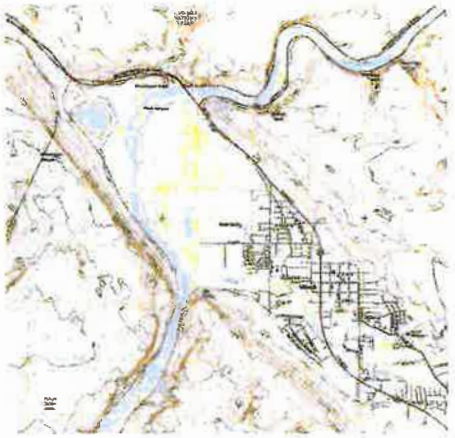
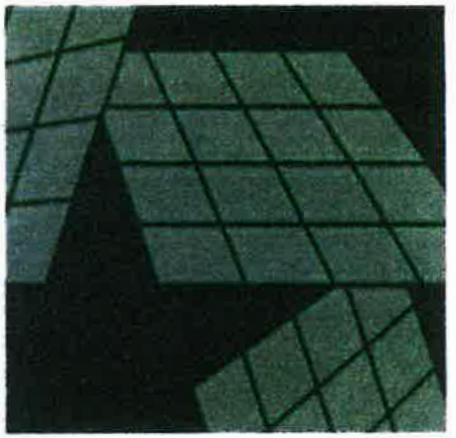
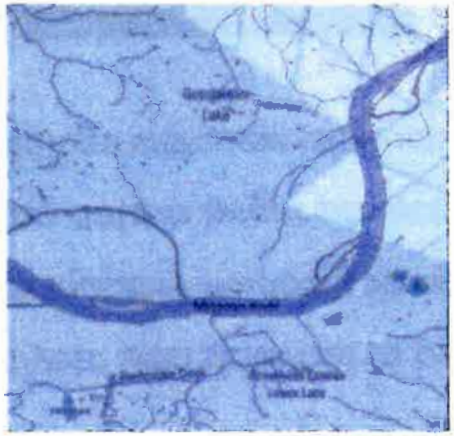
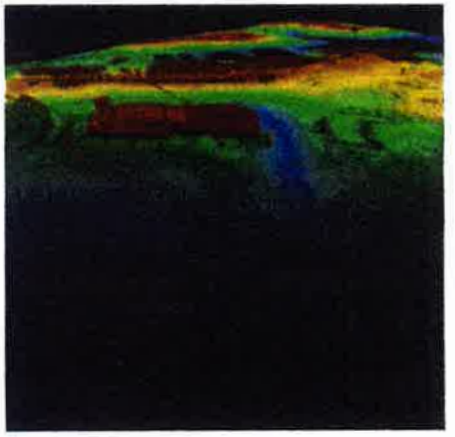
3D Elevation Program (3DEP)









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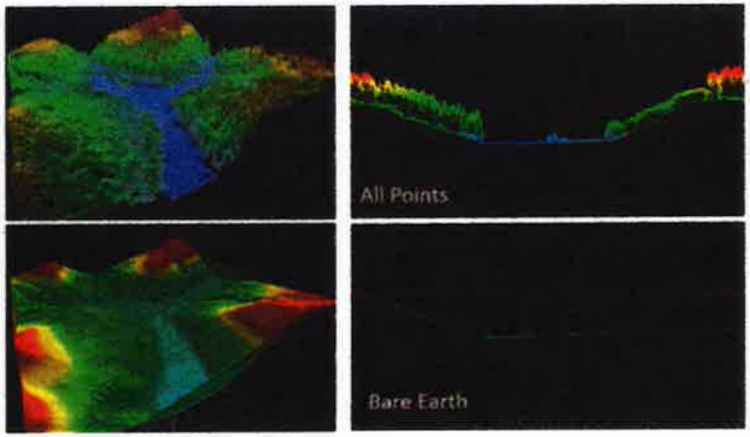
Kevin T. Gallagher
Associate Director, Core Science Systems
September 13, 2018

3D Elevation Program (3DEP)

- Apply lidar technology to map bare earth and 3D data of natural and constructed features
- Goal to complete acquisition of national lidar coverage with IfSAR in Alaska in 8 years, by 2023
- Address the mission-critical requirements of 50 states, 34 Federal agencies, and other organizations documented in the National Enhanced Elevation Assessment
- ROI 5:1, conservative benefits of $690 million/year with potential to generate $13 billion/year
- Leverage the capability and capacity of private industry mapping firms
- Achieve a 25% cost efficiency gain by collecting data in larger projects
- Completely refresh national elevation data holdings with new products and services



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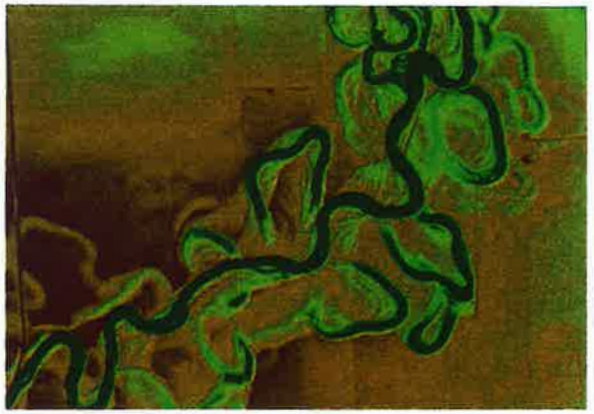
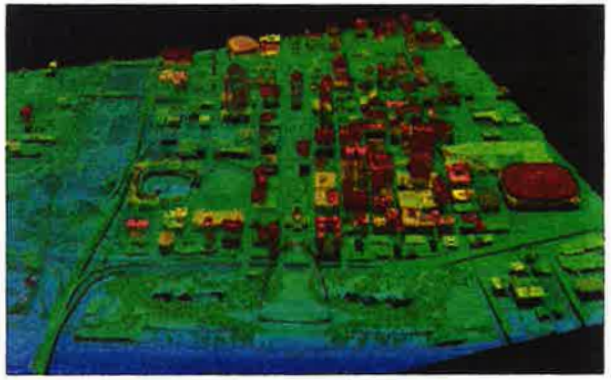
National Enhanced Elevation Assessment (NEEA)

Rank	Business Use	Annual Benefits	
		Conservative	Potential
1	Flood Risk Management	$295M	$502M
2	Infrastructure and Construction Management	**$206M**	**$942M**
3	Natural Resources Conservation	$159M	$335M
4	Agriculture and Precision Farming	**$122M**	**$2,011M**
5	Water Supply and Quality	$85M	$156M
6	Wildfire Management, Planning and Response	**$76M**	**$159M**
7	Geologic Resource Assessment and Hazard Mitigation	$52M	$1,067M
8	Forest Resources Management	**$44M**	**$62M**
9	River and Stream Resource Management	$38M	$87M
10	Aviation Navigation and Safety	**$35M**	**$56M**
:			
20	Land Navigation and Safety	**$0.2M**	**$7,125M**
	Total for all Business Uses (1 – 27)	**$1.2B**	**$13B**



