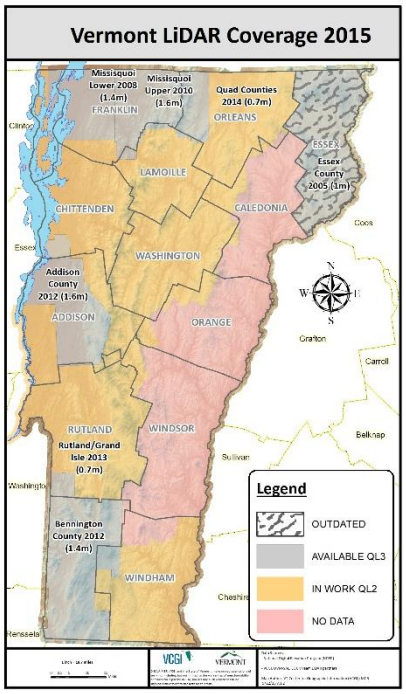
Vermont LiDAR Initiative: Critical Infrastructure

Introduction

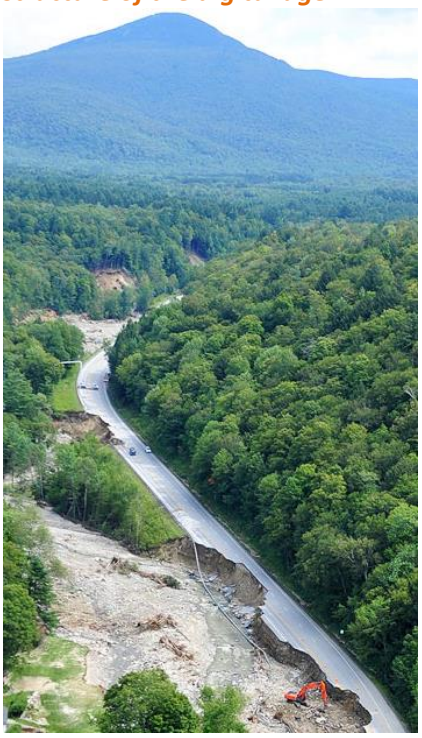
Highly accurate elevation data on hydrologic features, landforms, infrastructure and other features is beneficial for improving flood readiness, public safety and emergency management, water quality, resiliency and decision support. ***Light Detection and Ranging (LiDAR)*** technology is currently the most efficient and cost effective means of acquiring this data for the state. ***Current up-to-date coverage is 70%*** with an estimated $960,000 needed to complete the state.



Post TS Irene, the public safety, emergency and environmental resource communities joined a broad range of other critical state interests in identifying ***statewide high resolution elevation data as a critical need.*** With assistance from the state and matching federal funds ***full state coverage could be achieved by 2017***.

LiDAR = Critical Infrastructure

Just as roads, bridges and water supply were the physical infra-structure of the industrial age, ***electronic data is the infra-structure of the digital age.***



Rt 4 between Killington & Mendon, VT. Photo: Lars Gange & Mansfield Heliflight

Few sources of geospatial data offer the richness of "LiDAR as infrastructure" to inform todays more technical society.

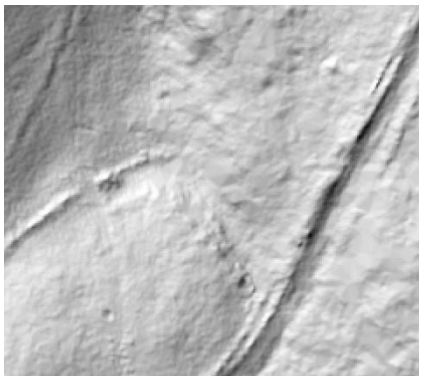
Flood Risk Management

Currently half the state is without Digital Flood Insurance Rate Maps (DFIRMs), and other areas need updated studies. DFIRMs help inform flood hazard areas permitting by municipalities and state agencies and also flood damage mitigation planning.

Infrastructure Management

LiDAR is used in preliminary project and construction planning of culverts, bridges and roads and provides more accurate storm water modeling results. It also improves road centerline data and linear referencing system accuracy and the identification of "Ancient Roads", class 4 town highways, legal trails and historic features.

