taconic Mountains. The highest elevation is Mount Greylock at 3,487 ft, and the lowest points are at sea level where Massachusetts meets the Atlantic Ocean. The eastern part of the Commonwealth, which includes Boston, is densely populated, while the western Berkshire Hills and Taconic Mountains are the most rural part of the Commonwealth. Accurate elevation data are important to many programs, but based on the current priorities, the following activities are the most important: flood risk mapping, water resource assessment, building feature extraction, and climate change adaptation for habitat and infrastructure. Currently, Massachusetts has a statewide DEM that is 3 m vertical gridded to 5 m, which was photogrametrically derived from 2005 imagery. Thirty-meter DEMs are available for the entire Commonwealth from the USGS. FEMA and MassGIS have collected significant lidar data during the past few years and DEMs ranging from 1 to 3 m will be available for most of the eastern half of the Commonwealth. Significant additional areas were acquired as a result of the New England lidar project funded in part with American Reinvestment and Recovery Funds. The 2007 strategic plan for Massachusetts spatial data infratstructure identified lidar as a priority.

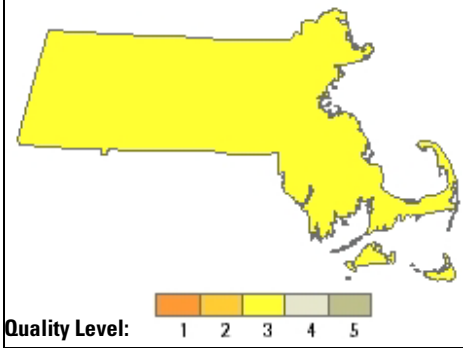
Commonwealth Functional Activities

Program: Watershed Assessment and Planning	**Business Use:** 3. River and Stream Resource Management
 **Quality Level:**	**Water Resource Assessment:** The GIS program supports 25 or more GIS users in the Department as well as supplying direct support in data development and analysis. Particular attention to watershed deliniation and water supply protection areas.
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Improved resource assesment.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Benefits description not reported.
Tide-Coordinated: Yes	**Estimated Strategic Benefits:** Moderate Benefits description not reported.
Data Outside Commonwealth Needed: Not reported	

Program: Flood Hazard Management Program	**Business Use: 14. Flood Risk Management**
 **Quality Level:**	**Flood Risk Mapping:** The development of new or updated FEMA flood risk products.
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Major; no dollar value reported Widely available lidar data statewide would have great benefits in the development of new or updated FEMA flood risk products. The time and cost savings would be achieved by FEMA and its mapping contractors. The program's coordination role would be easier and better performed by widespread (statewide) availability of the data.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Availability of a statewide elevation dataset would vastly improve the ability of communities to use the FEMA flood data in a consistent manner and allow for improved statewide analysis of the data.
Tide-Coordinated: Yes	**Estimated Strategic Benefits: Minor** It appears likely that acceptance of the flood products would be improved with better elevation data as their basis.
Data Outside Commonwealth Needed: Not reported	

Program: Massachusetts Spatial Data Infrastructure—Structures and Public Safety Requirements	**Business Use:** 22. Urban and Regional Planning
	**Building Feature Extraction in Context of Object-Oriented Image Classification:** Building feature extraction primary in support of enhanced 911 (E–911). **Estimated Annual Operational Benefits:** Not reported; $50,000 If the Commonwealth had lidar data at the desired quality level, it could calculate building masses from elevation data. Lidar elevation and intensity values would help with classification of orthophoto imagery. Massachusetts would also be able to support classification of forest and urban forest species, which would further improve classification of impervious surface. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Massachusetts can increase the quality of the product delivered using lidar data. The accuracy and precision will benefit primary customers, which is the Commonwealth's 911 program. There is a need for very complete classification without errors or omissions, which lidar will help achieve.
Update Frequency: 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside Commonwealth Needed:** Not reported	**Estimated Strategic Benefits:** Major Public safety will have improved response times potentially saving lives. In other application areas, emergency response will benefit from ability to do real-time flood mapping, environmental users will benefit from resource identification, economic development will also benefit from quicker and cheaper site evaluation.

Program: Climate Change Adaptation	**Business Use:** 21. Infrastructure and Construction Management
	**Risk Management, Development of Adaptation Strategies:** Climate change adaptation. Climate change is the greatest environmental challenge of this generation, with potentially profound effects on the economy, public health, water resources, infrastructure, coastal resources, energy demand, natural features, and recreation. The Commonwealth of Massachusetts is committed to doing its part to mitigate and adapt to this challenge, recognizing the necessity of engaging in adaptation planning today by taking a close look at strategies that could help the Commonwealth become more resilient and ready to adapt to climate change as it occurs. Regarding infrastructure, the most significant vulnerability of existing structures stems from the fact that most were built based on historic weather patterns, not taking into account future predicted changes to sea level, precipitation, and flooding. This puts such infrastructure at increased risk of future damage and economic costs. Therefore, having more accurate maps and surveys—such as lidar elevation surveys—will help update current conditions, identify vulnerable facilities, and improve predictive capability. Incorporating these changes into the repair and upgrade of existing infrastructure, as well as the improved siting and design of future infrastructure, will help minimize the anticipated effect of climate change effects on the infrastructure network. Key strategies include bolstering infrastructure resources by increased conservation, efficiencies, reuse of resources, and timely maintenance; building system redundancies; updating land use, siting, design, and building standards to include climate change projections; using natural systems for enhanced protection; and increasing resilience of infrastructure and the built environment. **Estimated Annual Operational Benefits:** Major; dollar value not reported Elevation data will help update current conditions, identify vulnerable facilities, and improve predictive capability. Incorporating these changes into the repair and upgrade of existing infrastructure, as well as the improved siting and design of future infrastructure, will help minimize the anticipated effect of climate change effects on the infrastructure network. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Elevation data will identify specific neighborhoods, busnesses, and infrastructure at risk in flood events, which will allow for customers to take adaptive measures.
Update Frequency: 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside Commonwealth Needed:** No	**Estimated Strategic Benefits:** Not reported.

Program: Climate Change Adaptation	**Business Use:** 7. Wildlife and Habitat Management
 **Quality Level:**	**Habitat Inventory, Development of Adaptation Strategies:** Various adaptation alternatives, opportunities, and measures are available to address vulnerabilities arising from climate change. Strategies vary by type, scale, scope, and institutional responsibility. An analysis of natural resources and habitat identifies potential strategies to enable the four broad ecosystem types in Massachusetts—forested, aquatic, coastal, and wetland—to adapt to climate change. These include protecting ecosystems of sufficient size and across a range of environmental settings, maintaining large-scale ecosystem processes and preventing isolation, limiting ecosystem stressors, and maintaining ecosystem health and diversity. These also include using nature-based adaptation solutions, embracing adaptive management, and developing a unified vision for conservation of natural resources, which can be carried out on a collaborative basis.
Update Frequency: >10 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported A variety of applications for elevation data in developing adaptation strategies for important habitat types were identified. For aquatic habitats, detailed elevation data support modeling of streamflow to identify vulnerable intermittent headwater streams and their buffer areas. For coastal ecosystems, elevation data will help identify undeveloped areas that are upgradient from coastal wetlands to allow wetland migration and buffer intact ecosystems. Lidar data will also identify and prioritize protection of areas that may become wetlands in the future as sea level rises. As sea levels continue to rise, the whole system of coastal wetlands and subtidal habitats will move inland. Data will also be used to identify, assess and mitigate existing impediments to inland migration of coastal wetlands, which cannot occur in areas where either the topography does not permit it, or where barriers, such as roads, seawalls, or settlements, prevent it. For wetlands ecosystems, lidar can be used to identify important wetlands and both aquatic and terrestrial connectivity between wetlands and associated upland.
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside Commonwealth Needed: No	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Not reported

Local Functional Activities

City Government—Town of Amherst	
Program: FEMA FIRM Revision	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Although not yet into the production stage of FEMA FIRM revisions, the city government has already seen significant savings in the cost of obtaining elevation data by lidar as opposed to traditional photogrammetry as was done in the past. The level of detail in elevation data from lidar also is much greater than what had been obtained in the past. Use of lidar appers to decrease the amount of labor necessary to process elevation data for the purposes the data are needed.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More detailed DEM and hillshade images cab now be used in maps, as can 1-ft elevation contours, online and as downloadable data, which make for better map products than what had been available in the past.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Local zoning includes a flood protection zone that differs from the FEMA FIRM flood zones. The zone is based upon elevation in many areas and was not accurately mapped to match the current base map until the acquisition of the lidar-generated terrain model. The zone is being remapped to match the definition and the modern base map.

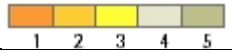
Michigan

The State of Michigan does not yet have statewide lidar and lidar-based high-resolution DEM data but has requirements for this type of data. The requirements documented through this survey are related to flooding, wildfires, and transportation infrastructure. Other State level requirements and more quantitative benefit information were not yet documented through this survey due to low response rate, and limited available resources during this period by key stakeholder groups for the intensive survey.

State Functional Activities

Program: Hazard Mitigation Planning	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** >10 years **Bathymetric Data:** Not reported **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Flooding:** Flooding, hazard mitigation planning, and flood risk management. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported A GIS-based analysis could allow consistent statewide analysis to replace inconsistent local analyses. This could identify and prioritize areas most likely to benefit from multistructure flood mitigation projects, tying in with FEMA funding, and benefit-to-cost justification. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported A statewide GIS analysis could allow the flood portions of dozens of local hazard mitigation plans (plus the State hazard mitigation plan) to be produced more quickly and consistently, allowing comparisons and prioritizations between alternative flood mitigation projects. **Estimated Strategic Benefits:** Moderate A more consistent and comprehensive statewide analysis of at-risk properties could be obtained and used in hazard mitigation plans at the State and local levels, allowing the identification and prioritization of flood risks and flood mitigation projects.

Program: Wildfire Vulnerability Analysis	**Business Use:** 16. Wildfire Management, Planning, Response
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** Not reported **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Wildfire:** Wildfire, wildfire vulnerability analysis, and wildfire management planning and response. It is expected that these activities would be much improved by high-quality elevation and vegetative cover data. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Not certain that appropriate quality of required elevation data was selected; need a quality that would allow vegetative cover to be identified, ideally along with tree heights, as well as the identification of built structures in the area. A statewide GIS analysis of those data could then allow wildfire risk areas to be identified and wildfire vulnerabilities to be assessed, in order to identify and prioritize wildfire mitigation projects throughout the State. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Good elevation data, including forest types and tree height information and identification of structure locations, would allow a great expansion of the quality and consistency of wildfire analyses throughout the State, in local and State hazard mitigation plans. This would allow the identification and prioritization of wildfire mitigation projects to take place and to justify the benefits of these projects to FEMA. **Estimated Strategic Benefits:** Moderate Good elevation data, including forest types and tree height information as well as the identification of structure locations, would allow a great expansion of the quality and consistency of wildfire analyses throughout the State, both in local hazard mitigation plans and the State hazard mitigation plan. This would allow the identification and prioritization of wildfire mitigation projects to take place, and to justify the benefits of these projects to FEMA, including enhanced life safety, infrastructure protection, transportation and emergency access, and economic and tourism benefits.

Program: No program	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**  	**Transportation planning:** Transportation infrastructure preliminary design, planning, and construction management.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Minor; dollar value not reported Benefits description not reported.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Minor; dollar value not reported Benefits description not reported.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Minor Benefits description not reported.
Data Outside State Needed: Not reported	

Local Functional Activities

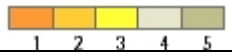
City Government—City of Lansing	
Program: Emergency Operations Center Hazard and Vulnerability Analysis	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood mapping, hazard and vunerability analysis	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Elevation data will be used for planning, identifying, and educate the public of the effects of inundation as the result of an 100-year flood. These data will also be used identify potential properties to be acquired within the flood plain to be restored to a natural setting. New benefits will be the ability to generate 3D models to show the potential effect of a 100-year flood and for a dam breach inundation study.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported From an emergency management perspective, elevation data provides a new resource to better plan for an event. Without these data, the potential effect of an event can be only a conjecture. More up-to-date and improved accuracy in data allow for a better quality product. Improvement the the delivery of any product will be dependent on the purchase of software to analyze the data. A moderate improvement is anticipated in this area.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major The social and benefits will be the ability to better educate the public of the effect of a 100-year flood, which is a public health and safety responsibility of the city. The property acquisition program anticipates acquiring property in the flood plain, razing the buildings, and restoring the land to a natural environment.

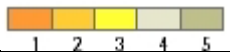
<table>
<tr><td colspan="2">City Government—City of Lansing</td></tr>
<tr><td>Program: Planning and Neighborhood Development</td><td>Business Use: 22. Urban and Regional Planning</td></tr>
<tr><td colspan="2">Functional Activity: Developing building footprints and 3D models</td></tr>
<tr><td>Quality Level: QL3 elevation data from lidar</td><td>Estimated Annual Operational Benefits: Major; dollar value not reported
Elevation data with software to analyze the data will provide the necessary tool to conduct viewshed analysis. This is a service that is currently not available. This will save staff time in preparing presentation material for public input on development activities, cell tower locations, and demolitions.</td></tr>
<tr><td>Update Frequency: 4–5 years</td><td>Estimated Annual Customer Service Benefits: Major; dollar value not reported
The benefit is to provide a service that is currently not available and savings in transportation costs to the site as well as allowing for timely delivery of the benefit. The public will be able to better visualize the effect or benefit within the scale of development around the project site during public participation. Currently data are not being used for this program activity.</td></tr>
<tr><td>Bathymetric Data: Not reported</td><td rowspan="2">Estimated Strategic Benefits: Major
Elevation data will better enhance the public participation process by allowing the public to better visualize what existing and what is proposed in the development process. The environmental benefits can be derived from view and solar analysis. Taking into consideration of scale and shadowing as the result of any proposed development.</td></tr>
<tr><td>Tide-Coordinated: Not reported</td></tr>
</table>

Minnesota

The State of Minnesota is known as "The Land of 10,000 Lakes," and enhanced elevation data have been important in managing water and natural resources in the State. Historically, a number of counties acquired lidar data to support flood plain mapping requirements. Larger regional projects in northwestern and southeastern Minnesota obtained lidar and elevation data derivatives through cooperative partnerships as a result of flooding effects. More recently, the Clean Water Fund of the Clean Water, Land, and Legacy Amendment has provided base funding to help realize the goal of creating a seamless elevation model for Minnesota. As a result, the Minnesota Elevation Mapping Project has a goal to develop and deliver a seamless high-accuracy digital elevation map of the State of Minnesota, based on data collected using lidar technology. The project is managed by the Minnesota Department of Natural Resources and includes multiple State, Federal, and local partners. The following information may not fully reflect all of the possible business uses or functional activities in Minnesota, but includes a subset of information from respondents.

State Functional Activities

Program: Watershed Management	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 	**Watershed Assessment:** Watershed modeling and identification of water quality stressors and priority management areas.
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported Provides highly detailed picture of landscape features contributing sediment load to streams. This allows for the analysis of large geographic areas quickly in the office, improving operational efficiency in best management practice targeting. Provides elevation data for fine-scale watershed modeling. Augments existing data sources for watershed stressor identification.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate More efficient and accurate analysis and identification of potential sources of nonpoint pollution benefits the public by improving the return on investment of public and private funds in nonpoint source reduction efforts.
Data Outside State Needed: Yes, for watersheds along State boundary	

Program: NFIP	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 	**Flood Risk Mapping**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported FEMA requires the use of lidar products for all flood risk mapping.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Customers are better served through improved accuracy and can avoid costs to have survey validated elevations.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Millions of dollars can be saved, and improved delivery of flood mitigation projects can be achieved.
Data Outside State Needed: Yes	

Program: Program Delivery	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Pre-engineering Design—Cut and Fill for Earthwork Balance**
Update Frequency: >10 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported When the entire State is available, the effect could be years in time savings, resulting in the savings of many hundreds of thousands of dollars.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Regional offices will be receiving identical looking and identical performing data, which is a big benefit in terms of training and customer expectations.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate There are uses being discovered each day for enhanced elevation data, but if such data were have not been used in the past, then there is little reason to think that they will be used outside of current elevation data uses.
Data Outside State Needed: Not reported	

Program: Reinvest in Minnesota Reserve Conservation Easement Program	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5	**Wetland Restoration**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Faster and more accurate project site screening and priority ranking. Reduced surveying needs.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Faster evaluation of potential project sites (program applications).
Tide-Coordinated: No	**Estimated Strategic Benefits:** Minor Do not know.
Data Outside State Needed: Yes	

Program: County Atlas Geologic Mapping Program	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5	**Geologic Mapping** **Estimated Annual Operational Benefits:** Major; dollar value not reported More accuracy in surficial map unit delineation. Reduction in the need for field-checking unit boundaries. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported These data have been used where available and when the county is willing to release them. Commonly, there is a reluctance to share data that counties have purchased, even when the product may ultimately benefit them. **Estimated Strategic Benefits:** Major Elevation data of the highest quality level would show geologic hazards more clearly (karst features, landslide scars); better delineate watersheds; and allow accurate mapping of near-surface sediment and bedrock that control recharge to the groundwater.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

County Government—Clay County	
Program: GIS Mapping	**Business Use:** 24. Real estate, banking, mortgage, insurance
Functional Activity: Building permits	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Accurate and current data.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Verify location. Good information.
Bathymetric Data: No	**Estimated Strategic Benefits:** Major Accurate information to the land owner.
Tide-Coordinated: No	

Mississippi

The State of Mississippi has undocumented operational requirements for accurate, reliable elevation data that serve the widest utility of all government agencies. Uses for the data include economic development, emergency planning and response, flood map modernization, geologic mapping, groundwater modeling and management, highway planning, and urban and suburban infrastructure engineering. The collection and maintenance of these data have taken place through individual, uncoordinated actions that often result in duplicated efforts at various levels of government, using different standards and specifications. A centrally coordinated collection effort could solve key issues that have been seen within the State, would provide a dataset collected with consistent standards, make the data easily accessible for all levels of government and the public, and reduce acquisition costs through economy of scale, and could fill gaps in funding at the local and State level.

It is also apparent that local officials with intimate knowledge of local conditions are the best stewards of the data layers associated with their jurisdictions. As budgets are being strained at all levels of government, the logical solution is to develop a system of partnerships to share costs and ease the burden of funding. Large collaborations also have the added benefit of reduced costs per square mile of data thereby stretching those dollars further. Acquiring data in this piecemeal fashion has resulted in multiple collections and local lidar in some counties—all with varying specifications, age, accuracy, and with a very small percentage of that data in the public domain, which means that the data cannot be widely used across all levels of government.

There are many benefits in developing a statewide program to acquire enhanced elevation and lidar, with very few disadvantages. One confirmed advantage is the reduction of overall costs. This can be accomplished in several ways, including reducing duplication of data, utilizing economies of scale, and leveraging costs among participants. Additionally, there are benefits derived from having standard information, including uniform and generally greater accuracy, better decisionmaking capability, and better collaboration capabilities. It then becomes easier to manage resources in business and land development, environmental management, and emergency management.

The USGS has recently released lidar standards in anticipation of increased data acquisitions that will be absorbed into the NED. Lidar data acquired through this project will be collected using the USGS standards as a minimum, with FEMA standards and additional break line collection determined on a project basis or as funding permits. The primary intent of this specification is to create consistency across all lidar collections, in particular those undertaken in support of the NED. Unlike most other “lidar specs,” which focus on the derived bare-Earth DEM product, this specification places emphasis on the handling of the source lidar point cloud data. This is to assure that the source data collected remain intact and viable to support the wide variety of non-DEM science and mapping applications and derivatives that can benefit from lidar technology.

State Functional Activities

Program: Mississippi State University/Geosystems Research Institute—Coastal Studies	**Business Use:** 4. Coastal Zone Management

Quality Level: 1 2 3 4 5

Update Frequency: 2–3 years

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: Yes, adjoining coastal States

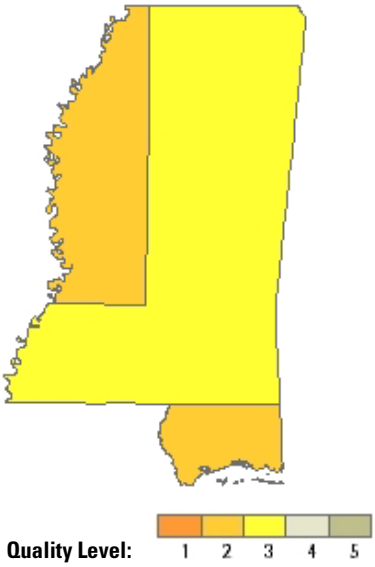
Coastal Inundation: Coastal wetlands provide a line of defense for coastal communities against hurricane effects. The wetlands can reduce wind, wave, and surge energy, which will in turn reduce the damaging effects of hurricanes on coastal infrastructure and communities. Research has been developed to improve understanding of coastal resiliency from hurricane effects in regards to wetland areas. This was achieved by using integrated numerical modeling and in-situ observations and remote sensing techniques.

Estimated Annual Operational Benefits: Major; dollar value not reported
Significantly better spatial resolution and vertical accuracy of lidar-derived elevation data provide clear advantages for use in delineating lands subject to a given sea level rise.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
The increased spatial detail of lidar elevation data, as well as its improved vertical accuracy, provides enhanced topographic information that is advantageous to sea level rise effect studies.

Estimated Strategic Benefits: Major
Coastal elevation is such an important parameter in sea level rise effect studies, it must be known precisely, and the data used to model elevations in the analyses must support the accurate delineation of elevation zones that correspond to specific sea level rise scenarios. Accurate delineations are especially important if the potential inundation area is used as a mask to generate estimates of affected population, land cover types, infrastructure, or economic zones

Program: Mississippi Emergency Management Agency	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response



Quality Level: 1 2 3 4 5

Update Frequency: Event driven—Needs not met by a cyclic data acquisition program

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: Yes, adjoining States in case of an event close to a State boundary

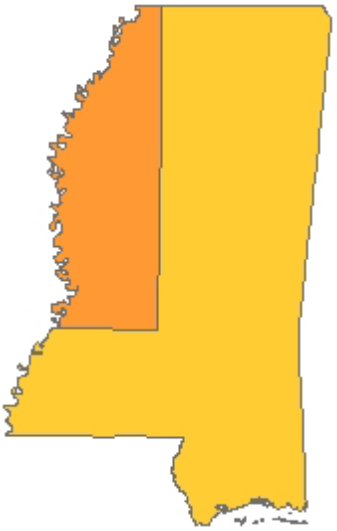
Emergency Response to a Disaster: The Mississippi Emergency Management Agency is responsible for coordinating support for State and local response to all hazards. These responsibilities include alert and notification, activation of the State Emergency Operations Center, coordination of emergency support functions, establishing priorities for allocating resources, and maintaining operational control of the State Emergency Response Team, the Mobile Operations Center, the Disaster Reconnaissance Team, and the communications/State warning point section. The Mississippi Emergency Management Agency also supports damage assessment after an event and assists with the transition to the recovery phase. All these functions are directed toward the goal of minimizing the risk and affect to people, property, and the environment.

Estimated Annual Operational Benefits: Major; dollar value not reported
Geospatial data from before and after an event, primarily lidar data, are needed for change analysis for monitoring and tracking the type and rate of landscape changes 3D visualizations of the disaster area can improve emergency managers understanding of the situation and enable them to make better plans and decisions.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Lidar has the capability to quickly assess the amount of damage that has been sustained by the transport network as the result of a disaster, and depending on the technology used, these systems are able to survey large areas quickly and more efficiently than deploying emergency responders to drive over every part of a transportation network to ascertain the locations of debris, damage, and other blockages of the transport network.

Estimated Strategic Benefits: Major
Lidar data immediately after a storm or other disaster events has the potential to increase the number of lives saved by rescuers. Lidar data enable rescuers to respond in a more expedient manner. In emergency situations, minutes and even seconds can make the difference between life and death for victims of a disaster. Having prior knowledge of the roads to avoid because of blockage serves to shave minutes off the time it takes for rescuers to reach victims.

Program: Mississippi Automated Resource Information System	**Business Use:** 25. Education K–12 and Beyond



Quality Level: 1 2 3 4 5

Update Frequency: 6–10 years

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: Limited hydrography-based needs

GIS Coordination and Outreach: Legislatively created to standardize and disseminate geographic information regarding natural and cultural resources. To fulfill education and research mission, the Mississippi Automated Resource Information System would want all available products.

Estimated Annual Operational Benefits: Moderate; $7,500
Based on a cost of distribution of data.

Estimated Annual Customer Service Benefits: Major; $7,500
Based on goodwill and clientele satisfaction.

Estimated Strategic Benefits: Major
Fulfilling functional activity description.

Program: Mississippi Department of Environmental Quality Office of Geology and Geospatial Resources Division—Flood Mapping	**Business Use:** 14. Flood Risk Management

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: Yes, adjoining States where watershed boundaries cross

Modernizing and Updating FEMA Flood Risk Maps

Estimated Annual Operational Benefits: Major; $560,000
The data would allow users to create datasets for analysis with minimal time and effort.

Estimated Annual Customer Service Benefits: Major; $250,000
Good elevation data statewide would further reduce acquisition costs and the amount of time required to complete certain phases of the project and would improve the quality of the data from studies and analyses. Overall, this would give the public a better sense that the department is more efficient by reducing the cost and time to take a project to completion.

Estimated Strategic Benefits: Major
Accurate elevation data are a benefit across the enterprise GIS user community, including social benefits, environmental benefits, strategic and political benefits.

Program: Mississippi Department of Transportation—Transportation Information Division	**Business Use:** 21. Infrastructure and Construction Management

Quality Level: 1 2 3 4 5

Update Frequency: 6–10 years

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Not reported

Planning, Investigation, and Preliminary Design of Roadway Projects: Provide a safe, efficient, environmentally sound intermodal transportation system for all users, especially the taxpayers of Mississippi. To also facilitate economic and social development and prosperity through the efficient movement of people and goods and to facilitate intermodal connections within Mississippi.

Estimated Annual Operational Benefits: Major; $2,500,000
New operational benefits would be reduced costs to acquire data on a project by project basis, quicker evaluation of proposed projects, and the overall improvement in the data resulting from studies and analyses using good data statewide, reducing the cost and time to take a project from conception to construction.

Estimated Annual Customer Service Benefits: Major; $500,000
Good elevation data statewide would further reduce acquisition costs and the amount of time required to complete certain phases of the project and would improve the quality of the data from studies and analyses. Overall, this would give the public a better sense that the department is more efficient by reducing the cost and time to take a project to construction.

Estimated Strategic Benefits: Moderate
A good statewide lidar dataset would provide more data for evaluating existing roadway conditions and identify needs for safety projects. Statewide lidar data would benefit environmental efforts by providing more detailed information over larger areas on all projects, providing a more complete picture of the study area and how the proposed construction would affect those habitats.

Program: Mississippi Forestry Commission	**Business Use:** 5. Forest Resources Management

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Yes, fires and destructive insects do not stop at State boundaries

Forest Resources Management: The Mississippi Forestry Commission is committed to protecting and sustaining State forest resources using professionally applied stewardship principles and education. Mississippi will ensure their forests contribute to abundant timber and wildlife, clean air and water, and a healthy economy.

Estimated Annual Operational Benefits: Major; dollar value not reported
Ability to determine vegetated and nonvegetated area for measuring tree canopy coverage and estimate timber volumes for forested areas

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Ability to provide terrain information for analysis with minimal time and effort and could be used across all departments.

Estimated Strategic Benefits: Major
Integration of imagery and lidar produces valuable information for forest management and has application for carbon accounting to understand the ecosystem services of forests. Lidar is a critical component for more accurate measurement of logging practices and emission and carbon sequestration calculations.

Program: Central Mississippi Planning and Development District	**Business Use:** 22. Urban and Regional Planning
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** No	**Urban and Regional Planning:** The Central Mississippi Planning and Development District (CMPDD) is a regional planning organization serving the governments of seven adjacent counties in central Mississippi—Copiah, Hinds, Madison, Rankin, Simpson, Warren, and Yazoo. The legislatively created CMPDD is a nonprofit entity concerned with meeting the ever-changing needs of its 7 member counties and 34 municipalities. The district promotes areawide progress through regional planning and development concepts in such areas as local planning, governmental management, and human resource coordination. **Estimated Annual Operational Benefits:** Major; dollar value not reported Government will be in a better position to make informed, scientifically sound decisions regarding urban and rural planning. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved quality of mission and products thus a reduced cost to the taxpayer (customer). **Estimated Strategic Benefits:** Major Policymaker decisions are strengthened when current and accurate geospatial datasets are available in support of the decisionmaking process.

Local Functional Activities

County Government—Desoto County	
Program: DeSoto County GIS Department	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping for emergency services and urban and regional planning	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $25,000 The operational benefits will include the timely assistance in regards to emergency response and critical flood planning in and around the Mississippi River as well as backwater tributaries. The GIS Department would be able to assist all facets of DeSoto County Government in planning, exploring, and developing new and current infrastructure.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; $75,000 This service is currently being provided with current data. Customer service is important in providing citizens with elevation data.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major The latest data for the region are more than 11 years old, and new data might entice more investors to come into the area. Public safety and planning for future development are very beneficial to citizens and the economy .

Missouri

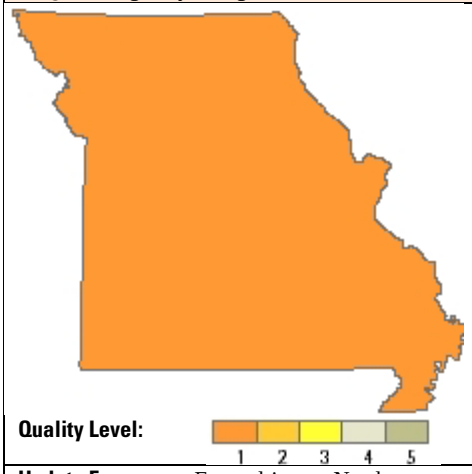
The State of Missouri has a need for improved elevation data to strengthen the State's preparedness for flood events, to protect the health and safety of Missourians, and to mitigate damages from flooding. Elevation data are a multipurpose resource, however, and benefits will extend beyond flood map modernization to other applications as varied as watershed management, dam safety assessment, transportation modeling, precision agriculture and soil mapping, identification of sinkholes, correction of aerial photography, and regional and urban planning.

Counties and regional planning commissions are responsible for much of the lidar collections in the State. Local governments use lidar for public safety because flooding is a major hazard. Other uses include highway and culvert design, land use planning, and to update structure databases.

Lidar technology has a breadth of applications that directly influences and affects local citizens, their quality of life, as well as their lives! The potential to save local, county, and State governments valuable resources by providing a low cost alternative to traditional land surveys as well as to have cost avoidance related to better flood plain mapping, risk analysis, and emergency planning and response support is great. For example, on May 10, 2011, Governor Jay Nixon pledged $25 million in State funds to help counties and communities with their costs of responding to the historic flooding. If better elevation could mitigate just 10 percent of these costs, those savings (or the avoidance of costs) would be $2.5 million.

State Functional Activities

<table>
<tr><td colspan="2">Program: Water Resources Center (Quantity) Office of Director</td><td>Business Use: 14. Flood Risk Management</td></tr>
<tr><td rowspan="4"> 
Quality Level: 1 2 3 4 5
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program
Bathymetric Data: No
Tide-Coordinated: No</td><td>Dam Breach Inundation Mapping for Emergency Action Plan Development: One of the missions of the Department of Natural Resources Water Resources Center is to ensure that dams in the State are constructed, maintained, and operated in a safe manner. This is accomplished by regulation of all nonagricultural, non-Federal dams more than 35 ft in height and by providing technical assistance and informational resources to all dam owners.
One way to estimate the benefits of lidar data would be to estimate land survey cost for all the sectioning used to produce the dam breach inundation mapping, which number in the thousands of sections per year, versus use of lidar data from desktop. Done in the field, that would be a huge cost, and in fact, it simply could not be done; however, this is a legally mandated deliverable. Lidar helps make it both possible, more accurate, quicker, and at less cost for staffing office work. The completed deliverable has a direct bearing upon public safety.</td></tr>
<tr><td>Estimated Annual Operational Benefits: Major; $1,000,000
Dam safety assessment includes dam hazard rating, site selection, dam flood stage rating and structural analyses, dam breech inundation studies, dam flood prediction, levee analysis for integrity and capacity, and emergency management plans. An annual dollar benefit is difficult to determine, but an approach would be to estimate the commercial value of the deliverables and attribute perhaps half of that value to having the lidar data just for this specific application. About 100 or more inundation maps per year at an assumed value for completed product of about $20,000 each would equal $2 million; a benefit of half that amount would be $1 million for a very roughly determined value of the lidar data for 1 year's work.</td></tr>
<tr><td>Data Outside State Needed: No</td><td>Estimated Annual Customer Service Benefits: Major; dollar value not reported
Benefits description not reported.</td></tr>
<tr><td>Estimated Strategic Benefits: Major
Benefits description not reported.</td></tr>
</table>

Program: Highway Design	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Highway Design:** High-accuracy ground model for highway design, culvert placement, and size.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Moderate; $125,000 30 percent of the mapping cost, less than 5 percent of the total program cost.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Minor; dollar value not reported Benefits description not reported.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Not reported None.
Data Outside State Needed: No	

Program: Water Resources Center, Parks, Soil and Water Conservation, Waste	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Park Design and Maintenance:** Missouri recreation areas are often in flood prone areas. Improved elevation data needed to effectively plan for campgrounds, roads, and structures.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; $10,000 Park and conservation area planning, infrastrucutre protection. Annual dollar benefit difficult to determine.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Missouri recreation areas subject to frequent flooding.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Campgrounds often closed during flood events. Potential for flash floods.
Data Outside State Needed: No	

Program: Management of the State's fish, forest, and wildlife resources	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, by watershed	**Soil and Wetland Conservation and Wildlife Habitat:** The Department of Conservation is responsible for soil and wetland conservation, along with wildlife habitat conditions. **Estimated Annual Operational Benefits:** Major; $125,000 Planning use for landscape restoration, annual dollar benefit difficult to determine. Range of $50,000 to $200,000, averaged to $125,000. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Minor Benefits description not reported.

Program: Geologic Mapping and Hazards Analysis	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Geologic Analysis:** Identification of the State's geological resources and hazards. The New Madrid seismic zone, rich deposits of heavy metals, and karst topography are all found in Missouri. **Estimated Annual Operational Benefits:** Major; $10,000 Early identification of sinkholes and portential landslide areas could save lives and property, annual dollar benefit difficult to determine. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Minor Benefits description not reported.