Flood Risk Management



Infrastructure

Landslides

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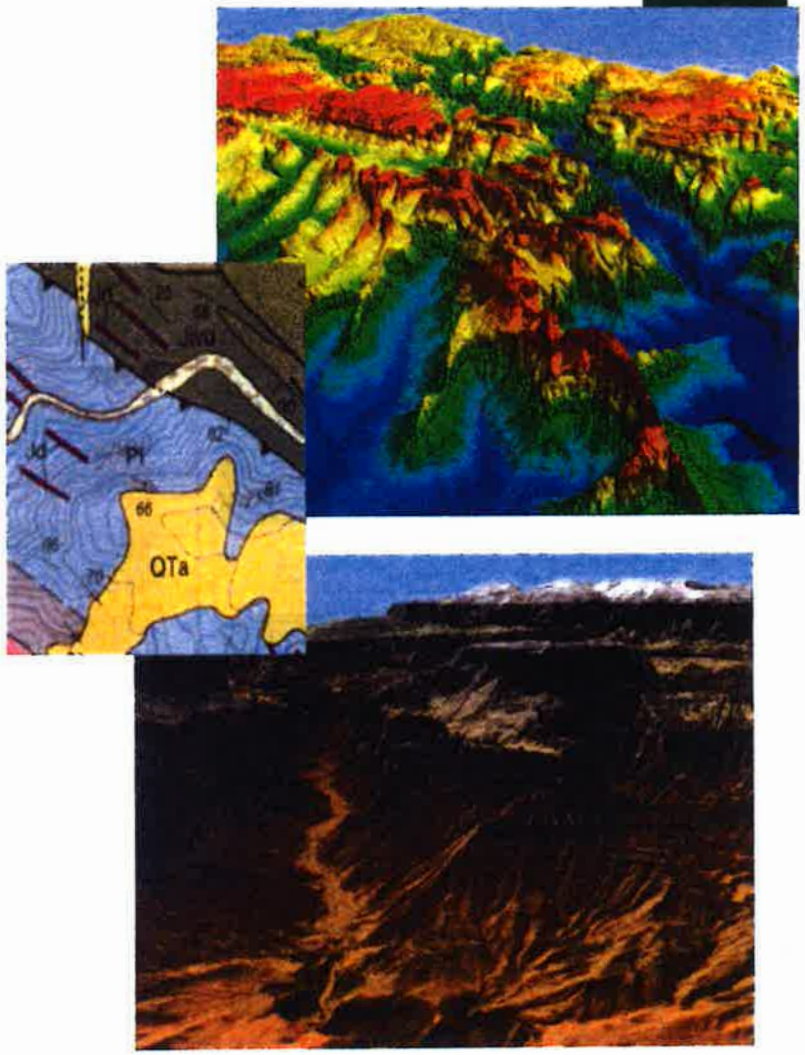
3DEP for Critical Mineral Independence

Lidar is essential for Geologic Resource Assessment

- Critical for mapping young deposits and landforms, which are those most essential to understanding Earth resources
- Underpins geologic mapping that guides assessment and development of solid-Earth resources: base and precious metals, sand and gravel, coal, oil, and natural gas
- Supports site-specific engineering studies by the geotechnical industry
- Improves the efficiency of geologic mapping, dramatically improves the spatial precision of geologic maps, and increases the number of units that can be mapped, in some cases doubling them



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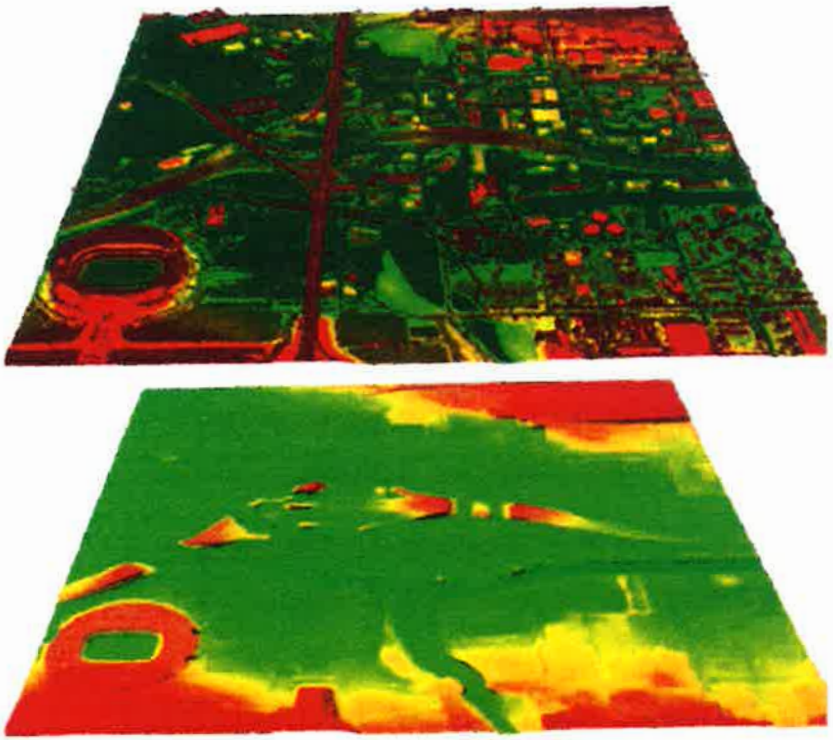
3DEP For America's Infrastructure

The significant challenge of improving the Nation's infrastructure depends on high-quality elevation data



Lidar point cloud (top) and a derived bare-earth digital elevation model (bottom) for Denver, CO

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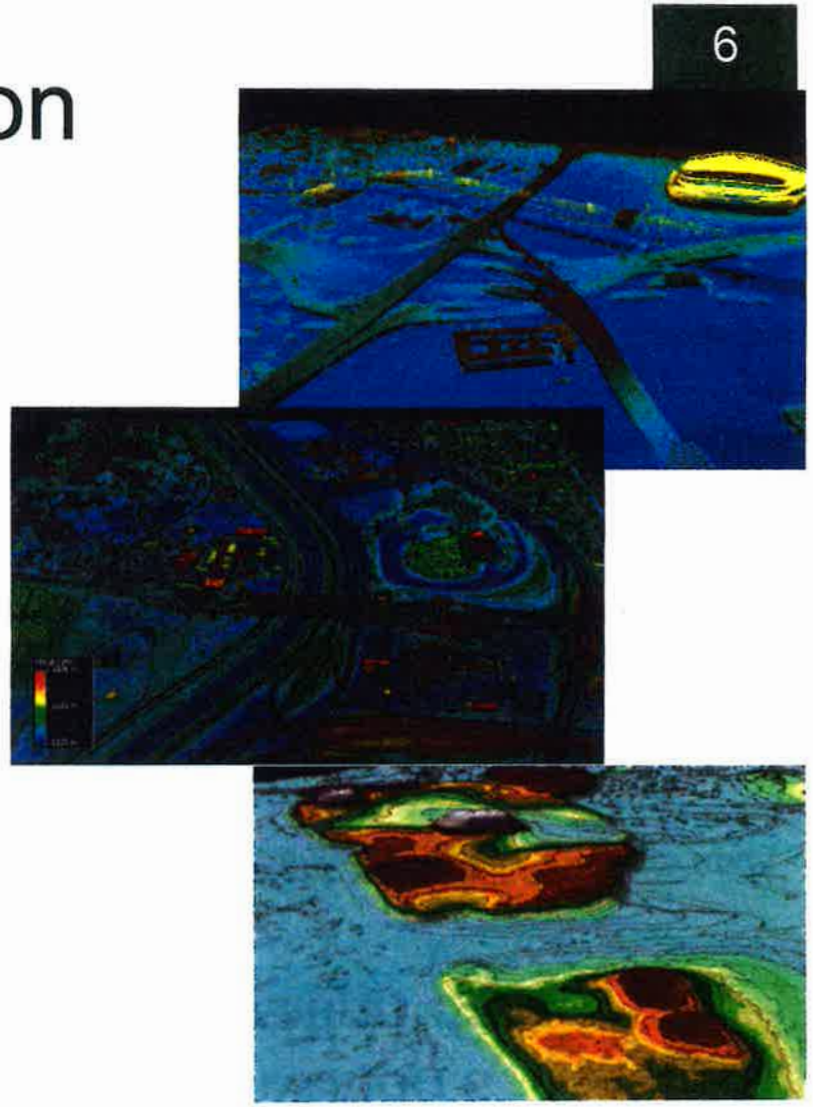
Uses include:

