USGS: 3D Elevation Program (3DEP)
Meeting the needs of the Nation

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≋USGS
science for a changing world

The National Map
Your Source for Topographic Information

3D Elevation Program (3DEP)

- **Applies ground-breaking lidar technology to acquire and distribute three-dimensional data of bare earth, vegetation and structures at centimeter-level accuracy**

- **Increases the quality level of lidar being acquired to enable more accurate understanding, modeling, and prediction**

- **Goal to acquire national coverage in 8 years to serve a broad range of critical applications**

3DEP Data Quality
Improves and Enables Applications

10 meter resolution
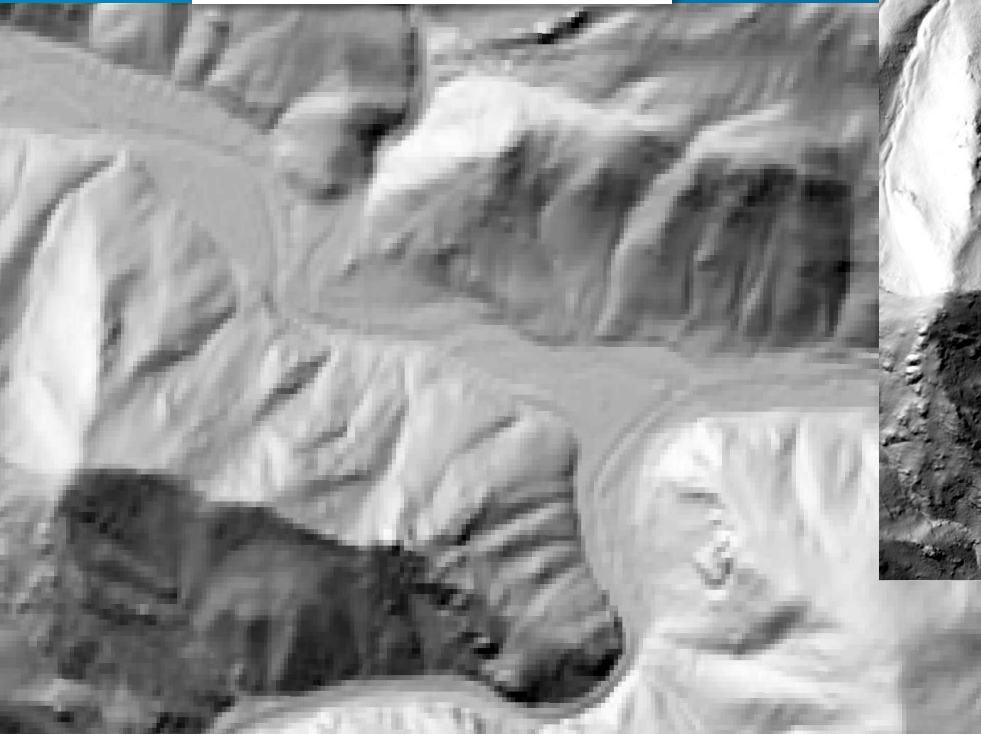
1 meter resolution

Enable: Flood Risk Management

Centimeters Matter!

