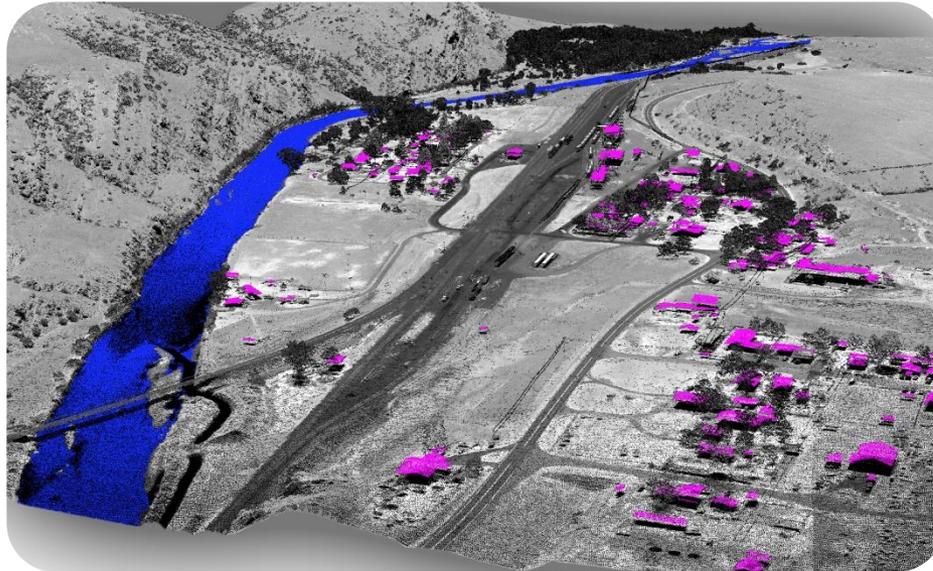


What Can LiDAR do for you?

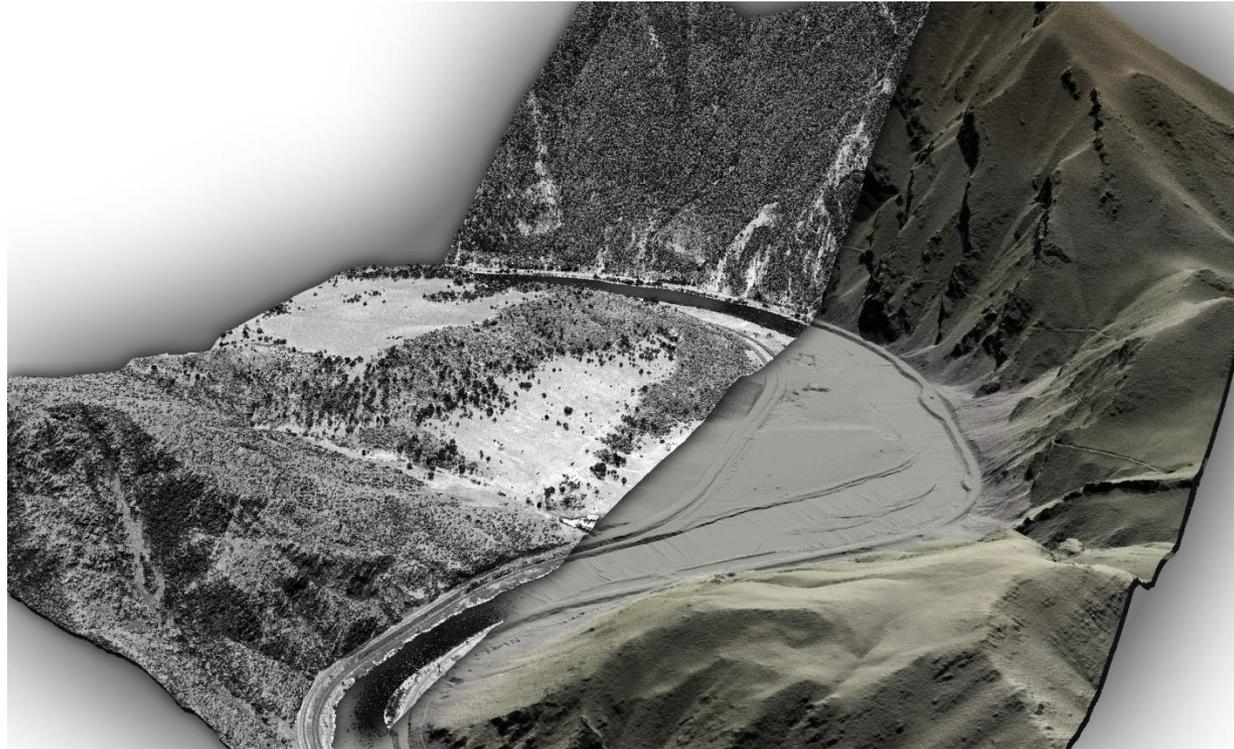
quantum
SPATIAL



Russ Faux, Sr. Vice President, Corvallis, OR
Melissa Christie, QSI Western Region Account Manager, Reno NV