- Route, grade, line-of-sight, and utility surveys and corridor mapping
- Terrain and other obstruction identification for aviation
- Dam, levee, and coastal-structure failure modeling and mitigation
- Hydraulic and hydrologic modeling
- Evaluations of geologic, coastal, and other natural hazards, and geotechnical evaluations
- Permit application and construction plan development and evaluation
- Drainage issues and cut-and-fill estimate requirements
- Vegetation, topographic, and geomorphologic feature analysis
- As-built model development
- Preliminary engineering, estimate development, and quantity estimation activities
- Bridge site selection
- Base-map and elevation model creation

3DEP for Transportation

Planning and Development

- Economically site new or relocate existing infrastructure facilities and make final design plans
  - Dramatically reduces the amount of time needed to understand the area in 3D compared to surveying
  - Provides greater safety over other traditional surveying methods because it reduces the number of surveyors in traffic
  - Reduces intrusion into private properties
- Common uses include:
  - Calculate cut and fill, culvert sizing, amount of vegetation removal, grade calculation and more
  - Height clearances
  - Right of way and surface conditions
  - Identification of cultural and sensitive sites



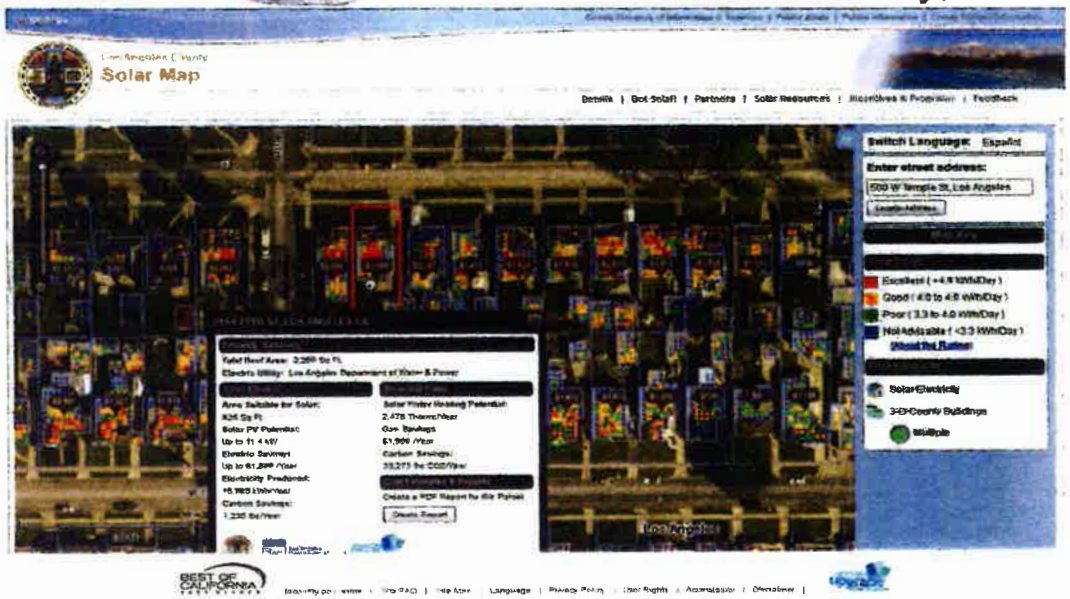
The Kentucky Transportation Cabinet realized tremendous savings from compressed design timeframe and reduced fieldwork, including the identification of previously unknown prehistoric and historic earthworks and mounds and other cultural and sensitive sites

3DEP Powering Our Future

Conventional and Alternative Energy Resources

- Routing transmission lines and pipelines, construction planning, encroachment control, and asset inventories
- Calculating wind potential
- Planning, construction and operation of hydro power
- Determining solar potential - lidar provides roof pitch/aspect, etc.

From NEEA Study, 2011



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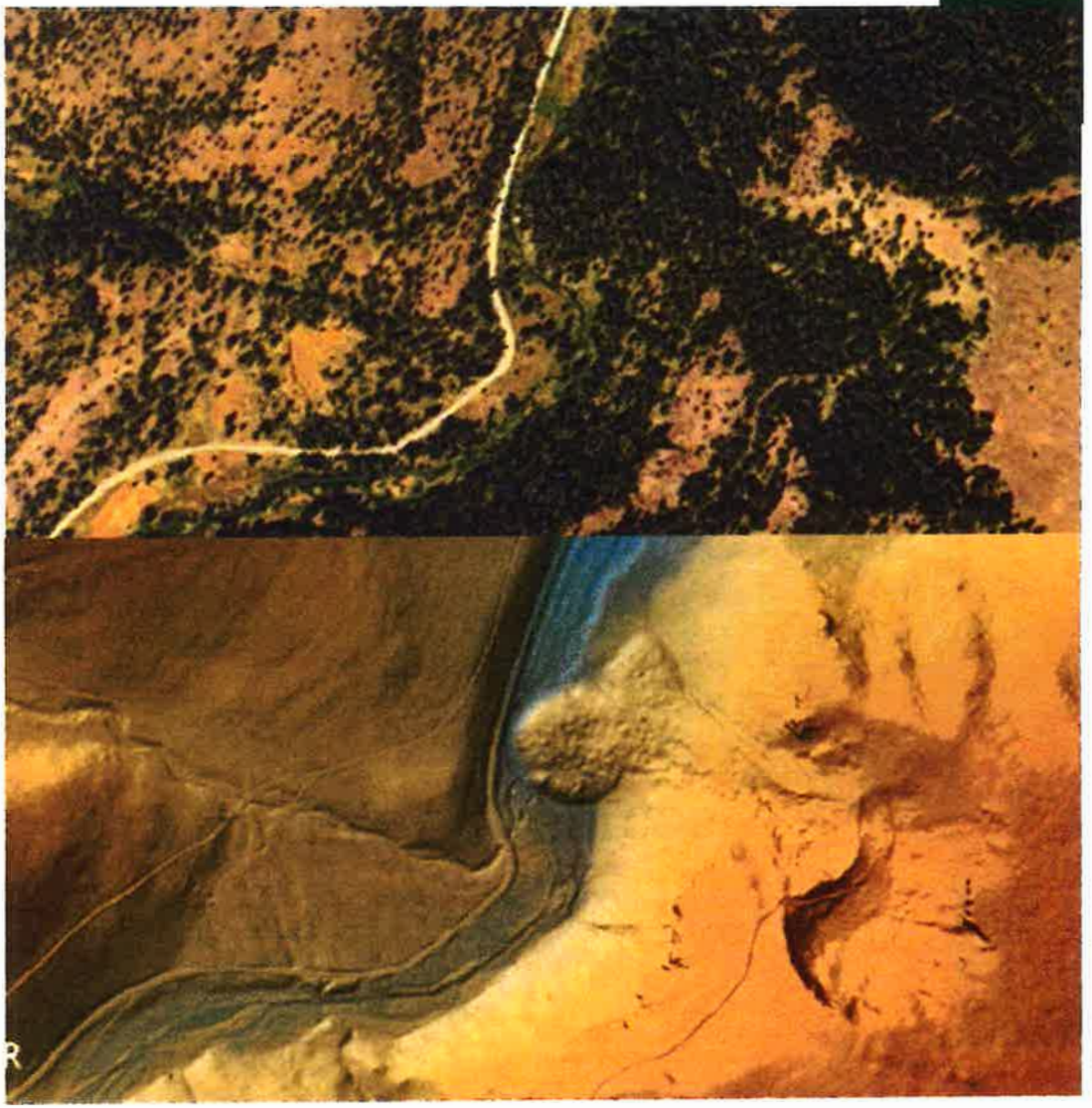
Landslide Hazards