- Red River, MN lidar shows changing river morphology

- QL2 provides 10 cm of additional accuracy over QL3 – critical to flood risk management, particularly in areas of low relief
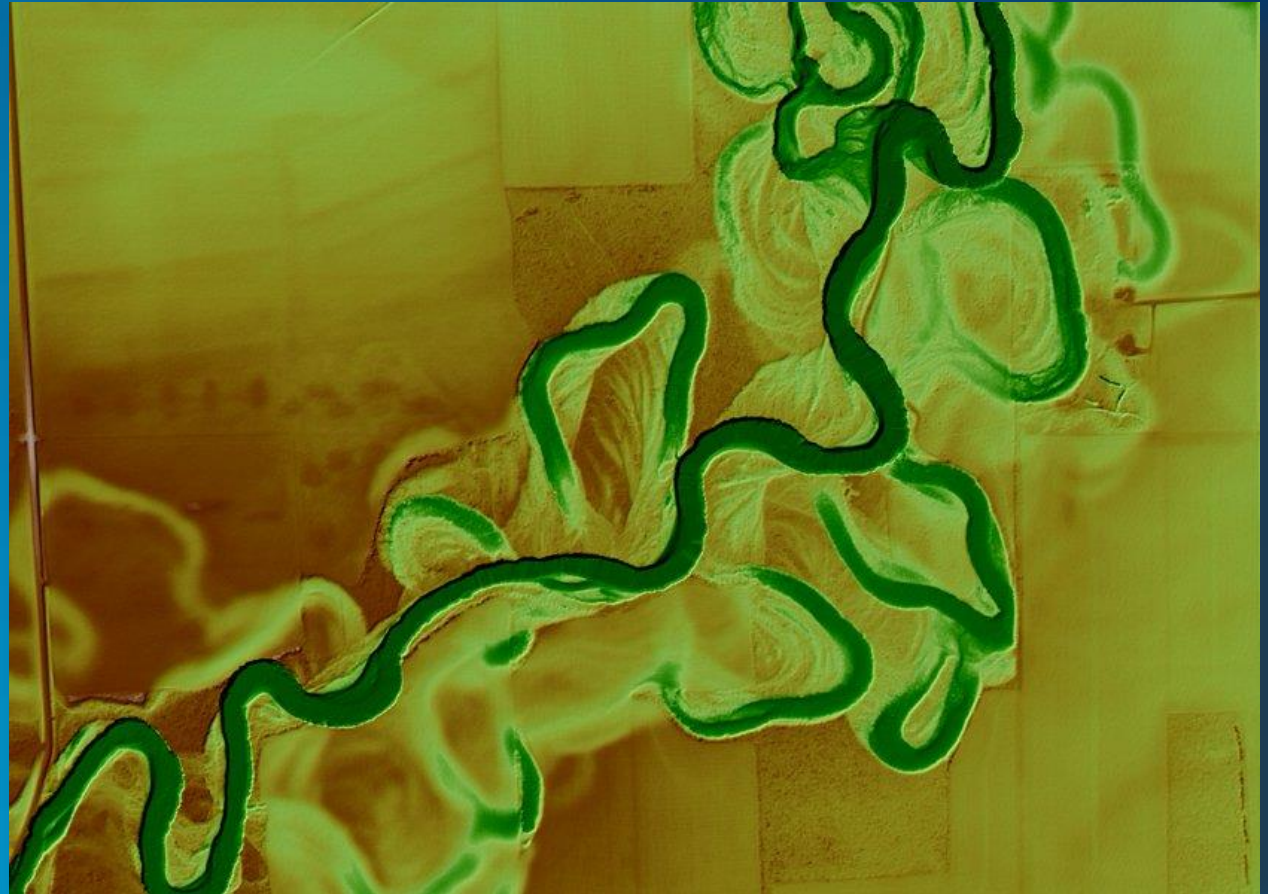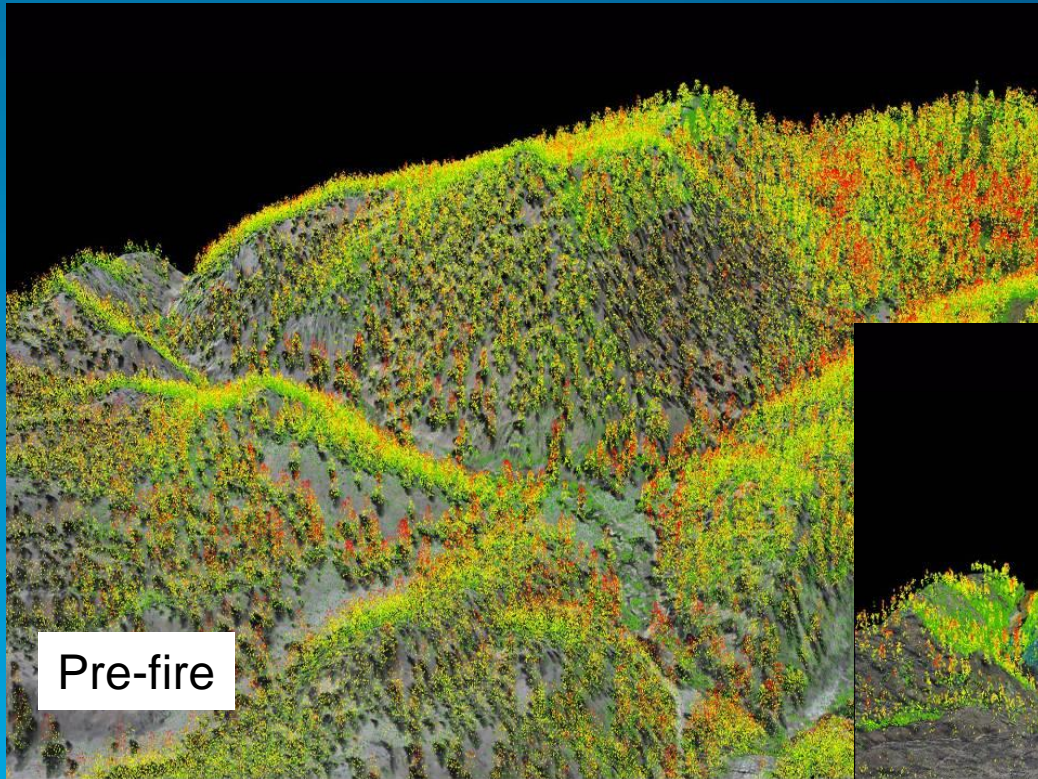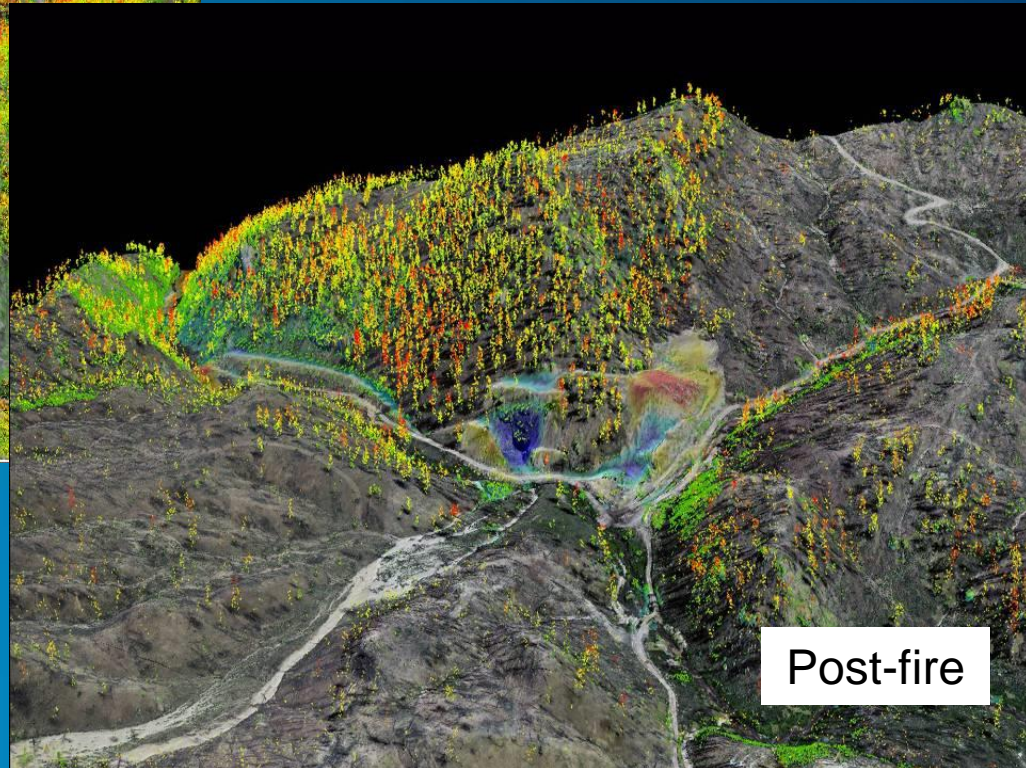