Program: Emergency Response and Flood Plain Management	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 1 2 3 4 5	**Emergency Response:** Missouri is subject to frequent flooding and has the potential for a major seismic event. Levees are not well mapped. The New Madrid seismic zone needs improved elevation data. A good structure inventory is also needed for the seismic and flood prone areas.
	Estimated Annual Operational Benefits: Major; dollar value not reported Flood risk mitigation, improved flood insurance maps.
	Estimated Annual Customer Service Benefits: Major; $2,500,000 Emergency response uses include vulnerability assessments of critical infrastructure, spill routing, animal burial siting, public safety tower siting and deadzone identification, hazardous material spill containment, identification of vulnerable populations for response and planning before floods, search and rescue in waterways, and line-of-sight analyses.
	Estimated Strategic Benefits: Major Benefits description not reported.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: 5 mile buffer	

Program: Economic Development	**Business Use:** 22. Urban and Regional Planning
 **Quality Level:** 1 2 3 4 5	**Urban and regional planning:** Urban and regional planning includes site plan analysis, accurate building footprints, and conflation.
	Estimated Annual Operational Benefits: Moderate; $400,000
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Flood prediction and mitigation includes flood plain delineation, new generation of flood plain and flood insurance maps, flood prone properties, risk determination and insurance assessment, flood flow characterization (for example, direction, velocity, and depth), flood preparedness and response planning, evacuation planning, and reverse E–911 proactive notification.
	Estimated Strategic Benefits: Minor Benefits description not reported.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

County Government—Boone County	
Program: Implementation of Regional Plan	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Climate chanage adaptation planning	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported More accurate mapping of areas at risk from sea level rise.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More accurate mapping of areas at risk from sea level rise.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate Improved planning for sea level rise.
Tide-Coordinated: No	

County Government—Boone County	
Program: Resource Management	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Storm water buffer mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Able to accurately and quickly calcuate storm water buffer. Can also see terrain for parcels taking out permits.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Not available; Providing the public with accurate and current elevation information.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Moderate Not available; public safety can use the elevation data during flooding events to model affected areas. Environmental benifits by using the data for code enforcement. Commissioners and elected officials use the data capture project during electionss to highlight advancements being done at the county to support the citizens (to support FEMA risk and other mapping efforts).
Tide-Coordinated: Not reported	

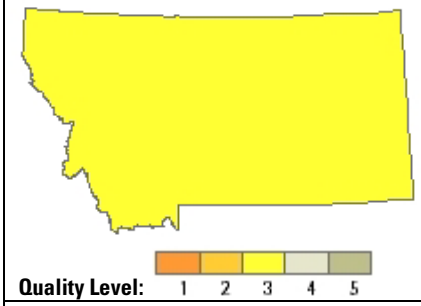
County Government—St. Louis County	
Program: 911 Addressing	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
Functional Activity: 911 database maintenance	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $100,000 The elevation data are used in conjunction with imagery to derive planimetrics and other infrastructure features for proper placement of address points and road centerlines for 911 addressing. The existing dataset dates from 2005 and only partially covers the county. Annual or biennial updates would greatly enhance the accuracy of the dataset, as well as completing the western regions of the county where addressing is incomplete based mostly on centerlines digitized from orthophotography.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Performance will increase linearly with linear increases in address quality. The complete lidar project would allow automated extraction of structures and centerline, which would greatly speed the delivery of improved addressing. Customer experience would not only be enhanced by improved 911 addressing, but the addition of enhanced 911 will create an increased need to precisely locate callers relative to structures, roads, and topography. Most of the existing system has not yet taken full advantage of the available data, as structures and centerlines are hand digitized. Most of the benefit is in improved performance, but customer experience will be better realized with the deployment of enhanced 911.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Public safety benefits would increase, but are already high, by building complete and timely addressing as well as surface and terrain models for enhanced 911 mapping. Strategic and political benefits would accumulate from significantly improve police performance, possibly with reductions in overall costs of patrolling. An enhanced product could also induce participation from fire protection and ambulance services, enhancing regional cooperation in public safety. Improved addressing quality in 911 is a significant public safety benefit. No environmental benefits have been identified within this program, though this same addressing can be employed in geocoding in other programs within the county. Strategic and political benefits stem from improved police response times. First responders do not make use of the data at this time.
Tide-Coordinated: Not reported	

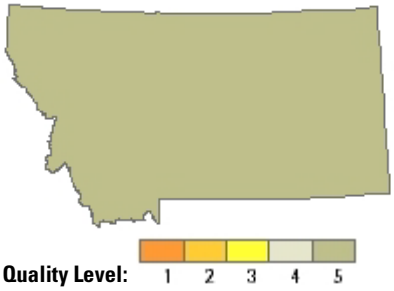
County Government—St. Louis County	
Program: Emergency Management	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
Functional Activity: Emergency management	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $250,000 Data at the quality level selected are not currently available, but rather at the next lower quality level and from a much longer refresh cycle. Far more accurate and current projections of flood inundation and flood inundation relative to structures. Ability to derive planimetrics to project bulidings at risk versus earthquake hazards. Rapid damage assessment for tornadoes, manmade hazards, and other threats as they occur against roads, buildings, and other infrastructure data layers from lidar-derived planimetrics.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Flood modeling is significantly out of date and does not reflect recent changes to the flood plain. Building planimetrics are more than 5 years out of date and only reflect part of the county. Enhanced data would allow for a significant reduction in time for damage assessment with better knowledge of the location and height of potentially affected structures, as well as better situational awareness and planning products during disaster response. No data at this quality level.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major The primary benefits are in public safety and disaster response, with greatly enhanced response and recovery services due to better knowledge of risks and hazards. There could likely be minor environmental benefits due to better knowledge of disaster effects on environmental inventories (for example, knowing where environmental features were damaged or destroyed by flooding). Enhanced common operating picture and strategic awareness products in disaster planning and response would have significant political benefits in the form of public awareness of increased effectiveness of planning and response operations. No data at this quality level.
Tide-Coordinated: Not reported	

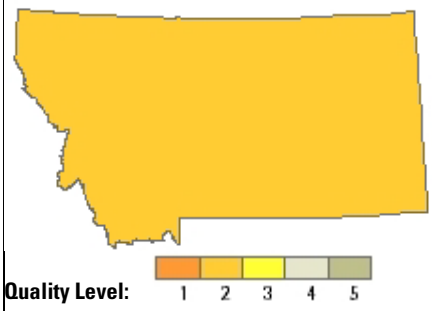
Montana

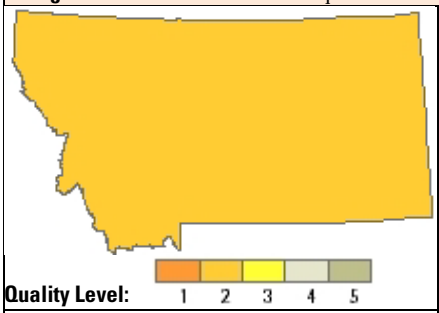
The State of Montana encompasses 145,552 square miles of land and approximately 1,490 square miles of water. Its landforms range in elevation from 1,800 to 12,799 ft. This vast and differing terrain calls for various requirements for enhanced elevation data. To date, the majority of the enhanced elevation data collection in Montana has taken place through local and State efforts coordinated with the assistance of Federal grant funding, which often results in somewhat standardized data that are based on Federal guidelines and specifications. A centrally coordinated collection effort would further this effort by establishing consistent standards and possibly reduce acquisition costs through economies of scale. The priority functional activity that drives current enhanced elevation requirements in Montana is flood risk modeling and mapping of riverine areas. Every year, millions of dollars in damage is caused by flooding. New and updated flood plain mapping studies and maps based on enhanced elevation data at FEMA QL3 would improve the accuracy, reliability, and confidence in these required products at a much greater rate and lower cost. Acquiring the necessary elevation data over Montana's "at risk" flood plain areas is the highest cost associated with this activity. Additional requirements for enhanced elevation data fall under the identified functional activities of terrain and hydrologic modeling and analysis, wetland mapping, geologic hazard mapping and seismic analysis, engineering and construction of public works, and climate modeling assessment for multiple economic sectors. Although currently statewide enhanced elevation data may not be an efficient or cost effective program, many areas being mapped and studied under the defined top tier functional activities could benefit from a collection program that would improve the data accuracy and reliability as well as the confidence in the program areas these data support. For example, a statewide enhanced elevation dataset that meets FEMA guidelines and specifications for flood hazard mapping would increase completion rates for the local Flood Hazard Mapping Program and the associated flood risk studies by tenfold (estimate). There are also ancillary products derived from enhanced elevation data that influence the cost benefit summary. The State anticipates an overall increase in productivity of 25 percent and a cost savings of 20 percent in most program areas as a direct result of acquiring these data.

State Functional Activities

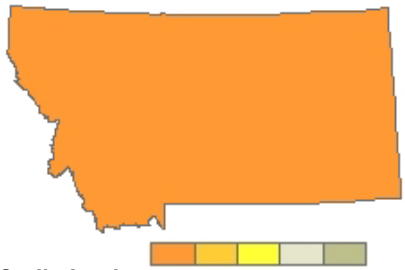
<table>
<tr><td colspan="2">Program: State of Montana Floodplain Management Program</td><td>Business Use: 14. Flood Risk Management</td></tr>
<tr><td rowspan="5"> 
Quality Level: 1 2 3 4 5
Update Frequency: 6–10 years
Bathymetric Data: Yes
Tide-Coordinated: No
Data Outside State Needed: Yes, buffer zone with border States and Canada</td><td colspan="2">Flood Risk Modeling and Mapping: New and updated flood plain mapping studies and risk maps based on enhanced elevation data would improve the accuracy, reliability, and confidence in these required products at a much greater rate and lower cost. Acquiring the necessary elevation data are the highest cost associated with these projects. A statewide elevation dataset that meets FEMA mapping standards would increase the rate of completing new studies by tenfold (estimate).</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $150,000
Elevation data provide the foundation for all new flood plain mapping in Montana. Enhanced elevation data can be collected for large areas at a fraction of the cost and level of effort from past practices. The accuracy of the data improves the overall reliance and confidence in the resulting mapping products used by communities and the NFIP. The Montana Department of Natural Resources and Conservation (DNRC) and FEMA would be able to complete new flood risk modeling and mapping projects at a much faster rate and lower cost. Acquisition of the necessary elevation data is the highest cost associated with these projects. A complete statewide elevation dataset that would meet the guidelines and specifications for flood hazard mapping would increase the State's rate of completing new studies by tenfold (estimate).</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; $150,000
New and updated flood plain mapping studies and maps. Accuracy, reliability, and confidence in these products are greatly enhanced.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
Environmental benefits would include data to perform new mapping of derivative products, such as channel migration zones.</td></tr>
</table>

Program: State Water Quality Program	**Business Use:** 1. Natural Resources Conservation
	**Terrain and Hydrologic Modeling and Analysis:** Protection, sustainability, and improvement of the environment using enhanced elevation data for terrain and hydrologic modeling and analysis. There are ancillary products derived from enhanced elevation data that influence the cost benefit summary; however, the State anticipates a 25 percent increase in productivity as a direct result of having these data.
	Estimated Annual Operational Benefits: Moderate; $40,000 The elevation dataset allows the Montana Bureau of Mines and Geology (MBMG) to understand the terrain and its influence on Montana's environment. These data are used for modeling input for various analyses and for compliance and monitoring programs within the State.
	Estimated Annual Customer Service Benefits: Moderate; $40,000 Provide a consistent data source for analyses and assist in the environmental compliance to protect Montana's citizens.
Update Frequency: 2–3 years	
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Moderate The elevation dataset allows the MBMG to accomplish part of its mission in understanding the terrain and its influence on Montana's environment.
Tide-Coordinated: No	
Data Outside State Needed: Yes, buffer area with adjoining States and Canada	

Program: Wetland Mapping and Riparian Center	**Business Use:** 7. Wildlife and Habitat Management
	**Wetland Mapping:** Wetland and riparian mapping derived from a visual interpretation of vegetation and water on the Earth's surface. There are ancillary products derived from enhanced elevation that influence the cost benefit summary; however, the State anticipates a 25 percent increase in productivity as a direct result of having these data.
	Estimated Annual Operational Benefits: Moderate; $100,000 While there would likely be no time or cost savings, the improved accuracy would be extremely valuable. The University of Montana's Natural Heritage Program currently uses visual photointerpretation of 1-m NAIP to map wetlands and riparian areas. Lidar would greatly enhance the accuracy of this mapping.
	Estimated Annual Customer Service Benefits: Major; $100,000 Precision and accuracy of products would be enhanced, encouraging users to rely on them more for primary decisions.
Update Frequency: >10 years	**Estimated Strategic Benefits:** Not reported Accurate maps of wetlands and riparian areas would directly benefit conservation planning. Better conservation planning, backed by accurate maps, would be both a strategic and political benefit (conservation plans could not be dismissed as based on bad or outdated maps) and an environmental benefit (the target resources would be better identified, so that the right ones were identified).
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Yes, buffer area with adjoining States and Canada	

Program: STATEMAP and Earthquake Studies	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
	**Geologic Hazard Mapping and Seismic Analysis and Risk Mapping:** Geologic hazard mapping and seismic analysis and risk mapping through the determination of surface geology and anomalies associated with slopes inherent to landslides, determining fault lines and locations, and planning for proper surface use. There are ancillary products derived from enhanced elevation that influence the cost benefit summary; however, the State anticipates a 20 percent increase in productivity as a direct result of having these data.
	Estimated Annual Operational Benefits: Major; $150,000 The MBMG STATEMAP Program would benefit from better elevation and anomaly data. Earthquake studies would be able to greatly improve seismic hazards and change analysis relative to faults and fault movement due to seismic activity.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; $150,000 The public would be better informed of areas with landslide activity, active fault lines, and fault location in general.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, buffer area with adjoining States and Canada	**Estimated Strategic Benefits:** Major Land developers, planners, and decisionmakers could make better informed judgments and decisions regarding land use with the improved data (such as where not to locate a subdivision or mine waste repository).

Program: Department of Environmental Quality (DEQ) Remediation, Public Works, Department of Transportation Programs, Major Facility Siting Program, Open Cut Program, Coal Program	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Water, Sewer, and Power Line Planning and Analysis:** Storm water modeling and cut and fill analysis for Earth moving and site analysis for horizontal construction. Road infrastructure; dams, reservoirs, and levees; improved delineation, planning, and analysis for construction of buildings, water systems, road infrastructure, dams, levees, sewer, and power lines. There are ancillary products derived from enhanced elevation that influence the cost benefit summary; however, the State anticipates a 20 percent increase in productivity as a direct result of having these data.
	Estimated Annual Operational Benefits: Major; $100,000 Improved planning, delineation, and construction of buildings and facilities
	Estimated Annual Customer Service Benefits: Moderate; $100,000 Cost savings in tax payer dollars and customer satisfaction.
Update Frequency: 2–3 years	**Estimated Strategic Benefits:** Major Major benefit to public safety and satisfaction.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Groundwater Investigation, Assessment, and Characterization Programs	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5	**Hydrologic and Hydraulic Modeling of Groundwater for Development:** Hydrologic and hydraulic modeling of groundwater for development that affects the availability and quality of surface water and groundwater. There are ancillary products derived from enhanced elevation that influence the cost benefit summary; however, the MBMG anticipates a 25 percent increase in productivity as a direct result of having these data.
	Estimated Annual Operational Benefits: Moderate; $20,000 Lidar data would greatly reduce the MBMG's need for surveys, the time required to survey, the time frame the surveys are accomplished, and other operational requirements.
	Estimated Annual Customer Service Benefits: Moderate; $20,000 Lidar data would increase the benefit to the customer as the MBMG could better assess groundwater and surface water movement.
Update Frequency: 4–5 years	**Estimated Strategic Benefits:** Moderate Development (agricultural, industrial, residential, and commercial) are heavily influenced by water issues in the arid west. The State's Ground Water Information Program seeks to directly address issues related to water supply, water quality, aquifer recharge, aquifer depletion, and a myriad of other issues related to water. Lidar data would enhance the capability of the MBMG to make scientific determinations on these issues.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Montana Climate Office	**Business Use:** 1. Natural Resources Conservation

Quality Level: 1 2 3 4 5

Update Frequency: >10 years

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Yes, border States and Canada (include all four-digit HUCs)

Climate Modeling in Support of Water Availability Assessment for Multiple Economic Sectors: Climate modeling in support of water availability as well as assessment and forecasting products to support agriculture and water yield monitoring and prediction, disaster services planning, reservoir recharge and conveyance, wildfire suppression planning, ground cover stress assessment, fisheries and wildfowl management planning, animal and plant disease assessment, climate change, and natural anomaly research. There are ancillary products derived from enhanced elevation that influence the cost benefit summary; however, the State anticipates a 25 percent increase in productivity as a direct result of having these data.

Estimated Annual Operational Benefits: Moderate; $40,000

The Montana Climate Office would see a considerable reduction in the time spent on data preparation, and would be able to more efficiently meet mission objectives of delivery climate services by automating procedures. The availability of elevation data at the quality level specified would bring the State closer to meeting mission objectives. The only way the State could fully meet the objectives and significantly reduce cost is if border data, such as from adjoining States and Canada, were included. Analysis units are four-digit HUCs that are coincident with Montana; not the Montana administrative boundary. Montana will still need to face the cost of integrating Canadian data along the border.

Estimated Annual Customer Service Benefits: Major; $40,000

A consistent, authoritative source product at the quality level specified would provide climate services products where now there are none. The ability to automate and customize procedures to meet customer objectives would greatly enhance the array of products as well as the customer experience while keeping down costs.

Estimated Strategic Benefits: Moderate

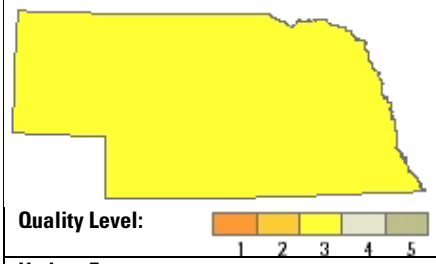
Climate assessment and forecasting products to support agriculture, water supply and water yield monitoring and prediction, disaster services planning, reservoir recharge and conveyance, wildfire suppression planning, ground cover stress assessment, fisheries and wildfowl management planning, animal and plant disease assessment, climate change, and natural anomaly research.

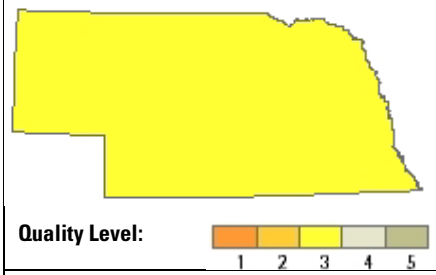
Nebraska

The State of Nebraska has requirements for lidar data for the entire State that will provide an accurate, consistent, and useful georeferenced base elevation layer that will benefit a wide range of users. The improvement in information provided in this base layer will allow more accurate identification of point estimates of slope, aspect, and elevation, allowing more accurate identifications of landforms and surface features, stream cross-sections and geomorphology, watershed boundaries, forest heights, flood plains, and much more. This elevation layer will allow improvements in planning efforts while reducing needs and costs for engineering (elevation) surveys for groundwater and surface water modeling and management, watershed planning and management, community planning, emergency management, conservation planning, and public and private construction. For the State of Nebraska, having these data publicly available for the entire State will improve planning efforts and reduce costs for public agencies and private businesses while improving the ability of State agencies to manage public resources they are entrusted with.

Lidar applications from which Nebraska may realize real benefits in cost savings or improved efficiencies include infrastructure planning, natural resources and environmental science, emergency management and response planning, evaluating alternative options for infrastructure, permit process improvement, research, economic development, development and use of automated planning tools, and development of new technologies and approaches to resource challenges.

State Functional Activities

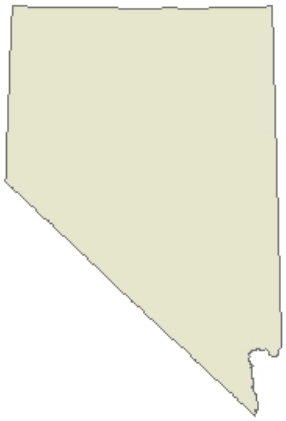
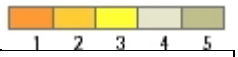
Program: Integrated Management Planning	**Business Use:** 2. Water Supply and Quality
	**Conservation Practices Assessment:**
	Estimated Annual Operational Benefits: Major; dollar value not reported Assessment of conservation terraces will allow improved conjunctive management modeling.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Strategic Benefits:** Not reported Lidar can be useful in defining field boundaries, identifying conservation structures, locating reservoirs and dams, assessing the condition of conservation terraces, estimating potential storage in reservoirs and terraces, and evaluating slope for erosion potential. Agricultural application of lidar technology can help better target and design watershed practices to improve watershed health and to maintain or enhance productivity.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

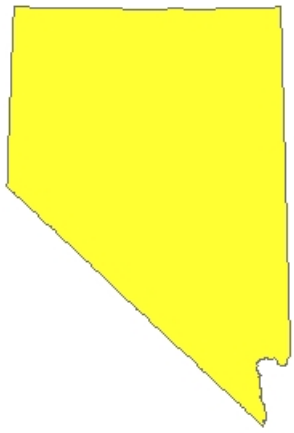
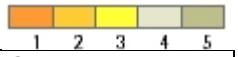
Program: Flood Plain Management and Dam Safety	**Business Use:** 14. Flood Risk Management
	**Flood Risk Mapping**
	Estimated Annual Operational Benefits: Major; $70,000 More survey savings will be realized from the availability of statewide lidar data. More accurate flood area maps will be available for citizens in the State and will help local communities to carry out their flood plain management responsibilities.
	Estimated Annual Customer Service Benefits: Major; $600,000 As more areas with quality topographic data, more areas will have more accurate flood risk maps. More future flood loss can be reduced or eliminated.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Strategic Benefits:** Major If quality topographic data become available statewide, new accurate flood risk maps can be produced, and exiting flood maps can be revised. This more accurate risk information will improve public safety, guide future developments, and make communities more risk-resistant. Public perceptions of government services will be improved. Numerous other benefits will be achieved.
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Nevada

The State of Nevada has a number of high-resolution, high-accuracy elevation data needs. Two of these, related to the business uses of geologic resource assessment and hazards mitigation and flood risk management are high value programs in spite of representing a small portion of the State budget. Public safety will be enhanced through more extensive and accurate seismic hazard assessments. Better elevation data will improve flood risk maps that enhance public safety and have the potential to save Nevada residents money on flood insurance. Geothermal exploration and mineral investigations made using enhanced elevation data will have a significant positive effect on the Nevada economy. Better elevation data will also aid the State in dealing with fire hazards through better data for fuels reduction and firefighting. Additional applications in the State include improved air quality modeling, forestry, and the mapping of mining activities for regulatory compliance and reclamation.

State Functional Activities

Program: Bureau of Air Quality Planning	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 	**Air Modeling Analyses:** The Bureau of Air Quality Planning uses exiting 1- and 3-m DEM data extensively to support air modeling analysis. More accurate and current elevation data would improve modeling and enhance the reliability of analysis.
	Estimated Annual Operational Benefits: Major; dollar value not reported Current elevation data would allow the bureau to account for the major elevation changes occurring in mining areas while modeling air quality.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Better modeling will improve customer service because more accurate information will be available.
	Estimated Strategic Benefits: Major Better information will be available to the public.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Forest Resource Management and Fires	**Business Use:** 5. Forest Resources Management
 **Quality Level:** 	**Forest Resource Management Planning and Mapping:** lidar would assist the Division of Forestry by improving their ability to identify species types and locations, manage wildfire (such as firefighting and fuels reduction), and better work with land owners on site development plans.
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Improve elevation data would allow the Bureau of Forestry to do better analysis.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Better elevation data would assist land managers and planners.
	Estimated Strategic Benefits: Minor Public safety will be improved through access to better information during wildfires.
Update Frequency: 2–3 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Geologic Mapping Program	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation

Quality Level: 1 2 3 4 5

Update Frequency: Event driven—Needs not met by a cyclic data acquisition program

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Not reported

Geologic Mapping: The overall quality and cost effectiveness of several kinds of geologic mapping projects would be greatly enhanced if lidar data existed in Nevada. Geothermal exploration, seismic hazard investigations, site characterization studies, and mineral investigations and development usually begin with geologic mapping that would benefit from having lidar bases and topographic enhancements as tools.

Estimated Annual Operational Benefits: Major; $200,000
If lidar data existed in Nevada, it could be used as the base topography in setting up 3D virtual geologic mapping models and could be used in coloring elevations for correlation and shading landforms, which are tools that aid in mapping, and for topographic profiles used in geologic cross sections.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
The overall quality and cost effectiveness of several kinds of geologic mapping projects would be greatly enhanced if lidar data existed in Nevada. Geothermal exploration, seismic hazard investigations, site characterization studies, and mineral investigations and development usually begin with geologic mapping that would benefit from having lidar bases and topographic enhancements as tools.

Estimated Strategic Benefits: Major
A high-quality lidar database for Nevada would allow all communities to have their natural hazards be mapped and characterized cost effectively. For example, lidar could be used to locate and map late Quaternary faults that could rupture during earthquakes so urban development can be planned to avoid building over such faults. Other natural hazards, such as landslides, flooding, and even earthquake shaking susceptibility, can also be mapped using lidar. Earthquake research would greatly benefit from lidar in Nevada because it would allow future earthquake surface ruptures to be mapped in great detail, aiding scientific studies by creating a more complete documentation of an earthquake event.

Program: Bureau of Mining Regulation and Reclamation	**Business Use:** 10. Resource Mining

Quality Level: 1 2 3 4 5

Update Frequency: 4–5 years

Bathymetric Data: Yes

Tide-Coordinated: No

Data Outside State Needed: Not reported

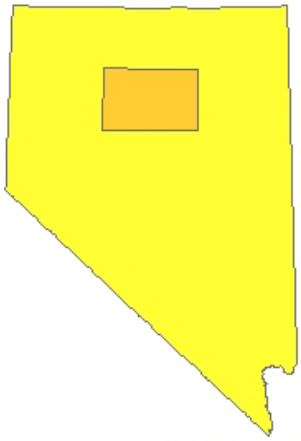
Mine Facility Maps: The Bureau of Mining Regulation and Reclamation uses elevation data as a source for mapping mine facilities. Existing elevation data do not show many of the areas that have been mined in Nevada. Good quality elevation data that are updated regularly will result in maps that are more current and accurate.

Estimated Annual Operational Benefits: Major; dollar value not reported
The bureau will have access to better source information for mapping efforts.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Customer service will be enhanced through access to more accurate and higher quality maps.

Estimated Strategic Benefits: Major
More timely and accurate information will be available to the public.

Program: Flood Risk Modeling and Mapping of Riverine Areas and Alluvial Fans and Dam and Levee Safety Analysis	**Business Use:** 14. Flood Risk Management



Quality Level: 1 2 3 4 5

Update Frequency: 6–10 years	**Flood Insurance Rate Map and Coordinated Needs Management Strategy Activities:** The mapping of flood hazards would be significantly improved if QL2 and QL3 lidar were available statewide. The improvement would enhance public safety and potentially save Nevada residents money on flood insurance.
Bathymetric Data: No	**Estimated Annual Operational Benefits:** Major; dollar value not reported The NFIP is in the process of completing conversion to digital flood maps and is mapping special flood hazard areas (SFHAs). Some of these SFHAs have been redelineated to show additional homes in the "required insurance" zones, while the flood insurance study reports that, in Nevada, "no new detailed study" was done. Many of these studies were based on the 10-m resolution NED. Improvement in topographic information could save many residents of Nevada money because of the potential for better data to show their residences as being in locations with reduced flood risks.
Tide-Coordinated: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported This data type can be used for many different users. The lidar data may also bring new communities and tribal areas into the NFIP due to improved data accuracy.
Data Outside State Needed: Not reported	**Estimated Strategic Benefits:** Major The mapping of flood hazards would be significantly improved if QL2 and QL3 lidar were available statewide. The improvement would enhance public safety and potentially save Nevada residents money on flood insurance. Improvement in topographic information could save many residents of Nevada money because of the potential for better data to show their residences as being in locations with reduced flood risks. This data type can be used for many different users. In addition, the entire hazard mitigation process can be based on better data, which can be used to prioritize the greatest needs.

Local Functional Activities

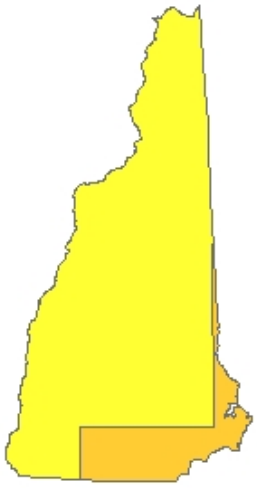
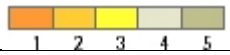
Regional Government—Southern Nevada Water Authority	
Program: In-State Water Resources Project	**Business Use:** 2. Water Supply and Quality
Functional Activity: Watershed assessment	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Combined with other technology like remote weather gauging instruments, the elevation data would greatly assist ongoing monitoring of hydrology in the region.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Better elevation and contour data would be available for the area of interest. Also, having the lidar data available to customers will open up additional applications for the data and enhance the value of the data.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Would be able to track changes in hydrologic patterns, when combined with imagery snapshots, over time, and which could show effects to the environment.

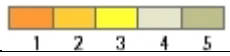
Regional Government—Southern Nevada Water Authority	
Program: Water Smart Landscape Program	**Business Use:** 1. Natural Resources Conservation
Functional Activity: Biological modeling and change detection	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Having lidar data returns that included vegetation and other above-ground features would be beneficial to identify various plant types and vegetation in the Las Vegas Valley metropolitan area.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported A major benefit would be the ability to perform change detection, not only with imagery but with elevation data. Also, having the lidar data available to customers will open up additional applications for the data and enhance their value.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Possible environmental benefits would be tracking growth patterns and changes in an urban environment and their effect on the microclimate and water usage for the Las Vegas Valley.

New Hampshire

The State of New Hampshire has many agencies that know the value of lidar to their programs, including flood risk mapping, sea level rise, and forest and soil mangement. The issue is a lack of funding to complete statewide coverage.

State Functional Activities

Program: Flood Hazard Mapping	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 	**Flood Risk Mapping:** State agencies are using lidar for flood plain management to identify areas of flood risk to use zoning to prevent development in danger zones and to identify developed areas that require flood insurance.
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Major; $650,000 Benefits description not reported.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Benefits description not reported.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Benefits description not reported.
Data Outside State Needed: Yes	

Program: Fluvial erosion hazard assessment	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 	**Geologic Mapping:** Mapping fluvial erosion is a high priority in New Hampshire. Streams and rivers continue to erode and flood in significant urban areas. Lidar is used to identify these areas before the erosion occurs.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; $50,000 Accurate delineation of valley walls is critical in mapping fluvial erosion hazard zones. Data at the specified quality level will enable break lines that define the valley wall to valley flat transition to be identified remotely, limiting the amount of staff time and travel required for field verification. Data will also identify subtle topographic features, such as meander scrolls and other evidence of former channel positions, that are critical in mapping present and past flood plains. In many cases these features are not visible to an observer on the ground and cannot be seen in the high-resolution digital orthophotography that is available.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported More accurate fluvial erosion hazard (FEH) zone delineations that can be incorporated into local hazard mitigation plans and local FEH zoning ordinances. Accuracy is imperative to obtain landowner acceptance of the FEH maps at the parcel scale. Lower costs of mapping due to a reduction in the labor required to field verify valley walls.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Greater public confidence in the accuracy and reliability of FEH maps will translate into increased adoption of local FEH zoning ordinances and ultimately increase public safety. Lowered costs of mapping will translated into an increase of river miles that can be mapped with available program resources.
Data Outside State Needed: Yes, watersheds	

Local Functional Activities

Regional Government—Rockingham Planning Commission	
Program: Adaptation Change Study	**Business Use:** 15. Sea Level Rise and Subsidence
Functional Activity: Sea level rise hazard analysis for communities	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Level not reported; $20,000 A pilot study was completed with limited lidar elevation data. All New Hampshire coastal communities could be studied with enhanced elevation data.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported This study could become available to all coastal communities. A pilot study using limited existing data has been very well received.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Further study will increase outreach and also understanding of the need for coastal adaptation planning. The pilot study has been well received and has enhanced the educational outreach.
Tide-Coordinated: Not reported	

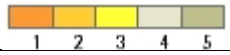
Regional Government—Rockingham Planning Commission	
Program: Regional Planning	**Business Use:** 1. Natural Resources Conservation
Functional Activity: Natural resource conservation, planning	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Currently, the commission runs a GIS and data distribution hub with very poor elevation data. This hampers the activities. Lidar-derived elevation data would provide a fundamental base mapping layer that has been lacking.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Lidar-derived elevation data would enable to commission to fulfill elevation data requests with relevant data. Currently, customer requests for elevation data are fulfilled with poor data.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major The commission would have relevant elevation data for regional planning support and for distribution to consultants. Currently, when there is a request for elevation data, people are taken aback to realize the lack of quality data.
Tide-Coordinated: Not reported	

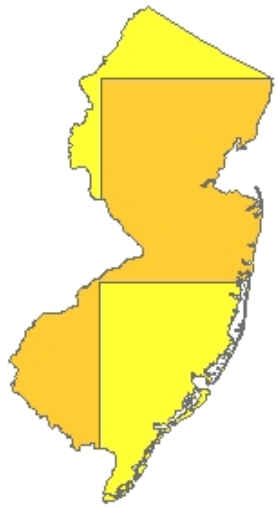
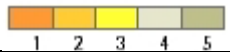
New Jersey

The State of New Jersey has some level of lidar coverage for the entire State. FEMA, the New Jesey Department of Environmental Protection (NJ–DEP), and the USGS have played the largest roles in acquisition and coordination of lidar data. Coastal flood loss and drinking water supply are the two largest issues to which lidar data are applied in New Jersey. Both these functions are administered in the NJ–DEP. The most immediate needs for New Jersey elevation data are to have the western Warren and Sussex Counties lidar reprocessed, as it was rejected by USGS quality assurance for use in the NED due to excessive processing artifacts and a systematic horizontal control error. Also mapping of the shoreline using the National Geodetic Survey (NGS) vertical datum transformation tool (VDatum) software and lidar is being discussed with Rutgers University, the Richard Stockton College, the NOAA Coastal Services Center, and FEMA. The State will compare methodology of the NGS vertical datum shoreline derivation to a method that USGS coastal marine geology program is using. The USGS has assisted the NJ–DEP in developing policy guidance on how to revise open water features (lidar and (or) orthoimagery). The NJ–DEP is the USGS NHD and Watershed Boundary Dataset (WBD) State steward, so developing a strategic plan to reconcile orthoimagery and lidar shoreline in tidal areas is an issue. FEMA has started a program of lidar maintenance in New Jersey with the reacquisition of data for Burlington and Camden Counties this past leaf-off season. The NJ–DEP also has contracted for the production of a 3-m statewide DEM. This will support many small watershed uses and future orthoimagery acquisition. Discussions with the Delaware River Basin Commission are underway to create a basinwide DEM in conjunction with StreamStats as part of the northeast area WaterSmart initiative.