John Day, OR area

- Aerial photo image (top)
- Lidar image (bottom) of same area provides visible evidence of landslide activity



OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES 1937

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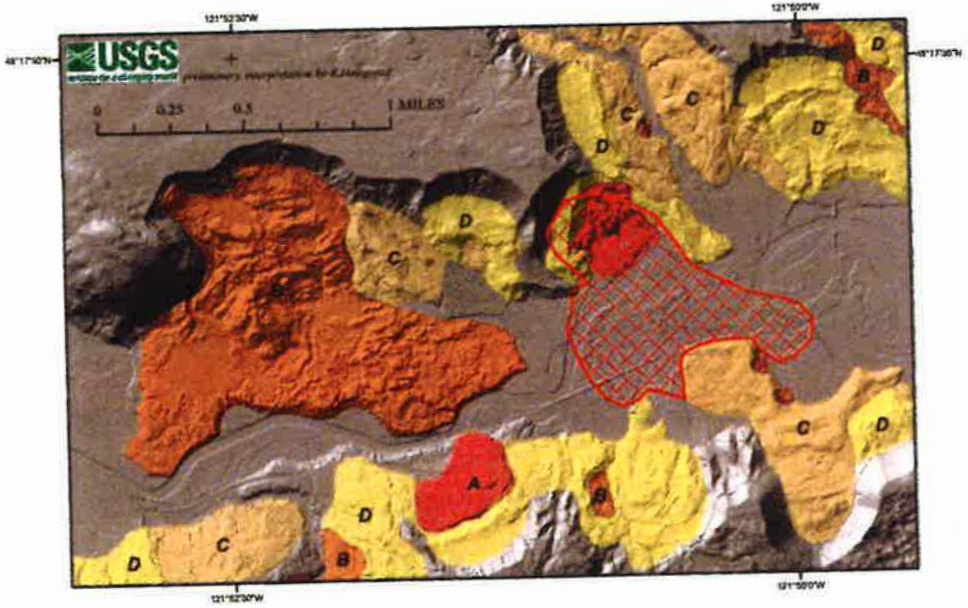
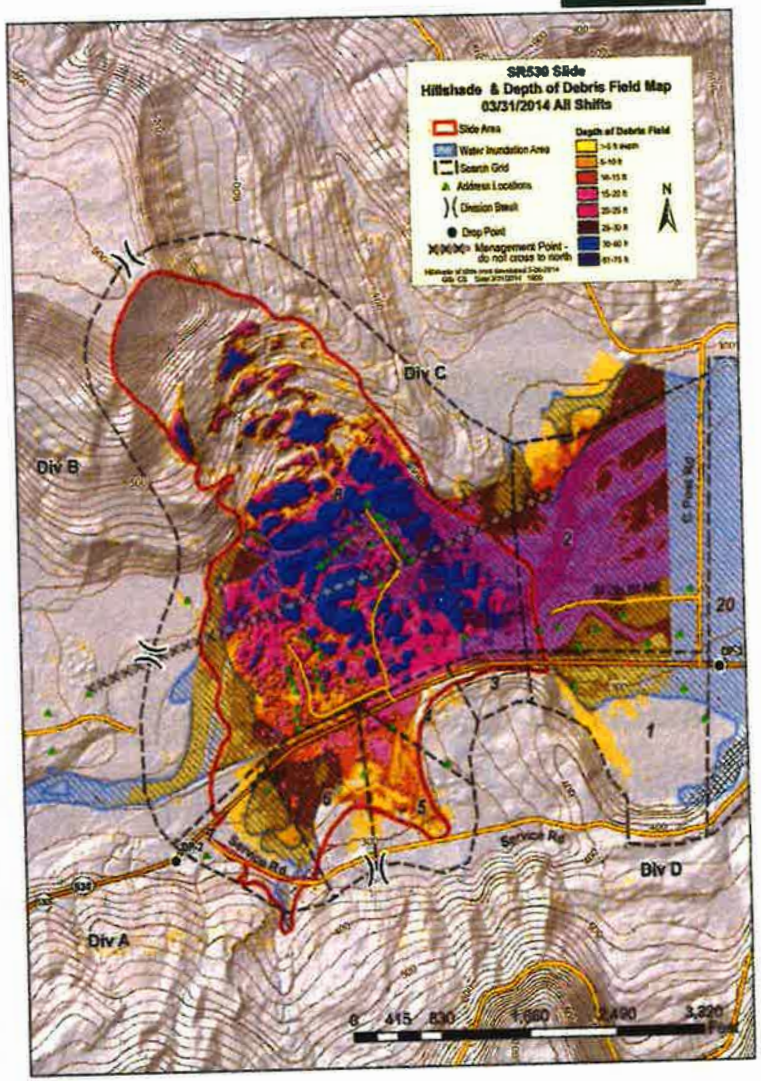
Revealing historic and potential landslides

Oso, WA Landslide March 22, 2014





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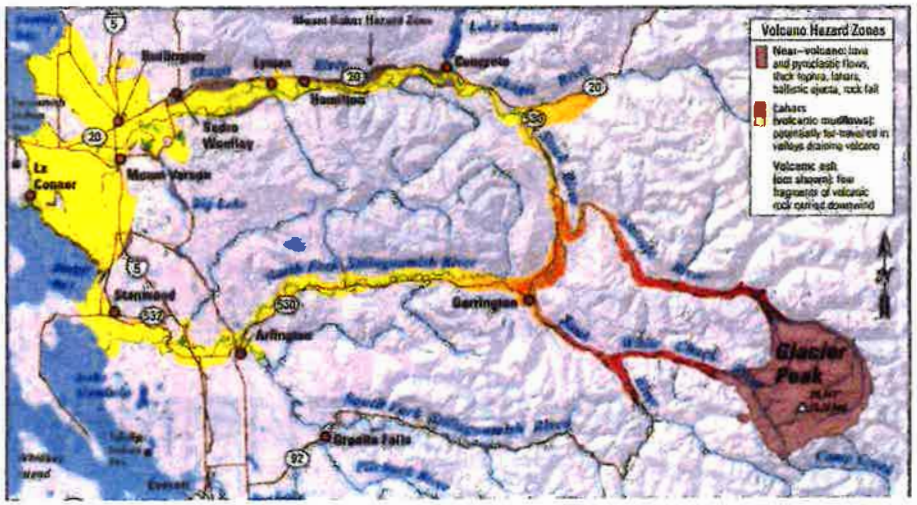
3D Elevation Program (3DEP)