OVERVIEW



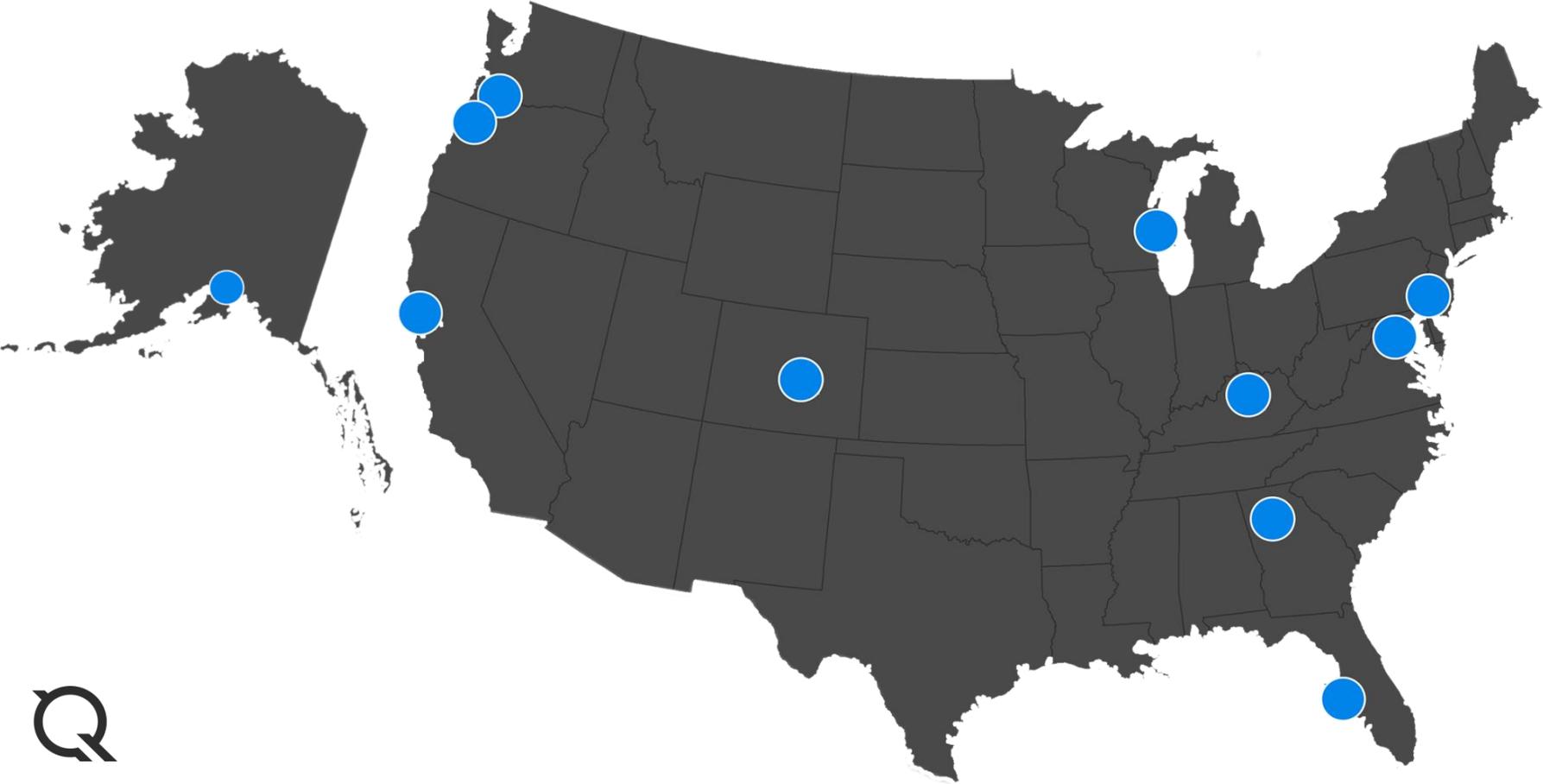
LIDAR EXPLAINED
TOPO-BATHYMETRIC LIDAR
ASSET PROTECTION
MITIGATE THREATS TO PERSONAL SAFETY