State Functional Activities

<table>
<tr><td colspan="2">Program: Land Use Management</td><td>Business Use: 2. Water Supply and Quality</td></tr>
<tr><td rowspan="4"> 
</td><td colspan="2">Watershed Management: The NJ–DEP is charged with maintaining an adequate supply of safe drinking water from both surface water in the northern part of the State and groundwater in the southern part of the State. Comprehensive reviews of land use change are needed to protect surface water, surface water filtering buffer areas, groundwater recharge areas, and well sites. Impervious surface locations also become important to maintain drinking water supply for the most densely populated State in the Nation.</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $10,000,000
Used to facilitate watershed land use change analysis to protect surface water and groundwater drinking supply and recharge areas. Instituting f best-management practices (BMPs) to maintain or improve water quality can be modeled.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; $5,000,000
Improves forecast for water supply and consumption.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
Improved decisions based on data, science, and changes in supply can be made to protect surface water and groundwater resources and water quality.</td></tr>
<tr><td>Update Frequency: 6–10 years</td><td colspan="2" rowspan="3"></td></tr>
<tr><td>Bathymetric Data: No</td></tr>
<tr><td>Tide-Coordinated: Yes</td></tr>
<tr><td colspan="2">Data Outside State Needed: Yes</td><td></td></tr>
</table>

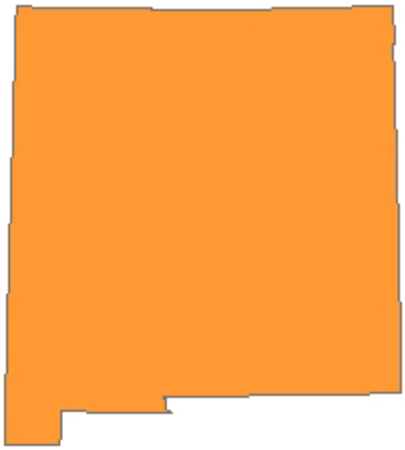
Program: Statewide Beach and Dune Susceptibility Assessment	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 	**Monitor and Model Beach-Dune System:** Map and predict susceptibility to coastal storm events; map and model areas of coastal vulnerability and shoreline change and predict what areas may be subject to shoreline recession and inundation.
	Estimated Annual Operational Benefits: Major; $100,000 Lidar combined with the 105-ft height dune to 15-ft water depth profiles allow a much more accurate assessment of coastline change and improved prediction of coastal vulnerability and change.
	Estimated Annual Customer Service Benefits: Major; $50,000 More accurate elevation data will provide coastal residents and businesses improved recommendations for shoreline BMPs and costs. Improved modeling to predict coastal change and vulnerability of infrastructure and living and natural resources.
	Estimated Strategic Benefits: Major A more informed comprehensive management of coastal resources can be made at the local and regional levels. Long-term trends and data can be better represented and assessed.
Update Frequency: Annually	
Bathymetric Data: No	
Tide-Coordinated: Yes	
Data Outside State Needed: No	

Program: Critical Infrastructure Protection	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 	**Flood Risk Analysis at Critical Infrastructure Sites:** The most probable disaster in New Jersey is flooding. Lidar data will help predict vulnerable areas and assist in planning for a more coordinated response and mitigation and recovery of effected areas.
	Estimated Annual Operational Benefits: Moderate; $10,000 A statewide DEM to create critical infrastructure site topographic analyses will enable planned emergency responses to be implemented in an expeditious and organized manner. This is currently in production by the NJ–DEP.
	Estimated Annual Customer Service Benefits: Moderate; $10,000 Improved and maintained elevation data are an essential part of data needed for informed partners to enable a coordinated action plan to be formulated. Informed partners benefit from a site-specific plan that allows them to protect infrastructure investment and function. Infrastructure change can be monitored at local scale.
	Estimated Strategic Benefits: Major Faster coordinated response means less loss and easier financial recovery, faster return to full functional capability. Environmental considerations can be better prepared for and mitigated at less cost.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Yes	

New Mexico

The State of New Mexico has two major business uses for enhanced elevation that would require the need for QL1 lidar to be provided statewide. The New Mexico Department of Transportation has the business use requirement for infrastructure and construction management to provide statewide transportation planning, design and maintenance, and construction for its roads, rail, and air systems. This infrastructure and construction management business use is also requested to meet the elevation requirements of three county and local agencies in the State. The second major business use for New Mexico county, local, and tribal agencies is for flood risk management. New Mexico has flood risk management requirements from four county, local, and tribal agencies. These non-State agencies have a flood risk management business use to provide hydrologic and hydraulic modeling, retention and reservoir design, flood risk mapping, and water resource planning. Flood risk management was a priority use for survey respondents, although none of the New Mexico State agency that respondent identified elevation requirements in this major business use.

State Functional Activities

Program: Statewide transportation planning, design, construction, and maintenance (to include roads, rail, and air)	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Road Infrastructure:** New Mexico has a functional activity need for enhanced elevation to support statewide road infrastructure design and engineering, new infrastructure design and infrastructure management (roads, water, waste water, drainage, and electricity), storm water modeling, capital improvement, flood plain administration, and infrastructure planning.
	Estimated Annual Operational Benefits: Major; dollar value not reported All functional groups would have access to the same current elevation data.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported All customers would use the same elevation data. Other elevation data sources could be used to supplement the existing elevation data.
	Estimated Strategic Benefits: Major New statewide coordination would take place in relation to the elevation data.
Update Frequency: 2–3 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

City Government—City of Farmington	
Program: Public Works—Flood Control	**Business Use:** 14. Flood Risk Management
Functional Activity: Retention resevoir design, hydrologic and hydraulic modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Lidar data provide the basis for hydrologic modeling and retention dam design. Traditionally, the surface model for these activities was created with photogrammetry, which would take 3 to 12 months and cost more than lidar for the entire city. In arid environments, regularly updated lidar helps monitor changes in drainages due to localized flood events and provides data for updating FEMA maps when retention structures are added or drainages are modified.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Ongoing lidar acquisition will ensure that these benefits will continue to be realized as the surface changes over time. Data cover the entire city to use on projects as needed. The long wait and greater cost associated with ordering photogrammetric based surface data for idividual projects is completely avoided.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major New lidar data will allow continued delivery of timely and cost-effective services as the city develops and expands. The lidar data were purchased for less that the cost of photogrammetric data covering a single project, which has reduced the cost and improved turn around time on projects. In turn, public safety from flooding is improved faster and at a lower cost to the citizens, streaching limited tax dollars.

City Government—City of Farmington	
Program: Public Works Department	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: New infrastructure design and infrastructure management (roads, water, waste water, dainage, and electricity)	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $200,000 Traditionally photogrammetric data were aquired for project areas only, leaving much of the city without updated elevation data. Lidar data are acquired for the entire city for the same cost as a small photogrammetry project; this have enabled the use of the data on a wide variety of projects and reduce the design costs of new projects that were not originally planned when the data were aquired. To keep up with the changes to the landscape, new data are needed continually to properly model the current ground surface. These data would extend the efficiency and cost savings benefits to the program.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Keeping lidar elevation data up to date will extend the benefits currently enjoyed. The lidar data meet the needs of the city internally and provide better, more efficient services to the citizens of Farmington. One of the greatest benefits is the greatly reduced cost and turnaround time for new project designs.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Continued lidar data aquisition would simply continue the current benefits, namely improved response times for projects and queries from both city leaders and the general public. The ability to generate surface data quickly on an as-needed basis has greatly improved both service delivery and public perception.

City Government—City of Farmington	
Program: Zoning and Development Permitting	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Impervious surface water runoff	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $10,000 Currently, there are no data with which to realize existing operational benefits for controlling storm water runoff. Elevation data would allow the county to accurately assess developer plans for controlling storm water runoff in new residential and commerical developments.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; $2,000 If allowed to license the data, a major effect and improvement in the plans the county requires and receives for new development construction and the mitigation of storm water runoff are envisioned. There are currently no elevation data to provide customer service benefits.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major The city will be able to better assess plans for storm water runoff and mitigation strategies as development proceeds to protect the waterways, streams, and creeks of St. Clair County. There are currently no elevation data to realize public, social, or political benefits.

County Government—Bernalillo County	
Program: GIS Program	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Infrastructure planning and capital improvement	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Less field work and fewer inspections, including cost savings for transportation and fuel. Alternative to topographic surveys, incorporate aerial surveys for site development to assess elevation, slope, aspect, and drainage, pertaining to new construction and reconstruction for tranportation corridors, facilities, and drainage structures. Currently, lidar surface data are acquired biennially for anticiapted high-development areas (based on development and permitting activity) of the county. Extending these data regionally would moderately extend benefits, improving mission compliance countywide.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Currently, lidar surface data are acquired biennially for anticiapted high-development areas (based on development and permitting activity) of the county. Extending these data regionally would moderately extend benefits, improving mission compliance countywide. High availability of these data through the county's enterprise GIS for planners, engineers, and customer service staff, all of whom deal directly with the public on development in the county, assures improved performance, timeliness, and customer service.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Currently, lidar surface data are acquired biennially for anticiapted high-development areas (based on development and permitting activity) of the county. Extending these data regionally would moderately extend benefits, improving mission compliance countywide. Improvements to infrastructure control drainage in the Rio Grande Valley. Digital elevation data applied to the FEMA map modernization initiative revised DFIRMS translates to cost saving benefits to the public for those porperties removed from flood plain.

County Government—Bernalillo County	
Program: Not reported	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Capital improvement—Flood plain adminstration	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: Not reported	

County Government—Bernalillo County	
Program: Not reported	**Business Use:** 2. Water Supply and Quality
Functional Activity: Water resource planning activity	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: Not reported	

County Government—Doña Ana	
Program: Innundation mapping	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Innundation mapping and analysis has not been done for Doña Ana County. The county is in the beginning stages of performing these analyses using hydrologic and hydraulic modeling methods. Using lidar in conjuction with the USACE Hydrologic Engineering Center and ESRI products allows for development of better practices and streamlining of the process to cover all flood control structures. The operational benefits are developing as the project gains momentum. Time and cost savings are noticed in reduced field time and in predictive locations for in-depth study. Having QL2 data available to cover watersheds beyond county boundaries would allow much better modeling of all flood structures in the county. The same procedures would be applied to each structure, allowing for better analysis. Eventually, this will permit more accurate information, which will benefit emergency operations in the event of flooding.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported If the data were available annually, there would be increased benefit to internal customers and to the university and research entities. Availability of data in 3-year increments would be useful for historic analysis of topographic changes and human effects.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Moderate Public safety is now coming to understand uses of elevation data. Increased understanding should lead to better application to water supply, hazmat, and evacuation issues. Environmentally, water storage and water movement processes could be better understood and managed. Education and public safety are not as interested in elevation data at the moment. All these relationships are currently being fostered at every opportunity. Environmental and political concerns are limited to (and addressed by) aerial photography.
Tide-Coordinated: Not reported	

Regional Government—Albuquerque Metropolitan Arroyo Flood Control Authority	
Program: Storm Water Facility Design	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Storm water modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $15,000 Elevation data at QL1 take designs to about 65 percent completion before the need for field survey arises. Elevation data at this level are available by a partnership of regional and Federal organizations. If the area were covered by a national program at QL1, the staff time required to identify areas of deficient elevation data and to provide those data to consulting engineers during each project would be reduced.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported If the area were covered by a national program at QL1, the staff time required to identify areas of deficient elevation data and to provide those data to consulting engineers during each project would be reduced. The availability of 1-ft contour equivalent elevation data has reduced the design time for projects. Previously, several ground surveys were required before development could start. Right now, digital elevation data are usually used up to the 65 percent compeltion level of plans.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Minor If the area were covered by a national program at QL1, the staff time required to identify areas of deficient elevation data and to provide that data to consulting engineers during each analysis would be reduced. Existing high-resolution data are used for certain types of hydrodynamic simulation modeling for water resources engineering studies that can determine evacuation zones in a dam failure scenario.
Tide-Coordinated: Not reported	

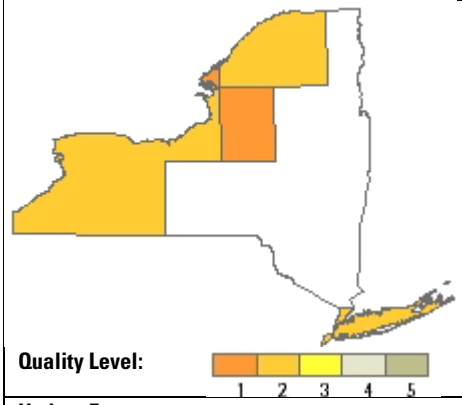
Tribal Functional Activities

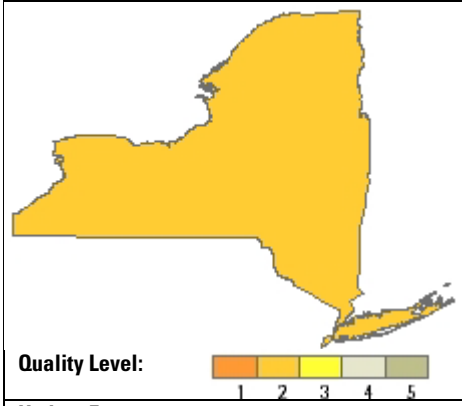
Pueblo of Sandia	
Program: GIS Program	**Business Use:** 14. Flood Risk Management
Functional Activity: Hydrologic and hydraulic modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $20,000 The Pueblo of Sandia currently uses a lidar-derived topographic surface at specified QL1 accuracy that covers a small portion of the reservation. This surface has been used for modeling of river overflow for identification of areas suitable for endangered species habitat enhancement. With accurate topographic mapping covering the entire reservation and tribally owned lands, the pueblo would be capable of accurately characterizing flood potential and risk to life and property.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported With accurate topographic mapping covering the entire reservation and tribally owned lands, the pueblo could also more accurately characterize and manage its agricultural resources and cultural resources including traditional cultural properties. The existing lidar-derived topographic surface had been used in several applications, for example, with cursory examination of a significant river levee bordering the Rio Grande.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Protection of life and property would be the most significant benefit. Accurate characterization of natural resources, agricultural resources, and environmental and ecological habitat is another significant benefit. The public, social, and political benefits of using the exiting lidar topographic surface are limited by its small size relative to the reservation.
Tide-Coordinated: No	

New York

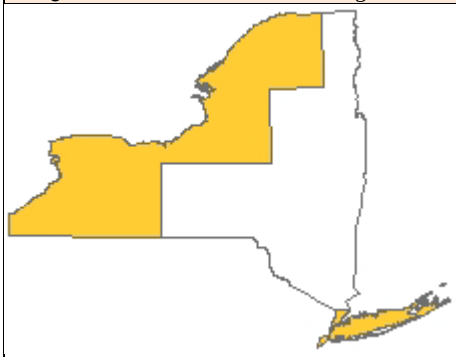
The State of New York has requirements for updated and higher resolution elevation data over most of the State. A high priority is lidar coverage for coastal zone management purposes and for inland freshwater resources and flood hazard mitigation. A repeat cycle of between 6 to 10 years would be generally acceptable, with more frequent collections for certain activities. The lidar collections should be at least QL3 with coastal and other areas (urbanized areas, critical facilities) requiring QL2. In general, New York encourages lidar collection to cover gaps in areas where no acceptable lidar exists presently, before recollecting widespread updates to replace existing acceptable lidar datasets. While New York has significant history with coordinating data collection efforts across and within levels of government, a coordinated national-level enhanced elevation program must have well publicized specifications and planned acquisition schedules available well before collection in order to leverage the existing partnership opportunities. Sufficient time must be allowed for stakeholder planning and an appreciation of local and State budget cycles for funding requests considered.

State Functional Activities

Program: Coastal Zone Management (various State agencies)	**Business Use:** 4. Coastal Zone Management
	**Coastal Erosion Hazard Area Mapping:** Coastal zone, hazards, and flood risk management. Coastal zone mapping is required by State statute every year; acquisition schedule should be tied to statute and statute revised as needed to include lidar acquisition as part of the mapping.
	Estimated Annual Operational Benefits: Major; $1,875,000 Coastal erosion and flood inundation management; loss prevention to property and coastal resources.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Major Benefits description not reported.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Yes, for contiguous watersheds	

Program: Capital Transportation Programs	**Business Use:** 21. Infrastructure and Construction Management
	**Transportation Infrastructure**
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Provide more current and accurate baseline data for improved risk analysis, disaster response and preparing environmental impact statements for projects.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Moderate Benefits description not reported.
Update Frequency: 6–10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, adjoining counties	

Program: New York State Department of Environmental Conservation Bureau of Habitat Freshwater Wetlands Program	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5	**Freshwater Wetlands Mapping:** Freshwater wetlands mapping. **Estimated Annual Operational Benefits:** Major; $900,000 Meet regulatory requirements of the State's Freshwater Wetlands Act; reduce costs by avoiding mapping of unnecessary areas. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Major Benefits description not reported.
Update Frequency: 6–10 years	
Bathymetric Data: Not reported	
Tide-Coordinated: Not reported	
Data Outside State Needed: Yes, adjoining watersheds	

Program: Ocean and Great Lakes Program	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5	**Analysis of Wind Energy Potential** **Estimated Annual Operational Benefits:** Major; dollar value not reported Improved analysis of wind generating potential and siting analysis; mitigate risk due to potential flooding and shoreline erosion. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Major Benefits description not reported.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: No	

Program: Division of Homeland Security and Emergency Service—Office of Cyber Security—Hazard Mitigation	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, contiguous watersheds and (or) counties.	**Hazard Modeling:** Hazards monitoring (primarily flood related). **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Improved inundation and flood inundation modeling; better input into hazard mitigation plans. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Moderate Benefits description not reported.

Program: Division of Homeland Security and Emergency Service—Office of Cyber Security—Critical Infrastructure Mapping	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, roads and other critical infrastructure in adjoining counties.	**Critical Infrastructure Protection:** Critical infrastructure protection statewide. **Estimated Annual Operational Benefits:** Major; dollar value not reported Benefits description not reported. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Moderate Benefits description not reported.

Program: New York State Department of Environmental Conservation Bureau of Flood Protection and Dam Safety, Dam Safety Section	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5	**Dam Safety Analysis:** Improvements to dam safety analysis, permitting, and monitoring.
	Estimated Annual Operational Benefits: Major; $2,000,000 Dam owners are required to submit dam failure and inundation analysis to support dam hazard classifications and emergency action plans (EAPs) in the case of higher hazard dams. Statewide availability and consistent standards for high-accuracy elevation data would improve the ability of the Dam Safety Section to check and verify these analyses and to perform analyses to evaluate requests for hazard classification changes. The primary potential benefits are improved productivity of staff and improved protection of the affected public.
Update Frequency: 6–10 years **Bathymetric Data:** No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Dam owners are required to submit dam failure and inundation analysis to support dam hazard classifications and EAPs in the case of higher hazard dams. When available, analysis methods that use high-accuracy elevation data have significant cost benefits for dam owners as well as improved outcomes. Statewide availability and consistent standards for high-accuracy elevation data would maximize these savings and benefits. Estimated savings to dam owners are included in above dollar benefit, assuming 25 dam owners per year (low estimate) would otherwise need to employ traditional (field survey) methods.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major When high-accuracy elevation data are available for dam failure and inundation analyses, outcomes are improved, and costs are reduced. This increases the safety of the affected public and helps to mitigate any potential environmental damage. It also significantly reduces the cost of complying with State regulations for dam owners. Statewide availability and consistent standards for high-accuracy elevation data would maximize these savings and benefits.
Data Outside State Needed: Only those watersheds that have dammed streams that enter into the State.	

North Carolina

North Carolina began collection of statewide lidar data in 2001 to support the FEMA Map Modernization Program (MapMod). The collection of lidar-based elevation data has led to a suite of programs that support local and State government, universities, private business, and the public. A few of these efforts by the State are noted below.

NC OneMap is the State program that embodies the building of a spatial data infrastructure for the State and is North Carolina's contribution to the National Spatial Data Infrastructure (NSDI). The 37 data themes of NC OneMap, including elevation, are public domain data and information available to any customer. The business uses for these data are not limited. Thus, while natural resources conservation was chosen in the enhanced-elevation survey response, NC OneMap data are appropriate for many of the 27 business uses that were listed in the survey for this report.

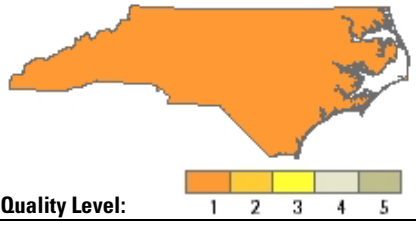
North Carolina was the first cooperating technical State (CTS) for MapMod, and statewide lidar data collection started in 2001. The NC Floodplain Mapping Program (FMP) was established and used lidar to create accurate elevation products that support the accuracy and content requirements for DFIRMs, which have been completed statewide, and scheduled update and maintenance for these products is underway. Learning from the use of lidar-based elevation for MapMod, the Office of Risk Information and Analysis is addressing a much wider range of hazard issues across the State. Significant research and development is taking place to create additional data, information, and products on all hazards statewide to aid in developing plans for response to and mitigation of these hazards. High-quality elevation data have led to significant cost savings and risk avoidance for North Carolina residents and businesses.

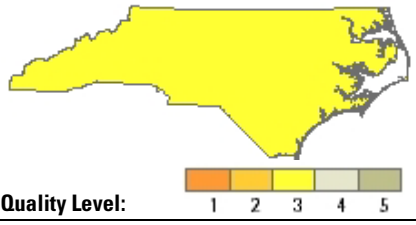
The MultiHazard Threat Database (MHTD), a nonpublic-facing State database, is used primarily for disaster response when an event originates from or affects animals and plants in the State. Data in the MHTD largely comes from businesses that donate sensitive locational information and other data to the MHTD. Elevation data are used in emergency response to rapidly visualize the best location for response personnel and materials to be deployed when involved in a disaster that affects plants and animals, whether that is flooding or an infectious animal disease or some other issue. Effective location determination is crucial to a timely emergency response.

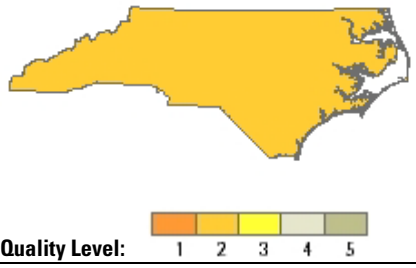
At the NC Department of Transportation (DOT), final design base map production is a process of mapping the midlevel details of an overall road project for road placement, design, construction, expansion, and maintenance. The elevation data from the statewide lidar support this level of detail. The base map is then used as one of the products that support the field survey and final design processes of transportation planning, saving time and money in the beginning stages of road design and construction.

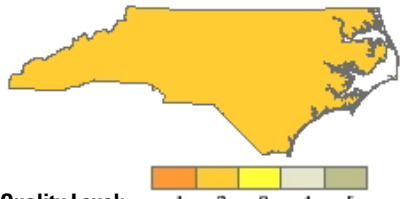
The NC Geodetic Survey (NCGS) uses lidar-based elevation data to support research activities by State government, universities, and the private sector in land subsidence and sea level rise. These research efforts in North Carolina would benefit significantly by having a regular update of the elevation data so that temporal change, both in degree and speed, could be accurately determined on an annual basis.

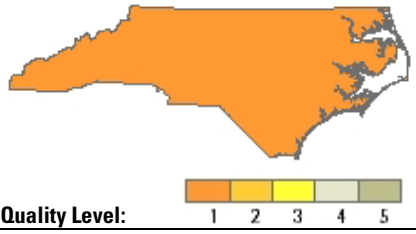
State Functional Activities

Program: NC OneMap	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:**	**Geospatial Information Clearinghouse:** NC OneMap is the State program that embodies the building of a spatial data infrastructure for the State, one that feeds the NSDI as it develops. Building a spatial data infrastructure for the State was defined as the long-term goal for GIS in North Carolina by the North Carolina Geographic Information Coordinating Council. NC OneMap provides public domain data and information to any user for any business use. Thus, while BU#1 (Natural Resources Conservation) was selected in the survey response, NC OneMap is appropriate for many of the business uses that were part of the survey.
Update Frequency: 2–3 years	**Estimated Annual Operational Benefits:** Moderate; $1,000,000 This is the estimated financial benefit of having current, accurate elevation data to serve as part of the NC OneMap data resource. The $1 million per year benefit is based on the value of the data to the user community balanced against the cost of maintaining the data on an annual basis, particularly for those areas of North Carolina where the landscape is changing significantly due to development or natural processes.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	**Estimated Annual Customer Service Benefits:** Major; $625,000 The 2010 NC OneMap Refresh Planning Project looked at overall benefits being derived from NC OneMap and the data layers contained therein. The benefit is defined as cost savings to users who do not need to develop the data themselves or seek other sources for the data. Considering all the critical data layers in NC OneMap, the overall value or benefit to the user was estimated to be $2.5 million. Because elevation is a framework data layer that has more and varied users, its value is given more weight than many of the other layers. Therefore, a weighted value of 25 percent of the total benefit was assigned to elevation data and its customer service benefit, yielding a dollar benefit of $625,000.
	Estimated Strategic Benefits: Moderate Benefits description not reported.

Program: Office of Risk Information and Analysis	**Business Use:** 14. Flood Risk Management
 **Quality Level:**	**Flood Plain Mapping and Hazard Risk Assessment:** DFIRMs for all counties in the State have been produced, and map maintenance is in the process of being performed on the DFIRMs, which are publically accessible on the Internet. Additionally, significant amounts of research and development are taking place in the State to provide the public and government leaders with additional information and data on all hazards and to develop plans for the mitigation or adaptation to these hazards. Lidar-based elevation data are critical, including bathymetric lidar needs for ocean front and sound front areas.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; $75,000,000 Efficiencies are maximized in emergency management due to more accurate horizontal and vertical flood determination to support the assessment of potential losses from flooding and to assess the hazards of first-floor flooding of every building in the State inside and outside the 100- and 500-year flood plains.
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Yes, extension by watershed into neighboring States to support common operations across State boundaries during emergency situations	**Estimated Annual Customer Service Benefits:** Major; $170,000,000 Creating quality, statewide base-level elevation data to provide accurate information for flooding of first-floor elevations in commercial and residential structures throughout the State provides significant loss avoidance for residents and businesses in North Carolina in terms of property damage and loss.
	Estimated Strategic Benefits: Major The establishment of a statewide flood warning system and increased business development in the State.

Program: Transportation Planning, Design, Construction, and Maintenance	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Annually **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Final Design Base Map Production:** Final design base map production is a process of mapping the midlevel details of a transportation project for road placement, design, construction, expansion, and maintenance. The elevation data from lidar support this level of detail. The base map is then used as one of the products that supports the field survey and final design stage of transportation planning where the tolereances for elevation are much finer than the lidar data at any of the quality levels defined in the survey could support accurately. One-inch elevation errors in the final road design and placement are significant to the overall project success. **Estimated Annual Operational Benefits:** Major; $75,000 Time savings in the development of final survey base maps for transportation construction and maintenance. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Improved earthwork estimates due to more dense point spacing and the ability to immediately provide dense and accurate bare-Earth lidar elevation points to final design. **Estimated Strategic Benefits:** Not reported None.

Program: NC Geodetic Survey	**Business Use:** 15. Sea Level Rise and Subsidence
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Annually **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Subsidence and Sea Level Rise Research and Monitoring:** This functional activity involves supplying State government, universities, and the private sector with high quality, high resolution elevation data and information which these organizations use to do their work or their research into land subsidence and sea level rise in North Carolina. An annual update to the elevation data would provide a temporal view of these issues, with degree and rate of change evaluated annually. **Estimated Annual Operational Benefits:** Moderate; $60,000 A regular replacement or update of the enhanced elevation data provides researchers and others a temporal perspective on both subsidence and sea level rise rates and effects in the State. **Estimated Annual Customer Service Benefits:** Major; $100,000 State government departments involved in surface and ground water issues and research organizations involved in sea level rise research can save both time and money by having continued high-resolution elevation data updates that form a temporal view of subsidence and sea level rise in the State. **Estimated Strategic Benefits:** Major Improved quality of data and information that becomes available to the public and decisionmakers to help deal with adverse conditions caused by subsidence and sea level rise.

Program: MultiHazard Threat Database	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Visualization of Disaster Response Requirements:** The MHTD, a nonpublic-facing database, is largely used for disaster response when the source of the disaster affects or is linked to animals and plants in the State. While a disaster might be flooding, for example, the MHTD is largely used to mitigate the effects caused by the disaster on animal and plant populations. The goal is to deal with these influences so that human populations are not endangered by the effects of animal and plant issues. Additionally, the MHTD is used in cases where animal and (or) plant diseases surface in the State and could harm the full animal or plant industry in the State and possibly bring harm to the human population. **Estimated Annual Operational Benefits:** Major; dollar value not reported Improved citing of response personnel and equipment following an event that endangers human life because of animal or plant issues or effects. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported The affected human population is provided the best and most rapid response to animal and plant issues that could influence human health. **Estimated Strategic Benefits:** Major Either creates or enhances the value of the MHTD to the public, law enforcement, and elected officials at all levels of government.

Local Functional Activities

County Government—Mecklenburg County	
Program: Flood Plain Management	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood plain management and remapping for FEMA initiatives	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $850,000 The benefits are valued in the flood plain mapping and safety programs. The biggest benefit is to achieve accurate and timely data more efficiently and faster for usage.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; $1,300,000 Data and information are more current and accurate and are available to users at a point where the current data are becoming out-of-date. The benefits are in the value of information for remapping, analysis, and study.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major A new and current enhanced elevation dataset will benefit the public safety and social aspects the greatest, with the political benefits being the planning and preparation for major events like the upcoming 2012 Democratic National Convention in Charlotte, N.C. Benefits are in remapping of DFIRM maps and in the public safety sector. These benefits are viewed not by dollar amounts, but by accurate information being used for safety.

County Government—Mecklenburg County	
Program: Framework Base Mapping	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Base mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $50,000 The elevation dataset is currently used for base mapping efforts and supplying the engineering community with accurate contour information for land development purposes. Having more timely and accurate information will greatly improve the efforts of the community.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; $50,000 Having new and accurate elevation data will benefit the customer by bringing a greater accuracy level to the base mapping resources. Because the current elevation dataset is becoming aged and dated, the current data are becoming less valuable to the customers.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major The benefits will be largely in planning and development of accurate base layers. Currently, the existing benefits are for land development and planning purposes. These datasets are used to better prepare areas for residential and commercial construction and development.

County Government—Pasquotank County	
Program: Flood Plain Mapping	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $100,000 Higher resolution elevation data would give the ability to more finely determine and adjust the flood areas of the county, and having the lidar data on a regular update and maintenance cycle would help keep up with changing conditions such as sea level rise.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Accurate flooding information provides better service to citizens.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major These data are currently available. Greatly accurate data allow for best policy decisions and better customer service to citizens regarding flood zone management.

County Government—Pasquotank County	
Program: Planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Subdivision runoff	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $100,000 Runoff analyses are limited by analysis of ditches and streams in the county. High-resolution lidar data would improve predictions of runoff by helping to calculate the load carrying capacity of ditches and streams in the county.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; $200,000 Builders and owners of new buildings and (or) subdivisions and shopping areas would be better able to understand how their construction will affect flooding issues downstream from their construction site, thus saving significant investments later on to fix issues that develop.
Bathymetric Data: Yes **Tide-Coordinated:** Yes	**Estimated Strategic Benefits:** Major The citizens of the county are happy that runoff is examined before allowing a subdivision. Finer detail and bathymetric lidar would do much to help in this regard.

Tribal Functional Activities

<table>
<tr><td colspan="2">Eastern Band of Cherokee Indians</td></tr>
<tr><td>Program: Tribal GIS System</td><td>Business Use: 13. Cultural Resources Preservation and Management</td></tr>
<tr><td colspan="2">Functional Activity: Site protection preservation and analysis</td></tr>
<tr><td>Quality Level: QL1
elevation data from lidar</td><td>Estimated Annual Operational Benefits: Major; $500,000
Elevation data play a key role in the location and protection of indian heritage sites in North Carolina and elsewhere. The elevation data are used to help locate those heritage sites and provide bounding area information for preservation of the sites. The tribal GIS system serves sites in North Carolina and nine other States in the eastern United States.</td></tr>
<tr><td>Update Frequency: 4–5 years</td><td>Estimated Annual Customer Service Benefits: Major; $300,000
Site suitability determinations for the siting of construction will be easier to achieve with enhanced elevation data available for the process. Significant field work can be avoided if site is not suitable for development.</td></tr>
<tr><td>Bathymetric Data: No</td><td rowspan="2">Estimated Strategic Benefits: Major
Educadtion of the public on tribal history and presence in North Carolina and the protection of the sites.</td></tr>
<tr><td>Tide-Coordinated: No</td></tr>
</table>

North Dakota

The State of North Dakota has requirements for QL1, QL2, and QL3 data covering the entire State, including a buffer area across both State and international borders. Approximately 18 percent of the State is covered by existing QL3 or higher resolution elevation data. Large areas of the State are currently covered only by very old elevation data that do not meet QL5. Experience in the use of lidar data is rather limited in most State agencies due to the lack of data over areas of interest. Primary uses for enhanced elevation data by the State government are identified as emergency response, flood and drainage modeling, water quality monitoring, invasive species control, and transportation infrastructure design. There is a need for a broad range of data products that vary by user. Benefits of enhanced data include more accurate hydrologic and hydraulic modeling, refinement of the Watershed Boundary Dataset, more accurate and efficient orthophoto production, and reduced need for field surveys, which will reduce labor costs, provide more reliable flood inundation predictions, and enable more educated decisionmaking by management. Property damage and lives lost in emergency events could be reduced. North Dakota would be very supportive of a national program for lidar acquisition.

State Functional Activities

Program: National Watershed Boundary Dataset Stewardship, TMDL Determinations, Nonpoint Source Pollution Prevention Programs	**Business Use:** 2. Water Supply and Quality

Update Frequency: 6–10 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Yes, data to complete watersheds that cross State and international boundaries would improve models

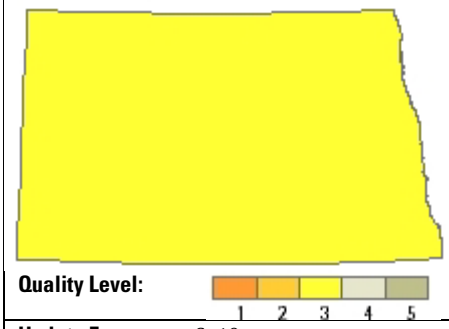
Watershed Delineations and Water Quality Monitoring

Estimated Annual Operational Benefits: Major; dollar value not reported
Refinement of Watershed Boundary Dataset delineation with high-resolution elevation data; determination of TMDL's using established computer models that need elevation as an input.

Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
Improved performance of models. Larger data file sizes will be challenging to handle. No data exist at quality level desired, so exact effect is unknown.

Estimated Strategic Benefits: Major
Refinement of elevation data for watersheds would improve flood control planning, refinement of watershed delineations, and elevation of hospitals for flood response efforts.