3DEP for Volcano Hazards

- Model volcanic processes and the path of lahars that can travel downstream to populated areas
- Plan for escape routes
- Unravel the volcano's history by mapping volcanic deposits hidden by heavy forest cover and inaccessible on steep terrain
- Design a new real-time monitoring network



Glacier Peak Volcano, WA

Courtesy of D. Ramsey, USGS

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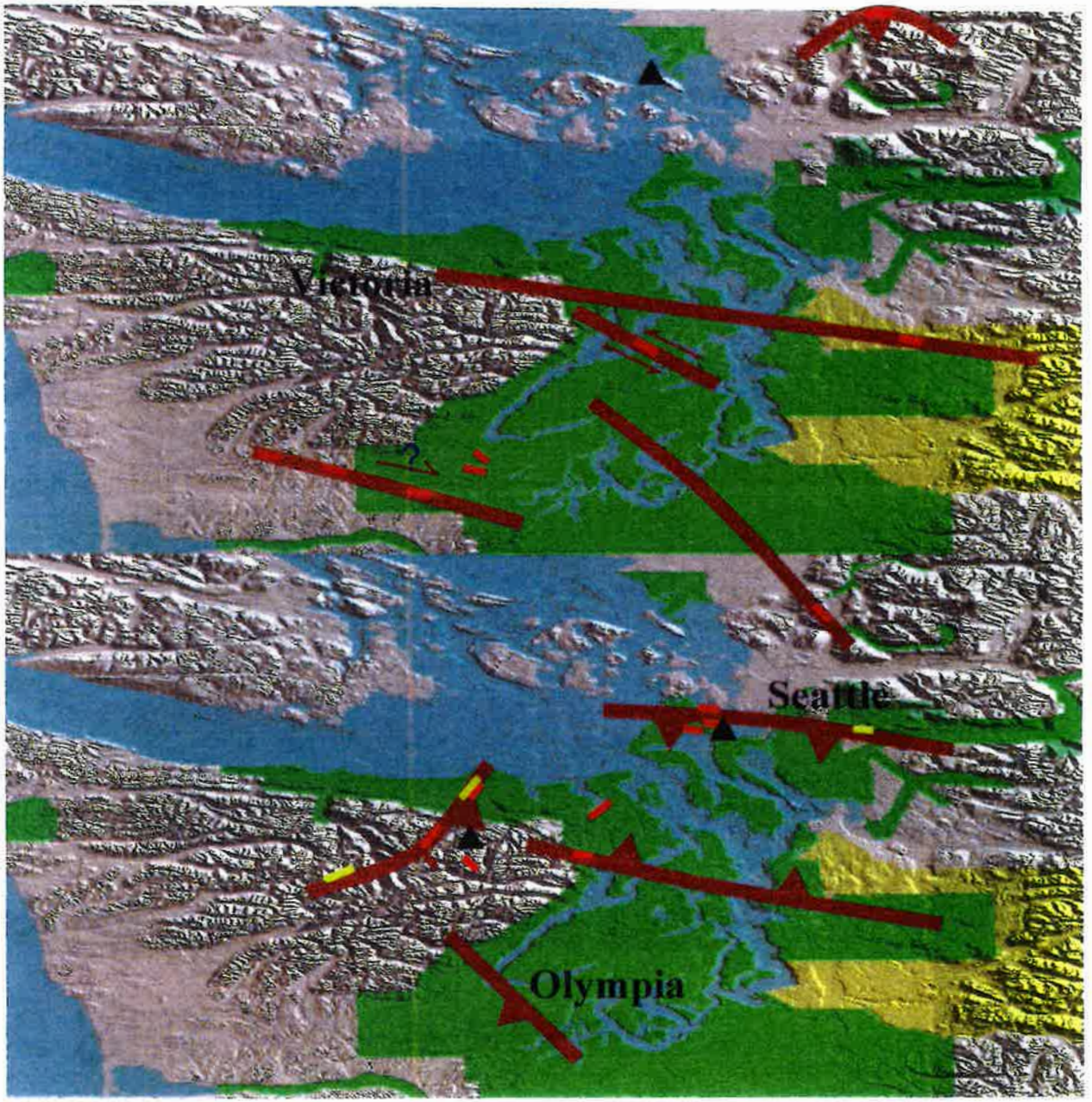
3DEP for Seismic Hazards

Detecting Faults



Scarp found with lidar

Scarp found other means

Geomorphic evidence of shoreline uplift

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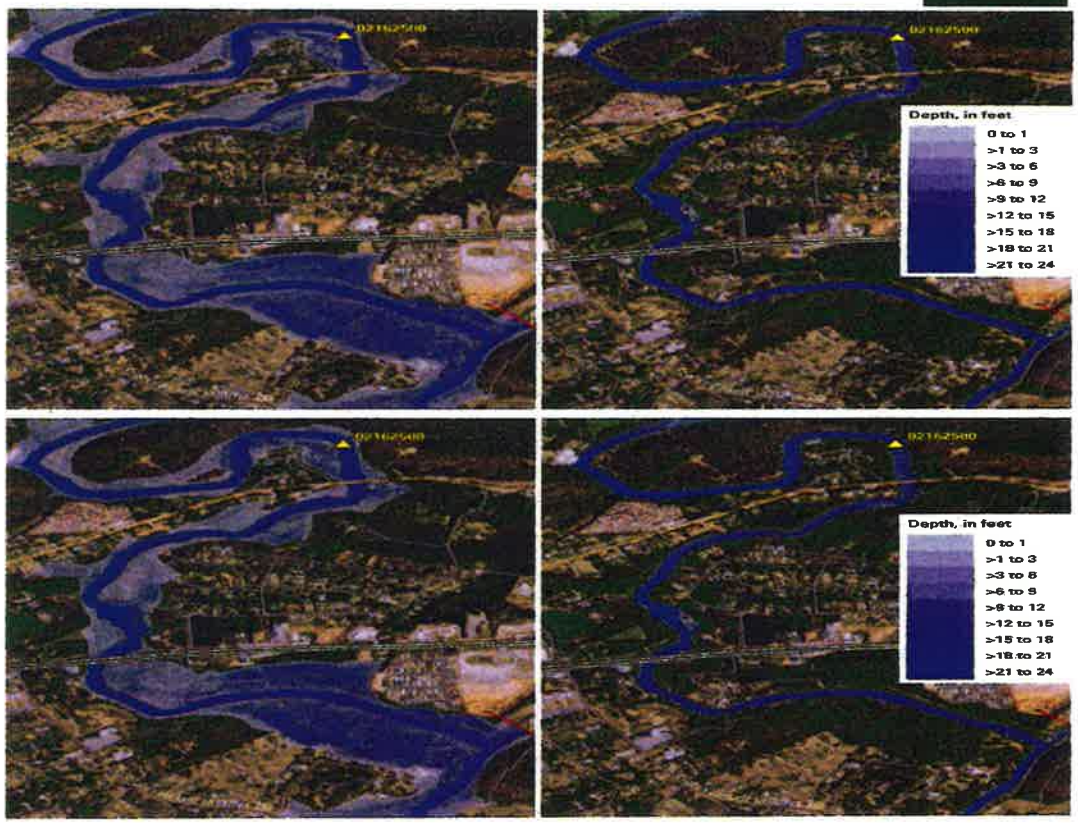
Holocene Tectonism PI: Ralph Haugerud, USGS