Ancient Road on Aerial Imagery Only



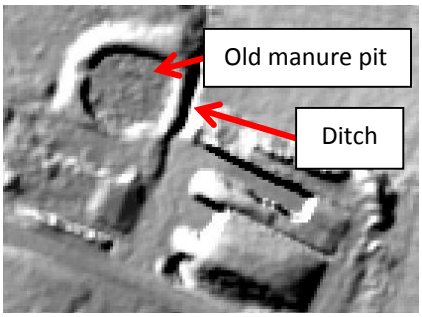
Ancient Road on "Bare Earth" DEM

Natural Resources Conservation

LiDAR helps identify water flow paths across farmland to aid water quality protection, the restoration activities of poor cropland back into wetlands, planning riparian area practices and ***reduces onsite engineering activities***.

Site specific maps afford technical staff the ability to conduct advance planning and assessment at the individual site level, thus ***improving conservation planning***

efficiency, identification of site specific water quality concerns and focusing outreach.

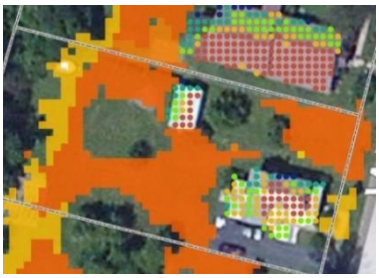


Water Supply and Quality

Enhanced elevation data also supports fluvial geomorphic assessments, river corridor delineation and informs critical analyses ***identifying non-point phosphorus inputs to Lake Champlain and other basins.***

Renewable Energy

LiDAR Digital Surface Models (DSM) accounts for tree canopy, shading, building shape and rooftops etc. enabling the ability ***to model solar potential*** for both roof and ground mount solar photovoltaic (PV) arrays.



Solar Potential Mapping

Other renewables such as wind, biomass, hydro and their support infrastructure also benefit from the use of highly accurate Digital Elevation Models (DEM's) and "derivatives" such as slope, aspect and contour data.

Goals and Benefits

Completed in 2011, the National Enhanced Elevation Assessment (NEEA) sponsored by the National Digital Elevation Program's (NDEP) 12 Federal member Agency notes the need and value of high quality topographic information, acquired via terrestrial or airborne LiDAR. Subsequently, NDEP created the "3D Elevation Program" initiative adopting the ***top ten "enhanced elevation data support critical applications"*** identified in the NEEA that apply to Vermont:

Table 1. Top NEEA business uses

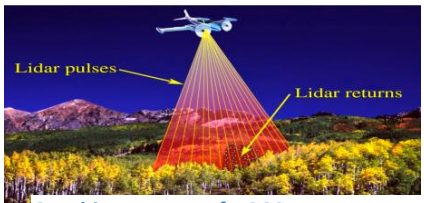
#	Business use
1	Flood risk management
2	Infrastructure/constr. mngmnt
3	Natural resources conservation
4	Agriculture and precision farming
5	Water supply and quality
6	Wildfire manage/plan/response
7	Geologic resources and hazard
8	Forest resources management
9	River/stream resource mngmnt
10	Aviation navigation and safety

This initiative was also endorsed by the National States Geographic Information Council and the National Geospatial Advisory Committee. The confluence of support for data acquisition is reflected in the 3DEP primary goal to ***"systematically collect enhanced elevation data … over the conterminous United States…on an 8-year schedule."***

LiDAR at a Glance

LiDAR is a remote sensing method using light in the form of a pulsed laser to measure ranges (variable distances) to the Earth yielding precise elevation data. When combined with other data it generates ***precise, 3D information about the shape of the Earth, i.e., "Bare Earth" DEMs, DSMs and their "derivatives".***

The combined utility of LiDAR elevation products supports such a wide array of applications that it can truly be considered a form of critical digital infrastructure. For more technical details see the ***"More Info"*** section below.



Graphic courtesy of USGS

Coordination/Implementation

In 2012 the Vermont Center for Geographic Information ***(VCGI) formed the "LiDAR Workgroup"*** as a strategic response to Hurricane Irene with the goals of supporting the coordination, acquisition and dissemination of statewide LiDAR. The group is currently comprised of federal, state and local partners: U.S. Geological Survey, National Resource Conservation Service, UVM Spatial Analysis Lab, VT Assoc. of Planning & Dev. Agencies, VCGI, VT Agencies of Agriculture, Natural Resources & Transportation, Lake Champlain Basin Program, U.S. Forest Service, VT Sustainable Jobs Fund and the VT Geological Survey.

Summary

As the state GIS coordinating organization, VCGI is committed to the success and long-term support of this effort. Existing and future data from this program will be shared with appropriate federal data portals to provide the public with multiple data access points.

For More Information

See the VT LiDAR Initiative web page at **vcgi.vermont.gov/lidar**

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