Program: Orthophotos	**Business Use:** 21. Infrastructure and Construction Management



Update Frequency: 6–10 years

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: No

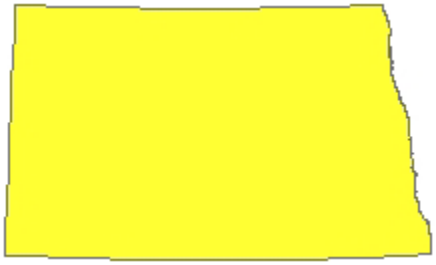
Road Infrastructure

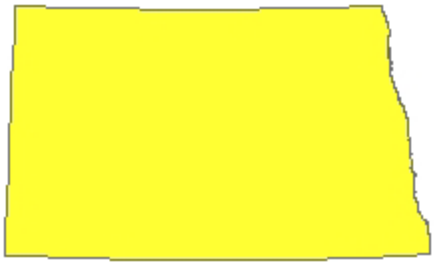
Estimated Annual Operational Benefits: Major; dollar value not reported
Improve ability to produce orthophotos at the accuracy that is required. Reduced time by using existing data instead of creating digital surface model. Reduced field survey time.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Broader coverage. Creation time for data would be reduced.

Estimated Strategic Benefits: Major
Reduced design time for public transportation. Effcient use of public funds.

Program: GPS Data Logging	**Business Use:** 8. Agriculture and Precision Farming
 **Quality Level:** 1 2 3 4 5	**Noxious Weed and Invasive Species Infestation Reporting and Control:** Not reported.
Update Frequency: 2–3 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported More accurate and up to date data.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Faster delivery of more current, higher quality point location infestation data to the counties.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Not reported Benefits description not reported.
Data Outside State Needed: Need for data in surrounding States may develop as the emerald ash borer infestation spreads towards North Dakota	

Program: Emergency Response	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5	**Predictive Flood Inundation Mapping:** Not reported.
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Not reported; dollar value not reported Benefits description not reported.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Not reported Benefits description not reported.
Data Outside State Needed: Yes; toxic plumes, floods, and other hazards cross State boundaries	

Program: Hydraulics	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Hydrologic and Hydraulic Modeling:** Not reported.
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Using enhanced elevation data reduces field surveys and improves accuracy compared with existing data.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More accurate modeling. Delivery of products on a more timely basis.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Not reported Benefits description not reported.
Data Outside State Needed: No	

Local Functional Activities

City Government—City of Fargo	
Program: Storm Sewer Utility	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood plain and storm water management	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Better data would provide for better management decisions.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The current process would not be changed but it may well provide a positive timing element. These data offer a higher level of service for consulting engineers and off-the-street customers.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate
Tide-Coordinated: No	Up to date quality data reduces labor costs, provides for better assumptions, and enables better planning information. A larger dataset would aid in planning for extraterritorial expansion and merging with adjacent jurisdictions. Up-to-date data reduce labor and hopefully provide a better product to users.

City Government—City of Minot	
Program: District III Planning and Development	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Flood risk mapping, hydrologic and hydraulic modeling to help identify zoning and planning for rural communities	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Lidar data are not currently used, so its hard to put a value on it. Lidar-derived elevation data could aid in educating the public on certain problems in the region, such as flood, sediment, fire, and other potential disaster-related issues along with environmental issues (septic tanks).
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Information would be an asset for poor counties when trying to protect the environment and property.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major
Tide-Coordinated: No	Bathymetry would be used for sediment issues along the Missouri River. Also, these data can assist in planning for sewer systems, along with flood plain issues. Lidar data have been used for a new flood plain, which was valuable in protecting a community. This community is now able to develop accurate zoning and other planning documents to “grow” the community.

Regional Government—Bismarck-Mandan Metropolitan Planning Organization	
Program: Not reported	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Transportation and land use planning	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported It helps the metropolitan planning organization. The benefits requested here are unknown.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported New customer benefits are unknown. Local jurisdictions can use data for local planning, engineering and design efforts.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate
Tide-Coordinated: No	These benefits are unknown. These data aid emergency management addressing natural and manmade disasters.

County Government—Mckenzie County	
Program: Not reported	**Business Use:** 12. Oil and Gas Resources
Functional Activity: Pipeline mapping	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Unknown.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Information would be easier to obtain.
Bathymetric Data: No	**Estimated Strategic Benefits:** Minor
Tide-Coordinated: No	Unknown.

County Government—Cass County	
Program: Not reported	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk modeling	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Time savings for county engineering staff when preparing for spring flooding. Having elevation data available in-house enables staff to prepare in advance and mitigate as much as possible the effects of spring flooding. Staff has the ability to produce maps and provide information to county residents in a timely manner. The county has been able to perform 80 or more buyouts of flood-prone properties to mitigate the risk of flooding and would have the ability to produce more detailed models of other rivers in the county, including Maple and Sheyenne, which would enable assessment of the effects on a wider population.
Update Frequency: Annually	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More detailed models of other rivers in the county could be produced, which would enable assessments of the effects on a wider population that could be shared with customers (county residents). The county has provided an interactive flood risk reduction site that allows residents to estimate the river stage at which their property is at risk from spring flooding. Maps and data are readily available to answer customer questions immediately instead of involving an extensive search of data on the Web (which were often out-of-date and inaccurate)
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate With the discussion of a major diversion project in process for the Red River Basin, the availability of more accurate data will assist in educating the public and decisionmakers. The public is much better educated about how the river flooding is going to affect their property and environment. From a public safety stand point, resources can be prepared and deployed in advance to protect areas where flooding is most likely to occur.
Tide-Coordinated: No	

County Government—Ward County	
Program: Ward County Highway Department	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Road infrastructure	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported There is some relief due to the savings of on the ground surveying, but what higher quality elevation data really bring is higher accuracy to the design and a better end product for the public as well as help to eliminate unforeseen errors.
Update Frequency: >10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported There is some relief due to the savings of on the ground surveying, but what higher quality elevation data really bring is higher accuracy to the design and a better end product for the public as well as help to eliminate unforeseen errors.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate There is some relief due to the savings of on the ground surveying, but what higher quality elevation data really bring is higher accuracy to the design and a better end product for the public as well as help to eliminate unforeseen errors.
Tide-Coordinated: No	

Ohio

The State of Ohio has had statewide, high-resolution lidar-based digital elevation data and lidar point cloud data for the past several years thanks to the coordinated efforts of the Ohio Geographically Referenced Information Program (OGRIP), the Ohio Office of Information Technology (OIT), the Ohio Department of Transportation (ODOT), the Ohio Department of Natural Resources (ODNR), and other State agencies and stakeholder groups, with additional financial support from the NGA, the Department of Homeland Security (DHS), and the USGS.

The basic horizontal resolution for the Ohio statewide lidar is 2 m, corresponding to QL3. Several counties and cities are taking advantage of the Ohio Statewide Imagery Program (OSIP) buy-up options to acquire even higher resolution lidar and corresponding elevation data that are better than QL3. Original OSIP lidar collection flights were in two directions in several of the Ohio major urban areas to support accuracy within taller structures.

The requirements and benefits documented through this survey are related to water quality, flooding, geology, coastal issues, transportation infrastructure planning, and forest management. Additional requirements and more precise and authoritative quantitative benefit information were not yet documented through this survey due to limited available resources during this period by key stakeholder groups for the complex survey and the current lack of a full-time USGS spatial liaison dedicated to Ohio.

The original driving requirement for statewide, high-resolution elevation data for Ohio was to support the accurate orthorectification of new statewide, high-resolution color aerial photography through the OSIP. Statewide lidar data were not an original requirement to support the OSIP but were found to be the most efficient method to meet the elevation requirement. The OSIP lidar data have been shown to be valuable beyond the original aerial photo orthorectification requirement, but it may still be important to note the value of enhanced elevation to support accurate development of other themes of spatial data, such as imagery, which have their own requirements.

During subsequent meetings, a few additional functional activities for Ohio lidar and elevation data were noted that did not come out during the survey period. These included archaeology, history, more detailed stream mapping, and recreation.

State Functional Activities

<table>
<tr><td colspan="2">Program: Biological and Water Quality Monitoring and Assessment, Coastal Zone Management: Nonpoint Program, and Planning for Watershed Conservancy Districts</td><td>Business Use: 2. Water Supply and Quality</td></tr>
<tr><td colspan="2" rowspan="4"> 
</td><td>Water Quality: Water quality monitoring and assessment impervious surface information (from lidar and related sources) also related to water quality.</td></tr>
<tr><td>Estimated Annual Operational Benefits: Moderate; dollar value not reported
Enhanced elevation data would allow for the accurate, automated delineation of catchments associated with individual stream monitoring sites. Accurate delineation allows for a more extensive characterization of sites, which benefits study planning and result assessment.</td></tr>
<tr><td>Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
The primary products of the Biological and Water Quality Monitoring and Assessment Program are biological and water quality reports. Enhanced elevation data could increase the efficiency of monitoring efforts as well as the quality of the data and analyses produced, which could improve report timeliness and utility to readers.</td></tr>
<tr><td>Estimated Strategic Benefits: Moderate
Enhanced elevation data could result in environmental benefit, because they could improve the quality and timeliness of stream and watershed assessments. Improved assessment supports better decisionmaking that would hopefully result in real environmental improvement in streams, rivers, and lakes.</td></tr>
<tr><td colspan="2">Update Frequency: 4–5 years</td><td rowspan="4"></td></tr>
<tr><td colspan="2">Bathymetric Data: Yes</td></tr>
<tr><td colspan="2">Tide-Coordinated: No</td></tr>
<tr><td colspan="2">Data Outside State Needed: Yes</td></tr>
</table>

Program: Flood Risk Modeling and Mapping, Dam and Levee Safety	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Not reported **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes	**Flooding:** Flooding, flood risk modeling and mapping, dam and levee safety analysis, impervious surface information (from lidar and related sources) also related to runoff and flooding. **Estimated Annual Operational Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Not reported Benefits description not reported.

Program: Mapping	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Geology:** Geologic mapping, geologic assessment, mine mapping, hazard mitigation, glacial mapping, surficial geomorphology. **Estimated Annual Operational Benefits:** Major; dollar value not reported Elevation data help with geomorphology mapping of glacial deposits and karst sinkholes. The use of high-quality elevation data mostly helps with higher detail of data capture and less generalization. It is especially important for pinpointing karst sinkholes as accuracy is more important. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Customers can expect better accuracy and more thorough mapping. **Estimated Strategic Benefits:** Major Higher accuracy of surficial geomorphological mapping provides excellent opportunities to inform the public of the importance of geologic mapping for the purpose of protecting sensitive areas. Mapping detailed areas allows for coordination between the State and local government agencies due to better quality.

Program: Coastal Zone Management	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Coastal Issues:** Coastal issues, coastal zone management, bluff recession, viewshed analysis, offshore wind facility planning, shore structure inventory; support of regulatory programs. **Estimated Annual Operational Benefits:** Not reported; $300,000 Updating of coastal erosion area mapping under Ohio Revised Code §1506.06. Identify unauthorized coastal structures using digital surface model, full-point cloud, and hydroflattened lidar data for reporting to NOAA. Assistance to littoral property owners. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Since the general public does not have the analysis software, any benefits derived will be indirectly received through consultants. Provide datasets to consultants for benefit of public projects, usually in a LASer format (a standard file format for exchanging lidar data). **Estimated Strategic Benefits:** Minor Collaborative efforts to leverage public funds and bring a more fiscally responsible use would be accepted by the constituents. Education outreach efforts for bluff erosion and recession, vegetative slopes BMPs have been received as a regulatory component although it was not intended as such.

Program: Transportation Infrastructure	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Transportation Planning:** Transportation infrastructure preliminary design, planning, and construction management. Better elevation data help in culvert replacement efforts and in determining cut and fill in the preparation of the road bed. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported The benefits are estimated to be moderate due primarily to the vertical accuracy, which limits the use of the data. Would need to compare the existing lidar data to the proposed in order to make a determination. Savings for the ODOT may be up to $2,000 per project. **Estimated Annual Customer Service Benefits:** None; dollar value not reported None. **Estimated Strategic Benefits:** Moderate An increased point density may have a slight environmental effect due to the higher resolution of the terrain for analysis purposes. Public and private entities may also benefit for these reasons stated above.

Program: Comprehensive Sustainable Forest Management	**Business Use:** 5. Forest Resources Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Forest Management:** Forest management, forest structure, volume, and composition biometrics. The lesson learned from current OSIP statewide, high-resolution imagery, elevation, and lidar is the need for more returns in lidar point cloud and more classification values to support forest management. **Estimated Annual Operational Benefits:** Major; dollar value not reported QL1 data would provide the opportunity to quantify and project current forest stands, cover types, development, volume, and biomass through automated means. This is critical with decreasing staff available to conduct detailed forest inventory on the ground. These data will facilitate maintenance of the Forest Stewardship Council (FSC) and sustainable forestry initiative (SFI) sustainable management certification. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported QL1 data will facilitate quantification of forest inventory relating to timber harvest location and layout. This will result in more efficient harvesting at a sustainable level, providing benefits to Ohio's timber industry as well as local governments. **Estimated Strategic Benefits:** Major QL1 data may provide information necessary to maintain certification by the FSC and SFI certification for Ohio's State forests. These data will allow for analyses of completed, current, and planned silvicultural and forest management activities on State forest lands.

Local Functional Activities

County Government—Clinton County	
Program: Regional Planning Commission	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Suitable land for business growth	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported The amount of money spent on performing basic functions, such as creation of contour data and structure outline datasets, could be minimized in the early phase of inviting a major business to choose to build in Clinton County if the data were already available. Being able to answer questions early is always a benefit.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported With the currently available elevation data, questions from businesses and corporations on land suitablility can be answered immediately. This benefit could enable the county to attract and inviting businesses to the county.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Moderate Current elevation data were used for the creation of new, accurate flood zones, which benefit property owners, helping them to answer the question "Am I in or out?". Accurate floodzones have a direct influence on public safety in relation to roads, bridges, and culverts that might be affected in a flooding situation.

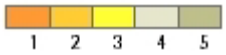
Oklahoma

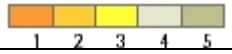
The surface terrain varies significantly throughout the State of Oklahoma with vast, moderately hilly topography, flat and arid regions, and mountainous areas all located in different regions of the State. Responses from the variety of State agencies expressing their requirements for enhanced, high-accuracy elevation data only reinforce what geospatial data users in the State already know: There is an overwhelming critical need for high-accuracy elevation data coverage for the State of Oklahoma. One of the most economical means for capturing this type of data is through the use of lidar technology. At a minimum for urban areas, the level of accuracy needs to be such that a 1-ft contour interval can be generated from a 0.5- to 1-m spaced ground sample. This level of accuracy is necessary to meet the vast majority of needs for hydrologic studies, natural resource planning and assessments, environmental monitoring, and construction planning activities. The State of Oklahoma agencies are working with various partners at multiple levels of government to build and maintain the Oklahoma Spatial Data Infrastructure (OSDI). Enhanced elevation data are a key component of the OSDI which will be leveraged with nationwide datasets. All levels of government within the State need access to more highly accurate elevation data, which are especially important for solving terrain related applications in Oklahoma's expanding metropolitan areas, conversion of rural terrain areas to built-up, more populated terrain areas, applications for large and small cities, as well as the many requirements by tribal governments across Oklahoma.

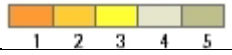
State Functional Activities

Program: Dam Safety Program	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** No	**Dam Breach Analysis:** Analyzing and modeling the potential breach of dams in high-hazard and non-high-hazard areas. The analysis includes potential damage assessment to structures and loss of life, property, and natural resources. Using enhanced digital elevation data allows rapid, remote analysis of dam breach areas and associated potential damage locations. The level of accuracy gives a much clearer picture of a breach event than even ground survey cross sections because of the sheer volume of accurate elevations. Even with surveyed cross sections, you still have to interpolate between them, and the enhanced elevation data do that for you on a more consistent and accurate basis. **Estimated Annual Operational Benefits:** Major; $3,762,500 Significant benefits are derived from not having to use survey crews to collect detailed elevation data for each dam site. Having enhanced elevation data statewide will expand the breach analysis program to include additional high-hazard and non-high-hazard dams being converted to high-hazard status due to population growth in rural areas. **Estimated Annual Customer Service Benefits:** Major; $1,254,000 The State would be able to produce more and higher quality dam breach analyses for the same amount of money. **Estimated Strategic Benefits:** Major Statewide expansion of the program gives all State residents a greater level of protection through emergency action plans and not limiting the better high accuracy information to only high priority areas.

Program: Flood Plain Management Programs	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Yes; there may be a need for some upstream elevation data outside the State that are needed for developing flood plain maps downstream within Oklahoma	**Flood Risk Mapping:** Development of highly accurate flood plain maps to aid officials at various State agencies in conducting risk analysis for flooding events. There may be a need for some upstream elevation data that exist outside the State that are needed to develop accurate flood plain maps for areas downstream within the State. **Estimated Annual Operational Benefits:** Major; $1,400,000 Enhanced elevation data would greatly improve flood risk analysis results of various State agencies and reduce the amount of time required to create the analysis models. The availability of enhanced elevation data would also decrease the costs for counties and rural communities to update and improve flood plain mapping. **Estimated Annual Customer Service Benefits:** Major; $1,050,000 Analysts would be able to produce more high-quality flood risk models leading to higher quality flood risk maps. Available enhanced elevations data would likely reduce the time to produce flood plain maps, making them more accessible sooner to the public and professionals in the field. **Estimated Strategic Benefits:** Major The State could provide higher quality flood risk maps for low-hazard dams to cities, counties, developers, lenders, and insurance companies to discourage future development in these potential flood areas and allow for better decisionmaking where the public is concerned.

Program: Location Survey	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 	**Location Surveying and Highway Design:** Location surveying for preliminary engineering for the design of highways and bridges.
	Estimated Annual Operational Benefits: Moderate; $15,000,000 Available enhanced elevation data will provide quality elevation data in areas where conventional survey access is limited or very expensive to acquire.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported More accurate elevation, structures, and land cover data provide better drainage information and allow service agencies to better serve the public with higher quality data and improved or better decisionmaking. The existence of high accuracy elevation data also aids in the generation of new datasets, which provide the ability to generate surface data in less time in areas where access is limited and data acquisition costs are nearly prohibitive.
Update Frequency: 2–3 years	**Estimated Strategic Benefits:** Moderate Geospatial data users can graphically illustrate a newer and more accurate representation of the Earth's surface and what is on it, by using the high-accuracy elevation data. The availability of this quality level of elevation data will significantly benefit users from all parts of society.
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Yes; cooperative work with departments of transportation of bordering States	

Program: Watershed Planning and Total Maximum Daily Load Development	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 	**Water Quality Modeling:** Collect and interpret water quality data to determine the total daily maximum load for streams in Oklahoma. This activity is performed to meet regulatory requirements by the EPA.
	Estimated Annual Operational Benefits: Minor; dollar value not reported Most of the agency's watershed modeling was done with 30-m DEM data. Enhanced elevation data would significantly improve the outputs from the models. Using this type of enhanced data also improves the quality of graphs in reports created for projects.
	Estimated Annual Customer Service Benefits: Do not know; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Do not know Benefits description not reported.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Oklahoma Natural Heritage Program	**Business Use:** 7. Wildlife and Habitat Management
 **Quality Level:** 	**Species Distribution Modeling:** Prediction of species distribution based on measured environmental variables. Accurate species distribution models are necessary for conservation planning, especially for endangered species protection and mitigation efforts.
	Estimated Annual Operational Benefits: Moderate; $500,000 State specialists would potentially be able to model currently unknown breeding grounds for lesser prairie chickens site locations with new enhanced elevation data due to the higher resolution of the data. State agency personnel may also be able to identify certain vegetation types not currently distinguishable with existing, lower quality elevation data.
	Estimated Annual Customer Service Benefits: Moderate; $500,000 Being able to produce basically enhanced species distribution models using the higher accuracy elevation data would allow resource planners better information on what to expect and how to manage the limited resources.
Update Frequency: 2–3 years	
Bathymetric Data: No	
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate Having access to better base elevation data means the State can make more accurate models and therefore give more precise recommendations to the public and private sector for natural resource management.
Data Outside State Needed: No	

Local Functional Activities

City Government—City of Ardmore	
Program: Several programs	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
Functional Activity: Municipal mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $40,000 Existing elevation data are used in all aspects of maintenance, construction, and development for all municipal projects where elevation data have a role. The areas of data that are missing are bathymetric data of all city-owned lakes or elevation data or the waterlines coming from the lakes. These additional data would be invaluable in assessing current resources and planning for future growth in the region.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Moderate; $4,000 New customer service benefits from newly acquired elevation data would probably not be as critical as the data currently used because the bulk of the enhanced elevation data for the city and surrounding area have already been acquired. However, the new elevation data could easily point out issues that need to be addressed that are currently unknown. Having current elevation data in-house, elevation data do not have to be acquired every time a project needs to access elevation data. The ability of having a good elevation dataset on hand is invaluable to daily operations.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate The additional data would definitely help in planning for future growth and hazard mitigation. Having one standard elevation dataset has helped the City of Ardmore tie all the projects together with all the elevation data matching on a citywide basis rather than on a project specific area.

Regional Government—City of Oklahoma City and The Association of Central Oklahoma Governments	
Program: Comprehensive planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Municipal government operations	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $400,000 Acquiring and possessing high-accuracy elevation data saves staff time by reducing field work, increases the ability to peform analyses, and increases the quality of program outputs. It also provides the ability to perform regionwide analyses that significantly reduces staff time acquiring and processing the data.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; $200,000 If all enhanced data can be made avialble from one location, they can improve efficiency, lower customer and partner costs, and promote ecnomic development. There is a much increased capability to provide customers and partners alike the data they require, through improvements to accuracy, broad coverage, and regular consistant acquisition of elevation data across the geographic region.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Greater accuracy in the data provides for better modeling, and higher resolution allows for better visualization for engineering and planning applications. Enhanced elevation data can be used for engineering and other high-accuracy tasks and projects, which would not be possible with lower accuracy levels of elevation data. Enhanced elevation data are often used for flood rate map production, hydrologic modeling for disaster preparedness, visualisation for engineering and planning, while also improving business efficiency and promoting development.

Regional Government—City of Oklahoma City and The Association of Central Oklahoma Governments	
Program: Storm Water Quality Management	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Storm water quality management and regulatory compliance	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $400,000 Improves ability to manage storm water quality regionwide by providing consistent elevation data. Higher resolution and consistent elevation data improves the city's ability to do storm water quality management throughout the system.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; $200,000 Wider coverage, higher resolution data can provide better accuracy, centralized storage location for the data, and time savings through better decisionmaking. Storm water quality permitting and pollution control studies are produced from these data for customers.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Having all the data in one location makes it easier to share with customers, saving them time and money and promotes business. Pollution control protects environmental quality. Having enhanced elevation data for a larger area provides consistency that makes benefits possible regionwide.

Regional Government—City of Oklahoma City and The Association of Central Oklahoma Governments	
Program: Transportation and Utility Infrastructure Management	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Transportation and utility infrastructure management	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $1,000,000 Accurate elevation data allow much better infrastructure project planning and modeling of existing assets. Having more accurate data for a wider area would allow new tasks to be performed using the enhanced elevation data, would increase the ability to collaborate and make it easier to provide required data to partner organizations.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; $1,000,000 Having the new data avialable would eliminate acquisition time and allow better validation of engineering work, as well as providing the ability to build better models for visualization and analysis. More accurate data for a larger area would improve the engineering and planning work associated with building and maintaining infrastructure.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major Enhanced data available in a consistent format that are acquired on a regular basis significantly reduce lag and startup times. Not having to dedicate city resources to the acquisition of high-accuracy elevation, this type of data allows the city to focus on the main planning and engineering goals. Highly accurate data expedite major construction projects, leading to cost savings, project efficiencies, better decisionmaking and overall better quality of life.

Tribal Functional Activities

Kickapoo Tribe of Oklahoma	
Program: Clean Water Act Section 106 Program	**Business Use:** 2. Water Supply and Quality
Functional Activity: Nonpoint source assessment	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $19,000 Any improvement to enhanced elevation data to show water quality results while comparing to the natural features would provide a better model and better results.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; $38,000 The customer benefits would be to the tribal community and its members regarding their water quality.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Benefits would demonstrate areas of concern with respect to nonpoint sources and aid in development for the future.

Choctaw Nation of Oklahoma	
Program: Clean Water Act Section 106 Program	**Business Use:** 2. Water Supply and Quality
Functional Activity: Selection of water quality monitoring sites	
Quality Level: QL4 elevation data from imagery	**Estimated Annual Operational Benefits:** Moderate; $10,000 Allow staff to visually see geography of drainage basins. Allow staff to select better sites for water quality monitors.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; $10,000 Allow staff to select monitor sites that are accessable and assess same for how well they would meet data collection criteria for turbidity and flow rate. Make maps convey 3D terrain of region.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Would show in more detail the terrain of the monitor sites and allow for better visualization and evaluation of same. Only used as map background to display 3D quality of terrain.

Choctaw Nation of Oklahoma	
Program: Agriculture	**Business Use:** 8. Agriculture and Precision Farming
Functional Activity: Lease agreements for tribal members	
Quality Level: QL4 elevation data from imagery	**Estimated Annual Operational Benefits:** Major; $15,000 Allow preliminary assessments of tracts of land for suitability for leasing as pasture or recreational use. Allow detailed in-office assessments of tracts of land for suitability for leasing as pasture or recreational use and identification of fencing and other features used in determining lease value, such as pasture terrain and slopes, soil suitability, available water and type (stream, pond, and so on).
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; $15,000 Improved detailed data would allow for much more accurate in office assessments of potential income-producing uses for tracts of individually owned native American land, therefore increasing the income of these individuals and possibly improving the quality of the land by inclusion of stipulations for same in the lease agreement. Examples would be additional fencing, weed control soil improvements, erosion control measures, addition of stock ponds, and other value-enhancing features. Currently available orthophotos with elevation and contours allow staff to calculate a preliminary acreage for suitability of pasture or recreational use only.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Would allow staff to show potential lessor and lessee, tribal leaders, and administrators how the tract of land up for lease "looks" now and what uses are proposed for that land. Should increase income potential for tribal members by allowing more cost effective evaluation of available land and better determination of best uses for same. Allow staff to locate land to evaluate in the field.

Oregon

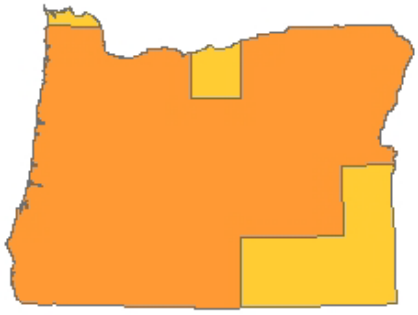
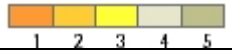
Oregon has a robust and active lidar community with a wide variety of disciplines using the data for a broad spectrum of management, analysis, and research. The extensive use of lidar in Oregon is directly due to the high resolution of the data that have already been acquired. Major uses include infrastructure planning and management, ecosystem and resource management, and public safety.

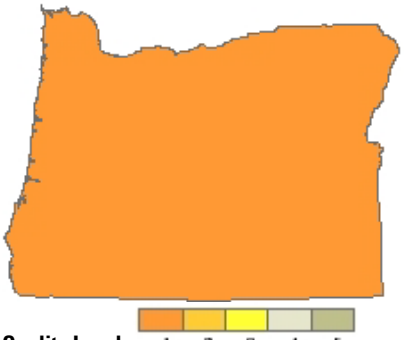
Infrastructure planning and management uses of lidar include analyzing sites for solar development, mapping road centerlines and designing public works projects. Ecosystem and resource management uses of lidar include forest inventory, evaluating farming practices, and watershed assessment. Public safety uses of lidar include mapping landslides, updating the tsunami inundation line, and analyzing flood risk.

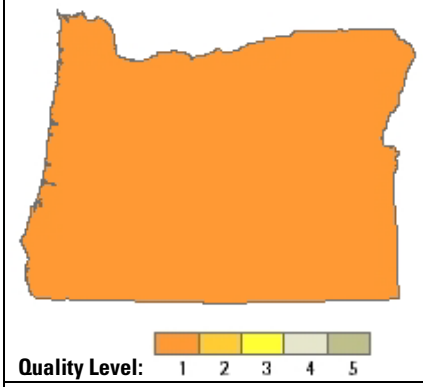
Approximately 20,000 square miles in Oregon have high-resolution, QL1 (8 points per square meter) lidar available. There have been 18 major projects since 2008 with 60 different government agencies, tribes, and private firms providing more than $9.8 million dollars in funding. This funding level and diverse participation illustrates the broad based support in Oregon for QL1 lidar as it allows for many different uses and derivative products.

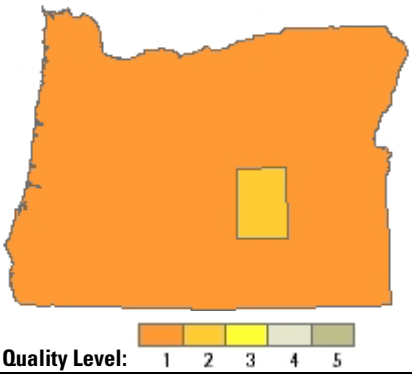
While Oregon has been very successful in creating partnerships to acquire lidar, nearly 80 percent of the State is still in need of these data to support the many uses described above. Oregon strongly supports a national program for lidar acquisition.

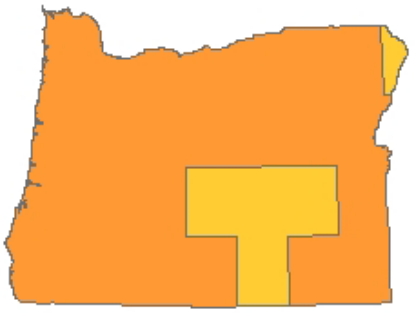
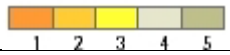
State Functional Activities

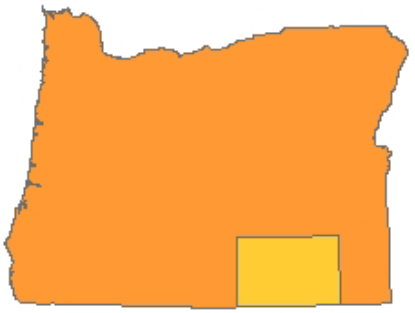
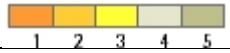
Program: Forest Management	**Business Use:** 5. Forest Resources Management
 **Quality Level:**  	**Forest Management:** Forest management involves collecting and sharing information about the conditions of Oregon's forests, protecting forestlands, and conserving forest resources. Intensity image is also a required product.
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Major; $6,500,000 The single biggest effect of lidar technology on the science of forestry is that of forest inventory. Traditionally, forestwide inventories have been based upon samples taken within different vegetation strata across the landscape. Now forest managers are closer to being able to have a true inventory of the trees in any given area or ownership. Another benefit is that the design of new road layout is constrained by control points that the constructed road should avoid and areas of optimal grade and alignment. By using the bare-Earth hillshade, it is possible to conduct preliminary engineering before making a field visit.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; $6,500,000 The engineering uses of lidar data are impressive. In the past land managers used the best available topographic information available, which typically consisted of the 1:24,000-scale USGS topographic quadrangles. The contour lines on these maps were developed using photogrammetric methods, and due to the forest cover in western Oregon, the USGS was not able to certify that these maps met The National Map accuracy standard of plus or minus half a contour interval (typically 40 ft). The lidar bare-Earth model is an accurate representation of the ground surface under the vegetation and can be used in many ways.
Tide-Coordinated: No	
Data Outside State Needed: No	**Estimated Strategic Benefits:** Major • landslide and unstable slope identification to avoid issues resulting from improper road location • identification of steep slope and operable lands • determining tractor ground versus cable ground and optimal landing locations • road design and layout including mass calculations for fills and cuts • determine yarding profiles and blind leads for cable systems • determination of landing placement • the canopy layer is an efficient tool to help Oregon Department of Forestry biologists quickly identify potential marbled murrelet habitat and candidate trees • the lidar-derived hillshade is an extremely valuable tool for the identification of potential cultural resource areas and specific historical activity locations

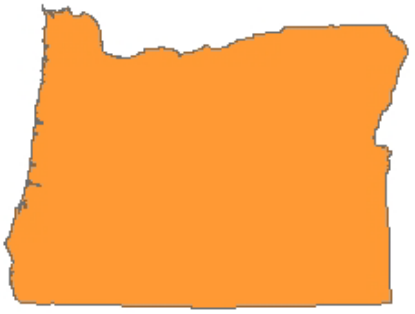
Program: Oregon Parks Recreation Department and Oregon Department of Transportation Engineering and Design	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 4–5 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Infrastructure Siting and Design:** Infrastructure siting and design involves developing and managing Oregon's system of highways, roads, and bridges and State park facilities. Intensity image is also a required product. **Estimated Annual Operational Benefits:** Major; $200,000 Improved data accuracy results in less fieldwork and better compliance with building and environmental regulations. The lidar data make it possible to analyze hundreds of potential sites with a sufficient amount of detail. Without lidar, each site would have to be surveyed. Higher quality data improve mission compliance by greatly increasing the efficiency of site selection. Having detailed elevation data for the entire highway system would allow the Oregon Department of Transportation to analyze thousands of sites with sufficient detail for 9,000 miles of highway. **Estimated Strategic Benefits:** Major Higher quality level data allow the State to do a better job of avoiding environmentally sensitive areas (locations would be more accurately located) and planning for runoff as well as locating in-ground effluent treatment sites. The Oregon Solar Highways Program has used lidar to inform the public about line of sight to solar installations and viewshed analyses. Lidar is also used to analyze vegetation cover for potential solar installations.

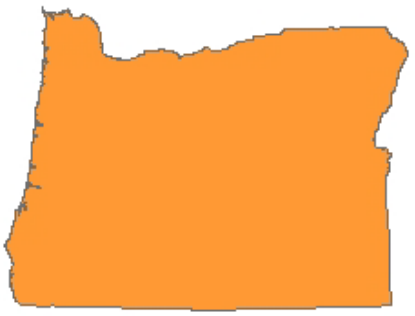
Program: Watershed Enhancement Grant Program and Watershed Council Support	**Business Use:** 3. River and Stream Resource Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, for all watersheds that enter Oregon.	**Assessment of Watershed and Upland Restoration Project Sites:** Assessment of watershed and upland restoration project sites involves historic channel mapping, vegetation analysis, cultural resource identification, farmland terrace installation, and ecosystem services assessments. Intensity image is also a required product. **Estimated Annual Operational Benefits:** Major; $18,400,000 Lidar provides high-quality data for assessment, modeling, and project planning. The higher quality the data (accurate and precise) the better outcomes implemented restoration projects have. Post-implementation monitoring is required of most restoration grants; the more accurate the data to plan projects the more likely restoration projects will be successful. Lidar data decrease the amount of time needed to plan projects and improve the reporting on projects. **Estimated Strategic Benefits:** Major The social benefits include an increased need for employees who have skills and experience with lidar data; for the Oregon Watershed Enhancement Board (OWEB), this means more contracting or staffing opportunities available with Lottery dollars granted to councils. The environmental benefits include better designed restoration projects. The strategic and political benefits include OWEB's ability to strategically plan for large investments (for example, property acquisition for conservation) based on better quality data.