3DEP for Flood Risk Management

Conservative annual benefits estimated at $502M

- Produce higher quality flood maps, including Flood Insurance Rate Maps
- Manage dam and levee safety programs to reduce flood risks
- Improve hydrologic modeling and flood forecasting
- Improve State and local flood risk management and response
- Improve storm water facilities and dam design
- Extract building footprints and identify the finished floor elevation to quantify potential damages based on flooding depths



Lidar aids hydraulic modeling to determine flood-inundation on the Saluda River, near Greenville, SC

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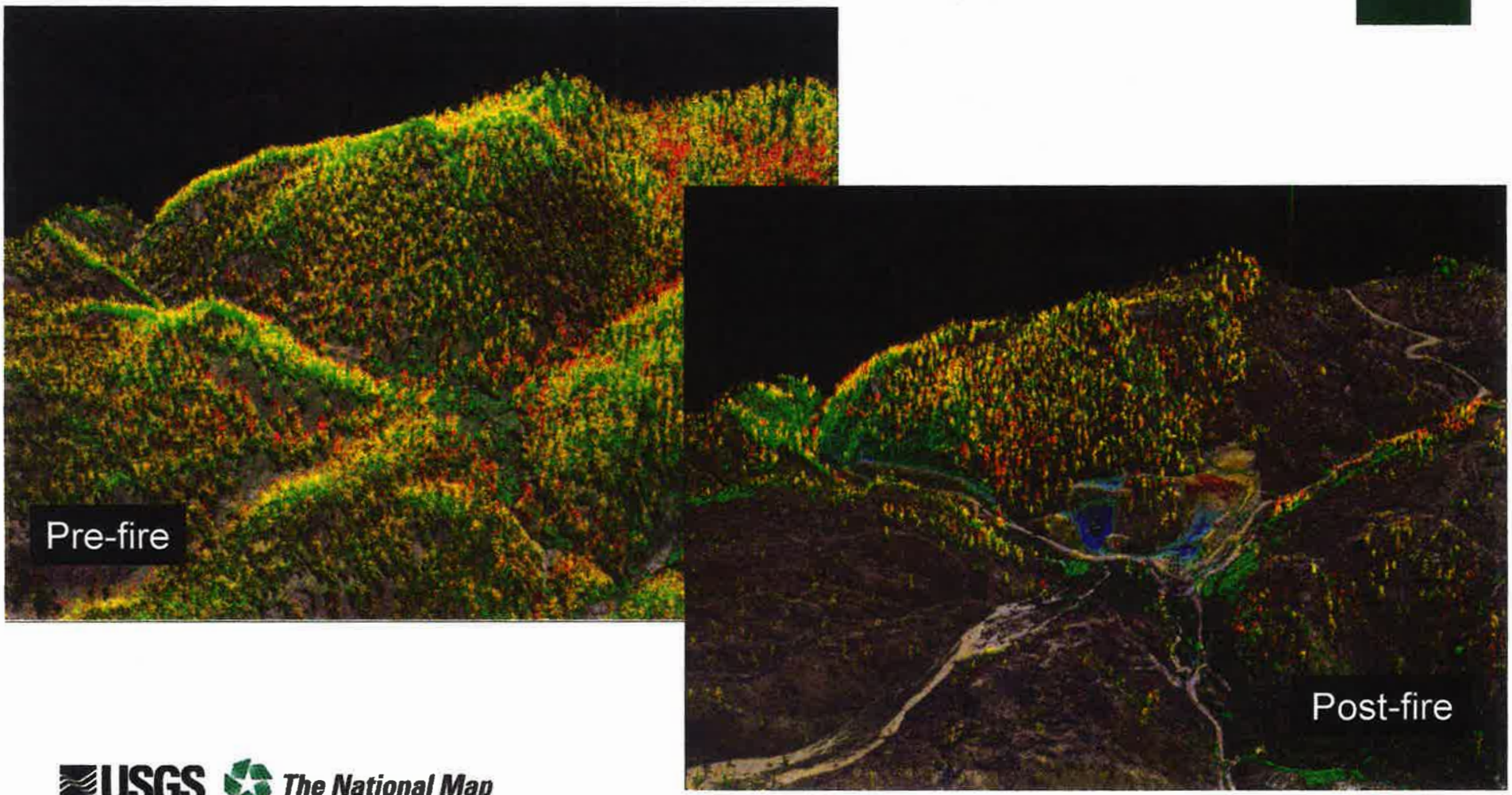
3DEP for Assessing Fire Disturbance

Hayman Fire, CO



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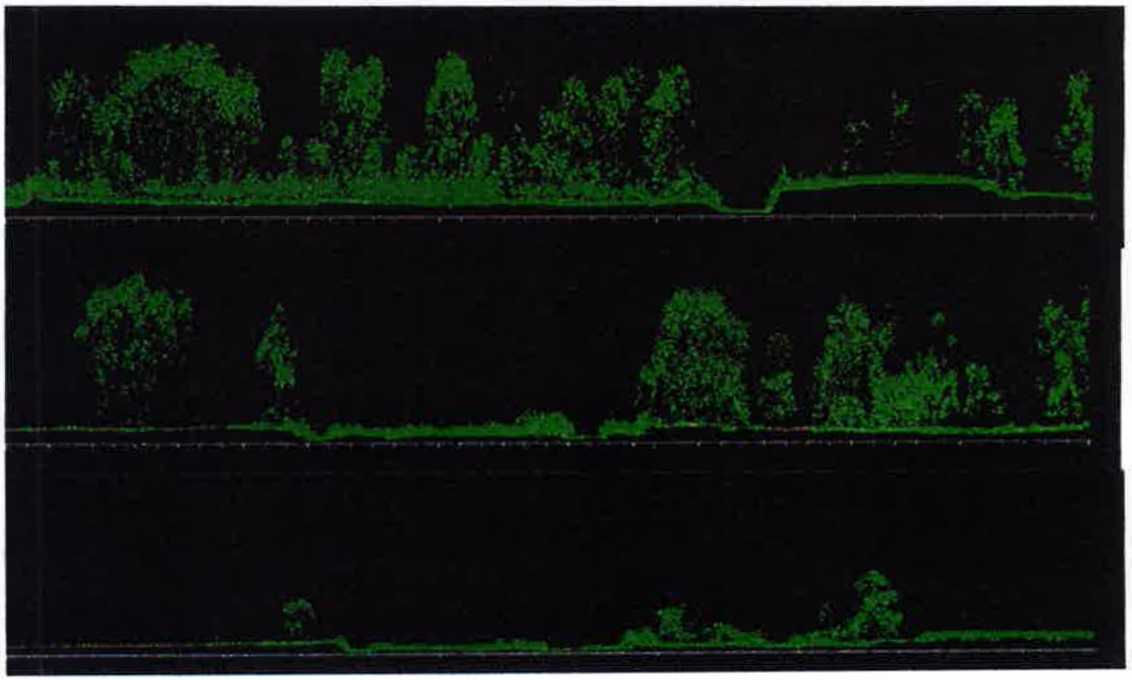
3DEP for Forestry