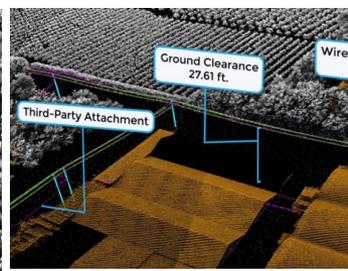
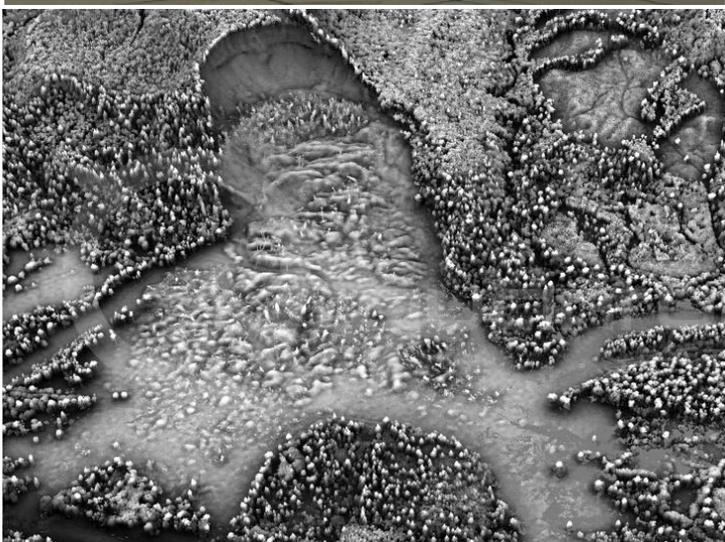
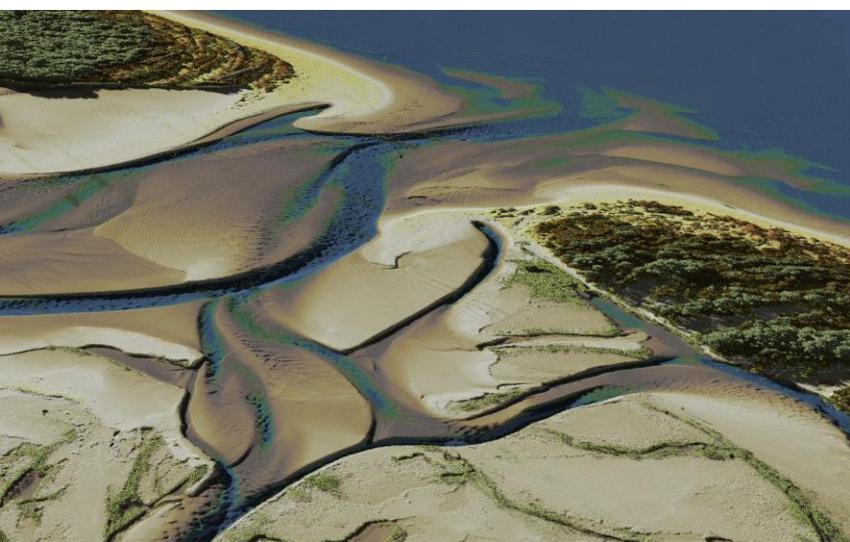
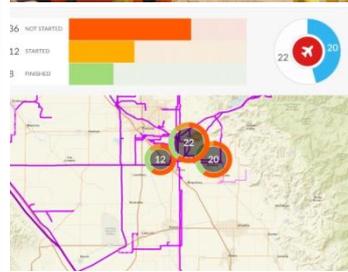
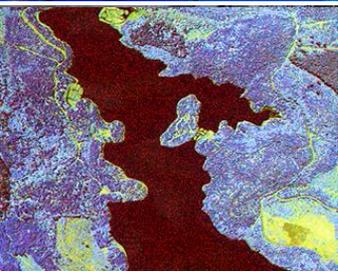
Who We Are