Image from Fugro Geospatial

Enable: Fire Disturbance Assessment

Hayman Fire, CO

Pre-fire

Post-fire

Enable: Land Management

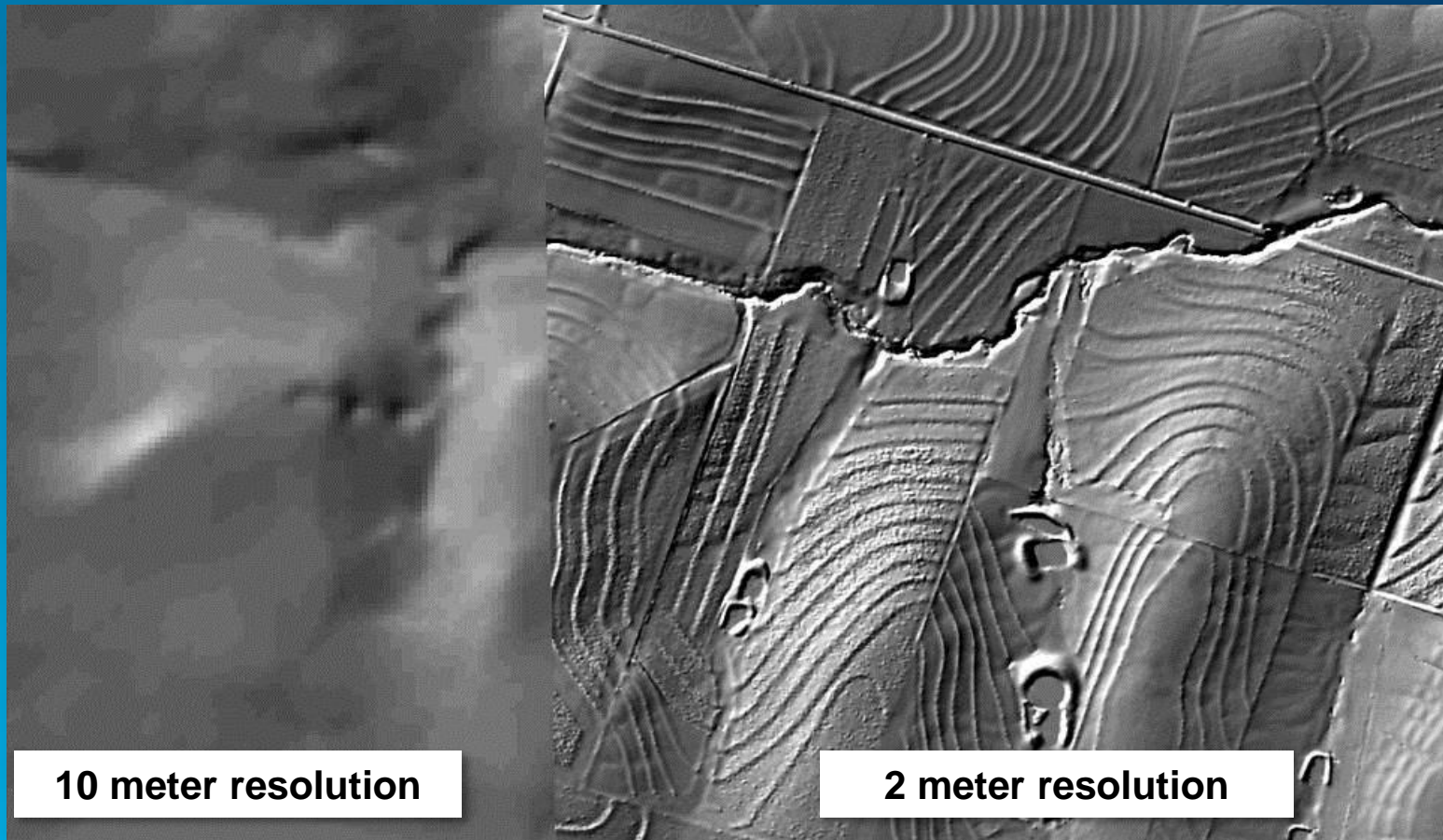## Vegetation Height and Cover: Inputs to Multiple Applications