Program: Agricultural Water Quality, Nonpoint Source Pollution, TMDL Drinking Water Protection	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Yes, for watersheds that enter Oregon.	**Water Quality:** Water quality involves protecting Oregon's rivers, lakes, streams, and groundwater to keep these waters safe for a multitude of beneficial uses, such as drinking water, fish habitat, recreation, and irrigation. Intensity image is also a required product. **Estimated Annual Customer Service Benefits:** Major; $5,400,000 Lidar would assist in being able to locate areas that have a high potential to cause erosion or sediment reaching the waters of the State and do educational and outreach activities in those areas with local farmers and ranchers to avoid future problems. It would be especially useful for reaching the ranchers on the eastern side of the State with improved plan reviews. The soil and water conservation districts in the eastern part of the State would be in a stronger position to reach out to their customers with the erosion and sediment analysis information. **Estimated Strategic Benefits:** Major Statewide lidar would allow for a consistent, statewide approach to erosion and sedimentation water quality issues. Having these data would make it easier to work more effectively with the agricultural community during plan review and offer them ideas to increase environmental benefits.

Program: Park and Recreation Planning	**Business Use:** 22. Urban and Regional Planning
 **Quality Level:**  	**Landscape Planning:** Landscape planning involves designing various aspects of State parks, including vegetation establishment and maintenance, trail development, facilities location, and campground layout. Intensity image is also a required product.
	Estimated Annual Operational Benefits: Major; $100,000 Airborne lidar surveys produce data much faster and cost significantly less than comparable field-based efforts. Lidar data are significantly more accurate than photogrammetrically derived data in canopied areas in the Pacific Northwest. There would be direct savings from a national program in not having to acquire additional data areas of interest (AOIs) and additional time savings in not having to contract for ad hoc acquisition.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** No **Tide-Coordinated:** No	**Estimated Annual Customer Service Benefits:** Major; $250,000 With a national program, the State budget could be directed towards additional planning efforts as opposed to data acquisition, which would increase speed of delivery. Having data available over entire AOIs would enable a wider use of the higher quality data, thereby improving customer experience. Better quality data result in more accurate planning, reducing future costs and improving customer satisfaction. Fewer field visits are required to verify plans or designs when high-quality data are used.
Data Outside State Needed: Not reported	**Estimated Strategic Benefits:** Major Increasing productivity would provide the public more recreational opportunities and reflect positively on the State. Using higher quality data has produced better decisions, providing a direct social benefit.

Program: Geologic Survey and Services, Natural Hazards Mapping and Support of State Land Use Goals, and Dam Safety	**Business Use:** 14. Flood Risk Management
 **Quality Level:**  	**Flood, Channel Migration and Tsunami Inundation Mapping, Flood Risk Mapping and Analysis, and Dam Safety Inundation Analysis:** Flood risk mapping involves producing data, reports and maps for dam safety, flood risk, channel migration and tsunami inundation. Intensity image is also a required product.
	Estimated Annual Operational Benefits: Major; $335,000 High-resolution topographic data are used to delineate elevation sensitive areas of modeled flood and tsunami inundation. This high-resolution topography is used to anchor and rectify serial photography to track and model channel migration zones, and the lidar digital elevation model allows the Oregon Department of Geology and Mineral Industries to locate abandoned channels and potential avulsion zones instead of having to perform extensive field work. For all these hazards, lidar is used to locate and digitize structures for risk management and to create easy-to-use base maps for Web applications to display hazard information. Statewide lidar would make it possible to expand the flood hazard mapping to additional areas with lidar coverage. Redefined public reviews have dramatically reduced challenges to the current flood mapping products. Lidar has also made possible more precise configuration of embankment dams for seismic analysis. The real savings are not tangible in dollars saved, but rather in the derived products produced and how they cascade through the system for the communities and other users.
Update Frequency: 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** Yes, for watersheds that enter Oregon	**Estimated Annual Customer Service Benefits:** Major; $775,000 If lidar-derived elevation data existed, the real winner is the public where a surveyor might not have to be employed to determine the structure relationship to the flood zone. In Oregon that could easily relate to savings of tens of thousands of dollars per year for the public. This may be vastly underrated as it is not known how much effort private citizens and businesses have to put in to create their own studies in approximate A zones that do not have good elevation data. The associated products and services, such as the ability to extract building footprints, identify meandering channels, and locate potential landslide areas will also assist in hazards risk analysis.
	Estimated Strategic Benefits: Major Being able to provide accurate and useful information to local governments helps to build strong positive relations and partnerships for hazard mitigation. Lidar brings hazards mitigation and mitigation planning to the forefront with much better analysis capability and outreach materials. The additional data, tools, and strategies allow for addressing additional concerns, such as the Endangered Species Act.

Program: Geologic Survey and Services	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5	**Hazard Mapping:** Hazard mapping involves producing maps and reports that can be used by the public and by government to reduce the loss of life and property due to geologic hazards and to manage geologic resources. Intensity image is also a required product.
	Estimated Annual Operational Benefits: Major; $325,000 High-resolution digital elevation models allow the Oregon Department of Geology and Mineral Industries to make landslide inventory maps that are far more accurate and complete than any other method, and at a cost savings of 75 to 85 percent compared with other methods.
Update Frequency: 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes	**Estimated Annual Customer Service Benefits:** Major; $325,000 Statewide lidar would make it possible to be able to rapidly provide easy to use, accurate landslide inventory maps to any part of the State. Landslide inventory maps made with high-resolution digital elevation models are three to four times as complete as is possible with other methods and are four to five times as accurate. Greater completeness and accuracy gives customers more confidence in the product. Cycle times for map production are drastically reduced, from 1 or more years to 6 weeks per quadrangle. Presentation of landslide inventory data on extremely detailed and accurate lidar base maps improves the ability of user to interpret the data.
Data Outside State Needed: No	**Estimated Strategic Benefits:** Major Statewide lidar would increase the geographic scope of the current efforts. Communities and individuals are far more likely to mitigate landslide hazards if the hazard is clearly and reliably defined. Good lidar-based inventory maps make most landslides readily apparent even to a lay audience. Having well-defined areas of hazard allows local governments to craft ordinances that maximize hazard mitigation while minimizing cost and effect on the community. Landslide inventory in forest lands is a crucial element in modeling and mitigating sediment input into streams with sediment related TMDL limitations.

Program: Fire Protection	**Business Use:** 16. Wildfire Management, Planning, and Response
 **Quality Level:** 1 2 3 4 5	**Wildland Fire Prevention and Management:** Wildland fire prevention and management involves protecting 15.8 million acres (246,875 square miles) of private and public forestland from fire. Intensity image is also a required product.
	Estimated Annual Operational Benefits: Moderate; $2,460,000 The ability to prevent fires through effective vegetation management will be enhanced with statewide forest canopy data derived from lidar.
	Estimated Annual Customer Service Benefits: Moderate; $2,460,000 With statewide quality topographic data derived from lidar, fire management activities will be more efficient. Fire managers are able to better respond to fires in areas where high quality topographic data exists.
Update Frequency: 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** No	**Estimated Strategic Benefits:** Moderate The goal is to have smaller fires that burn less frequently and lidar topography enables this goal. Better fire management is achieved through the use of quality elevation data.

Local Functional Activities

City Government—City of Springfield	
Program: New Shelby County DFIRMs	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $125,000 Contours, orthophotos, and change detection.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; $25,000 Not available; contours, orthophotography, and change detection on demand.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Not available; accurate elevation data are a benefit across the enterprise GIS user community including social benefits, environmental benefits, strategic and political benefits, and other benefits.

City Government—City of Springfield	
Program: Public Works	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Waste and storm water infrastructure design	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $2,610,000 The QL1 lidar dataset the city took deliverable of in August 2009 has proved to be extremely beneficial and has been integrated into the city's current operations seamlessly. All branches of the city's Public Works Department have directly or indirectly benefited from these data. Engineers have successfully used the data in preliminary design, environmental services has used them to calculate shade potential, and GIS uses have used the data to update aging and outdated elevation datasets. It is the city's intention to begin using QL1 lidar data to assist in the update and continued maintenance of the citywide planimetic datasets. It is the city's hope that the regional partners can come to a cooperative agreement to have lidar data acquired every third year. The reliability of routine updates would allow the city to rely on the lidar datasets to replace many of the existing business process. Currently, without a reliable update schedule, analyses are confined to the "snapshot in time" scenario and can only depend on existing data to inform existing datasets for a limited duration.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; $1,740,000 New QL1 lidar data have provided the city with the means to update aging elevation models, such as slope, aspect, viewshed, and hillshade. The higher resolution datasets have been a major success. Customers are continually delighted with the detail these datasets provide.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major With a regular schedule for lidar acquisition, systems can be implemented to provide elevation data in support of public requests, facilities management, citywide slope analysis, and FIRM support. Without regularly scheduled lidar acquisitions, other sources must be relied upon to update city wide inventories (planimetric, field surveys). Most other options have a much higher price tag, thus leading to a potential reduction in services the city can provide to the public. With the anticipated budget reductions locally, statewide, and nationally, it is imperative that agencies begin working together to share the cost of data acquisition and development. QL1 lidar data have provided ESD with a valuable tool set to measure environmental variable such as shade, and slope. They have also allowed ESD to locate potential depresional wetlands. The QL1 datasets the city currently possesses have resulted in staff having to make fewer trips to the field and allowed for more prompt response to requests from council members, timely meet requests form the private sector for topography, support citywide buildable lands analyses, and support ongoing facility design. QL1 data have resulted in more timely public service, better design of public facilities, and a better understanding of environmental hazards and constraints.

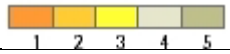
Tribal Functional Activities

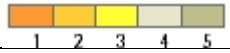
Confederated Tribes of Grand Ronde	
Program: Natural Resources	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Stream channel mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $184,000 Stream buffers derived from lidar data are more accurate. Difficult and time consuming GPS surveys of streams are converted to simple inception point surveys. Road layer more accurate for reporting purposes to the Bureau of Indian Affairs (BIA) road inventory.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Major; $184,000 Lidar data are used on many of the maps supplied to logging contractors, clearly identified stream-buffers, cable corridor analysis for cable logging operations, hillshade and contour lines help in general mapmaking.
Bathymetric Data: Not reported **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Lidar data will be used for educational purposes and cultural resource mapping. New stream layer derived from lidar data will be used for fish habitat protection and improvement. Lidar data are also being planned for use in forest inventory purposes.

Pennsylvania

The Commonwealth of Pennsylvania has recent statewide lidar with breaklines, contours, DEMs, point clouds, and other derivative products, with aggressive work being performed in a variety of applications. The need is for a program that will ensure continuing coverage on at most a 10-year cycle, with a view toward emerging technologies that may yield even more precise, refined, and varied elevation datasets.

Commonwealth Functional Activities

Program: Forestry	**Business Use:** 5. Forest Resources Management
 **Quality Level:** 	**Mapping of Forest Vegetation**
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Not reported; dollar value not reported Current data are inadequate to needs, particularly in Marcellus Shale region.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Responds to known and frequently repeated constituent demands.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Not reported Data are now inadequate or nonexistent.
Data Outside Commonwealth Needed: Yes, because of watershed definitions	

Program: GIS	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:** 	**Flood Risk Assessment, Response, and Mitigation**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported More exact flood modeling. Provide recent data or areas where data do not currently exist.
Bathymetric Data: Not reported	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported More accurate modeling will lead to better customer service.
Tide-Coordinated: Not reported	**Estimated Strategic Benefits:** Major More exact flood modeling allows for better disaster planning, recovery and mitigation.
Data Outside Commonwealth Needed: Not reported	

Local Functional Activities

County Government—City and County of Philadelphia	
Program: Not reported	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
Functional Activity: 3D modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Too many uses to enumerate here, but the data needs are continually refined for current information.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: Not reported	

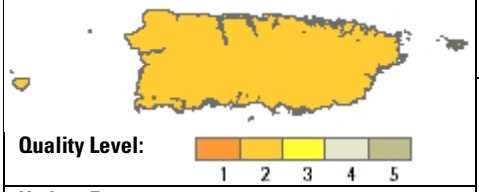
Regional Government—County Commissioners Association of Pennsylvania	
Program: Not reported	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Variety of uses	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported The counties have a huge variety of applications for this dataset.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: No	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: No	

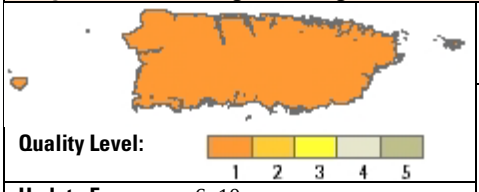
Puerto Rico

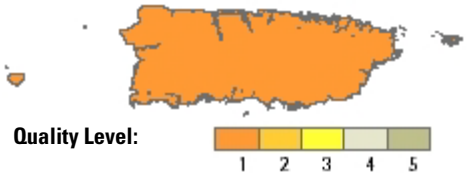
The Commonwealth of Puerto Rico, which is among the most densely populated islands in the world, has requirements for high-resolution, accurate, and current lidar-derived elevation products to support numerous missions to include public safety (especially tsunami response and mitigation), transportation planning and construction, sea level rise, and urban and rural planning. With limited budgets and mounting requirements, it's critical that these and other important programs are executed in the most cost-efficient and effective manner.

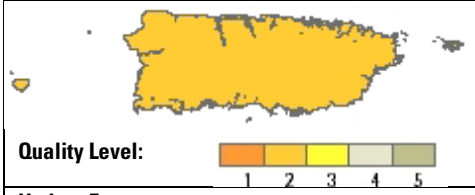
The Caribbean region has a critical requirement for a revised and accurate regional vertical reference datum to replace the one that is currently in place (the National Geodetic Vertical Datum of 1929 (NGVD 29) was never valid for Puerto Rico, and NAVD 88 is not and will not be valid for Puerto Rico). Lacking this fundamental reference system it is impossible to fully leverage the benefits typically associated with lidar datasets such as highly accurate bare Earth elevation measurements. Critical programs such as topographic map revision in support of flood mapping and modeling continue to be compromised in the region of the U.S. territories in the Caribbean due to the absence of a reliable vertical datum.

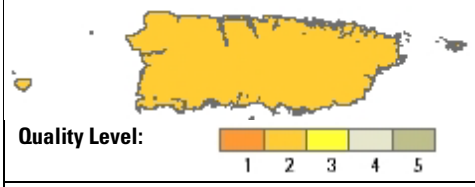
Territorial Functional Activities

Program: Geographic Information System Bureau and Land Use Bureau	**Business Use:** 22. Urban and Regional Planning
	**Zoning:** Urban and rural zoning, natural resources conservation area delineation, and potential effect of development analysis programs would benefit from availability of high-accuracy lidar elevation datasets.
	Estimated Annual Operational Benefits: Major; dollar value not reported The availability of lidar-derived elevation products would result in cost savings through automation of land use and land cover interpretation, classification, and analysis activities, which include enabling "virtual visits" to urban and rural project areas.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The customer (policymakers, program managers, and public at large) will get more detailed and accurate descriptive information of environment. Public safety programs will benefit through improved planning and modeling capabilities. Property loss due to natural hazards will be minimized through implementation of more effective urban and rural development strategies.
Tide-Coordinated: Yes	
Data Outside Commonwealth Needed: Not reported	
	Estimated Strategic Benefits: Major Improved ability to design, develop, and protect critical infrastructure which directly affect all citizens of the Commonwealth.

Program: Coastal Management Program	**Business Use:** 4. Coastal Zone Management
	**Coastal Resources Management:** This includes planning and modeling activities associated with existing and planned coastal development to establish sustainable best-use guidelines.
	Estimated Annual Operational Benefits: Major; dollar value not reported With the availability of high-accuracy lidar-derived elevation datasets, exposure to coastal hazards would be minimized as the result of improved coastal inundation models and map products. Enhanced elevation datasets would also support climate change studies and seal level rise vulnerability assessments along with associated adaptation strategy development.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported High-accuracy lidar coverage would result in improved decisionmaking tools that enable Federal and Commonwealth agencies to implement improved public policies to protect life, property, and biodiversity within the region.
Data Outside Commonwealth Needed: No	
	Estimated Strategic Benefits: Major Outreach strategies targeting policymakers and program managers are strengthened when current and accurate geospatial datasets are available to support informed decisionmaking.

Program: Linear Referencing System (LRS), Network Modeling, Aerial Photography, and Transportation Plans	**Business Use:** 18. Land Navigation and Safety
	**Transportation Infrastructure Planning:** This includes the use of lidar point cloud as well as derived DSMs and DTMs for planning and construction of roads, overpasses, bridges, and other transportation features.
	Estimated Annual Operational Benefits: Major; $66,000 Improved planning capability and management of resources. With the availability of lidar-derived elevation datasets, field survey requirements are significantly reduced, resulting in operational cost savings.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved quality of mission and products. Reduced cost to taxpayer (customer).
Bathymetric Data: Yes	
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Public safety enhanced as the result of timely transportation project completion and efficient use of available funds.
Data Outside Commonwealth Needed: No	

Program: GIS Support to Commonwealth Agencies	**Business Use:** 22. Urban and Regional Planning
	**Land Use and Land Cover Analysis**
	Estimated Annual Operational Benefits: Major; dollar value not reported The availability of lidar data would result in improved hazard preparedness and planning programs especially in the context of tsunami mapping and modeling and flood map revision as it pertains to zoning, infrastructure development, and land use.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported With reliable elevation datasets readily available Commonwealth agencies will be in a better position to make informed, scientifically sound decisions regarding urban and rural planning and emergency response.
Bathymetric Data: Yes	
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Public safety enhanced with current and accurate depiction of topography.
Data Outside Commonwealth Needed: No	

Program: GIS Database Centralization of Government Agencies	**Business Use:** 15. Sea Level Rise and Subsidence
	**Modeling the Effect of Sea Level Rise:** As an island territory extremely vulnerable to effects of natural disasters, a top priority for scientific research is to develop improved models for predicting potential effects of sea level rise.
	Estimated Annual Operational Benefits: Major; $20,000 It is of critical importance for Commonwealth planning agencies to have a thorough understanding of the global warming effects on sea level rise and subsidence. Local geologist and marine scientists have been monitoring coastal changes since the 1930s. Elevation data derived from lidar will be used in efforts to continue to monitor these changes.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Better informed public as the result of published of scientific investigations and revised cartographic products.
Data Outside Commonwealth Needed: Near shore bathymetry to support modeling of importance to program	**Estimated Strategic Benefits:** Major Sea level rise and subsidence is related to coastal floods, storm surge, and coastal erosion issues. Availability of lidar datasets will enhance response and mitigation efforts.

Rhode Island

The State of Rhode Island has requirements for sea level rise analysis. Lidar data have been compiled from various sources with a variety of levels of quality. Data for at least two-thirds of the State are unavailable. The gaps were filled in with orthophotographic DEM data. This compilation has proven insufficient for coastal needs. Bathymetric data was also compiled from a variety of sources. Although these data were helpful in the short term, the availability of new, consistent lidar data along the coast would be an invaluable improvement. The other immediate need for detailed lidar data is to support flood plain mapping updates in conjunction with FEMA and map modernization program.

State Functional Activities

<table>
<tr><td colspan="2">Program: Surface Water Quality and Nonpoint Source Pollution, Rhode Island Department of Environmental Management</td><td>Business Use: 2. Water Supply and Quality</td></tr>
<tr><td colspan="2" rowspan="5"> 
Quality Level: 1 2 3 4 5
Update Frequency: >10 years
Bathymetric Data: No
Tide-Coordinated: No
Data Outside State Needed: Not reported</td><td>Storm Water Management: Phase I—The National Pollutant Discharge Elimination System (NPDES) Phase I storm water program, initiated in 1990, required discharges from large construction sites, certain industrial activities, and operators of “medium” or “large” Municipal Separate Storm Sewer Systems (MS4s), which serve a population of 100,000 or greater, to obtain permits and implement a storm water management program as a means to control polluted discharges from these activities. Since 1984, the Rhode Island Department of Environmental Management (RIDEM) has been the delegated authority to implement the NPDES program in Rhode Island (referred to as RIPDES).
Phase II—On December 8, 1999, the EPA finalized the storm water Phase II rule that requires MS4s to obtain permits and establish a storm water management program. It is intended to improve waterbodies by reducing the quantity of pollutants that can enter storm sewer systems during storm events. The storm water Phase II rule extends the coverage of the NPDES storm water program to include “small” MS4s. The Phase II rule automatically covers, on a nationwide basis, all small MS4s located in “urbanized areas” (UAs) as defined by the U.S. Census Bureau. Small MS4s located outside of UAs may be subject to future designation on a case-by-case basis. The RIPDES program amended the RIPDES regulations and has included Phase II storm water requirements (amended February 5, 2003).</td></tr>
<tr><td>Estimated Annual Customer Service Benefits: None; dollar value not reported
Not applicable.</td></tr>
<tr><td>Estimated Strategic Benefits: Major
Environmental benefit is improved water quality from targeted regulatory compliance, strategic benefit of fine tuned regulatory compliance</td></tr>
</table>

Program: Coastal Resources Management Program	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5	**Planning for Climate Change:** The Coastal Resources Management Program of the Rhode Island Coastal Resources Management Council needs lidar data to enhance resiliency to coastal hazards and to plan adaptation strategies to climate change. High-resolution elevation data are critical for assessing risks to properties and natural resources within the coastal zone and for developing sound coastal policies for future conditions. Some specific applications include identifying and quantifying assets in coastal communities that are vulnerable to storm surge and sea level rise, examining future flood hazards under various tidal conditions, prioritizing resource allocation for maintaining and enhancing critical transportation routes and other infrastructure that will be flooded more and more frequently as sea levels rise, determining cumulative effects of shoreline protection, assessing and managing habitats, targeting lands to be preserved for wetlands migration, analyzing shoreline change, managinf storm water, and improving effectiveness of coastal buffer zones. Although QL3 is the very minimum resolution needed to reasonably plan for future conditions, data at QL2 are preferable. To analyze shoreline changes, a 5-year schedule with event-driven acquisition is a reasonable schedule. Benefits to coastal zone management are major. This program office does not have the resources to do analysis on the raw data; derivative products are needed. The University of Rhode Island is a State partner, and because the university would have more need for the raw data products, the partner particiapted in development of point cloud requirements.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported Statewide data would enable the creation of higher resolution planning tools for all coastal areas. The quality level chosen is the minimum required to use for planning for climate change. The QL2 level data would be preferred, but if costs are much greater, the QL3 can be used given the uncertainty of all aspects of the mapping (sea level rise, tide and surge levels, elevation).
Bathymetric Data: Yes **Tide-Coordinated:** Not reported	**Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Products will be improved with better data.
Data Outside State Needed: Not reported	**Estimated Strategic Benefits:** Major Will expand to the entire coastal area. Better elevation data will be very helpful in developing standards for sea level rise considerations in the regulatory process.

Program: University of Rhode Island Environmental Data Center	**Business Use:** 11. Renewable Energy Resources
 **Quality Level:** 1 2 3 4 5	**Terrestrial Wind Energy Potential:** The University of Rhode Island Environmental Data Center will assist State researchers with the development of a suite of first-tier screening tools for evaluating terrestrial wind power proposals throughout the State. Map and data products identifying preferred land-based development locations will be generated and distributed through Rhode Island's State GIS, along with products describing project methodologies and procedures. In addition, a Web-based decision support and analysis system will be built to allow users to evaluate locations of their choice based on parameters specific to their power needs and development objectives.
Update Frequency: 6–10 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported Data from the northeast lidar project already cover the entire study area.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Unable to quantify in the short term. Future data collection would allow areas to be reevaluated for energy potential.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Unable to quantify in the short term. Future data collection would allow areas to be reevaluated for energy potential.
Data Outside State Needed: Not reported	

Program: Community Assistance Program and Risk Map, Rhode Island Emergency Management Agency	**Business Use:** 14. Flood Risk Management

Quality Level: 1 2 3 4 5

Update Frequency: As provided by FEMA

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Yes, at any watersheds that cross State lines

Flood Plain Management: The Community Assistance Program-State Supporting Services Element (CAP-SSSE) is a product-oriented financial assistance program directly related to the flood loss reduction objectives of the NFIP. States and communities that are participating in the NFIP are eligible for this assistance. The CAP-SSSE is intended to identify, prevent, and resolve flood plain management issues in participating communities before they develop into problems requiring enforcement action. CAP-SSSE falls under the purview of the NFIP, which was established under the National Flood Insurance Act of 1968. Currently all 39 cities and towns in Rhode Island participate in the NFIP. The State flood plain management program provides the following services: Technical assistance and training to all NFIP communities, State agencies, nonprofit organizations, and the private sector; resources for flood maps and related technical data; oversight of community compliance with the NFIP; information related to mandatory purchase requirements for flood insurance; and review proposed flood plain development and provide technical assistance to State, Federal, and community officials in the aftermath of a Governor-declared disaster.

Estimated Annual Operational Benefits: Major; dollar value not reported
Benefits description not reported.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
Benefits description not reported.

Estimated Strategic Benefits: Major
Benefits description not reported.

Local Functional Activities

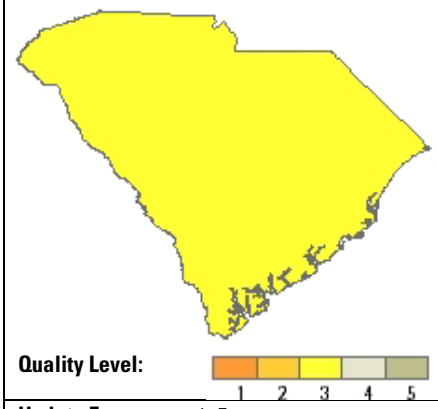
City Government—Town of South Kingstown	
Program: GIS Services	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Storm water analysis	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Major cost savings were realized by eliminating extensive field work by depending on the lidar data and DTM products. This allowed for compliance with storm water mission and goals. Use of GIS is currently being expanding throughout the organization. The accuracy of the surface model allows better mapping throughout the organization as related to contours, breaklines, and imagery rectification.
Update Frequency: Annually	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Better response to storm water response based on analysis of the complete watershed would greatly benefit the public. Availability of accurate imagery, better parcel mapping, improved planimetric data all improve the customer experience. Quality data also enable a quicker turn around on the delivery of data acquisitions.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major As lidar is the base product that all data are constructed on, there are potentially great benefits across the board from public safety disaster response to election commission redistricting. All GIS layers have the lidar-derived DTM as their foundation.

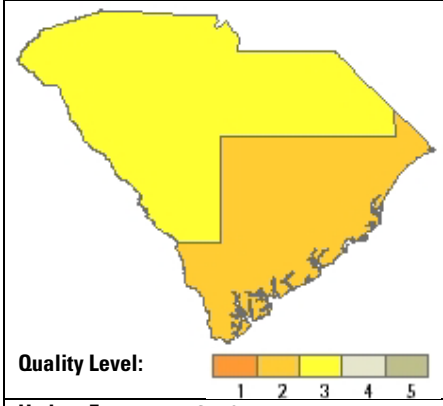
South Carolina

The South Carolina Department of Natural Resources (SC DNR) and the Department of Health and Environmental Control (SC DHEC) have numerous activities and programs that currently use elevation data and that can benefit from statewide, high-resolution elevation data. The SC DNR comprises a variety of programs, including GIS, geological survey and flood mitigation programs, fisheries and game management, law enforcement, as well as a variety of scientific disciplines, including climatology, hydrology, geology, marine science, archaeology, and geography. The SC DHEC's Bureau of Water comprises a variety of programs that also require enhanced elevation data to achieve their mission and to ensure high-quality drinkable, fishable, and swimming waters throughout South Carolina. Bureau of Water activities include modeling stream restoration for TMDL calculations, modeling stream migration and erosion, the redelineation of watersheds for TMDL, water quality monitoring, drinking water protection, storm water assessments, and sea level rise. Each of the departments has specific programs that currently use elevation data and that can benefit from statewide, high-resolution elevation data.

South Carolina is working with a consortium of Federal, State, and local government agencies to develop lidar-derived elevation data for the State. SC DNR and SC DHEC continue to serve as an active contributor and participant for the completion of statewide lidar. Currently, approximately 80 percent of lidar for the State has been completed or is in progress. The South Carolina requirements for enhanced elevation data will support the State's objective to provide more accurate, high-resolution elevation data for improved modeling and data processing capabilities and analysis results with regard to flood risk mapping, wetlands and habitat management, modeling stream restoration for TMDL calculations, stream migration and erosion, the redelineation of watersheds for TMDL, water quality monitoring, drinking water protection, storm water assessments, sea level rise and climate change projections, ecological modeling, geologic mapping, and other natural resource and environmental applications.

State Functional Activities

<table>
<tr><td colspan="2">Program: TMDL Development</td><td>Business Use: 2. Water Supply and Quality</td></tr>
<tr><td rowspan="5"> 
</td><td colspan="2">Stream Restoration Efforts: Stream restoration and water quality.</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; dollar value not reported
When holding outside entities responsible for compliance to TMDL requirements, agency is providing the most current elevation data to clients.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; dollar value not reported
Not applicable.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
Not applicable.</td></tr>
<tr><td>Update Frequency: 4–5 years</td><td></td></tr>
<tr><td>Bathymetric Data: Yes</td><td></td></tr>
<tr><td>Tide-Coordinated: Not reported</td><td></td></tr>
<tr><td>Data Outside State Needed: Yes, hydrographic basins extend into North Carolina, Georgia, and Tennessee</td><td></td></tr>
</table>

Program: Information Technology (IT) and GIS support	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5	**Flood Mitigation Program:** Flood mitigation and risk mapping.
	Estimated Annual Operational Benefits: Moderate; $240,000 Completion of statewide lidar would not provide additional operation benefits other than providing standard data across the entire State of South Carolina. Currently, coverage of approximately 80 percent has been completed or is in progress.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Currently the agency uses 7.5-minute DEM data of inconsistent quality and accuracy where no lidar data are available. Having statewide lidar-derived elevation data would provide more accurate products for the agency's mission critical programs that are supported by these data.
Update Frequency: 6–10 years	**Estimated Strategic Benefits:** Major Improved public safety related to risk mapping, scientific data analysis (sea level rise effect projections), and habitat and ecological modeling as these programs can be extended statewide.
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Yes, hydrographic basins extend into North Carolina, Georgia, and Tennessee	

Local Functional Activities

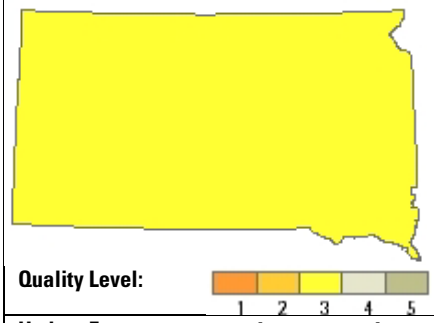
County Government—Florence County	
Program: Storm Water Modeling	**Business Use:** 14. Flood Risk Management
Functional Activity: Storm water and flood risk modeling	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $96,000 Quality of lidar data has reduced staff time and resources previously used in field checking. Improved and expanded use of lidar data.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Moderate; not reported Quality of lidar data has reduced staff time and resources previously used in field checking. Improved and expanded use of lidar data. Countywide lidar data available in Florence contours, hillshades, flow direction, hydrology, and elevation
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate Economic development, public works, transportation, and long-range planning benefits could be realized. Storm water and FEMA flood modeling capabilities improve hazard mitigation efforts.
Tide-Coordinated: No	

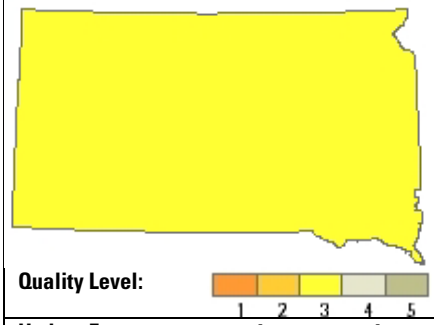
County Government—York County	
Program: Engineering	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: County engineering, planning, economic development, and taxation assessment	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; $132,000 Ability to better assess changes in earths surface and ability to review site plans using modern topography.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; not reported Can offer this product online in reference to other map data and 3D product; can use updated topography to make better decisions on hydrography.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate Can offer the product to citizens in support of internal and external activities, savings by buying in bulk.
Tide-Coordinated: No	

South Dakota

The State of South Dakota has requirements for QL3 data covering the entire State and including a buffer area across the borders. Approximately 12 percent of the State is covered by existing QL3 or higher resolution elevation data. Much of these data is in production and has not been delivered or used. Large areas of the State are currently covered only by very old elevation data that do not meet QL5. Primary uses for enhanced elevation data by the State government are identified as HAZMAT and other emergency response, flood and drainage modeling, habitat assessment, pine beetle damage mapping, and transportation infrastructure design. There is a uniform need for contours and some form of digital elevation models. Benefits of enhanced data, while not well understood due to lack of experience with the data, include more accurate hydrologic modeling and reduced need for field surveys, which will reduce labor costs, provide more reliable flood inundation predictions, and enable more educated management decisionmaking. Property damage and lives lost in emergency events could be reduced. South Dakota would be very supportive of a national program for lidar acquisition.

