Pennsylvania is in immediate need of new lidar coverage.
An ad-hoc group of state, federal, and local government agencies and nongovernmental organizations has come together as the **Lidar Working Group** to work toward complete QL2 lidar coverage of the state, and plan for data management and maintenance into the future. USGS has calculated an average return on investment for lidar at 5:1. Using **USGS 3D Elevation Program (3DEP)** funding, about one-third of project costs in previous 3DEP partnerships were covered. The aim is to line up partners within and outside state government for the 2018/19 budget year, and submit a proposal to 3DEP in September 2018.

5:1
return on investment

3DEP began in 2012 and is accelerating the rate of 3D elevation data collection. The call for action to collect high-quality lidar data requires broad support from a large partnership community. The initiative is being led by the USGS and includes many partners—Federal agencies and State, Tribal, and local governments—who will work together to complete the national data coverage in the near future. Private sector firms, under contract to the Government, will continue to collect the data and provide essential technology solutions for the Government to manage and deliver these data and services.

Until recently, data has been collected piecemeal using federal and local funding. Now with state leadership, Pennsylvania's lidar coverage can be focused and counseled to complete the geospatial data program in a cost effective and timely manner.

Estimated Cost and Timeline

A current estimate for the cost of obtaining QL2 lidar for the remaining 42 counties is about $6.7M (29,535 sq mi x $226/sq mi). On average, the 3DEP initiative can cover about one-third of the cost of successful proposals, bringing the cost to the state and other partners closer to $4.3M. The work would likely be completed as a 2-year or 3-year project, thus reducing the cost per year to partner agencies.

The partners would look at refreshing the elevation data on a 3-6 year cycle. Some determining factors are: technological advances leading to improved data accuracy at comparable or reduced cost, coordination with PEMA orthophotography cycle, and rapidity of change on the ground.

Some uses of lidar data are illustrated on the next page.

Previous Lidar Collection
2006 - 2008
vertical accuracy **18.5 cm**
2-foot contours and 1-meter DEMs
Funded by DCNR with contributions from OA, PennDOT, PEMA, DEP, USGS, FEMA

2006-2008

This 10-year-old lidar data, is the most-downloaded dataset on the state geospatial clearinghouse — despite the fact that, in many locations, the data does not reflect current on-the-ground conditions. The cost was about $15M and has since informed billions on in planning, engineering, and environmental investment.
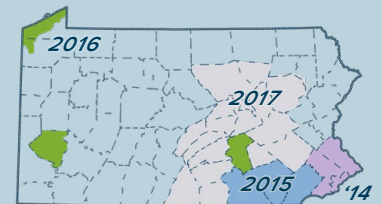
Current Lidar Collection
2014 - 2017
vertical accuracy **10 cm**
1-foot contours and 1-meter DEMs
Funded by USGS, NRCS, DVRPC, Dauphin County, Allegheny County, DEP

2016
2017
2015
'14

Lidar Working Group partner agencies
PEMA, DCNR, PennDOT, DEP, DCED, PA Game Commission, USGS, NRCS, USFS, PASDA, Shippensburg University, PA Magic, PA MAPPS, Susquehanna River Basin Commission
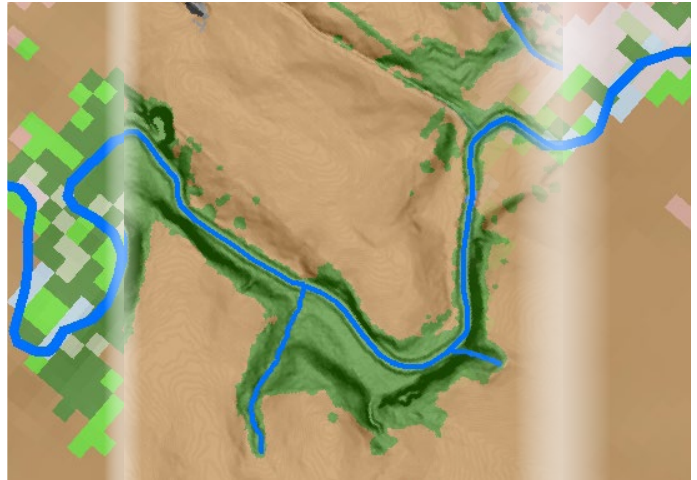
Harrisburg State Capitol Complex (below) visible in the Surface Model from 2016 lidar data