- **Biomass/ carbon estimations**

- **Habitat suitability models**

- **Fire behavior models**

- **Identify structures that may be at risk for fire**

Height above ground (m)
Value
High : 25
Low : 0

Cover (%)
Value
High : 100
Low : 0
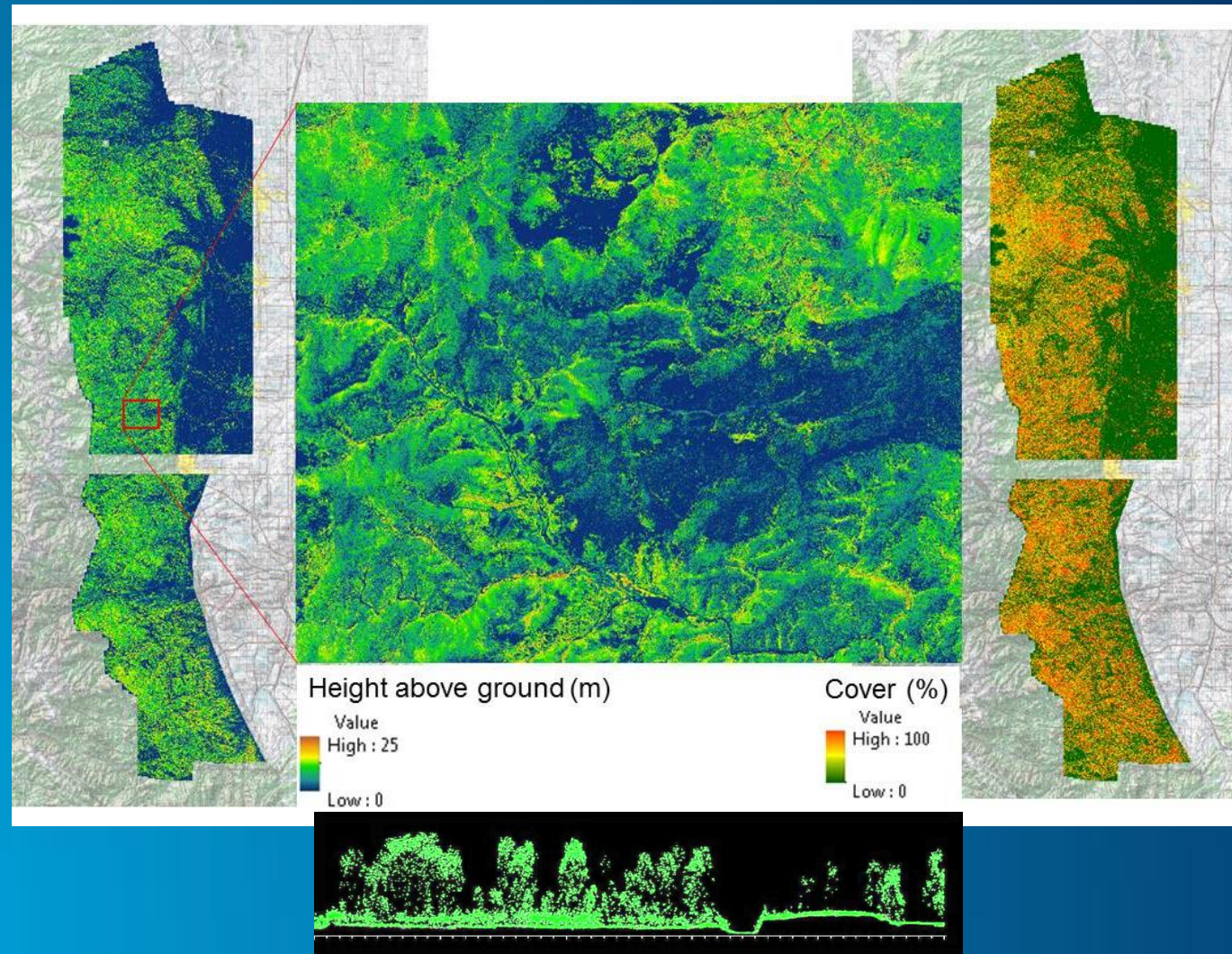
Enable: Precision Agriculture

Improved Data Quality

10 meter resolution

2 meter resolution

Courtesy of NRCS

Enable: Landscape-Level Understanding

Landslide hazards
John Day, OR area

- Aerial photo image (top)

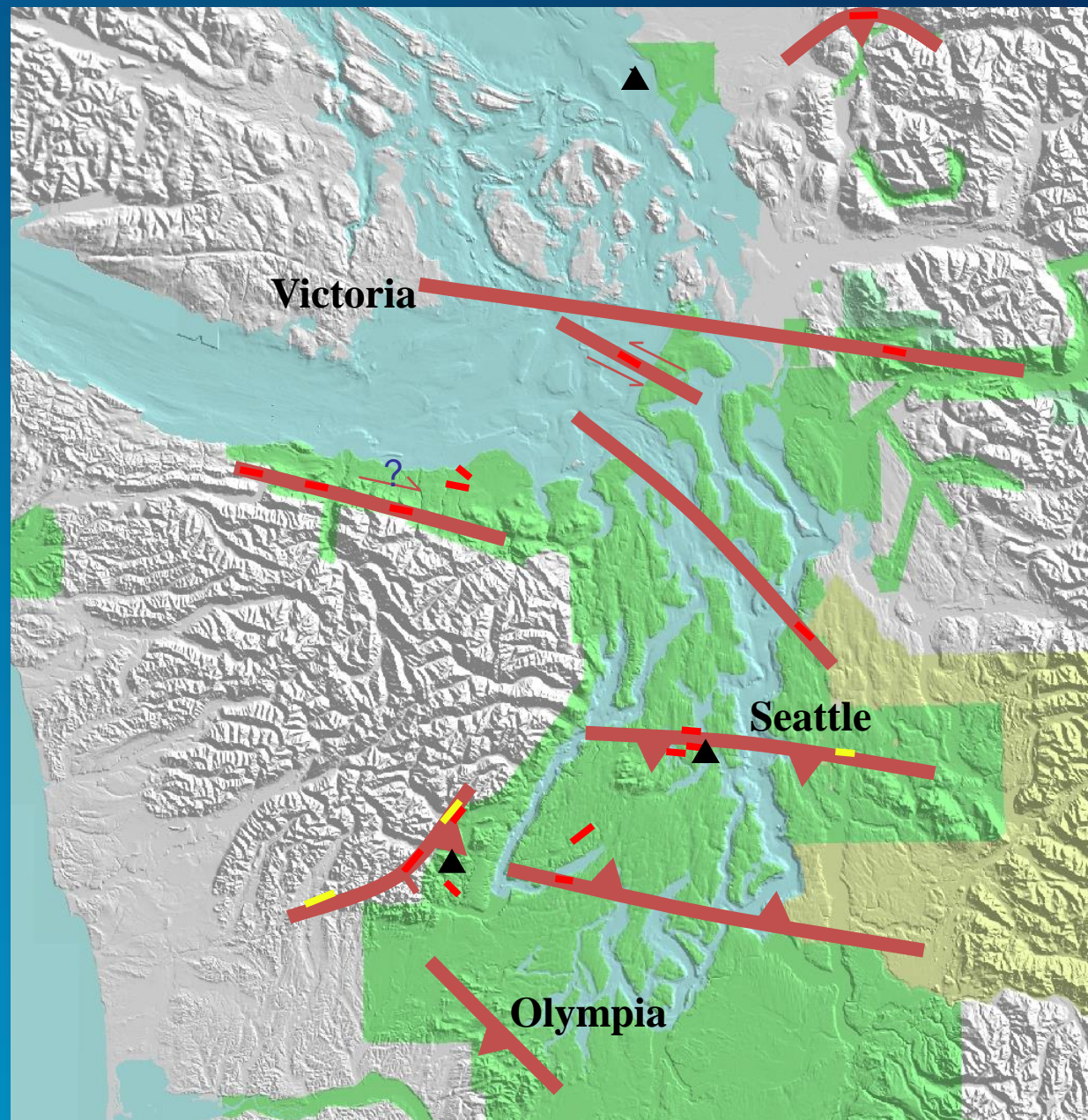- Lidar image (bottom) of same area provides visible evidence of landslide activity
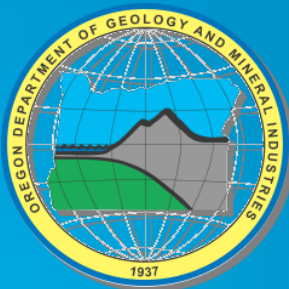
Enable: Hazards Mitigation