Estimate metrics for forestry inventory and habitat assessmer

- Canopy closure, width and height
- Tree Stem density
- Total tree volume (m^3/ha)
- Biomass



Enabling Precision Agriculture

Improved Data Quality with 3DEP

Courtesy of NRCS

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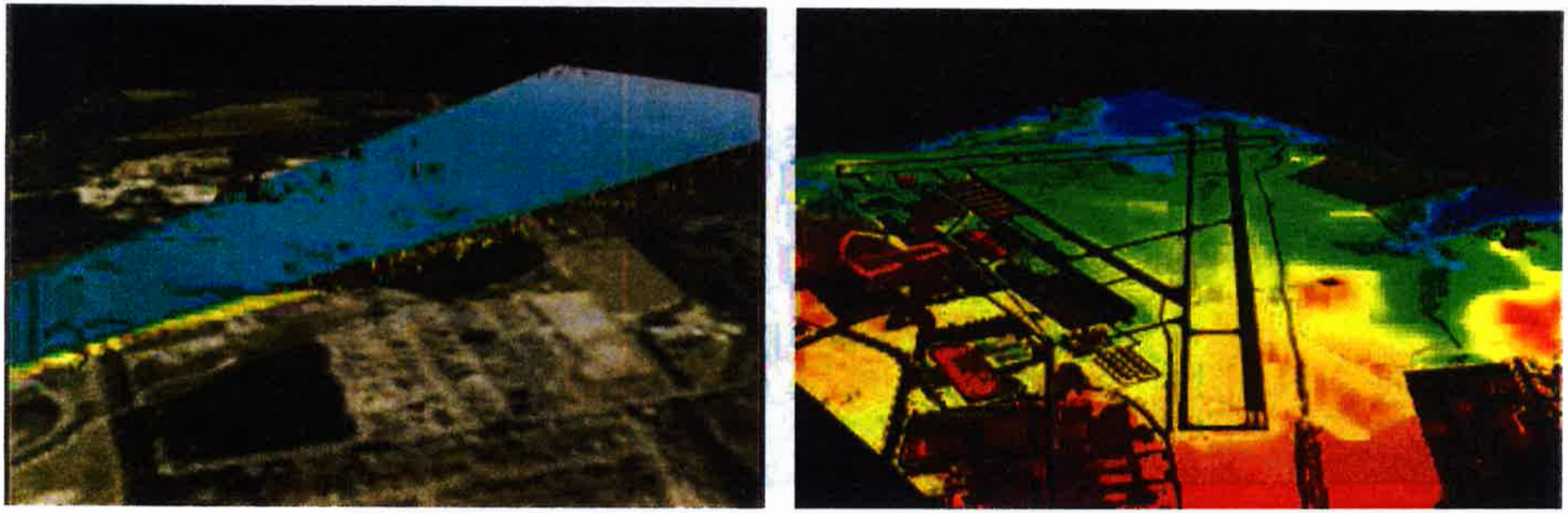
3DEP for Aviation Navigation and Safety

Detect Obstacles to Air Navigation



From NEEA Study, 2011

3DEP Partnerships

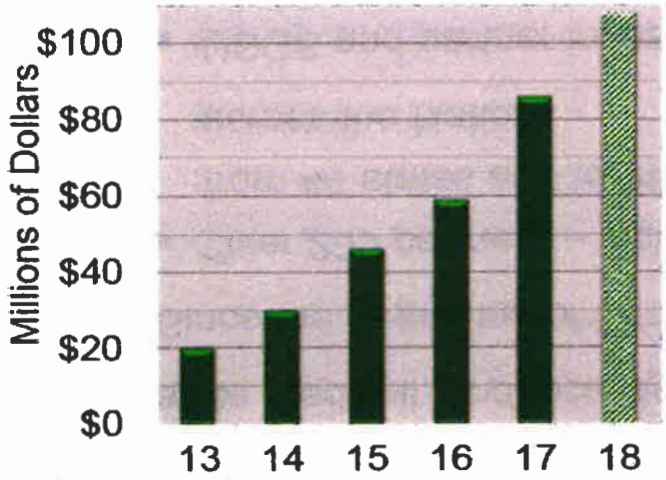
Taking stock

- 3DEP is managed by USGS on behalf of a broad partner community that includes state, Federal, and local agencies, as well as the private sector and non-profit groups
- Since the beginning of FY15
  - Over 200 partners – including 16 Federal agencies and state and local governments from 44 states and territories – have contributed funding for 3DEP data acquisition across the Nation
  - USGS and partner investments totaling $299.6M supported acquisition of 1.5 million square miles of data
  - The total coverage of 3DEP data available or in progress is approaching 50% of the Nation
  - Growing demands for higher quality, repeat coverage, new products and services
- Areas lacking coverage include significant areas of Federal and other lands in the West

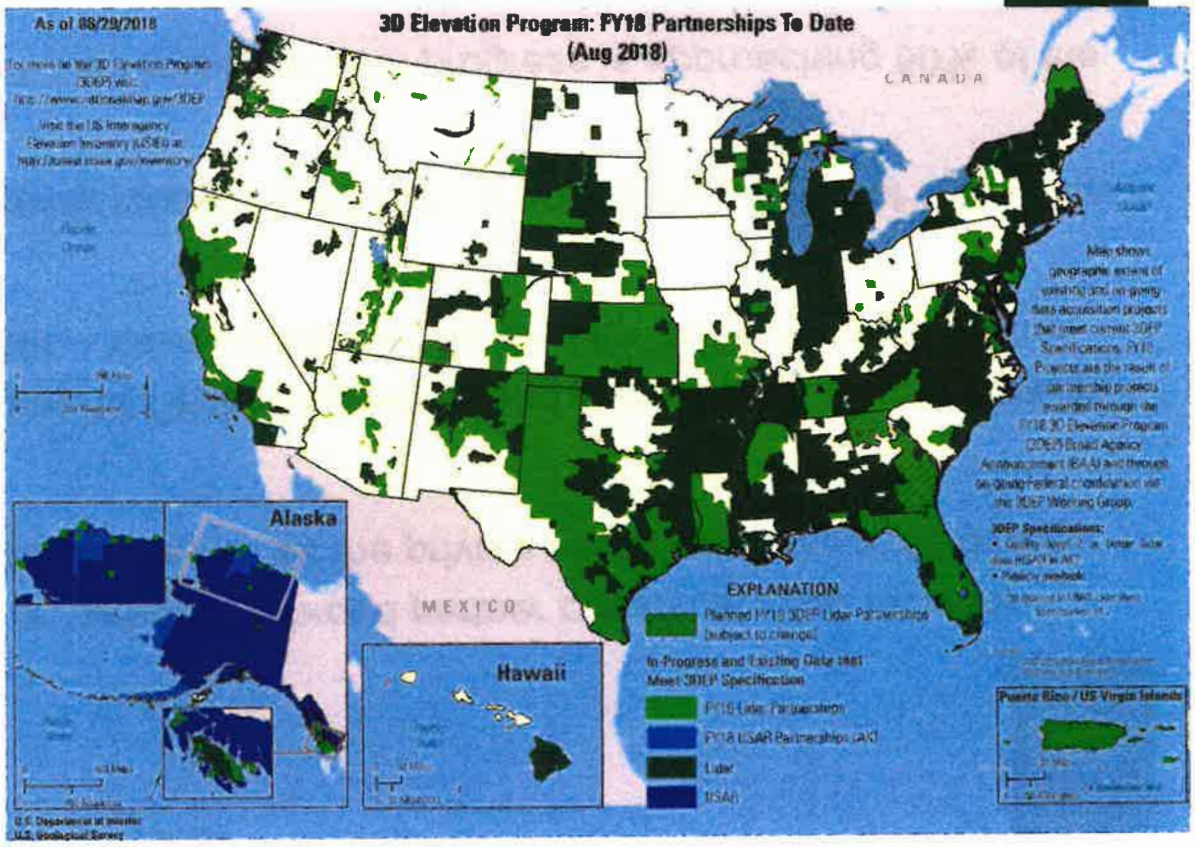
3D Elevation Program (3DEP)