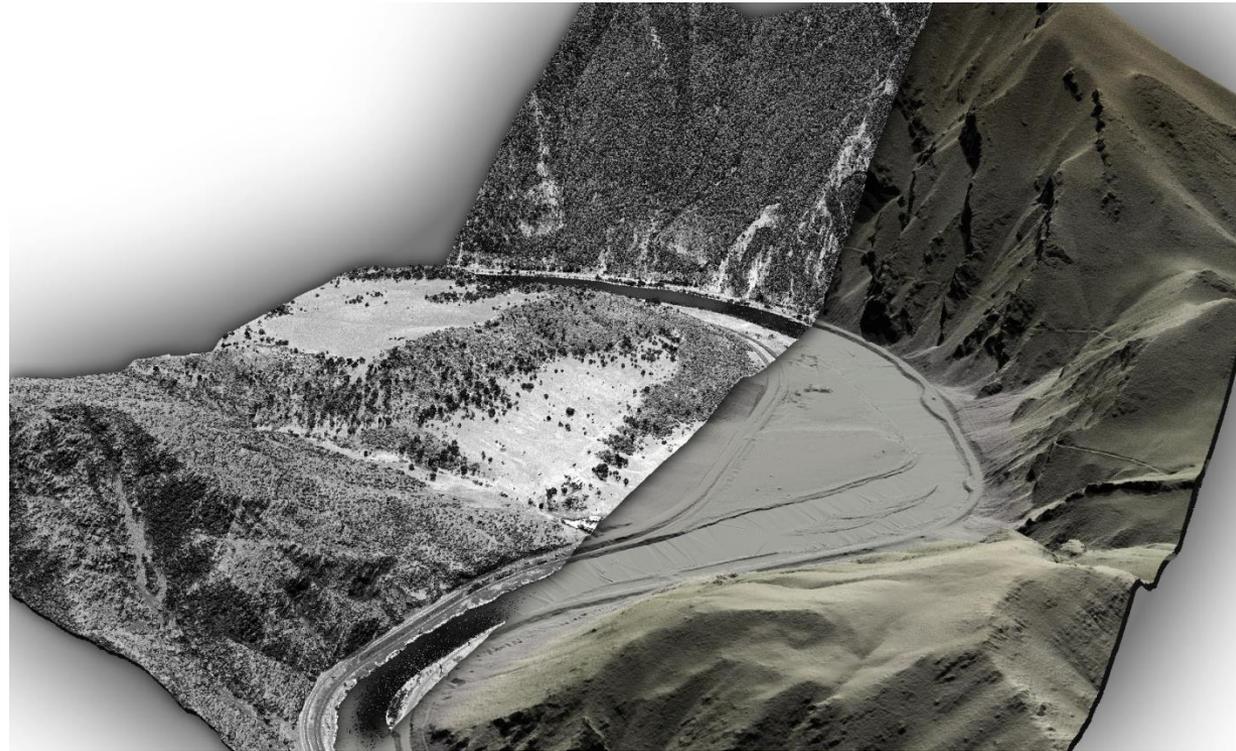
Deliver actionable intelligence & geospatial analytics to those who want to map, model and manage their world.