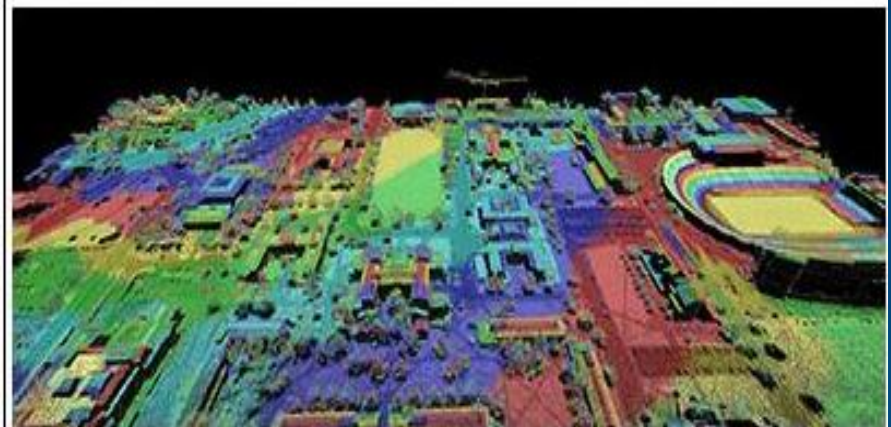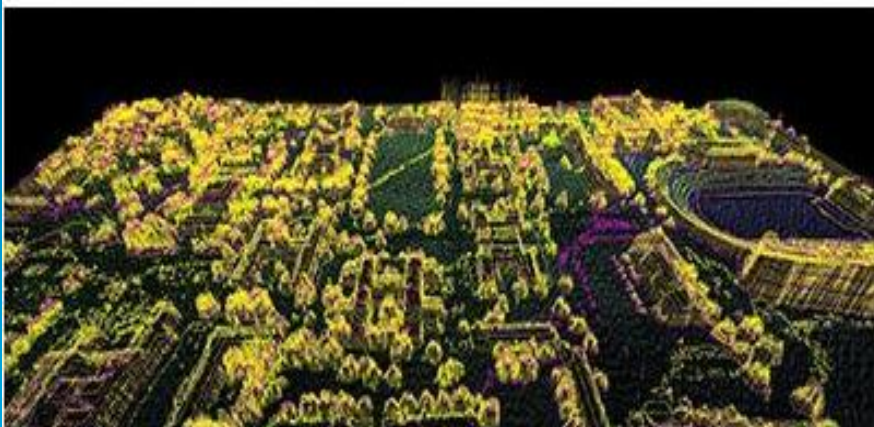## Detecting Faults

Scarp found with LiDAR

Scarp found other means
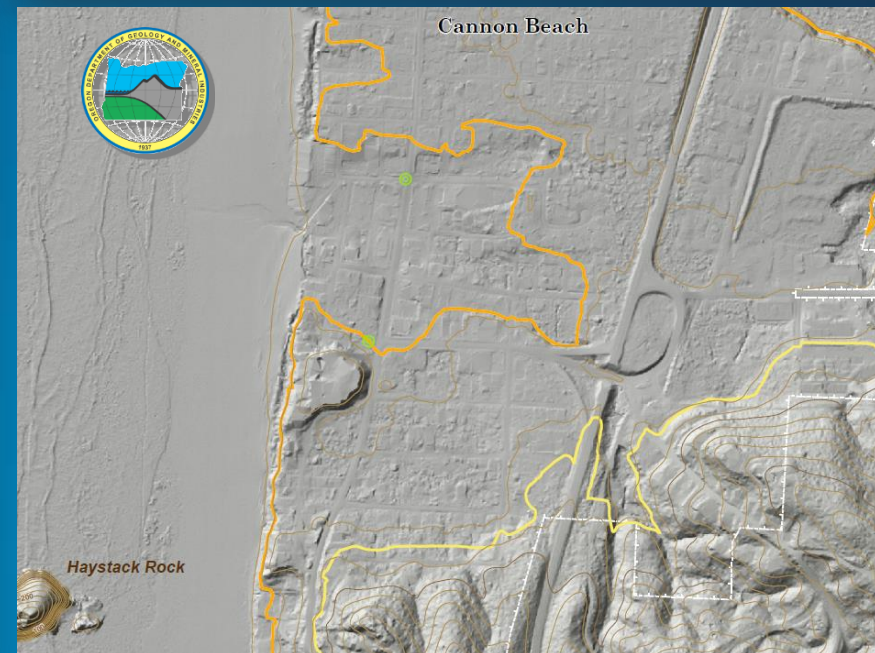
Geomorphic evidence of shoreline uplift