State Functional Activities

Program: NFIP and Emergency Response	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
	**Hazardous Materials (HAZMAT) and Flooding Emergency Response**
	Estimated Annual Operational Benefits: Not reported; dollar value not reported Up-to-date and more accurate data will yield improved model results.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Improved data access will speed delivery of products.
	Estimated Strategic Benefits: Not reported Improved products can save lives.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, toxic plumes, floods, and other hazards cross State boundaries	

Program: Habitat Assessment and Damage Mapping	**Business Use:** 1. Natural Resources Conservation
	**Habitat Assessment and Damage Mapping**
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Would provide a more accurate elevation model for registering and rectifying digital imagery at the 1-ft resolution level. More accurate DEMs for creating hillshade, slope, and aspect maps. Point cloud used to indentify tree types. Improved delineation of habitats better defines State ownership.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Do not know, cannot describe.
	Estimated Strategic Benefits: Minor Improved management decisionmaking for State lands.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, data adjacent to the State border would be used in assessments	

Program: Road and Bridge Design	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Road and Bridge Design and Drainage Analysis**
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Not currently using 2-ft contour lidar. Enhanced elevation data may reduce (but not eliminate) the need for manual drainage survey methods and save time and manpower.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Improved highway drainage feature design and plans with expedited delivery time.
	Estimated Strategic Benefits: Moderate Improved road safety due to better hydrologic modeling.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, a 4- to 5-mile buffer along State lines would be used in hydrologic modeling to determine possible stream flows and corresponding culvert sizes required to accommodate them	

Local Functional Activities

County Government—Brown County	
Program: Brown County Water Management Plan	**Business Use:** 14. Flood Risk Management
Functional Activity: Countywide water management plan	
Quality Level: QL3 lidar elevation data	**Estimated Annual Operational Benefits:** Major; $10,000,000 Better understanding of water movement throughout the very flat county and along James river.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Major; dollar value dollar value not reported Better advisement to township and county officials as to how to handle drainage situations.
Bathymetric Data: No	**Estimated Strategic Benefits:** Major Better advisement of where new development should take place and how to hold or drain water appropriately in flood-prone areas.
Tide-Coordinated: No	

County Government—Pennington County—Rapid City GIS	
Program: Pennington County—Rapid City GIS	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL2 lidar elevation data	**Estimated Annual Operational Benefits:** Moderate; not reported Data of sufficient quality to support flood mapping outside the city area do not exist. Better data would support flood mapping in the small communities in the county, along with developed areas near streams.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Flood mapping in the entire county could be better supported with better data. Flood mapping in the city area would be supported without the need for additional survey work.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate More accurate flood models in the entire county would enhace public saftey. In the city area, more accurate flood models add to public safety through regulation of flood areas.
Tide-Coordinated: No	

Regional Government—Planning and Development District III	
Program: District III Planning and Development	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Erosion and sediment issues along major rivers	
Quality Level: QL3 lidar elevation data	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Unknown.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Unknown.
Bathymetric Data: No	**Estimated Strategic Benefits:** Do not know Unknown.
Tide-Coordinated: Yes	

<table>
<tr><td colspan="2">Regional Government—Planning and Development District III</td></tr>
<tr><td>Program: District III Planning and Development</td><td>Business Use: 22. Urban and Regional Planning</td></tr>
<tr><td colspan="2">Functional Activity: Flood risk mapping, hydrologic and hydraulic modeling to help identify zoning and planning for rural communities</td></tr>
<tr><td>Quality Level: QL3 lidar elevation data</td><td>Estimated Annual Operational Benefits: Major; dollar value not reported
Currently, lidar data are not used, so it is hard to put a “value” on it. One benefit would be public education on certain problems in the region: flood, sediment, fire, and other potential disaster-related issues along with environmental issues (septic tanks).</td></tr>
<tr><td>Update Frequency: Event driven—Needs not met by a cyclic data acquisition program</td><td>Estimated Annual Customer Service Benefits: Major; dollar value not reported
Information would be an asset for poor counties when trying to protect the environment and property.</td></tr>
<tr><td>Bathymetric Data: Yes</td><td rowspan="2">Estimated Strategic Benefits: Major
Bathymetry for sediment issues along the Missouri River would be used. Also, these data can assist in planning for sewer systems, along with flood plain issues. A new flood plain was created using lidar-derived data; the new flood plain was valuable in protecting a community. This community is now able to develop accurate zoning and other planning documents to “grow” the community.</td></tr>
<tr><td>Tide-Coordinated: No</td></tr>
</table>

Tennessee

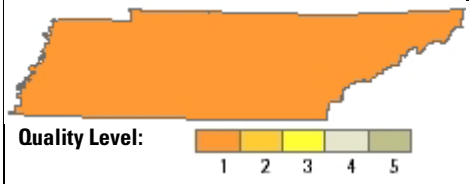
The State of Tennessee is pursuing, through a parallel effort of the national enhanced elevation assessment, development of a statewide business plan for lidar and enhanced elevation data. Through a Federal Geographic Data Committee (FGDC) "50 States" initiative grant, Tennessee and its partner, Applied Geographics, will be conducting stakeholder interviews and regional meetings in 2011 to identify the business needs and associated benefits of developing a statewide lidar elevation program.

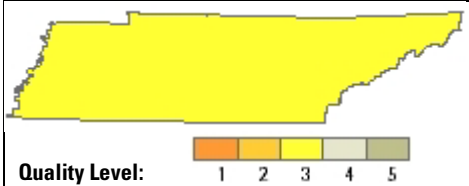
Tennessee has a rich history of developing framework GIS data. Through the original efforts of the Tennessee Base Mapping Program (2000–2007), the State has developed large scale (1:1,200 and 1:4,800) GIS data layers (orthoimagery, parcels, transportation, admininstrative boundaries, hydrography, and elevation). The existing Tennessee Base Mapping Program elevation data, however, do not support all elevation business functions across all levels of government in Tennessee.

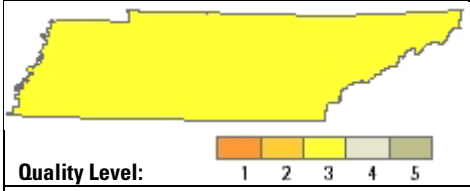
The State was able to begin to identify the functional areas in Tennessee that require enhanced elevation data through lidar technology. This process will expand through the State-led effort to include additional State agency stakeholders, flood plain management professionals, Federal agencies (USDA, USACE, Tennessee Valley Authority, and U.S. Department of the Interior), local governments, and industry (surveyors, engineers, utility districts) that rely on accurate elevation data to support their business function.

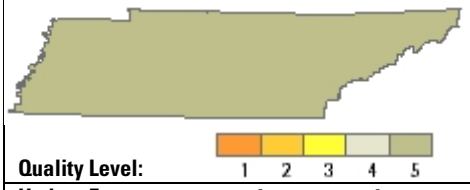
When complete, the goal for the Tennessee lidar elevation business plan is to have the State well positioned, in terms of both GIS practitioner and political support, relative to the national effort and to work with the USGS on potential funding and cost sharing scenarios and build out statewide lidar elevation data in Tennessee.

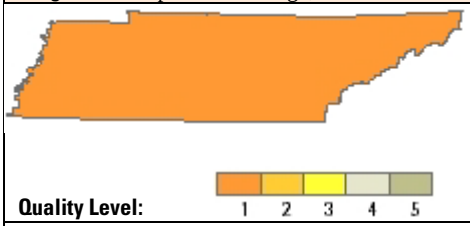
State Functional Activities

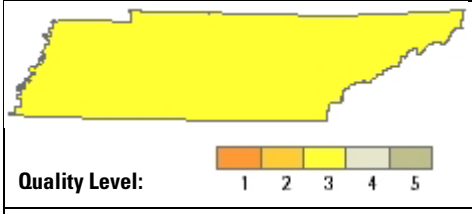
Program: Tennessee Department of Agriculture, USDA Forest Stewardship Program	**Business Use:** 5. Forest Resources Management
	**Development of Private Forest Management Plans:** Tree canopy, forest volume, individual tree counts, habitat modeling, and assessment.
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Present funding is based on past performance; if the number of clients and acres could be increased, this would allow the program to be expanded by targeting landowners that might receive the greatest benefit, those with the largest acreage and timber volumes. Program allocations would then also be increased.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported In some areas of the State where forest inventory estimates have not been provided, this service would be expanded due to the cost reduction in developing inventory estimates.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	**Estimated Strategic Benefits:** Moderate None.

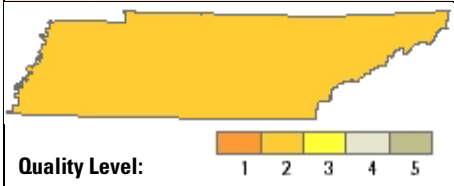
Program: State of Tennessee Finance and Administration	**Business Use:** 14. Flood Risk Management
	**Flood Plain Mapping**
	Estimated Annual Operational Benefits: Not reported; dollar value not reported Benefits description not reported.
	Estimated Annual Customer Service Benefits: Not reported; dollar value not reported Benefits description not reported.
Update Frequency: 6–10 years	**Estimated Strategic Benefits:** Not reported Benefits description not reported. 2010 Tennessee flood event: • $612.5 million in Federal disaster assistance • $225 million in claims paid through the NFIP • 24 people died • 10,000 displaced
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

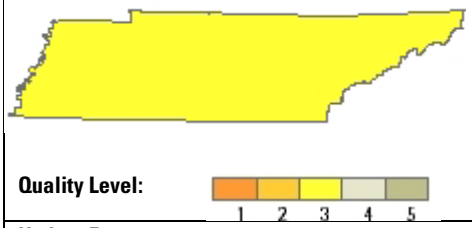
Program: State Hazard Mitigation Program	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
 **Quality Level:**	**Flood Risk Mapping**
Update Frequency: >10 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported For the mitigation program, better elevation data would improve the estimates for dollar exposure for flood risk and improve the allocation of funds to mitigate these risks. Improved elevation could be used in emergency response and planning beyond mitigation activities to better determine the State's response to flood events. Examples include predicting areas for evacuation based on projected flood crest and discharge values and planning for protective measures such as sandbagging.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Enhanced elevation data statewide would help standardize some of the processes and allow for documenting best practices and standards.
Tide-Coordinated: No	
Data Outside State Needed: Not reported	**Estimated Strategic Benefits:** Major • *Social*: Enhanced elevation data would allow for production of better FIRMs, storm water drainage efforts, and better data for public safety and other personnel responding to flood events. • *Environmental*: Better hydrologic modeling for water catchment systems for reducing sedimentation, pollution, and other effects; improved assessment of hazardous materials sites at risk of flooding. • *Strategic and political*: Better allocation of funding for flood hazard mitigation activities and understanding of populations at risk for flooding.

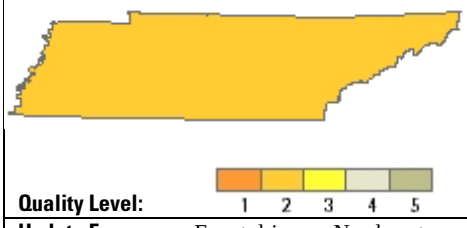
Program: Communication (Radio) Towers	**Business Use:** 27. Telecommunications
 **Quality Level:**	**Line-of-Sight Analysis**
	Estimated Annual Operational Benefits: Major; dollar value not reported Determining the best locations for communication towers is critical to drastically improving statewide coverage for dispatch, automated vehicle location, and reporting.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The new communication tower system will be digital and include automated vehicle location capability that does not presently exist. The value of this cannot be realized with the current system which does not have complete State coverage.
Bathymetric Data: No	**Estimated Strategic Benefits:** Major Elevaton data use is anticipated, but that project is not yet underway. It is anticipated that elevation data will greatly assist in determining new tower locations
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Transportation Design, Construction and Maintenance	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**	**Transportation Infrastructure:** Planning, design, and construction of transportation infrastructure with consideration of all effected cultural and environmental factors.
	Estimated Annual Operational Benefits: Major; dollar value not reported Improved and more efficient engineering design. Improved runoff modeling for bridge design and storm water management. Viewshed analysis of design alternatives (not possible now). Reduced time and cost for design and construction.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Landform modeling and visualization not practical now. Faster production of more accurate statewide digital orthophotography for State base mapping program.
Bathymetric Data: No	**Estimated Strategic Benefits:** Major Improved road planning and design based on very accurate and consistent elevation data. Vastly improved storm water management and mitigation. Improved flood modeling and mitigation. More accurate base mapping.
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

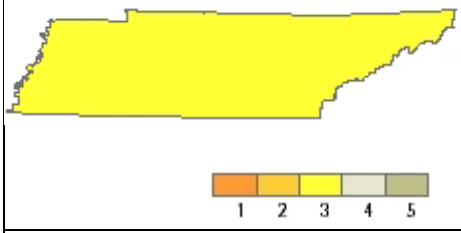
Program: Not reported	**Business Use:** 22. Urban and Regional Planning
	**General Planning** **Estimated Annual Operational Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Moderate Benefits description not reported.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Not reported	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
	**Hazards Mitigation:** Identification of landslide hazards for predictive modeling **Estimated Annual Operational Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Not reported Benefits description not reported.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Not reported	**Business Use:** 26. Recreation
	**Resource Management** **Estimated Annual Operational Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Moderate Benefits description not reported.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Not reported	**Business Use:** 13. Cultural Resources Preservation and Management
	**Historic Site Analysis and Preservation:** Mapping and identification of archeological sites, battlefields, structures for historic preservation. **Estimated Annual Operational Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Annual Customer Service Benefits:** Not reported; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Moderate Benefits description not reported .
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Program: Tennessee Solar Institute, University of Tennessee and Oak Ridge National Laboratory	**Business Use:** 11. Renewable Energy Resources



Update Frequency: Event driven—Needs not met by a cyclic data acquisition program

Bathymetric Data: No

Tide-Coordinated: No

Data Outside State Needed: Not reported

Solar Power Suitability Analysis

Estimated Annual Operational Benefits: Not reported; dollar value not reported
Benefits description not reported.

Estimated Annual Customer Service Benefits: Not reported; dollar value not reported
Benefits description not reported.

Estimated Strategic Benefits: Moderate
Benefits description not reported; $23 million dollars was made availabale for a solar opportunity fund, to look at suitability for solar energy. Elevation data have been used for solar suitabiity analysis.

Local Functional Activities

County Government—Hamilton	
Program: Not reported	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping, hydrologic modeling	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: Not reported	

County Government—Knox County	
Program: Annual Landbase Mainenance	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Landbase maintenance	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Not reported; $320,000 Cost savings by aerial surveys instead of field surveys; improved confidence in approving subdivision development plans. Regional coverage would better support utility flow models; building and infrastructure value-added data will provide better situational awareness in high-vegetation and rural areas.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Extend to regional audience the same benefits as above. Digital and hard copy map sales. Digital data sales. Confidence by engineering and development community in elevation data products.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major Regional coverage would aid multijurisdictional projects, especially in mutual aid support for emergency response and land use planning FEMA flood mapping, storm water runoff, field survey cost savings.
Tide-Coordinated: Not reported	

County Government—Knox County	
Program: Landbase	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Utility and storm water	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Cost savings by aerial surveys instead of field surveys.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported None; digital and hard copy map sales and digital data sales.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major None; FEMA flood mapping, storm water runoff, field survey cost savings.
Tide-Coordinated: Not reported	

County Government—Knox County	
Program: Not reported	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Site and road construction	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know
Tide-Coordinated: Not reported	Benefits description not reported.

County Government—Rutherford	
Program: Not reported	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know
Tide-Coordinated: Not reported	Benefits description not reported.

County Government—Rutherford County	
Program: GIS Services	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Storm water alanysis	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Major cost savings are experienced by eliminating extensive field work by depending on the lidar data and DTM products. This allows for compliance with storm water mission and goals. The use of GIS throughout the organization is currently being expanded. The accuracy of the surface model allows better mapping throughout the organization as related to contours, breaklines, and imagery rectification.
Update Frequency: Annually	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Better response to storm water response based on analysis of the complete watershed would greatly benefit the public. Availability of accurate imagery, better parcel mapping, improved planimetric data all improve the customer experience. Quality data also enables a quicker turn around on the delivery of data acquisitions.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major
Tide-Coordinated: Not reported	As lidar is the base product that all the data are constructed on, the county sees great benefits from public safety disaster response to election commission redistricting. All GIS layers have the lidar-derived DTM as their foundation.

County Government—Tipton County	
Program: Tipton County GIS	**Business Use:** 14. Flood Risk Management
Functional Activity: Drainage basin managment and flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Determining flood stages for rivers or major streams. Determining adequate drainage basins for new subdivisions. Creating proposed site layout plans for review. Higher accuracy data would provide better results. Better planning for flood events and development.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported All aspects would be improved relative to new surface data. Better confidence. Existing data are somewhat dated and inaccurate, causing customers to question quality.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Moderate
Tide-Coordinated: No	Perception would be improved with data representing what's in the field. Mainly for subdividing of property customers can see lay of land.

Texas

Enhanced elevation data are classified as a high priority dataset by the State of Texas. The role of these data in developing accurate flood plain maps led to capital funding for their acquisition by the Texas Legislature in 2007, as well as the adoption of a statewide purchasing contract to promote cooperative data acquisition projects.

Enhanced elevation data are essential for developing accurate maps that guide decisionmaking for planning, economic development, and natural disaster response in Texas. State, Federal, and local governments actively collaborate to develop new data and make them accessible in the public domain. The national enhanced elevation assessment survey has identified five major uses for enhanced elevation in Texas: flood plain mapping, transportation planning, resource management, forestry, and emergency management.

Between 1960 and 2008, Texas ranked first in casualties related to flooding. In the past 6 years, Texas has experienced multiple hurricanes, tropical storms, and wildfires and is now in a period of exceptional drought. The capacity to prepare for and manage responses to these events is significantly increased when accurate enhanced elevation data are available. The population of the State is projected to double in the next 50 years, and the need to plan for future water and energy resources is an ongoing process. Elevation data are a fundamental input to understanding where and how to plan and develop these critical resources.

During the past 4 years, more than $7 million has been invested in developing enhanced elevation data for flood plain mapping and other needs. In total, Texas has developed 35,000 square miles of priority enhanced elevation data—approximately 15 percent of its total land area. Recently, Texas has had to suspend capital allocation for enhanced elevation data due to State budget constraints. If these data were supported by a national strategy and State coordination, the benefits of these data could be realized along with significant cost savings.

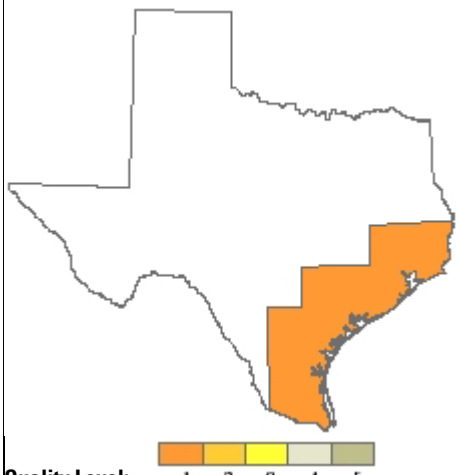
State Functional Activities

Program: Flood Plain Mapping; Dam Safety Program	**Business Use:** 14. Flood Risk Management
	**Flood Risk Assessment:** Flood risk assessment, analysis, and flood plain mapping.
	Estimated Annual Operational Benefits: Major; $2,300,000 Ability to provide hydrologic and hydraulic models and more accurate flood zones from elevation data. By reducing the need for field survey and inspection, agency costs would decrease, resulting in government savings.
	Estimated Annual Customer Service Benefits: Major; $3,600,000 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.
	Estimated Strategic Benefits: Major The public and social benefits are that of reducing the risk of loss of life as well as expenses associated with property damage. Equal opportunity for risk management for all levels of socioeconomic development. Between 1960 and 2008, Texas ranked first in casualties, second in flood damage claims, and fourth in the Nation in property damages. The State of Texas enacted legislation to support flood plain mapping in 2007. Many areas of Texas will not be able to address their flood plain needs due to lack of elevation data coverage.
Update Frequency: 6–10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes, adjacent States with HUCs	

Program: Rural Runway Design and Flight Path Obstructions; Outfall Tracking System	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Infrastructure Management and Support:** Management and support of infrastructure including transportation facilities and utilities for planning and design and placement of infrastructure using a minimal amount of field survey work. **Estimated Annual Operational Benefits:** Major; $120,000 Accurate and updated elevation data would allow a desktop inspection of the topography of the area before field inspection. Also provide the potential for eliminating trips to the field which would result in program savings. **Estimated Annual Customer Service Benefits:** Major; $60,000 Increase the efficiency of the process and reduce the time spent on gathering topographic data for project areas. The enhanced elevation data could allow manual extraction and classification of obstructions with a decrease in time and cost of field surveys. **Estimated Strategic Benefits:** Major This dataset would provide relevant, time-sensitive elevation information that would support the State Aviation Capital Improvements Program and the routine airport maintenance grants initiative, which focus on the safety and maintenance of the areas around the State's approximately 300 rural runways and airports. It would provide for enhanced safety for the general aviation system and community. It would help the Department of Transportation and local governments to preserve and maintain existing facilities and respond to present needs for repairs and improvements. Most importantly, it would allow for more timely and precise assessments of the anticipated needs in and around these facilities.

Program: Ecological Systems Database Project; Forest Resource Development	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Ecological Systems Modeling; Forest Inventory and Analysis and Urban Tree Canopy Analysis:** Forest and natural resource management and planning, including ecological systems modeling, urban tree canopy analysis, and forest inventory and analysis. **Estimated Annual Operational Benefits:** Major; $3,000,000 Statewide lidar would assist with timber management and forest inventory, urban tree canopy analysis, terrestrial and aquatic vegetation mapping, natural resource conservation, park planning, riparian studies, fish habitat studies, geologic studies, utility corridor mitigation studies, wetland mitigation studies, and species habitat delineation. **Estimated Annual Customer Service Benefits:** Major; $30,000,000 Providing reliable information regarding forest resources is extremely important considering that the forest sector in Texas is the third most important agriculture commodity. The forest sector produces $22 billion in industry outputs and employs 80,000 workers. It will also provide key information for carbon stock trading and renewable energy resources across the State. **Estimated Strategic Benefits:** Major Elevation data allow for better response to natural disasters, such as wildfires, floods, or hurricanes. Urban tree canopy provides many benefits to communities, including improving water quality, conserving energy, lowering temperatures in cities, reducing air pollution, enhancing property values, providing wildlife habitat, facilitating social and educational opportunities, and providing aesthetic benefits. Elevation data help with park planning, which benefits the numerous visitors to State and Federal parks and preserves.

Program: Texas Coastal Zone Management Program; Texas Coastal Ocean Observation Network Program	**Business Use:** 4. Coastal Zone Management



Quality Level:

Update Frequency: 2–3 years

Bathymetric Data: Yes

Tide-Coordinated: Yes

Data Outside State Needed: No

Coastal Flooding Due To Storms, Subsidence, and Sea Level Rise: Coastal zone management includes:

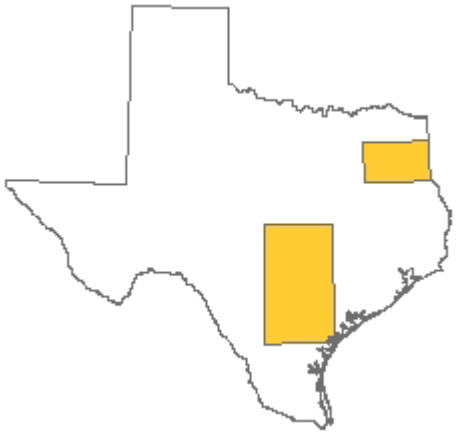
- tropical storm hazard mitigation
- oil spill hazard mitigation
- sea level rise and subsidence
- disaster response
- marine navigation and safety
- coastal infrastructure and construction management
- coastal urban and regional planning
- real estate insurance (flood and wind storm)
- coastal recreational use and management

Energy and water policy and disaster response are major components in the mission of the Federal and State governments. All three components converge at the coastal zone. America's coastal zone is experiencing increasing development (especially in critical infrastructure and energy facilities), increasing risk from natural and manmade disasters, increasing demand on limited water resources, and increasing pressure on fragile ecosystems. As the Nation and individual States strive to develop comprehensive coastal management programs to meet these challenges, airborne topographic lidar will be the key remote sensing system for commercial and research applications. Bathymetric lidar should be included, to an extent that water clarity would allow, to help stitch conventional bathymetric data and lidar topographic data together. For example, real-time water level elevation data provided to the Houston/Galveston Physical Oceanographic Real Time System for use by pilots to safely navigate ships in and out of the port offers an $18 million benefit annually.

Estimated Annual Operational Benefits: Major; dollar value not reported
High resolution 4D lidar data are critical for assessing short- and long-term shoreline trends, managing coastal development, and assessing the potential effects of climate change and sea level rise. An annual to semiannual national program of lidar coastal mapping would provide a uniform lidar dataset to support Federal and State coastal management requirements.

Estimated Annual Customer Service Benefits: Major; dollar value not reported
A national, high-resolution 4D coastal mapping program can provide fundamental data for high-resolution hurricane and tsunami models that can be used to save properties and lives.

Estimated Strategic Benefits: Major
Storm surge preparedness would greatly reduce property damage and save lives during hurricane storm surge events. Due to the frequency and magnitude of recent storms, it is anticipated that future economic development, investment, and mitigation can be better served by using current and more accurate elevation data. This will also provide a better basis for decisions relating to planning, engineering, and construction. The benefits will be better understanding of risk to lives and property, more precise risk mitigation strategies, and more efficient evacuation and response plans. In addition, 4D lidar datasets are excellent tools for education and training.

Program: Texas Abandoned Mine Land Program	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5	**Earthwork Volume Calculation:** Abandoned mine site studies for health and safety hazards analysis.
	Estimated Annual Operational Benefits: Major; dollar value not reported The elevation data provide the information necessary to design reclamation and calculate earthwork volumes associated with abandoned open pit surface mines, which is directly related to the program's goal to mitigate health and safety hazards posed by the mine sites. More accurate elevation data will enable improved reclamation design. Several internal—such as assembling work specifications, public solicitation of bids for photogrammetric work, establishing ground control points, and assessing photogrammetric data—are costly and time consuming. Access to lidar could make design reclamation and volumetric work less costly and more efficient for the program.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Topographic maps with 1-ft contour accuracy and elevation data should provide a better digital terrain model, since mine sites have varying levels of vegetation cover.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Strategic Benefits:** Moderate Same benefits (elimination of health and safety hazards posed by open pit surface mines) but the more accurate elevation data will allow the State to better estimate earthwork volumes.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Forest Resource Protection	**Business Use:** 16. Wildfire Management, Planning, Response
 **Quality Level:** 1 2 3 4 5	**Statewide Wildfire Risk Assessment and Planning and Decision Support for Wildfire Operations:** Statewide wildfire risk analysis and support for wildfire operations for better management and grant funding based on need.
	Estimated Annual Operational Benefits: Major; $3,000,000 The main areas for significant operational improvement include the mapping of wildland fuels, wildland-urban interface areas, and aerial hazards. Using DSM data derived from lidar would provide the vegetation profile and structure information needed to accurately map wildland fuels, including fire behavior fuel models, canopy cover, canopy ceiling and stand height, canopy base height, and canopy bulk density. These datasets are essential for determining the wildland fire behavior potential for an area. In addition, DSM data would give the ability to map structures to provide a better definition of the wildland-urban interface as well as monitor future urban sprawl. Knowing where potential effects to structures will occur is critical in the planning process and currently there is not a reliable source for this information statewide. Finally, the DSM data could be used to identify aerial hazards in support of air operations.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; $50,000,000 Information derived from the data, would provide more accurate and reliable information than current sources. This will raise the confidence level in State products and provide better information to wildfire managers and public officials when making critical decisions.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	**Estimated Strategic Benefits:** Major 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. It also serves as the basis for allocating $25 million per year in grant funds to local fire departments for equipment, training, and protective gear. Therefore, it is critical to have the best available information to support this process.

Local Functional Activities

City Government—City of Austin	
Program: Flood Hazard Mitigation	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported The higher resolution lidar data will provide more detailed topographic information in key areas such as stream channels and allow for the identification of curbs that define localized flows. This will allow for more detailed flood models and improved flood plain mapping. It will also provide more accurate data for preliminary engineering studies, master planning studies and detention pond volume analysis. This will reduce the need for survey before final design and allow engineers to move more quickly into conceptual design and better estimate quantities and costs at the planning stage of projects.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The higher resolution data will allow city staff to more accurately evaluate flood risks (depths of inundation, properties and structures at risk) and more quickly and accurately evaluate flood or drainage related issues that are influenced by topography. The topographic data and associated contours also will provide a better base dataset for the engineering and development community. This should result in development submittals that generate fewer city comments based on issues of topography and drainage.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Benefits description not reported.

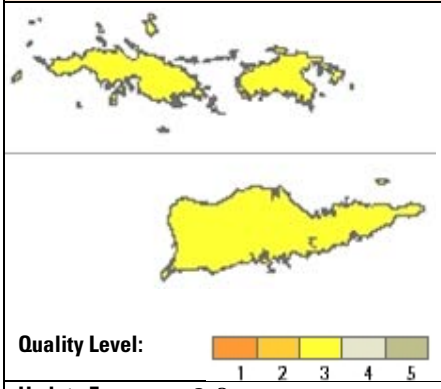
City Government—City of Austin	
Program: Pulaski Area Geographic Information System Consortium	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Land development preliminary design	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Eliminated field work for preliminary design data collection. Allows users to quality control GPS elevation values from their desktop. Allows for vertical profiles to be run for line-of-sight analysis. Allows for material estimates to be done for laying new pipe or road surfaces to use the z value of the terrain. Allows for more accurate water pressure calculations from points of serviceIt will allow for better orthophoto rectification, better hydraulic modeling, and line-of-sight to take into account buildings and other surface features. Allows for high-resolution visualization of small drainage features when mapping storm water assets. Allows for more precise excavation volume calculations when locating new tanks.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Give more accurate information.
Bathymetric Data: Not reported **Tide-Coordinated:** Not reported	**Estimated Strategic Benefits:** Major More accurate information.

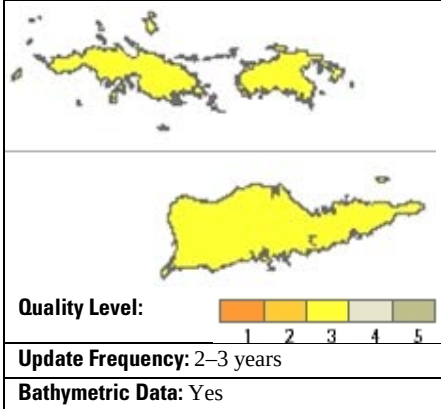
Regional Government—North Central Texas Council of Governments	
Program: Vision North Texas	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Suitability analysis	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Enhanced elevation data will be used for transportation infrastructure planning, such as for rail, high-occupancy vehicle traffic roadways, freeways, and tollways. Such data will also be used in planning tools, such as Regional Ecosystem Framework, Integrated Storm Water Management, and Greenprinting.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The public and private stakeholders in the region will use enhanced elevation data to assist with the decisionmaking processes regarding planning and development.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Vision North Texas is a private-public partnership headed by the Urban Land Institude, the North Central Texas Council of Governments, and the University of Texas at Arlington. This partnership is making an important contribution to the future quality of life, economic desirability, and long-term sustainability of the 16-county north-central Texas region. Vision North Texas is increasing public awareness about important regional land-use issues that affect mobility, air quality, water supply, and other economic and environmental resources. The area's population is projected to nearly double by 2050 to approximately 10 million residents. Expected growth challenges include those of transportation, energy, water supply, water quality, open space, and tree cover. Enhanced elevation data will assist with addressing these issues by providing baseline data to evaluate current conditions and will enable planning that will successfully accommodate the expected population growth.

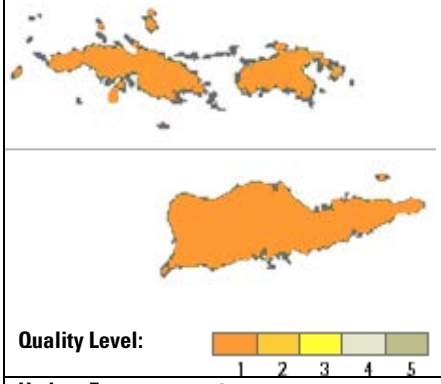
U.S. Virgin Islands

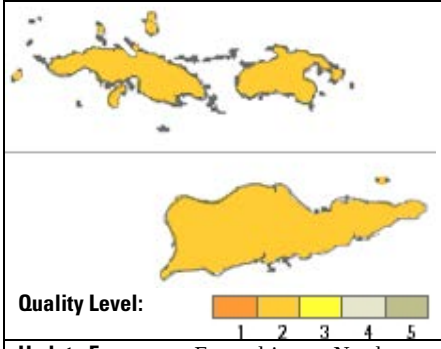
The U.S. Virgin Islands spatial data infrastructure plan identifies high-resolution, accurate, and current elevation data as a critical geospatial framework layer needed to support environmental protection and infrastructure planning and development programs. In addition, the territory is exceedingly vulnerable to the effects of natural disasters, such as earthquakes, tsunamis, landslides, and hurricanes, given its Caribbean subtropical location. Emergency response and mitigation programs require enhanced elevation data to better protect public safety and minimize damages resulting from natural disasters. The Caribbean region has a critical requirement for an upgraded vertical reference datum to replace the one that is currently in place (NGVD 29 was never valid for U.S. Virgin Islands, and NAVD 88 is not and will not be valid for the U.S. Virgin Islands). Without the development of a quality geoid, it is impossible to fully leverage the benefits typically associated with lidar datasets.

Territorial Functional Activities

Program: Flood Risk Mapping, Hazards Data Development	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** No	**Coastal Flood Risk Mapping and Modeling:** With the availability of current and accurate lidar-derived elevation data the territory can continue to contribute to the revision of regional flood maps. **Estimated Annual Operational Benefits:** Major; $140,000 Consistent, reliable, and accessible lidar-derived elevation datasets significantly speeds the process of flood mapping and modeling and lowers associated costs associated with traditional field survey measurements. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Accurate surface data facilitates effective post-event recovery operations. Newly acquired lidar datasets will facilitate the territory in ongoing efforts to complete HAZUS data inventory. **Estimated Strategic Benefits:** Major Accurate and current ground surface data will facilitate appropriate application of flood insurance coverages to residents of territory.

Program: Tsunami Planning	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** No	**Tsunami Hazard Mitigation:** There have been 91 reported tsunamis in the Caribbean Basin since Europeans moved to the area, 27 events of which are very well documented and caused extensive damage and casualties. Accurate and current topographic and bathymetric lidar-derived elevation datasets will better enable the territory model tsunami behavior and improve response operations. **Estimated Annual Operational Benefits:** Major; dollar value not reported Improved bathymetry and topography will allow development of tsunami inundation models that in turn will enable tsunami hazard planning with identified escape routes and safe areas. Enhanced elevation data will minimize response time to tsunami threat. Emergency managers will have a reliable data framework to support the decisionmaking process. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Reliable and timely tsunami inundation models benefit emergency response managers and the public at large. **Estimated Strategic Benefits:** Major Improved public safety by incorporating enhanced elevation datasets into emergency response, mitigation, and planning operations.

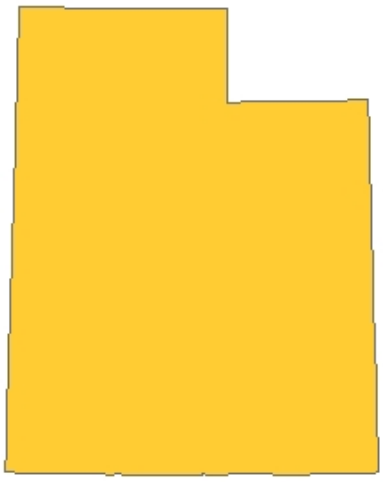
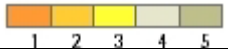
Program: Public Access	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 2–3 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** No	**Coastal Development Mapping:** This includes planning and modeling activities associated with existing and planned coastal development to establish sustainable best-use guidelines. **Estimated Annual Operational Benefits:** Major; dollar value not reported Lidar-derived elevation data has been proven effective in support of crucial shoreline monitoring (loss and gain) activities as they pertain to coastal use planning and development of public recreational use and access policies. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Current and accurate enhanced elevation datasets support natural resources managers in their effort to establish effective policies to protect sensitive coastal areas and better serve the general public regarding development, use, and access. **Estimated Strategic Benefits:** Major High-accuracy coastal elevation data will be critical to natural resource managers and researchers to identify and model the effects of sea level rise and other climatic changes that directly affect coastal zones.

Program: Caribbean Intercoastal Ocean Observing System	**Business Use:** 19. Marine Navigation and Safety
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** Offshore and intercoastal coverage required to support marine navigation requirements.	**Developing Ocean Observing Capabilities** **Estimated Annual Operational Benefits:** Major; dollar value not reported Bathymetric lidar will enhance the accuracy of as well as extend computer ocean circulation models in support of intercoastal marine navigation requirements. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved ocean circulation models using lidar bathymetric elevations will improve procedures currently used for identifying and navigation variables for regional ferries and cruise ships in transit. **Estimated Strategic Benefits:** Major Improved real-time observations and computer modeling capabilities enhanced by lidar-derived elevation data will enhance the understanding of regional currents, waves, and tide action to the benefit of marine navigators, environmental managers, and search and rescue teams.