Data are available or in progress for 48% of the Nation

*includes lidar and AK IfSAR



Data acquisition investments by all partners, by fiscal year - FY18 in progress



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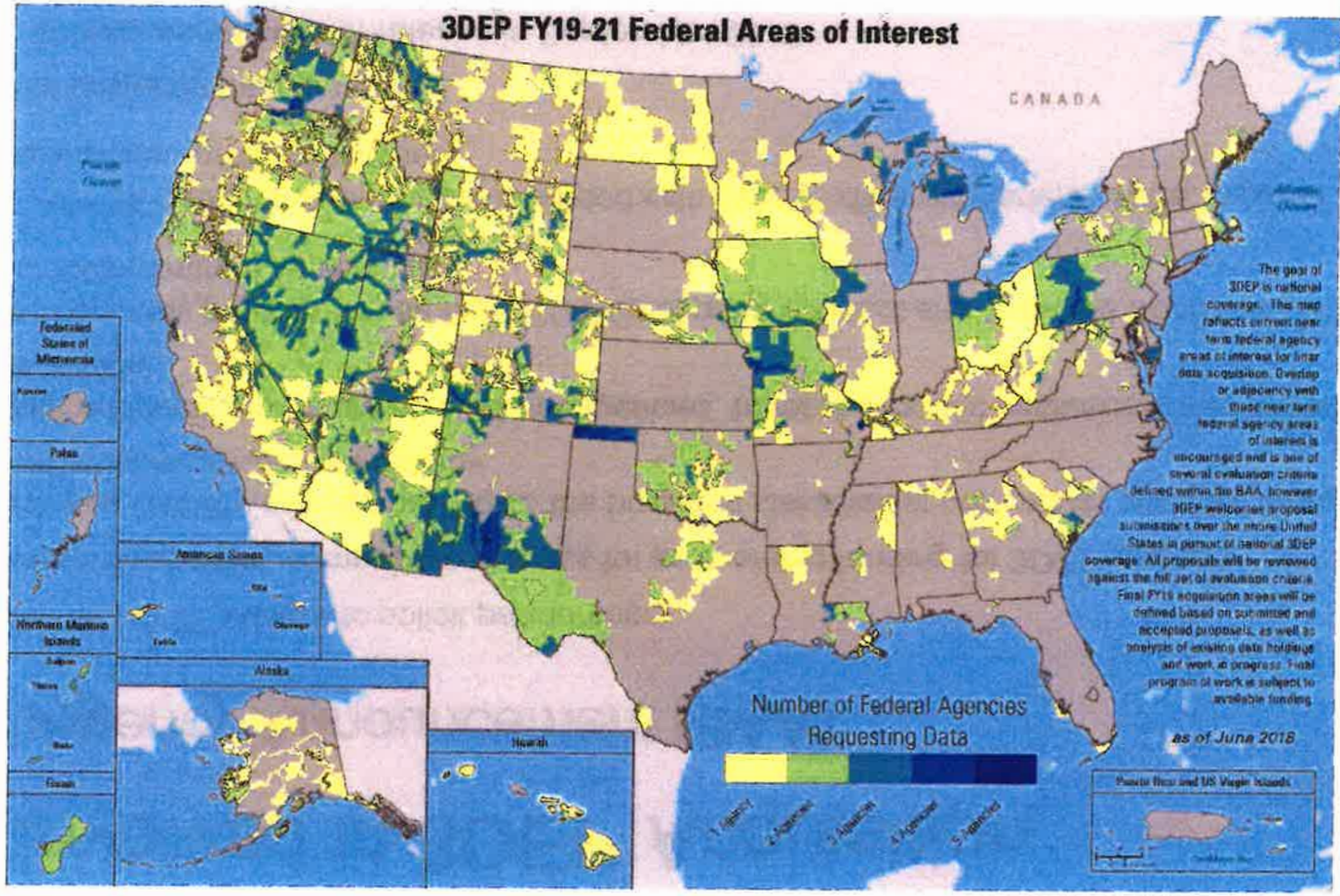
Get Involved in 3DEP Acquisition

Broad Agency Announcement (BAA)

- BAA is the USGS vehicle to solicit partnerships
  - Open, transparent, competitive process for partnership funding for 3DEP projects
  - Provides visibility and opportunity to the broadest stakeholder community possible through FedBizOpps.gov and grants.gov
  - State and local governments, Federal agencies, tribes, academic institutions, and private sector are eligible
  - Partners may propose to use the USGS Geospatial Product and Services Contracts (GPSC) or their own contracting vehicles
- FY15 – FY18 a total of 119 proposals funded with over 95 different Federal, state, regional, local, private and non-profit participants
- Get in involved in the next round!
  - FY19 BAA scheduled for release in September, 2018
  - FY19 BAA proposals scheduled to be due in November, 2018
  - Awards issued November 2018 – March 2019 based on the availability of funding
  - BAA remains open all year for additional proposals

3DEP Data Acquisition Partnerships

Working toward Federal Multi-Year Plan



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DRAFT – updated version will be published in the BAA

Get Involved in 3DEP Acquisition

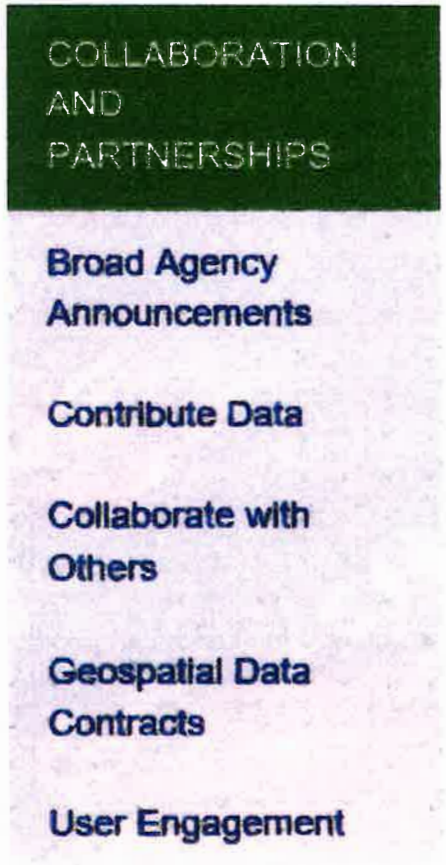
Resources

- Learn more about 3DEP

  nationalmap.gov/3dep

- Direct link to collaboration and partnerships

  https://on.doi.gov/2QogPE2



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Zion National Park, UT

3D Elevation Program (3DEP)