Victoria

Seattle

Olympia

Holocene Tectonism PI: Ralph Haugerud, USGS

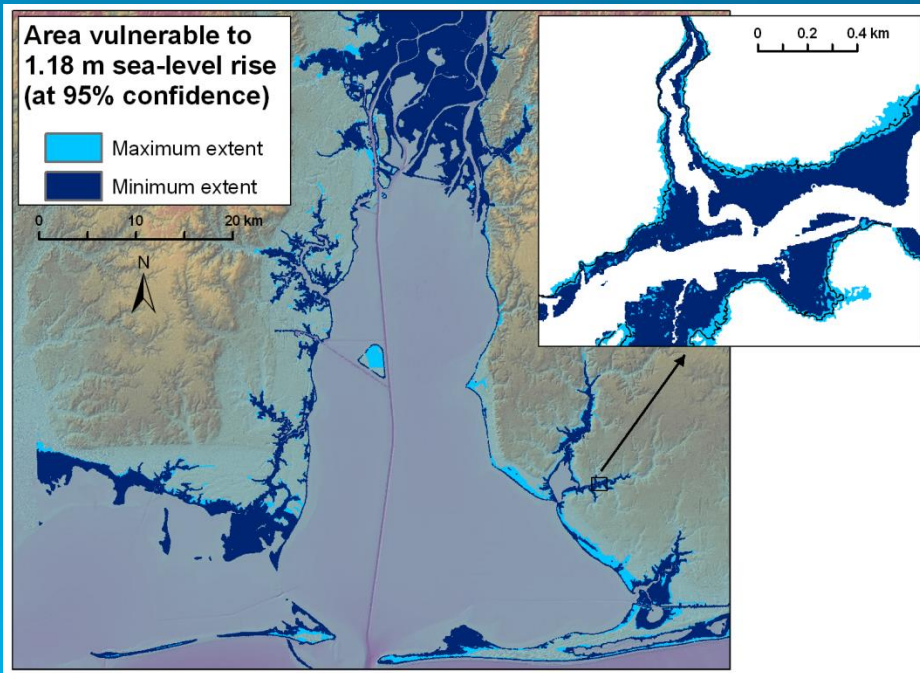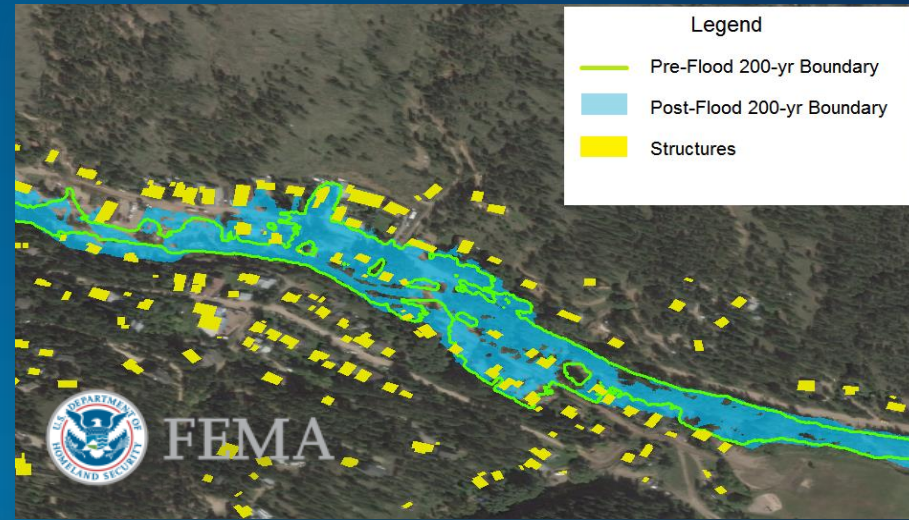# Enable: Infrastructure Management