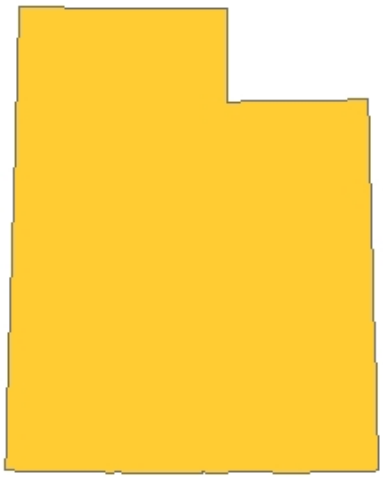
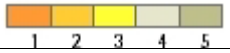
Utah

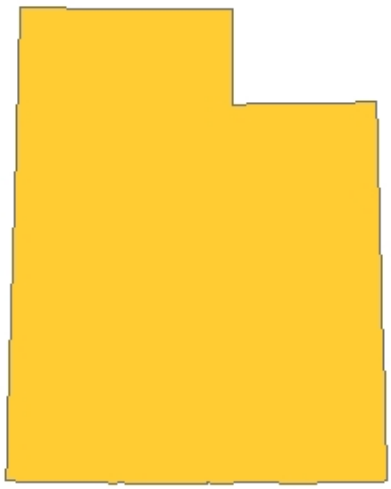
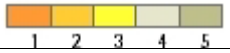
A statewide comprehensive high-resolution elevation dataset is of utmost importance for the State of Utah. Because of Utah's varied landscape; mountains, desert, valley floors, and canyon lands, a one-size, high-resolution dataset is neither practical nor cost effective. However, as noted in the survey reports from the Utah Geological Survey (UGS) and the academic community, the QL2 lidar high-resolution elevation data source is the need most identified. Acquiring this dataset over the mountains, desert, and valley floors would provide the UGS and the academic community with a dataset sufficient to meet their needs and would also more than meet the needs, as identified in the survey, of the Utah Department of Natural Resources Division of Water Resources and the Department of Public Safety Division of Emergency Management. These agency requirements are also primarily in the mountains, desert, and valley floor areas. Additionally, these data would also meet the needs of geospatial, GIS, and other users of this data type in Utah. A lower resolution elevation dataset, able to portray an accurate dataset in the canyon land areas, would complete the statewide coverage. However, the acquisition of datasets in the canyon land areas would have to meet the UGS needs for geologic mapping and geologic hazards mapping.

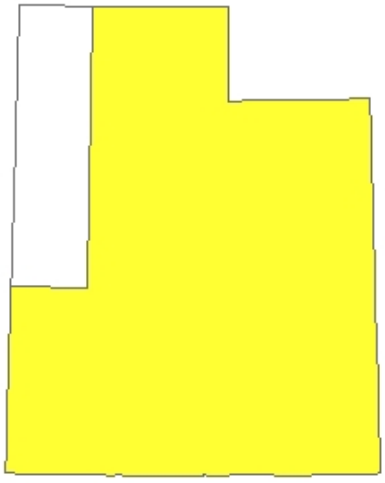
State Functional Activities

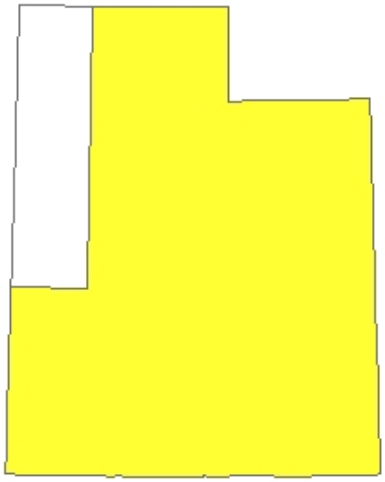
<table>
<tr><td colspan="2">Program: Geological Hazards Mapping</td><td>Business Use: 9. Geologic Resource Assessment and Hazard Mitigation</td></tr>
<tr><td rowspan="5"> 
Quality Level:
 

Update Frequency: 4–5 years
Bathymetric Data: Yes
Tide-Coordinated: No
Data Outside State Needed: Yes, natural hazards do not stop at State boundaries</td><td colspan="2">Geologic Hazards Mapping and Assessment: Geologic hazards mapping and assessment for use in developing geologic hazard maps and in emergency response to natural hazards. Also use for resource mapping, education, and other uses.</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $100,000
There are currently very limited lidar data available over areas of interest, that is, potential natural hazards. A comprehensive, statewide, high-resolution elevation coverage is critically important to have an on-hand database available for responses to natural hazards. Additionally, high-resolution elevation coverage of new geologic map areas would improve the mapping of surficial geologic features and, in some cases, poorly exposed bedrock features. This would also improve the mapping of landslide boundaries and features, especially in highly vegetated areas.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; $100,000
With a comprehensive high-resolution elevation dataset, more work can be done in the office that will increase turnaround time for completing mapping projects. Because the elevation data based on which that the map is created will be of higher quality, so will the geologic map products that are produced, that is, a higher level of detail is possible. Thus, customer experience will be improved through the more accurate location of geologic features.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
The geologic maps produced by the UGS are the foundation tool for nearly all geology-related activities. For example, geologists and geotechnical engineers usually start with geologic maps and geologic hazard maps when they perfrom site investigations for schools, roads, housing developments, and most other new projects. These users are constantly requested better accuracy and more detail in the geologic maps. Having statewide, high-resolution elevation data will allow the UGS to fulfil this need. This would lead to better decisions by planners, the public, and decisionmakers in regards to land management and development decisions. Additionally, the UGS collaborates with the responders to natural hazards emergencies. Having statewide, high-resolution elevation coverage would provide the UGS with initial on-hand information for any area in the State where a natural hazard may occur.</td></tr>
<tr><td colspan="2"></td></tr>
</table>

Program: University of Utah Department of Geography	**Business Use:** 25. Education K–12 and Beyond
 **Quality Level:**  **Update Frequency:** 4–5 years **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** No	**Higher Education GIS and Remote Sensing Education and Research:** Used in all aspects of academic research and training. **Estimated Annual Operational Benefits:** Minor; dollar value not reported Having a comprehensive statewide, high-resolution elevation dataset allows more research to be conducted in Utah instead of other places. Particularly, Utah college and university campuses would be able to use the data in their academic labs and in support of research. **Estimated Annual Customer Service Benefits:** Minor; dollar value not reported There is just an improvement in the level of research that can be performed. All uses are academic and research in nature so there is not a monetary benefit from existing elevation data. **Estimated Strategic Benefits:** Major The Utah academic community, through GIS and remote sensing departments, is using lidar and other elevation datasets for research and other academic applications. However the research applications using these datasets, particularly lidar data, are limited to the current coverage in Utah, in the Wasatch Front and other small areas. An expansion of the high-resolution elevation coverage would enable the academic community to conduct more research in the State.

Program: Natural Resource Management	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:**  **Update Frequency:** 2–3 years **Bathymetric Data:** Not reported **Tide-Coordinated:** No **Data Outside State Needed:** Yes, natural landscapes and wildlife habitats do not stop at State boundaries	**Natural Resource Monitoring and Assessment:** Natural resource monitoring and assessment for use by the academic community for modeling landcover and landscape rehabilitation projects. This involves the ability to research and monitor soils and vegetation growth, visualize landscapes and land cover structures, and study wildlife habitats. **Estimated Annual Operational Benefits:** Major; dollar value not reported Without accurate digital elevation data, Utah's academic community cannot adequately model landcover with remotely sensed imagery. The ability to monitor soils, vegetation growth, and structural diversity is a key component that allows the community to better monitor landscape rehabilitation projects. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Academic students, research, and State and Federal land management agencies are the primary customers. The ability to teach natural resource management is greatly improved by the use of quality high-resolution elevation data. Students are better able to understand landscape dynamics by visualizing landscape and land cover structure. In addition, having accurate digital elevation data will improve the academic community's ability to target types of wildlife habitat needed in certain areas of the State. Further, land management agencies who do not have the budget to monitor the vast landscapes in the intermountain west at the finest level, can use these data to help monitor landscape health using a holistic approach. **Estimated Strategic Benefits:** Major Educational benefits include a better understanding of landscape and land cover structure. Also improved understanding of existing wildlife habitats. Strategic and political benefits include the ability to better inform stakeholders on the status and trend of the landscapes from which they rely for water, grazing, and recreation.

Program: Hydrology and Dam Safety Applications	**Business Use:** 2. Water Supply and Quality
 **Quality Level:** 1 2 3 4 5	**Water Supply Analysis and Planning:** Improved hydrologic analysis for water supply studies, dam safety data analysis, precise cost estimates for hydrologic related project planning and preventing project cost overruns.
	Estimated Annual Operational Benefits: Major; dollar value not reported Improved hydrologic analysis for water supply studies. Better dam safety data analysis. More precise cost estimates for projects to prevent cost overruns.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported With better elevation data, the Utah Department of Natural Resources Division of Water Resources could provide more detailed and precise data analyses for water supply studies, dam safety analysis, and other related hydrologic applications and project planning for the State of Utah.
	Estimated Strategic Benefits: Major The availability of an improved high-resolution elevation dataset that provides more accurate and reliable hydrologic analysis, particularly dam safety data analysis, the Utah Department of Natural Resources Division of Water Resources is better able meet the agency's mission and goals in providing critical data to their users.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: FEMA Risk Map Program	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5	**Flood Risk Mapping:** FEMA Risk Map Program. The Utah Division of Emergency Management cooperates with FEMA to acquire lidar coverage of watersheds where potential flood risks have been identified.
	Estimated Annual Operational Benefits: Major; dollar value not reported The Utah Division of Emergency Management cooperates with FEMA to acquire lidar coverage of watersheds where potential flood risks have been identified. These datasets are provided to the county and local governments. A comprehensive coverage of areas where potential flood risks are identified is critical to meeting the needs of the counties and local governments for flood risk planning, prevention, and emergency response.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported The availability of high-resolution elevation data can increase production efficiency and overall accuracy of current geologic map products relating to flood risks. Wider availability of these data could also result in the production of new map products and datasets.
	Estimated Strategic Benefits: Major More efficient and accurate geologic map products used in identifying flood risks have direct application in making informed decisions about environmental issues.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: No	

Local Functional Activities

City Government—Salt Lake City	
Program: Comprehensive Environmental Planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Regional land use and transportation planning	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Data would be helpful in supporting several general regional planning projects involving regional land-use planning and rural transportation planning.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported The monetary value is unknown, but the improved quality of the information generated would be beneficial.
Bathymetric Data: No	**Estimated Strategic Benefits:** Minor
Tide-Coordinated: No	The monetary value is unknown, but the improved quality of the information generated would be beneficial.

City Government—Sandy City	
Program: Police and Information Services	**Business Use:** 27. Telecommunications
Functional Activity: Telecommunications line of sight	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Police are building a mesh network of pole-mounted antennas that allow officers in vehicles to tie into cameras mounted at intersections, parks, and other locations so they can observe sites in real time without having to be onsite. The lidar lets the city place the antennas and cameras accurately so law enforcement officers have good line-of-sight connectivity, avoiding trees and structures. Information Services maintains a whole series of point-to-point antennas for local area and wide area network connections between buildings. In both cases, when links need to be modified or added, lidar is used in GIS viewshed analysis to predict clear paths. Would bring the existing data up to date, for same purposes.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Same use for law enforcement.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate
Tide-Coordinated: No	Enhanced police and IT effectiveness.

City Government—Sandy City	
Program: Urban Planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Building footprint and tree crown extraction for planning and parks uses	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Building footprint extraction for planning and tree crown extraction for parks each allow specific uses. Planning uses these data for analysis of density, viewsheds, and for general cartography. Parks uses these data to estimate tree density, counts, locations, and total tree canopy along streets.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported There would be no new benefits, but there would be improved ones. Building footprint extraction for planning and tree crown extraction for parks each allow specific uses. Planning uses these data for analysis of density, viewsheds, and for general cartography. Parks uses these data to estimate tree density, counts, locations, and total tree canopy along streets. Other city departments also use the data.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate
Tide-Coordinated: No	Citizens can see and appreciate the city's efforts to improve their lives. Also would help improve accuracy in these areas.

County Government—Carbon County	
Program: Predisaster Mitigation Planning	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
Functional Activity: Multiple risk analysis and feature extraction	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported A lidar dataset flown over a small area of the county is being used to update FEMA maps in the detailed study area for the county. These data, the acquisition of which was recently approved, will be shipped shortly and will help with insurance needs within the county, will make developments possible that were not previously feasible due to inaccurate elevations, and will allow more realistic predisaster mitigation plans. The county also expects to be able to extract building footprints for the area covered by the lidar flight in a more accurate and expedited way.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported The improvements planned for the future from the same dataset include datasets that are not currently available. These datasets include building footprints, urban forest canopy, and engineering-quality elevation datasets for planning new projects. The updated FEMA maps will make the need for contesting the poor data of existing maps unnecessary. The data are now digital and so will be easier to disseminate and the data are much more accurate so they will present a more realistic picture of what may happen in and actual flood event and thus allow for better plans.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Major Better elevation data will instruct those who are currently at flood risk to obtain the needed insurance. Additionally, with the expected additional datasets planned to be derived from the data, the county will be able to serve the public in ways not available in the past, and better models of the environment will allow for better plans with regards to environmental and political benefits (the two are inextricably linked). The updated FEMA maps will benefit public safety and the environment because the county will be able to better plan for those within the update area. In addition, local officials will not be under pressure from developers whose projects are held up or hampered by the poor existing data, and people who know they will not need flood insurance based on verifiably faulty elevation data will not need to struggle to verify the information.

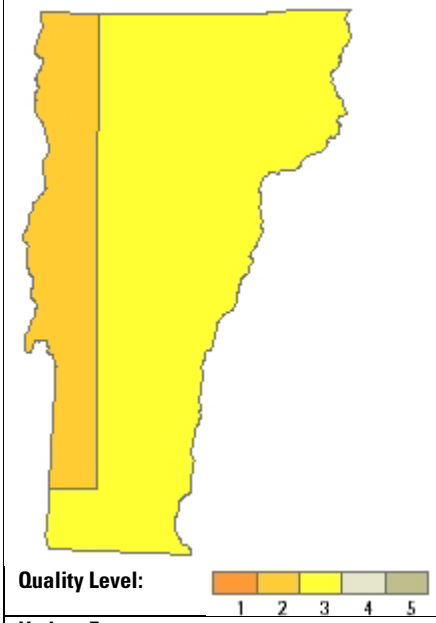
County Government—Washington County	
Program: Waterway Resource Management	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood mitigation	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Lidar data would be useful to monitoring and response related to floods. For example, recent flooding in Washington County resulted in the courses of several major waterways being changed. Additionally, some bridges were washed out along with some road damage.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Yes **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Do not know Benefits description not reported.

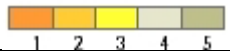
Vermont

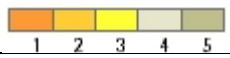
The State of Vermont has lidar coverage over about 20 percent of the State. Most agencies that have used the lidar realize the value of the data. Programs are being developed with the assumption that full coverage will someday be available. Funding continues to be the biggest issue for Vermont.

Myriad benefits to individuals, businesses, and nonprofit organizations from the use of enhanced elevation data for efforts such as preparing a town building permit application, wetland alteration permit application, the Renewable Energy Atlas of Vermont, or the Vermont Public Interest Research Group's solar advocacy program seem to be underestimated at the regional and statewide scales of the national enhanced elevation assessment effort. One example is the Renewable Energy Atlas of Vermont effort where an enhanced surface model and related characteristics, such as slope, would have benefited many components of the analytical results. The total effect and cost savings of these individual applications should be considered in aggregate where the sum of the parts rises well above the value of each use and should be considered in the survey.

State Functional Activities

Program: River Corridor Management Program	**Business Use:** 14. Flood Risk Management
	**Supporting Community Planning for River Corridors:** The river corridor management includes environmental management but mostly refers to flood plain mapping in this case.
	Estimated Annual Operational Benefits: Major; dollar value not reported The State could establish baseline data from which to determine erosion and sedimentation processes and address eutrophication problems.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported With consistent new elevation data, the State would have a baseline snap shot of conditions from which to study fluvial geomorphic changes, identify channels that are not in reference condition, and flag sites that are causing increased erosion and phosphorus discharges.
	Estimated Strategic Benefits: Major The data would be the critical baseline for comparison of change over time, but may not immediately provide information on fluvial processes and sedimentation.
Update Frequency: 4–5 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: Yes, by watershed	

Program: Tree Canopy Assessment	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:**  **Update Frequency:** 4–5 years **Bathymetric Data:** Not reported **Tide-Coordinated:** No **Data Outside State Needed:** Yes, with special emphasis into Canada	**Land Cover Mapping:** The land cover mapping program is identifying areas of urban tree canopy. This program depends on the point cloud almost exclusively. **Estimated Annual Operational Benefits:** Not reported; $25,000 Benefits description not reported. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Ability to see features more clearly. **Estimated Strategic Benefits:** Major Benefits description not reported.

Program: Project Development and Construction—Highway, Rail, Air, Transit	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**  **Update Frequency:** Event driven—Needs not met by a cyclic data acquisition program **Bathymetric Data:** Yes **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Highway and Bridge Planning and Design:** Transportation planning includes activities for roads, rail, air, and waterways. Lidar is most useful in events such as landslides for prliminary planning. **Estimated Annual Operational Benefits:** Moderate; dollar value not reported Better elevation data for hydrologic modeling will improve culvert sizing, a digital surface model would allow for airport obstruction assessments, and construction projects could focus survey crews to collect in specific area and use lidar data for areas where less accurate elevation is needed. **Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More opputurnities to do visualization in a 3D environment using better elevation data. Improved accuracy of hydrological modeling and project terrain models. **Estimated Strategic Benefits:** Moderate Projects could be advanced if high-quality eleveation data were available. Wider swaths of elevation models could be provided to designers for highway, rail, and bridge projects, allowing for better storm water and runoff design, better volume calculations, and improved scoping and visualization.

Program: Mapping, Earth Resources, Hazards, Energy	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside State Needed:** Yes	**Mapping, Earth Resources, Hazards, Energy:** Geologic resource assessment and hazard mitigation are built on geologic mapping, geoscience research, and hazard identification. The outcome is protecting public safety and obtaining as well as protecting resources that contribute to the well-being of citizens. **Estimated Annual Operational Benefits:** Major; $350,000 The Vermont Geological Survey is working to identify areas of potential landslides; lidar coverage would be significant. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Benefits description not reported. **Estimated Strategic Benefits:** Major Benefits description not reported.

Program: Landslide Inventory, Vermont Geological Survey	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5 **Update Frequency:** 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** No **Data Outside State Needed:** Not reported	**Landslide Inventory:** The geological mapping is identifying hazards such as landslide areas and flood areas. **Estimated Annual Operational Benefits:** Major; dollar value not reported Vermont has seen that lidar at this level of detail is extremely useful for landslide identification and other geologic mapping efforts that the State has undertaken through the Vermont Geological Survey. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported Vermont would be able to produce new map products that are much more user friendly. This would include slope and shaded relief maps and detailed topographic maps. The State would be able to identify landslides, rock outcrops, and many other features more efficiently than for areas where Vermont only has conventional topographic maps and orthophotos. It would reduce the need for expensive field work. **Estimated Strategic Benefits:** Major Widespread lidar coverage in the State will enable Vermont to map natural hazards far more effectively and present the results to the public in a more precise and timely manner.

Local Functional Activities

Regional Government—Central Vermont Regional Planning Commission	
Program: Transporation Planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Regional planning	
Quality Level: QL4 elevation data from imagery	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Data help in determining the elevations of the sites the commission is working on. Data will allow the commission to determine better site plan elevations.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More accurate elevation data can be provided; basic elevation data are being provided.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Minor
Tide-Coordinated: Not reported	Does not apply.

Regional Government—Chittenden County Regional Planning Commission	
Program: GIS Data Development	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Zoning	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Minor; dollar value not reported Enhanced elevation data are not available for the entire county, only a part, so the benefit is not countywide. Once data are developed, they will be useful in many capacities from lakeshore zoning to building footprint development.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported The data can be used to develop a countywide building footprint dataset. This would be useful in storm water runoff analysis. Having enhanced elevation data for the entire county will benefit all member municipalities, not just a portion of the commission. Zoning data can be developed at a more precise level, elevation data can be used for better land use planning analysis, for example, buildouts.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Moderate
Tide-Coordinated: No	New benefits are currently uncertain. Where these data are available, they are useful for fire and rescue as well as for natural resource planning.

Virginia

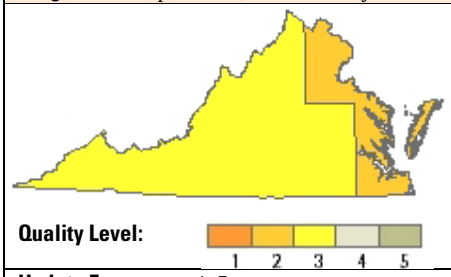
Agencies within the Commonwealth of Virginia have identified an array of potential uses of lidar and lidar-derived products that could significantly enhance and improve the services they provide to the businesses and citizens of Virginia. These uses include applications in coastal zone management, flood risk management, urban and regional planning, the development and protection of transportation (infrastructure planning, evacuation routes, emergency response routes), geologic and mineral resource mapping, mining effects, enforcement of mine regulations and reclamation, forest management (timber harvesting, fire protection, land conservation), and wildlife and habitat mapping. Enhanced elevation supports the creation of a suite of products that serve a diverse user base.

The Virginia Information Technologies Agency's Virginia Geographic Information Network (VITA/VGIN) Elevation Framework Initiative Action Team (FIAT) has determined that existing elevation data for Virginia are not of sufficient resolution, accuracy, or currency to satisfy the business needs of all stakeholders. Shortcomings in the current data holdings make many of the Commonwealth's tasks difficult or impossible to complete. The FIAT supports national efforts that will help the Commonwealth resolve these shortcomings.

In all cases, the Commonwealth believes that an enhanced elevation program should include the delivery of the raw point cloud, which currently supports a number of applications of importance to Virginia stakeholders. In addition, maintenance of the point cloud would provide the flexibility for the future creation of additional derivative products and applications as the knowledge of and the technologies that support the use of these data increase.

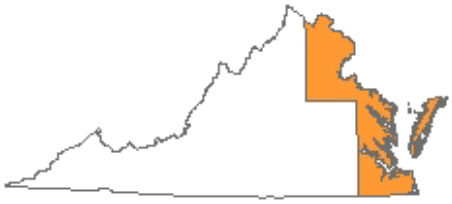
The Commonwealth believes that an enhanced elevation data program will complement and leverage existing Commonwealth efforts to provide geospatial framework data in the areas of orthoimagery and road centerlines. Effective coordination of these framework data programs will increase the use of each.

Commonwealth Functional Activities

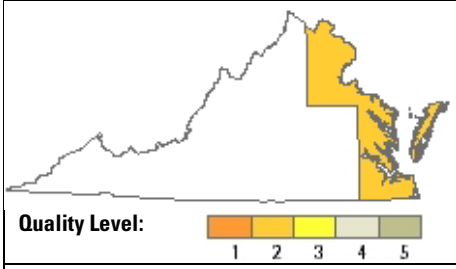
<table>
<tr><td colspan="2">Program: Transportation, Public Safety</td><td>Business Use: 14. Flood Risk Management</td></tr>
<tr><td rowspan="2"> 

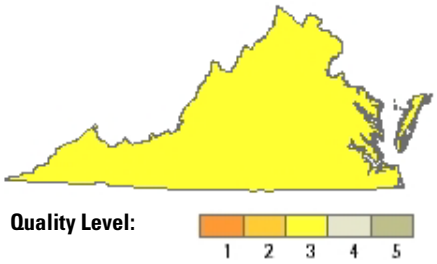
Update Frequency: 4–5 years</td><td rowspan="2">Bathymetric Data: Yes
Tide-Coordinated: Yes
Data Outside Commonwealth Needed: Yes, regional watershed mapping allows for mapping of and the prediction of flood waters across an entire watershed</td><td>Inundation Mapping: Inundation mapping is designed to minimize the potential effect of large quantities of water. The maps and models are used for planning purposes when designing transportation infrastructure and are used to map closures and danger zones during flood events. Essential for public safety.</td></tr>
<tr><td>Estimated Annual Operational Benefits: Moderate; dollar value not reported
Access to large extents of high-resolution consistent data would save time and increase overall data quality. Large-area consistent datasets provide uniformity in mapping, modeling, and predictions.</td></tr>
<tr><td></td><td></td><td>Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
Consistent maps, models, and predictions of drainage areas (both standard and catastrophic) are essential tools for both urban and rural planners and engineers.</td></tr>
<tr><td colspan="2"></td><td>Estimated Strategic Benefits: Moderate
Better maps, models, predictions of public, private lands, and associated infrastructure within drainage areas (including potential drainage areas such as a dam break may cause) can save lives and property.</td></tr>
</table>

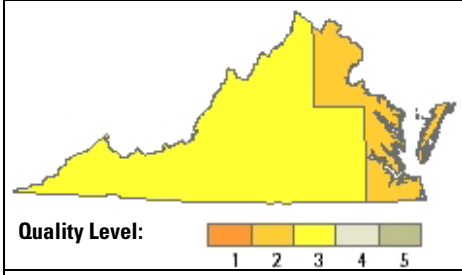
Program: Enforcement of Mining Regulations and Reclamation	**Business Use:** 10. Resource Mining
 **Quality Level:** 1 2 3 4 5	**Assessment of Mining Effects; Enforcement of Mine Regulations and Reclamation**
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Major; $1,500,000 Improved identification of areas that have been modified by surface mining. Improved enforcement of mining regulations; accelerated permit review.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved turnaround time on mine permit applications would benefit mineral extraction operators. Development of mining and reclamation plans (cuts, fills, spoil disposal) could proceed without costly ground surveys.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Increased profits to mineral extraction operators would benefit the economy, especially in the economically challenged coalfield area of southwestern Virginia. The public would also benefit from increased protection from risks related to active and abandoned mines. Hydrologic models of the effects of coal mining could be assessed with greater accuracy.
Data Outside Commonwealth Needed: No	

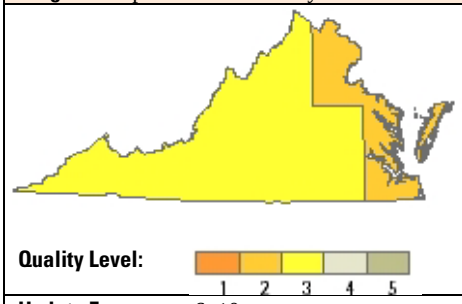
Program: Permit Issuance	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5	**Shellfish Leasing and Environmental Permit Activities:** Issuance of permits for encroachment over Commonwealth-owned subaqueous bottomlands and leasing of bottomlands for shellfish propagation.
Update Frequency: Annually	**Estimated Annual Operational Benefits:** Major; $50,000 Better information for both the public and for the Commonwealth agency when evaluating permit and lease applications.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported With better depth data, the Commonwealth can better serve potential applicants by front loading a selection of areas available for lease; this will help reduce conflicts with other uses.
Tide-Coordinated: Yes	**Estimated Strategic Benefits:** Moderate Better site selection will provide the public with a better selection of potential lease areas. Environmental effects can be better assessed. The conflict resolution process between competing uses will be better served with accurate depth information.
Data Outside Commonwealth Needed: No	

Program: Geologic and Mineral Resource Mapping	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5	**Geologic Mapping:** Geologic mapping includes geologic structures, geological hazards (including landslide risks), delineation of abandoned mines, and the mapping of mineral resources.
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Major; $400,000 Improved efficiency in mapping geologic and mineral resources resulting in ability to analyze larger areas in given time period; increased accuracy of mapping geologic structure and geologic hazards; and improved ability to find and delineate abandoned mines.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Greatly improved ability to provide site assessments without making a site visit; more rapid response to customer requests; greater accuracy in published geologic and mineral resource maps; and greater accuracy and feature identification in mapping landslide risks.
Tide-Coordinated: Yes	
Data Outside Commonwealth Needed: Yes, regional geologic features and hazards that stretch beyond the Commonwealth boundary	**Estimated Strategic Benefits:** Major Improved assessment of risks related to geologic hazards; improved assessment of risks related to abandoned mines; improved assessment of remaining mineral resources; and improved enforcement of mine reclamation laws.

Program: Support of Coastal Zone Management and Sea Level Rise Adaptation Planning	**Business Use:** 4. Coastal Zone Management
 **Quality Level:** 1 2 3 4 5	**Local Sea Level Rise Adaptation; Coastal Zone Resource Assessment:** The Virginia Coastal Zone Program coordinates the identification and mapping of the best remaining blue and green natural resources within Virginia's coastal zone. Blue or green infrastructure comprises those natural features on the land (for example, forests, wildlife habitat, and wetlands) or in the water (for example, anadromous fish use areas, oyster reefs, and underwater grass beds) that are critical to maintaining ecosystem and human health and survival. The multiple applications of lidar data can assist in this multifaceted mapping effort. Once identified and mapped, multiple levels of government can work together to develop policy and promote adoption of local plans and ordinances that will better protect and manage important coastal resources.
Update Frequency: 4–5 years **Bathymetric Data:** Yes **Tide-Coordinated:** Yes **Data Outside Commonwealth Needed:** Yes, data for entire Chesapeake Bay coastline would be useful	**Estimated Annual Operational Benefits:** Major; dollar value not reported Coastal zone localities currently have varying accuracies of elevation data available to them. Regional lidar would provide a common baseline for discussions, predictions, and assessments. Higher resolution elevation data from lidar would greatly enhance regional sea level rise planning efforts by more accurately predicting areas likely to be affected by inundation or storm surge.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Coastal zone localities currently have varying accuracies of elevation data available to them. Regional lidar would provide a common baseline for discussions, predictions, and assessments. Higher resolution elevation data from lidar would greatly enhance sea level rise planning efforts by more accurately predicting areas likely to be affected by inundation or storm surge.
	Estimated Strategic Benefits: Major Coastal zone localities currently have varying accuracies of elevation data available to them. Regional lidar would provide a common baseline for discussions, predictions, and assessments. Higher resolution elevation data from lidar would greatly enhance sea level rise planning efforts by more accurately predicting areas likely to be affected by inundation or storm surge.

Program: Virginia Base Map Program	**Business Use:** 22. Urban and Regional Planning
 **Quality Level:** 1 2 3 4 5	**Virginia Base Map Program—Framework Geospatial Data:** The Virginia Base Map Program framework data are shared by Commonwealth agencies as well as all localities within the Commonwealth. This wide distribution allows for an ROI beyond the annual program budget.
	Estimated Annual Operational Benefits: Major; $3,000,000 More precise flood risk mapping at the local level. Accurate analysis of coastal flooding and storm surge. Better analysis for sea level rise and mitigation. Better geologic mapping and better assessment of natural resources and coastal ecosystems.
Update Frequency: 6–10 years **Bathymetric Data:** No **Tide-Coordinated:** Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved support for flood risk mapping. Improved support for storm surge and sea level rise analysis. Improved support for local land use planning. Improved support for geologic mapping. Better assessment of natural resources and coastal ecosystems. Improved support for infrastructure projects in transportation and utilities, including renewable energy, such as wind and solar.
Data Outside Commonwealth Needed: No	**Estimated Strategic Benefits:** Major Flood insurance cost savings by matching coverage closer to actual risks. Public safety increased by more accurate modeling of storm surge hazards. Improved knowledge about needs for mitigation of sea level rise. Costs savings for infrastructure projects in transportation and utilities. Better conservation and management of natural resources.

Program: Games and Inland Fisheries	**Business Use:** 7. Wildlife and Habitat Management
	**Species Habitat Modeling:** Update frequency driven by change in landscape. Grossly altered landscapes (manmade or natural) require new data.
	Estimated Annual Operational Benefits: Major; dollar value not reported Increased accuracy of elevation data along with the raw point cloud data will allow the creation of models for an increased number of habitats and species. Provide the ability to map forest structure and create habitat models from such maps and data.
	Estimated Annual Customer Service Benefits: Minor; dollar value not reported Current customers are internal Commonwealth agency personnel; however, a new line of products (maps, models, research) could be of value to localities, academia, and nongovernmental organizations.
Update Frequency: 4–5 years	**Estimated Strategic Benefits:** Moderate Decisions (conservation priorities, development, mitigation, land acquisition) made based on habitat will benefit from increased accuracy of elevation data. Protection of biodiversity and ecosystem services; land conservation.
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside Commonwealth Needed: No	

Program: Department of Forestry	**Business Use:** 5. Forest Resources Management
	**Forest Management:** Forest management includes but is not limited to timber harvesting, forest health, fire protection, forest stewardship, water quality, land conservation, and protection of infrastructure on forest lands. The Commonwealth notes the potential for tremendous benefit; however, actual benefits can only be assessed through the use of the data coupled with additional research within the forest management community. The utility of the data is also limited by the age of the data.
	Estimated Annual Operational Benefits: Moderate; dollar value not reported Improved efficiency through better harvest planning, less field work, better direction of resources; monitor forest health; stream stabilization.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Decrease response time to customer request (permits) if lidar derivatives allow analysis of forest cover, health from office environment.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate Recreation and safety; fire-wise community plans; urban and community forest initiatives, improved water quality, protection of ecosystem services; land conservation; climate change mitigation.
Tide-Coordinated: No	
Data Outside Commonwealth Needed: Regional need for riparian buffer studies (Chesapeake Bay)	

Local Functional Activities

County Government—Accomack County	
Program: Planning	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood innundation mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Will provide more accurate data for flood prediction and models. Will provide data for the development of higher resolution contours.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Will provide the ability to provide enhanced data and analysis that will assist in meeting the needs of businesses and citizens.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major Help to assess changes in the landscape due to natural hazards (hurricanes, floods).
Tide-Coordinated: Yes	

County Government—Loudoun County	
Program: FEMA RiskMAP	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Will facilitate new task of automated hydrology and hydraulics and conversion of DFIRMs to RiskMAP products. Will offer additional, nonregulatory derivative products, such as depth grids.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Potentially alleviate project specific field surveys required for flood plain waivers. Applications for development will be based upon improved map quality and will be consistent with new base map data. This will facilitate the review process.
Bathymetric Data: No	**Estimated Strategic Benefits:** Moderate Well calculated flood risk assessments for both residential and commercial property owners is a right of property owners. Decisions should be made on the best available data.
Tide-Coordinated: No	

County Government—Montgomery County	
Program: GIS Services	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Proposed cellular structure viewshed	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Benefits come from reuse of lidar data. The data were originally acquired for flood plain remapping, but are now used internally as well as by the local development community. The DEM was used most recently to enable a better pictometry oblique aerial mapping product. Without its use, the vendor would use the publicly available USGS DEM, which is substantially less accurate.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported New uses for the lidar keep evolving as wider knowledge of its existence is known. The county recently used the lidar for wind turbine viewshed analysis. Lidar data were acquired in 2005, and soon after, the county began completing the FEMA flood mapping project to find other uses, such as utility and school construction design, erosion and sediment control, and cellular structure siting. Most recently the data were used for radio propagation coverage analysis as the county considered a new system.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate To be determined, but the key is flexibility to meet any needs and timely delivery of the data. The county used the "acquire it once, but use many times over" approach and has recouped approximately 25 percent of the cost of the lidar through licensing to local developers, engineers, surveyors, and citizens. This has created a positive view by all of responsible spending of limited tax dollars.