Uses of Lidar Data

Lidar data is processed to produce a variety of data layers, including height of tree canopy, building locations and heights, bare earth Digital Elevation Models and hillshades, and topographic contours. Lidar and its derivatives provide a standardized base map for cartographic products and geologic maps, as well as for accurate mapping of vector layers such as roads, trails, and streams. **Some applications for lidar are as follows:**

- Base maps
- Land cover
- Wetland determination
- Flood or inundation modeling
- Hydrography, flow-path, stormwater infrastructure (MS4)
- Archaeological and historical preservation
- Delineation of geologic hazards, such as landslides and sinkholes
- Forest canopy heights
- Energy and mineral resources
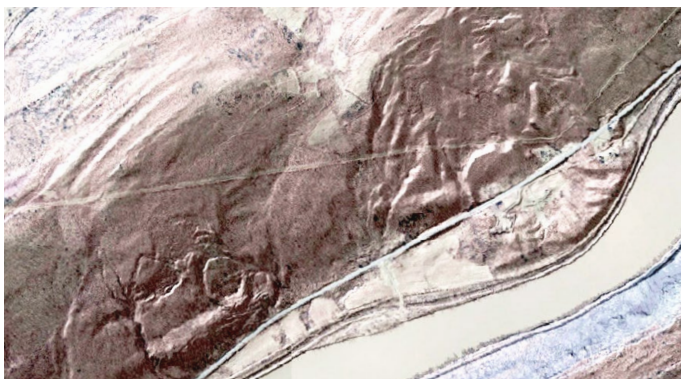- Infrastructure management
- Change mapping

2006 30m Land Cover Data Series from USGS along side the 2014 Chesapeake Conservancy High-Resolution Land Cover.
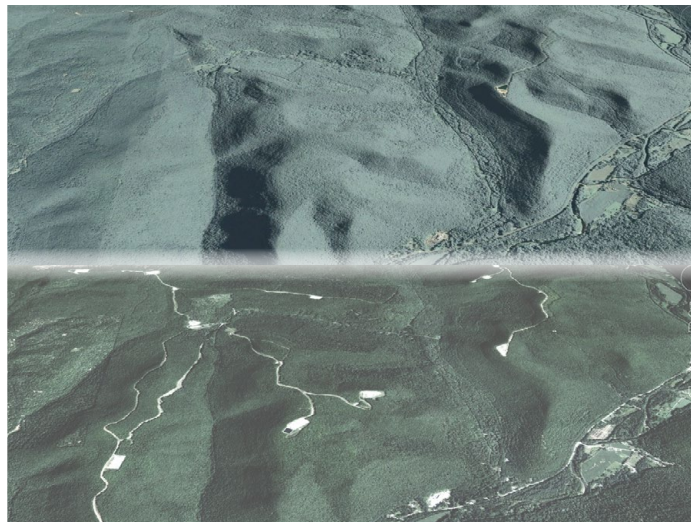

FEMA 100-year floodplain near Johnstown, PA displayed with 3D buildings. Building colors show the dollar loss estimate, with higher values in orange and red. Source: Cambria County GIS Center.

Comparison of the current stream mapping (green) to lidar-derived streams (blue). of the Upper Chiques Creek, Lancaster County.

Landslides caused >$18M damage to infrastructure in Allegheny County in the first third of 2018. Lidar images reveal scars and deposits from previous landslides and sinkholes that are masked by vegetation.

Mapping impervious surfaces with lidar data. Surfaces were classified as Buildings, Roads, and Other Impervious Surfaces.

Comparison of surface elevation before & after Marcellus well pad construction (above), and downslope impacts to water flow accumulation and soil moisture modeled using lidar data (below). Source: DCNR-Bureau of Forestry and Penn State University.