- Route, grade, line-of-sight, and utility surveys and corridor mapping
- Terrain and other obstruction identification
- Dam, levee, and coastal structure failure modeling and mitigation
- Hydraulic and hydrologic modeling
- Geotechnical evaluations
- Permit application and construction plan development and evaluation
- As-built model development
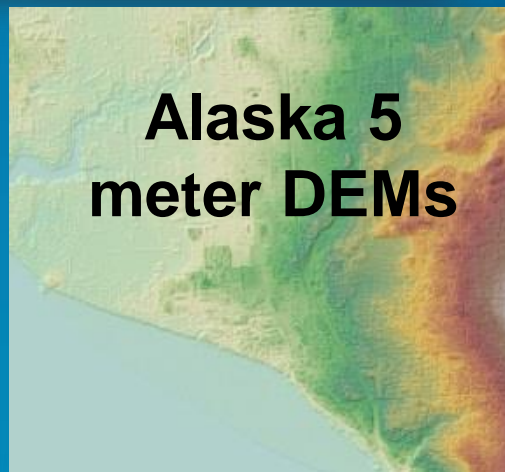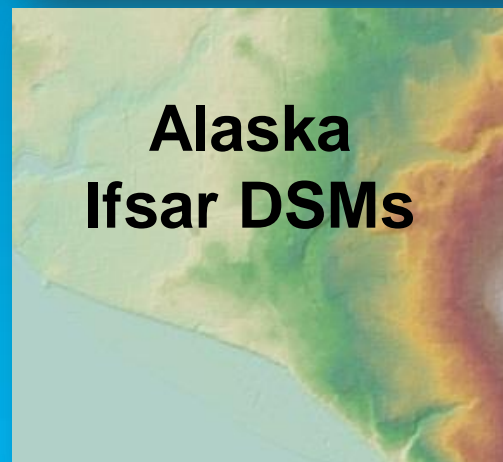- Preliminary engineering, estimate development, and quantity estimation activities
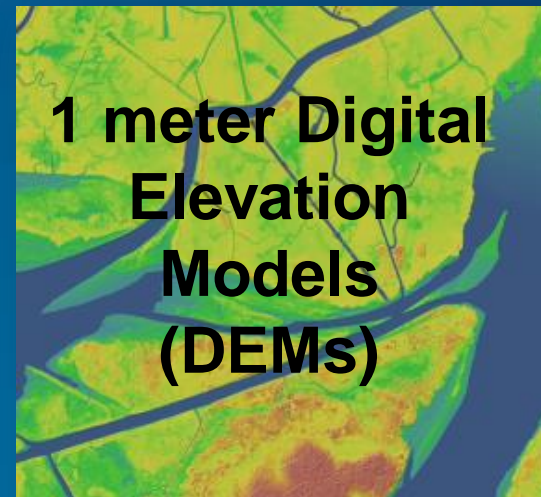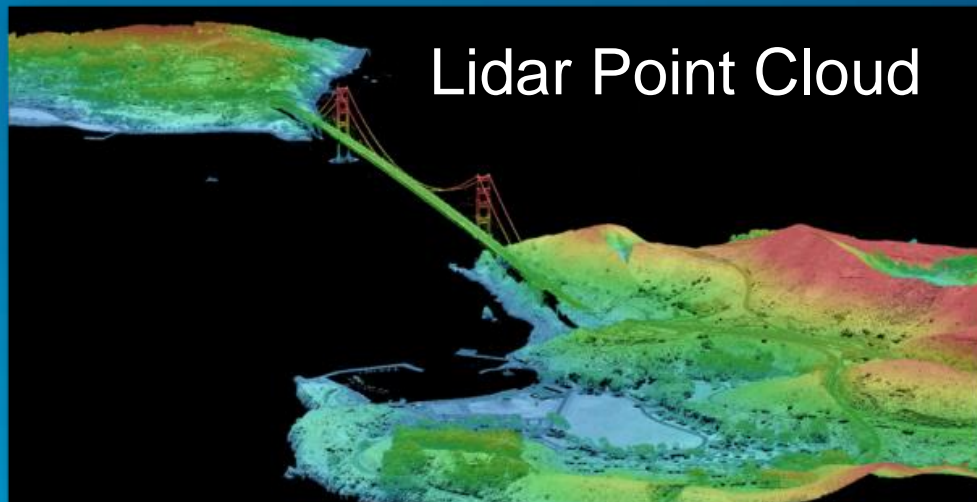
Enable: Climate Resilience

- Subsidence

- Flood Risk Mapping

- Tsunami Innundation

3DEP New Products and Services

In The National Map beginning in 2015

Lidar Point Cloud

1 meter Digital Elevation Models (DEMs)

Alaska Ifsar DSMs

Alaska 5 meter DEMs

Alaska Ifsar Orthorectified Intensity Images (ORIs)

3DEP New Products and Services

In The National Map beginning in 2015

3DEP New Products and Services
In The National Map beginning in 2015

3D Elevation Program - FY16 Partnership Opportunities[1]
(January, 2016)

As of 1/14/2016

For more on the 3D Elevation Program (3DEP) visit:
http://www.nationalmap.gov/3DEP

Visit the US Interagency Elevation Inventory (USIEI) at:
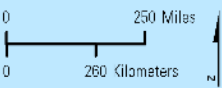http://coast.noaa.gov/inventory/
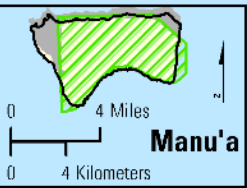
Pacific Ocean

CANADA

Atlantic Ocean

[1]Map shows extent of projects proposed to the 3D Elevation Program FY16 Broad Agency Announcement (BAA) and through ongoing Federal coordination via the 3DEP Working Group (rechartered NDEP) as of January, 2016. Proposals may be submitted to the BAA through September 30, 2016. Federal coordination is ongoing. The map will be updated as new opportunities and selections are identified.

3DEP Specifications:
- Quality level 2 or better lidar data (ifsar in AK)[2]
- Publicly available
- 8 years old or newer as of 2016

[2]as defined in USGS Lidar Base Specification v1.2

Sources:
3DEP FY15/16 Broad Agency Announcement
US EI data from October 2015

0 — 250 Miles
0 — 260 Kilometers

American Samoa

0 — 4 Miles
0 — 4 Kilometers

Manu'a

Alaska

Pacific Ocean

0 — 460 Miles
0 — 460 Kilometers

MEXICO

Hawaii

Pacific Ocean

0 — 50 Miles
0 — 50 Kilometers

EXPLANATION

- Data Acquisition Partnership Opportunities Selected
- Data Acquisition Partnership Opportunities Available[1]

In Progress and Existing Data that Meet 3DEP Specification
- lidar
- ifsar (Alaska)