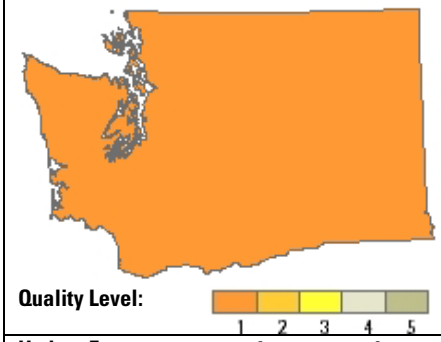
Regional Government—Hampton Roads Planning District Commission	
Program: Comprehensive Environmental Planning	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Regional land use and transportation planning	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Data would be helpful in supporting several of general regional planning projects involving regional land use planning and rural transportation planning.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported The monetary value is unknown, but the improved quality of the information generated would be beneficial.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Minor The monetary value is unknown, but the improved quality of the information generated would be beneficial.

Regional Government—Hampton Roads Planning District Commission	
Program: Hazard Mitigation Planning	**Business Use:** 14. Flood Risk Management
Functional Activity: Regional emergency management planning	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Higher resolution elevation data would greatly enhance the ability to determine if critical facilities are vulnerable to flooding and storm surge.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Minor; dollar value not reported The monetary value is unknown, but the improved quality of the information generated would be beneficial.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Minor The monetary value is unknown, but the improved quality of the information generated would be beneficial.

Washington

The State of Washington has requirements for QL1 lidar acquisitions, including the collection of bathymetric data along the near-shore zone of Puget Sound. Lidar-derived enhanced elevation and bathymetric data will support geologic resource assessment, hazard planning and mitigation, FEMA flood mapping, water quality assessments, and ecosystem study and restoration efforts. The only State participants in this survey were the State Champion, who is also the State Geologist in Washington's Department of Natural Resources (DNR), and the Chief Hazards Geologist for DNR. They combined their responses into one survey that was submitted by the State Champion. Other State-level participants were sought out to complete the survey but either did not respond to the survey request or did not complete the survey.

State Functional Activities

Program: DNR Geology	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
	**Geology in the Public Interest** **Estimated Annual Operational Benefits:** Major; dollar value not reported Could improve tsunami inundation modeling, forest practice landslide identification. Low-tide lidar allows for habitat indentification in the near shore environment. **Estimated Annual Customer Service Benefits:** Major; dollar value not reported More accurate landslide recognition to improve forestry regulation. More confidence in land use planning. **Estimated Strategic Benefits:** Major Better geological hazard maps, better forestry regulation, better aquatic near shore habitat mapping.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: Yes	
Tide-Coordinated: Yes	
Data Outside State Needed: Not reported	

Local Functional Activities

City Government—City of Olympia	
Program: Not reported	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Capital improvement, flood plain adminstration	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; dollar value not reported Benefits description not reported.
Update Frequency: 2–3 years	**Estimated Annual Customer Service Benefits:** Do not know; dollar value not reported Benefits description not reported.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Do not know Benefits description not reported.
Tide-Coordinated: Not reported	

County Government—King County	
Program: Rivers Mgmt	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Less need to acquire supplemental data to high-grade areas. Accurate flood planning and FEMA coordination.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Reduction in errors in existing database, improved orthorectification products. Less field work and fewer visits required.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major
Tide-Coordinated: Yes	With improvements in technology for using lidar, the county anticipates a wider range of applications from any future acquistions. The public was pleased when lidar data were first acquired; however, these data are becoming extremely dated in areas.

County Government—Pierce County	
Program: River Improvement Program	**Business Use:** 3. River and Stream Resource Management
Functional Activity: River Improvement Program	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Preliminary engineering, planning, real estate purchases. Improved compliance and cost savings in rural areas.
Update Frequency: Annually	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Extended areas of high-quality lidar allow the county to provide better service to rural areas within the county. Reduces preliminary engineering costs, enhances site and infrastructure planning, identifies properties that lie in flood zones.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Allows better visualization of projects to the public, improves accuracy of models and engineering designs, helps reduce effects by better knowledge of riverine environments, allow strategic planning for property purchases.

County Government—Pierce County	
Program: Water Quality Program	**Business Use:** 2. Water Supply and Quality
Functional Activity: Water quality monitoring	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Minor; dollar value not reported Trace nonpoint source water quality issues to probable source. No need for higher quality data, just more current.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Minor; dollar value not reported Increased coverage would improve accuracy and tracking times in rural areas of county.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Minor Since this quality of data is currently in use, no new benefits will be obtained. Minor improvements in water quality will improve public safety and salmon habitat. Also improved accuracy in tracking water quality issues will provide strategic and political benefits.

lidar	not reported
	not reported
	not reported

Regional Government—Puget Sound Regional Council	
Program: Travel Demand Model Development-GIS	**Business Use:** 22. Urban and Regional Planning
Functional Activity: Provide elevation gain for travel modeling	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Do not know; $40,000 Time and cost savings are unknown at this time because the addition of high-accuracy elevation information to the travel demand model network is done on a first time, experimental basis. Mission improvement occurs in two ways: Elevation gain over distance applied to travel demand model links enables vehicle speed adjustments, especially for trucks. Elevation gain over distance applied to travel demand model links that allows highly accurate speed and effort adjustments to nonmotorized modes of transportation. Time and cost savings anticipated from delineation of steep (undevelopable) slopes compared with current, lower resolution DEM used. Mission improvements include enabling seasonal adjustment of transportation network attributes by accurate slope and sharper 3D graphic presentations of travel demand model results.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Minor; dollar value not reported Additional minor public viewing and display from improved 3D detail and horizontal accuracy, through browser and Web mapping services.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Minor Potential benefits are tied to high-accuracy elevation coverage used to discriminate building rooftops for primitive extraction in an image classification process. Results from a successful classification could yield better impervious surface, vegetation (tree), and urban growth measurements. Strategic benefits include 3D viewing and display enhancements to travel demand model results, making the results more understandable to public.

Tribal Functional Activities

Lower Elwha Klallam Tribe	
Program: Natural Resources, Habitat Restoration	**Business Use:** 1. Natural Resources Conservation
Functional Activity: Salmon habitat preservation	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $2,500,000 Able to map hydrologic channels and fish rearing habitat more accurately in order to prioritize culvert replacement of undersized, perched, and impassable culverts. The tribe would be able to apply existing operational benefits to the entire area of interest.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value dollar value not reported Full lidar coverage at 2-m resolution with bathymetric data would greatly enhance the ability to perform various habitat-related analysis of the area of interest. Currently, the tribe has lidar data for critical sections of the area of interest but lack some resolution, full watershed coverage, and bathymetric data.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major These data would enable the tribe to perform more accurate and complete analysis and restoration for the entire area of interest. The tribe will be able to perform and complete analyses to demonstrate needs for habitat restoration for all benfit categories (for example, social, environmental, and strategic and political).
Tide-Coordinated: No	

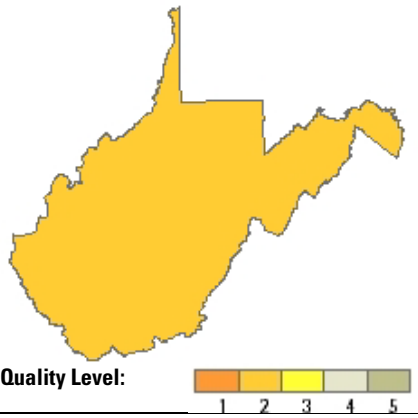
Lower Elwha Klallam Tribe	
Program: Natural Resources, Planning, BIA Tahola Agency	**Business Use:** 3. River and Stream Resource Management
Functional Activity: Stream mapping	
Quality Level: QL1 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Supply planners, natural resource staff, and BIA with critical information on stream and forest health.
Update Frequency: >10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Lidar coverage at 1m resolution with bathymetric data would greatly enhance the ability to perform various habitat related analysis of the area of interest.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major Provide information to Natural Resource Council, Friends of the Upper Quinault, and other nonprofit groups.
Tide-Coordinated: Yes	

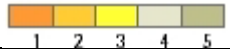
Quinault Indian Nation	
Program: EPA	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; $100,000 Able to model and illustrate flood risks. Able to more accurately model and illustrate flood risks.
Update Frequency: 4–5 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported More accurate, more recent data sharing. Able to share data with prospective and existing contractors and agencies.
Bathymetric Data: Yes	**Estimated Strategic Benefits:** Major Ability to illustrate and demonstrate more accurate and recent locations of hazard risks. Ability to illustrate and demonstrate where various risks and hazards are.
Tide-Coordinated: No	

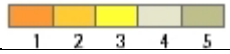
West Virginia

In 2004, West Virginia was the first State in the Nation to have a complete 1/9th Arc Second Digital Elevation Model (DEM) incorporated into the National elevation dataset (NED). However, the elevation data were photogrametrically compiled and not sufficient to meet accuracy requirements for application such as flood plain mapping to Federal Emergency Management Agency (FEMA) specifications. Lidar technology has advanced significantly in the last 8 years to the point where it can be used to build upon the NED base in many areas of the State requiring better data. How much of the State requires enhanced elevation data beyond the NED remains to be determined, but there is great interest and excitement in the possibilities lidar technology has to offer. West Virginia (WV) has identified enhanced elevation needs for a variety of purposes ranging from statewide coverages for flood risk management and hazards, broadband and wireless development, and transportation infrastructure development. Lidar data for certain areas of the State and specific applications have been identified for water and sewer infrastructure development, especially in rural areas, and environmental regulation pertaining to surface coal mining and Marcellus gas development. There is also strong interest in the State from the academic community for applied research applications, educational outreach, and lidar data development related to implementation of lidar data across the State. Local interest from counties and regions focuses on flood risk management and interactions with FEMA, flood insurance and property assessment, and State and county emergency operations. The lidar quality level update frequency varies by functional area and business need. As part of the WV State Geographic Information Systems Strategic Plan approved in 2010, an Enhanced Elevation Business Plan will be developed in the near future, and will incorporate the findings of the national enhanced elevation assessment study as appropriate. Although not specifically mentioned in the current national enhanced elevation assessment survey, other functional areas of importance to West Virginia include land cover and land use change, forestry, water resources, and geological uses of lidar data. In general, WV encourages lidar collection to cover gaps in areas where no acceptable lidar exists presently, before recollecting widespread updates to replace existing acceptable lidar datasets. While has a significant history of coordinating data collection efforts across and within levels of government, a coordinated national-level enhanced elevation program must have well publicized specifications and planned acquisition schedules available well before collection in order to leverage the existing partnership opportunities. Sufficient time must be allowed for stakeholders, and an appreciation of local and State budget cycles for funding requests.

State Functional Activities

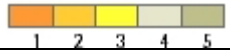
<table>
<tr><td colspan="2">Program: Emergency Management</td><td>Business Use: 14. Flood Risk Management</td></tr>
<tr><td rowspan="4"> 
</td><td colspan="2">Flood Risk Mapping</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; dollar value not reported
More accurate flood plain models and maps; improved Hazards U.S. Multi-Hazard (Hazus-MH) software model results; standardization and consistency of analysis and modeling of flood hazards; integration with other data (such as streamgages and National Weather Service forecasts).</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Moderate; dollar value not reported
Better assessment of flood risks and improved information to public, including flood warnings.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Major
Improved government services, better information to public, reduced flood insurance premiums.</td></tr>
<tr><td>Update Frequency: 2–3 years</td><td colspan="2" rowspan="4"></td></tr>
<tr><td>Bathymetric Data: No</td></tr>
<tr><td>Tide-Coordinated: No</td></tr>
<tr><td>Data Outside State Needed: Yes, contiguous watersheds where major streams enter and exit the State</td></tr>
</table>

Program: West Virginia Department of Transportation and West Virginia Department of Highways Transportation Operations	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 	**Transportation Infrastructure:** Transportation infrastructure planning, design, construction, and maintenance including roads and rail.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported Increase efficiency and accuracy of mapping projects; reduce survey field time and enhance personnel safety; better integration with other data such as geology, engineering, and environmental to speed up project review and reduce costs.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Better data consistency with project contractors and decreased costs through data standardization for analyses, such as cut-and-fill volumetrics and right-of-way.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate Improved maps and project information for public and government officials.
Data Outside State Needed: Yes, adjoining road networks from other States	

Program: West Virginia GIS Technical Center—Applied Research and Data Development	**Business Use:** 25. Education K–12 and Beyond
 **Quality Level:** 	**GIS Data Development, Research, Analysis, and Publication:** GIS data development, research, analysis, and publication supports research, applied research, and GIS technical assistance to State agencies. Quality level is determined by specific application requirements.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Improve standardization of government operations for mapping; and reduce costs "create once, use many times."
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Improved accuracy, quality, consistency, and currency of data for various government services.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate High-quality elevation data supports a wide variety of programs that directly benefit the public, private, and government sector operations.
Data Outside State Needed: Yes, to the extent that research or data development activities overlap the State boundary for specific purposes, such as landscape analysis, hydrology, or natural resources	

Program: Telecommunications Utility Regulation	**Business Use:** 27. Telecommunications
 **Quality Level:** 1 2 3 4 5	**Broadband Mapping and Wireless Communications**
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported Improved data and maps to support decisionmaking for providing services to underserved and nonserved areas of the State.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More accurate, timely, and detailed data for all sectors to use.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Moderate Improved public service commission decisionmaking on provider rate requests and public information; public safety.
Data Outside State Needed: Yes, contiguous terrain data one county deep for line-of-sight, signal strength and other analysis	

Program: Surface Mining Regulation and Permitting; Natural Gas (Marcellus)	**Business Use:** 1. Natural Resources Conservation
 **Quality Level:** 1 2 3 4 5	**Environmental Regulation**
Update Frequency: 2–3 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported Improved currency, accuracy, and detail of mapping to improve regulatory compliance and speed up permitting process and to compare results and effects through time; integration with other data sources, such as geology, hydrology, and land cover, that could also be derived from lidar or fused multispectral data.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Standardization of permitting process and compliance requirements with companies.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Improved information for public, regulators, and elected officials.
Data Outside State Needed: No, unless coordinated through common national or regional program with the EPA, the Office of Surface Mining Reclamation and Enforcement, USACE, or other Federal agencies	

Program: Water and Sewer Infrastructure Development	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:**  	**Water and Sewer Infrastructure Development:** Update frequency for data acquisition indicated for specific development projects but could be coordinated with statewide efforts.
	Estimated Annual Operational Benefits: Major; dollar value not reported Improved data to support planning, design, construction and maintenance of water and sewer projects, and potentially reduce project costs; better integration with other data sources such as geology, soils, land cover, and hydrology, to promote more sustainable development.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Improved public awareness.
	Estimated Strategic Benefits: Moderate Improved information for public, government regulators, and decisionmakers.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Local Functional Activities

County Government—Raleigh County	
Program: Metro GIS	**Business Use:** 17. Homeland Security, Law Enforcement, and Disaster Response
Functional Activity: 911 Center	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Sharing data between several agencies. Having more mapping layers available.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported More accuracy; none.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Moderate Not available.
Tide-Coordinated: Not reported	

Regional Government—Hagerstown/Eastern Panhandle Metropolitan Planning Organization	
Program: GIS	**Business Use:** 21. Infrastructure and Construction Management
Functional Activity: Transportation planning	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Topographic information affects planning and study efforts and decisionmaking process. With better data, greater confidence in analytical, decisionmaking, and planning efforts.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported Information products and analyses would be enhanced with higher quality data. Production of mapping information products and analyses.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Major With enhanced elevation data, the number of aerial surveys needed would be greatly diminshed, which would shorten the amount of time needed to complete projects and studies. This is a major issue in the area, namely high growth and proposed alignments are affected due to timeliness all aspects of transportation planning.
Tide-Coordinated: Not reported	

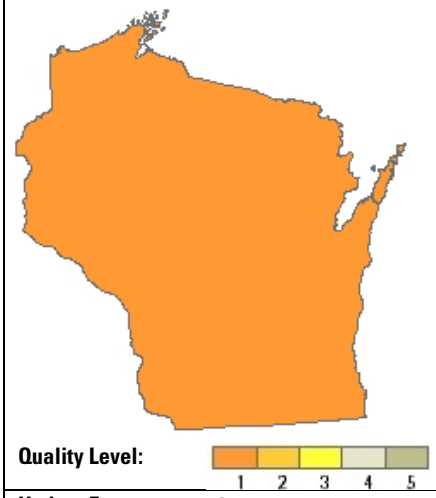
Wisconsin

The State of Wisconsin has requirements for high-resolution elevation data that support multiple programs among several agencies. Given the importance of agriculture to Wisconsin's economy, key business uses include programs related to agricultural resource management and environmental quality. Additional business uses include geological and flood plain mapping to support more informed decisionmaking about environmental issues and risks. In terms of infrastructure development, high-resolution elevation data play a role in highway planning and design and airport development and obstruction assessment. Business uses in higher education include educational and research activities in a variety of fields.

These survey results are not a comprehensive list of elevation requirements within the State but a subset of program activities provided at this point in time. There are likely additional requirements that could be documented in the future with further inquiry and investigation.

Currently, the majority of lidar acquisition projects in Wisconsin occur at the local level, and there is no current statewide product. This means that availability of high-resolution data is inconsistent across the State with varying levels of access to the data. All levels of government in the State could benefit from access to current, high-resolution elevation data.

State Functional Activities

<table>
<tr><td colspan="2">Program: Drainage Program</td><td>Business Use: 3. River and Stream Resource Management</td></tr>
<tr><td rowspan="5"> 
</td><td colspan="2">Hydrologic and Hydraulic Analysis for Drainage Districts</td></tr>
<tr><td colspan="2">Estimated Annual Operational Benefits: Major; $50,000
Ability to quickly and accurately model hydrologic characteristics of small catchments.</td></tr>
<tr><td colspan="2">Estimated Annual Customer Service Benefits: Major; dollar value not reported
Improved working relationships between State and county land conservation staff.
Improved efficacy in working with county surveyor and land conservation staff.
Better information for hydraulic modeling projects.</td></tr>
<tr><td colspan="2">Estimated Strategic Benefits: Moderate
Improved quality, accuracy, and timeliness of hydrologic and hydraulic modeling.</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="3">Update Frequency: 2–3 years</td></tr>
<tr><td colspan="3">Bathymetric Data: Yes</td></tr>
<tr><td colspan="3">Tide-Coordinated: No</td></tr>
<tr><td colspan="3">Data Outside State Needed: Yes, interest in drainage areas that extend into Illinois</td></tr>
</table>

Program: Land and Water Resources Management	**Business Use:** 8. Agriculture and Precision Farming
 **Quality Level:** 1 2 3 4 5	**Soil and Nutrient Runoff Management**
Update Frequency: 4–5 years	**Estimated Annual Operational Benefits:** Major; $5,000,000 Users (farmers, consultants, resource professionals) would not have to determine slope, aspect, and flow direction onsite. These measurements are critical in soil and water resource management, and field determinations are very expensive.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported More accurate, cost-effective, consistent, accessible, and current determinations of critical geomorphic factors that allow the assessment of natural resource vulnerabilities and allow for better management and control of soil erosion and polluted runoff.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major This dataset will help mitigate political and social conflicts over resource management and environmental quality.
Data Outside State Needed: Not reported	

Program: Geologic Mapping	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:** 1 2 3 4 5	**Geologic Mapping:** The preparation of maps, models, and databases to characterize geologic and hydrogeologic settings and processes, including surficial and bedrock geologic maps, groundwater flow models, and water table maps.
Update Frequency: >10 years	**Estimated Annual Operational Benefits:** Moderate; $45,000 Having high-resolution terrain data available would enable new mapping techniques, such as closed-depression modeling, to help better characterize those regions underlain by karst.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported The availability of high-resolution elevation data could increase production efficiency and overall accuracy of current geologic map products. Broader availability of these data could also spur the production of new map products and datasets.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major More efficient and accurate geologic map products have direct application in making informed decisions about environmental issues.
Data Outside State Needed: No	

Program: Floodplain Mapping Project (Floodplain Management Program)	**Business Use:** 14. Flood Risk Management
 **Quality Level:** 1 2 3 4 5	**Flood Risk Mapping**
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Major; dollar value not reported Having access to these data statewide would allow development of new flood hazard maps anywhere in the State. This would serve more community partners and protect more high risk flood zones from development. There will not be monetary savings as a result of these data being available, but rather the ability to cover more ground in the same amount of time and cost.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported This would result in accurate flood hazard maps throughout the whole State, which would increase acceptance of the maps among community partners and property owners.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major This would result in accurate flood hazard maps throughout the whole State, which would increase acceptance of the maps among community partners and property owners.
Data Outside State Needed: No	

Program: State Highway Improvement	**Business Use:** 21. Infrastructure and Construction Management
 **Quality Level:** 1 2 3 4 5	**Highway Planning and Preliminary Design:** Highway planning and preliminary design requires moderately accurate elevation data to plan for alternative routes, horizontal and vertical alignments, drainage, balancing cut and fills, determining terrain type (level or rolling), and slope analysis. Final design requires a high degree of accuracy normally provided by site-specific field surveys, photogrammetry, and lidar.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	**Estimated Annual Operational Benefits:** Minor; $250,000 Agencies such as the Wisconsin Department of Transportation (WisDOT) would expand on the existing operational benefits if elevation data were available for the entire State. Most planning studies do not cover large enough area to realize cost-savings from collecting aerial lidar data.
Bathymetric Data: No	**Estimated Annual Customer Service Benefits:** Minor; dollar value not reported Agencies such as WisDOT would expand on the existing customer service benefit.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Minor Statewide coverage would decrease the cost of providing the social and environmental benefits.
Data Outside State Needed: Yes, small buffer in adjacent States	

Program: Research and Education	**Business Use:** 25. Education K–12 and Beyond
 **Quality Level:** 1 2 3 4 5	**University-Level Education and Research in Geography**
	Estimated Annual Operational Benefits: Major; dollar value not reported Increased detail of high-resolution elevation data would support identification of smaller features, such as gullies. Potential effect on environmental programs and precision agriculture.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported Use of enhanced elevation data and derivatives to support university research and teaching efforts in geography, including subfields such as geomorphology, hydrology, and biogeography.
	Estimated Strategic Benefits: Major More local examples to teach from, more detailed analyses (for example, vegetation structure and solar calculations from rooftops).
Update Frequency: 2–3 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Yes	

Program: Airport Improvement and Maintenance	**Business Use:** 20. Aviation Navigation and Safety
 **Quality Level:** 1 2 3 4 5	**Airport Development and Obstruction Evaluation:** Airport development requires bare-Earth and multiple-pulse data to determine the best alternative for expansion and real estate acquisition. Detailed topographic and obstruction surveys in support of instrument approaches are required by the Federal Aviation Administration (FAA), which does not allow the use of lidar, but some planning activities would benefit from the use of a full point cloud.
	Estimated Annual Operational Benefits: Minor; dollar value not reported Use of elevation data assists with land acquisition.
	Estimated Annual Customer Service Benefits: Do not know; dollar value not reported Benefits description not reported.
	Estimated Strategic Benefits: Minor Benefits description not reported.
Update Frequency: Annually	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not reported	

Local Functional Activities

County Government—Outagamie	
Program: Land and Water Resources Plan	**Business Use:** 1. Natural Resources Conservation
Functional Activity: Conservation practice engineering	
Quality Level: QL3 elevation data from lidar	**Estimated Annual Operational Benefits:** Moderate; dollar value not reported Lidar is usually used in all designs at a minimum, the planning stages, and maximum of engineering for conservation engineering. Lidar is also used for delineating watersheds , calculating slope maps, and other applications. Lidar data have been used for 4 years.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Moderate; dollar value not reported The only new perceived benefit will be a terrain-to-points Python script to best get lidar data to the general public. Hillshades now used for countywide mapping across multiple departments. Detailed contour mapping provided to customers.
Bathymetric Data: No **Tide-Coordinated:** No	**Estimated Strategic Benefits:** Moderate Would like to create flood plain mapping for emergency management that relates river stage an innundated lands. Lidar is used in some facet of all conservation practice planning and design.

Wyoming

Of the programs surveyed in the State of Wyoming, the existence of high-resolution elevation data would benefit the following programmatic elements: mineral and energy production, water management, and wildlife management, and infrastructure planning.

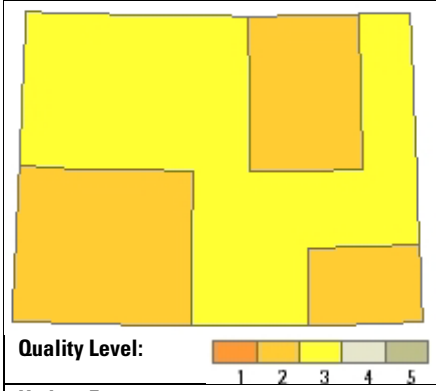
Wyoming supplies the Nation with vast quantities of coal and various forms of renewable and nonrenewable energy. High-resolution elevation data would assist in the intelligent discovery and management of these precious resources, helping to more sustainably meet the increasing demand for energy in the United States.

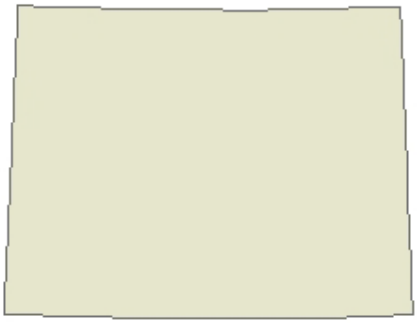
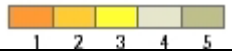
Snow and rain that falls in Wyoming feeds into three different major watersheds in the United States: the Columbia River, the Colorado River, and the Mississippi River. High snowmelt during spring and summer 2011 contributed to the replenishment of Lake Mead, but the high runoff also contributed to flooding scenarios in the Mississippi River drainage basin. Having access to high-resolution elevation data would allow water managers to more effectively predict snowpack and runoff and more effectively model and manage the Nation's freshwater supply.

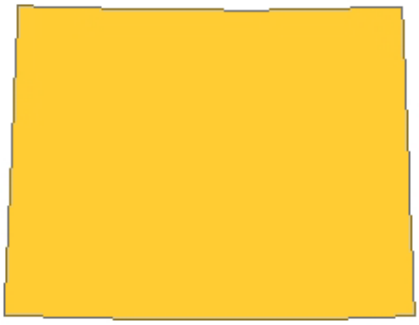
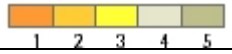
The low population density of Wyoming makes it a haven for wildlife; the State sustains large populations of many different species. Access to high-resolution elevation data would enhance the ability of wildlife management agencies to more effectively model habitat effects with changes in the regional environment.

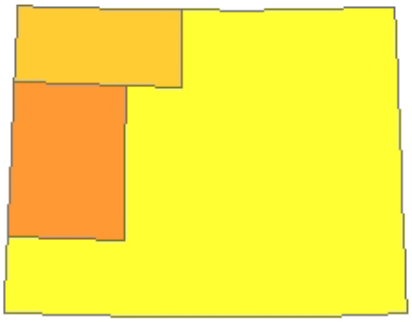
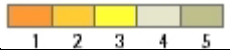
The State of Wyoming has more rural highway miles per capita than any other State in the Nation. This means that the development and maintenance of highway infrastructure frequently involves travelling long distances away from urban centers, which is expensive and time consuming. Having access to high-resolution elevation data would decrease the number and length of these trips during planning and design phases and would more efficiently use the State's resources.

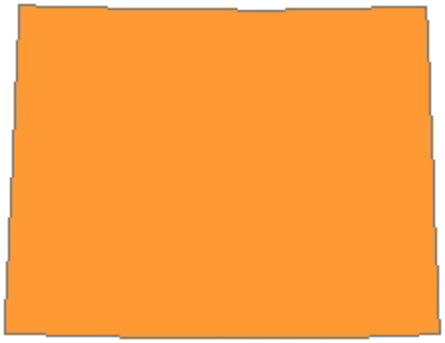
State Functional Activities

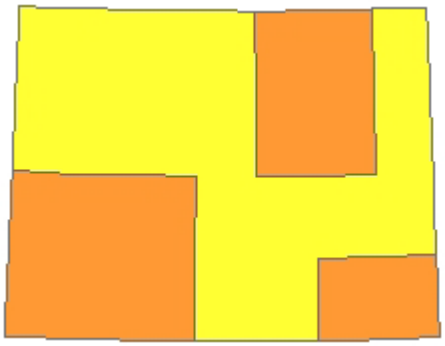
Program: Watersheds Program	**Business Use:** 2. Water Supply and Quality
	**Water Safety Modeling**
Update Frequency: >10 years	**Estimated Annual Operational Benefits:** Major; dollar value not reported These data would give more accurate values for storage in reservoirs, more accurate stream miles, and accurate values for runoff modeling.
Bathymetric Data: Yes	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported These data would save the agency valuable time spent in the field collecting much of the data for the monitoring group, such as collecting cross-section data of the stream monitoring site. Data could be collected from lidar at a quality that is sufficient for the needs of the program.
Tide-Coordinated: No	**Estimated Strategic Benefits:** Major Near real time modeling of water quality related events, more accurately place protective measures to alleviate events, and more quickly answer questions raised by the public and government.
Data Outside State Needed: Yes, for overlap to make project data seamless	

Program: Support Services	**Business Use:** 2. Water Supply and Quality
 **Quality Level:**  	**Water Supply:** Although the program in general would find only a moderate effect with the availability of lidar data, specific projects within the program have benefited greatly from lidar data that have been collected and made available from Federal programs, for example, dam safety and water irrigation usage.
	Estimated Annual Operational Benefits: Moderate; $500,000 These data might enable the agency to do projects and analyses in-house rather than contracting the work.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported These data would enable the agency to answer questions about hydrologic modeling, which in turn could speed up requests for the use of water in the State. The data might also be used to mitigate disasters, such as dam breaking.
	Estimated Strategic Benefits: Moderate Public benefits would be a better dam safety program throughout the State. Also, more efficient irrigation water usage as well and oil and gas drilling.
Update Frequency: >10 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: Sage-Grouse	**Business Use:** 7. Wildlife and Habitat Management
 **Quality Level:**  	**Determination of Sage-Grouse Habitat Based on Winter and Snow Conditions**
	Estimated Annual Operational Benefits: Moderate; dollar value not reported To model what the snow pack and drift would be in heavy snow years would not only be beneficial for sage-grouse but for big game species, as well.
	Estimated Annual Customer Service Benefits: Moderate; dollar value not reported The biologists would be the customers and they would be able to predict how the snow would affect the birds and lek checking season.
	Estimated Strategic Benefits: Moderate Socially and politically it would be best to present an accurate depiction of what effects the conditions were having on animal populations.
Update Frequency: 4–5 years	
Bathymetric Data: No	
Tide-Coordinated: No	
Data Outside State Needed: Not at this time, but can see the benefit for future project areas that may go over the State line	

Program: STATEMAP Geologic Mapping Program	**Business Use:** 9. Geologic Resource Assessment and Hazard Mitigation
 **Quality Level:**  	**State Geologic Mapping:** Bare-Earth lidar imagery will be used to enhance the State geologic mapping program (bedrock and surficial), quaternary fault mapping, energy development planning and resource inventory purposes, throughout the State of Wyoming.
	Estimated Annual Operational Benefits: Major; dollar value not reported Enhanced remote sensing imagery will provide higher quality base maps and data for field mapping purposes, reducing the need for smaller scale air photo inspection. Combining digital imagery with field mapping hardware will reduce the amount of time spent on digitizing data for final map and report products.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported With an enhanced elevation dataset, time spent in the office, before field mapping, will be reduced, and production timeliness will increase from the reduced time spent digitizing data collected in the field. Mapping will benefit from more accurate base maps that can be integrated into modern field mapping devices.
Update Frequency: 6–10 years	
Bathymetric Data: Yes	
Tide-Coordinated: No	
Data Outside State Needed: No	

Program: GIS and Intelligent Transportation Systems	**Business Use:** 18. Land Navigation and Safety
 **Quality Level:** 1 2 3 4 5	**Road Design**
	Estimated Annual Operational Benefits: Major; $250,000 Being able to plan and design roads without having to send people into the field would save the WisDOT a considerable amount of time and money.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Having that information available to everyone in the WisDOT would allow everyone to do their job more efficiently and in a timelier manner.
	Estimated Strategic Benefits: Major Having that information readily available to the public when related to a road construction project would help eliminate confusion about the why a road is being constructed in a particular location.
Update Frequency: Event driven—Needs not met by a cyclic data acquisition program	
Bathymetric Data: Not reported	
Tide-Coordinated: No	
Data Outside State Needed: Yes, for continuity of data over State line	

Program: Land Quality Division Permitting	**Business Use:** 10. Resource Mining
 **Quality Level:** 1 2 3 4 5	**Mine Permitting**
	Estimated Annual Operational Benefits: Major; dollar value not reported Accurate contours from before and after mining for inspections and bond release. Accurate contours for reclamation efforts for modeling purposes of bond release.
	Estimated Annual Customer Service Benefits: Major; dollar value not reported Improve the time needed to inspect the features on the ground and shortened time and increased customer satisfaction as a result.
	Estimated Strategic Benefits: Major More accurate data for use in mine wall modeling and quicker turnaround time for permits and amendments.
Update Frequency: >10 years	
Bathymetric Data: Not reported	
Tide-Coordinated: No	
Data Outside State Needed: Yes, for overlap to make project data seamless	

Local Functional Activities

County Government—Laramie County, City of Cheyenne	
Program: Drainage Planning	**Business Use:** 14. Flood Risk Management
Functional Activity: Flood risk mapping	
Quality Level: QL2 elevation data from lidar	**Estimated Annual Operational Benefits:** Major; dollar value not reported Elevation data at the quality level selected are unavailable. Use of aerial surveys greatly reduces the time and cost in obtaining the necessary elevation data. Ability to use GIS technology in-house instead of outsourcing hydrologic and hydraulic engineering modeling.
Update Frequency: 6–10 years	**Estimated Annual Customer Service Benefits:** Major; dollar value not reported Improved reliability of DFIRMs and perhaps more frequent updates for entire area of interest rather than a few localized drainages. Higher accuracy in identifying property owners that will need flood insurance. Elevation data at the quality level selected are unavailable.
Bathymetric Data: Not reported	**Estimated Strategic Benefits:** Moderate Perhaps a higher rating in the FEMA Community Rating System Program will be achievable, lowering the cost of flood insurance. Elevation data at the quality level selected are unavailable.
Tide-Coordinated: Not reported	