Planned Funded Data that Meet 3DEP Specification
- lidar
- ifsar (Alaska)

Data that Do NOT Meet 3DEP Specification
- Other lidar data
- No publicly available lidar data (ifsar in Alaska)

Puerto Rico / US Virgin Islands

0 — 50 Miles
0 — 50 Kilometers

Caribbean Sea

TNM Download *(V1.0)*   ❓ How to   ⟳ Start Over   Custom Views ▾   *S* Share Link   ✉ Contact Us

Datasets

Advanced Search Options   **Find Products**   «

☐ Elevation Source Data (3DEP)

Product Search Filter

☐ All Subcategories
☐ DEM Source (OPR)
  Show Availability
☐ Ifsar Digital Surface Model (DSM)
  Show Availability
☐ Ifsar Orthorectified Radar Image (ORI)
  Show Availability
☑ Lidar Point Cloud (LPC)
  Hide Availability

Description

File Format
  LAS
Data Extent
  Varies

Availability legend

- 🟥 DEM Source (OPR)
- 🟦 Ifsar DSM (Alaska only)
- 🟪 Ifsar ORI (Alaska only)
- 🟦 LPC - Nominal Pulse Spacing > 0.7m
- 🟩 LPC - Nominal Pulse Spacing 0.36m - 0.7m
- 🟨 LPC - Nominal Pulse Spacing < 0.35m
- 🟫 LPC - Nominal Pulse Spacing Unknown

☐ Hydrography (NHD) and Watersheds (WBD)

☐ Imagery - 1 foot (HRO)

☐ Imagery - 1 meter (NAIP)

☐ Map Indices

☐ Names - Geographic Names Information System (GNIS)

☐ National Land Cover Database (NLCD)

☐ Small-scale Datasets

☐ Structures - National Structures Dataset

☐ Topo Map Vector Data

☑ Use Map   ○ Box/Point ● Current Extent ○ Coordinates ○ Located Point ○ Polygon:

☐ Map Indices   ○ 1 Degree ○ 15 Minute ○ 7.5 Minute ○ All

Address/Place ▾   Search location.   Go   Clear
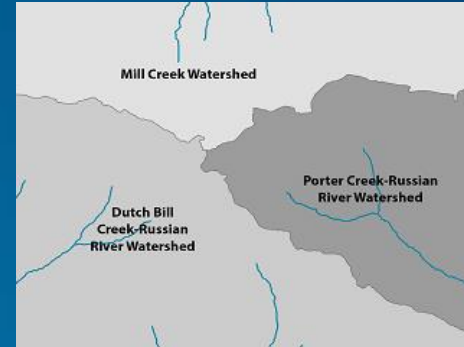
Lat/Lng ▲   40.1475, -111.0553

100 km
100 mi
The National Map
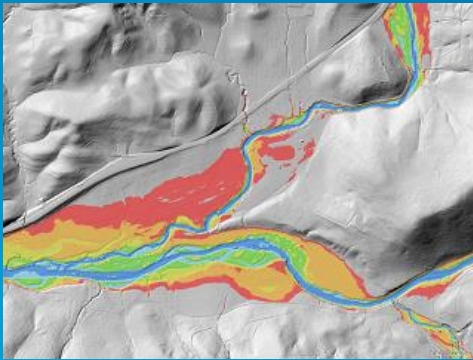
A best California practice: Sonoma County
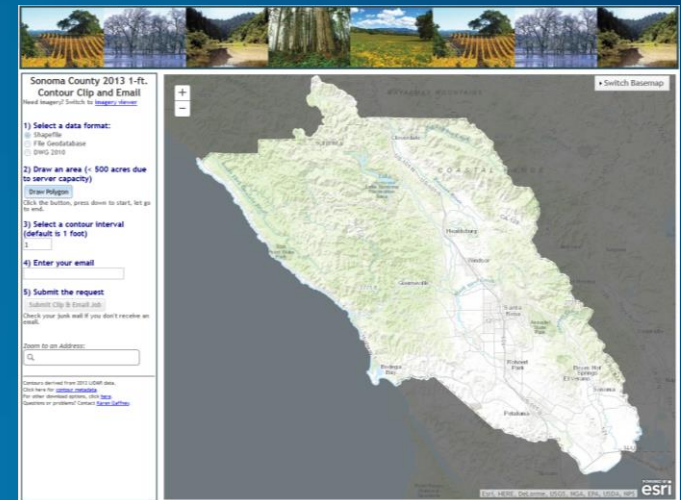
- **LiDAR-Derived Streams**

- **LiDAR Derived Hydro-Enforced DEM**

◆**LiDAR Derived Watersheds**

◆**Clip and ship 1-foot contours**

http://sonomavegmap.org/

Quality Level

Quality Level	Source	Vertical Accuracy RMSEz	Nominal Pulse Spacing (NPS)	Nominal Pulse Density (NPD)	DEM Post Spacing
QL1	Lidar	10 cm	0.35 m	8 points/sq meter	0.5 meter
QL2	Lidar	10 cm	0.7 m	2 points/sq meter	1 meter
QL3	Lidar	20 cm	1.4 m	0.5 points/sq meter	2 meter
QL4	Imagery	139 cm	N/A	N/A	5 meters
QL5	Ifsar	185 cm	N/A	N/A	5 meters

$89.5M

$52.8M

Lidar coordination in California

◆ Requirements gathered

◆ Main drivers for lidar:
  - ◆ Flood risk management
  - ◆ Fire protection
  - ◆ Ecosystems
  - ◆ Infrastructure
  - ◆ Land cover and monitoring
  - ◆ Seismic and other hazards

◆ No designated lead agency

Learn more at:

http://nationalmap.gov/3DEP/

Thank you!

Your 3DEP and NHD California contacts

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