What We Do



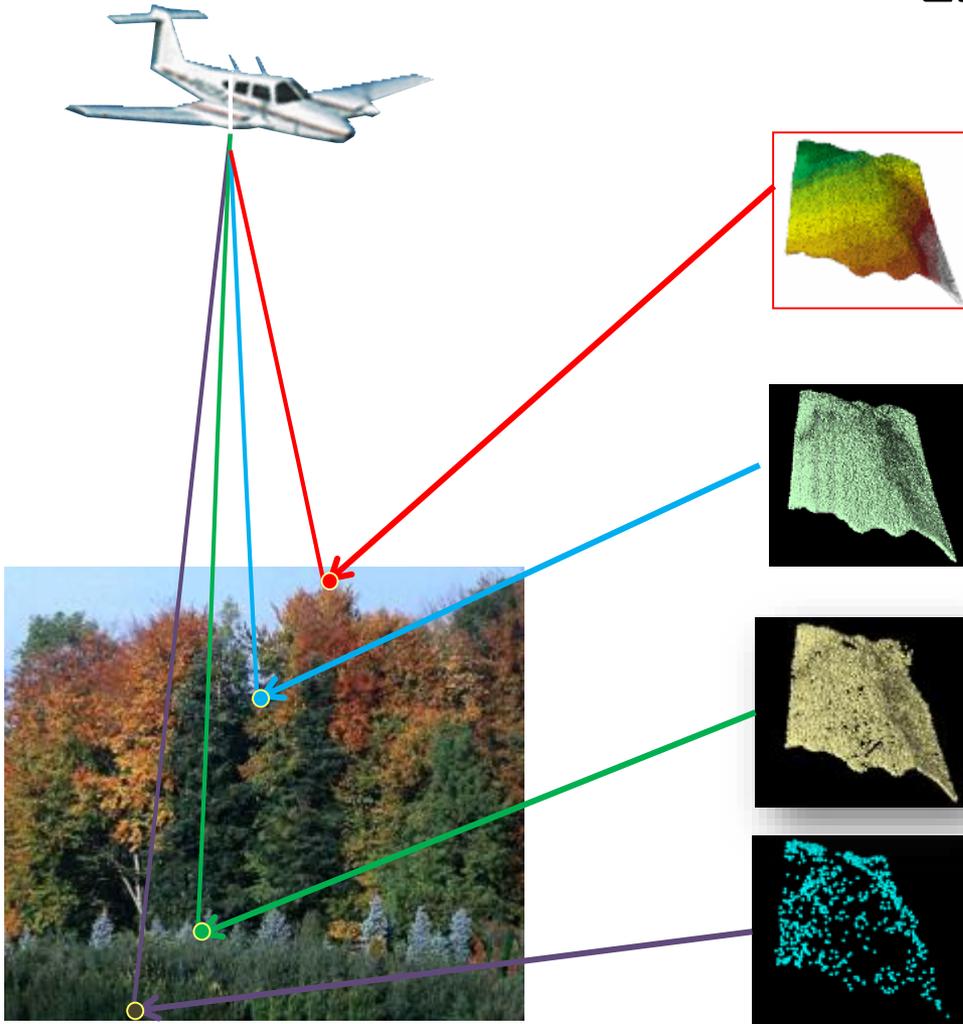


LIDAR EXPLAINED





LiDAR Returns



1st Return - Canopy

- First feature pulse reflects on
- Can be tops of buildings, trees, baseball fields, etc.
- First return can be last return if no vegetation is present.

2nd Return – Intermediate Vegetation

- Second feature pulse reflects on
- Can be tops or sides of buildings and trees

3rd Return – Low Vegetation

- Third feature pulse reflects on
- Can be sides of buildings, trees, shrubs, tall grasses or ground.

4th Return – Ground

- Last feature pulse reflects on
- Typically surface point
- Can be low vegetation, parking lot curbs, ground, etc.



What you get from a LiDAR sensor

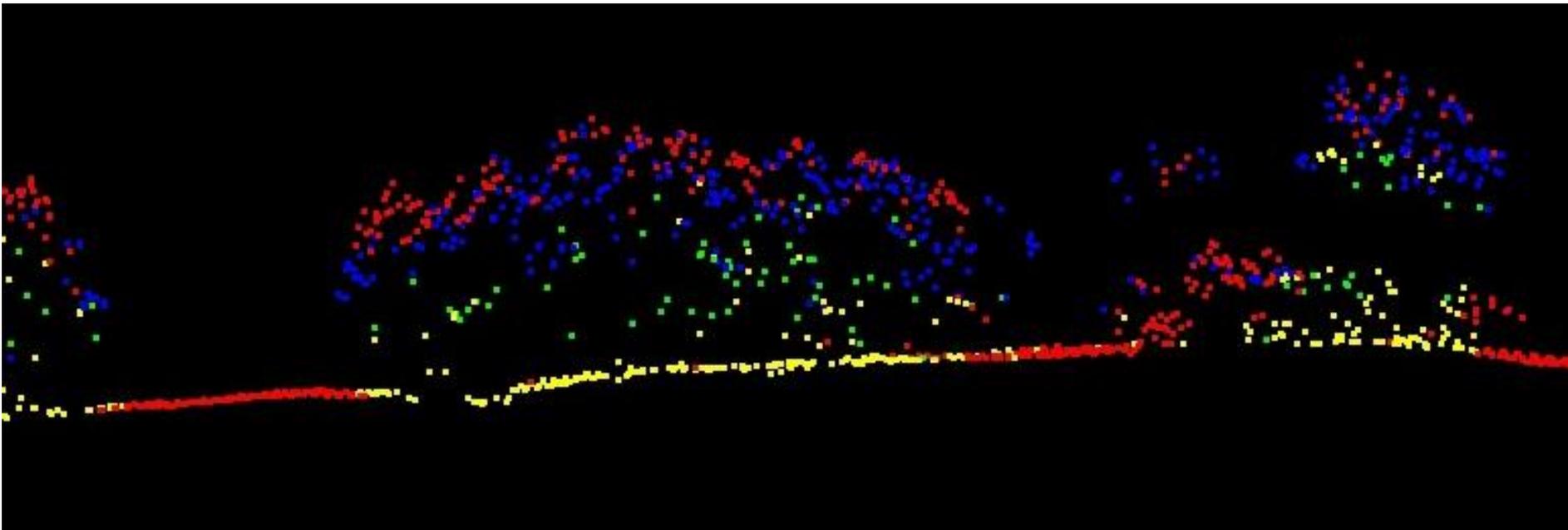
LiDAR provides points with x, y and z locations.

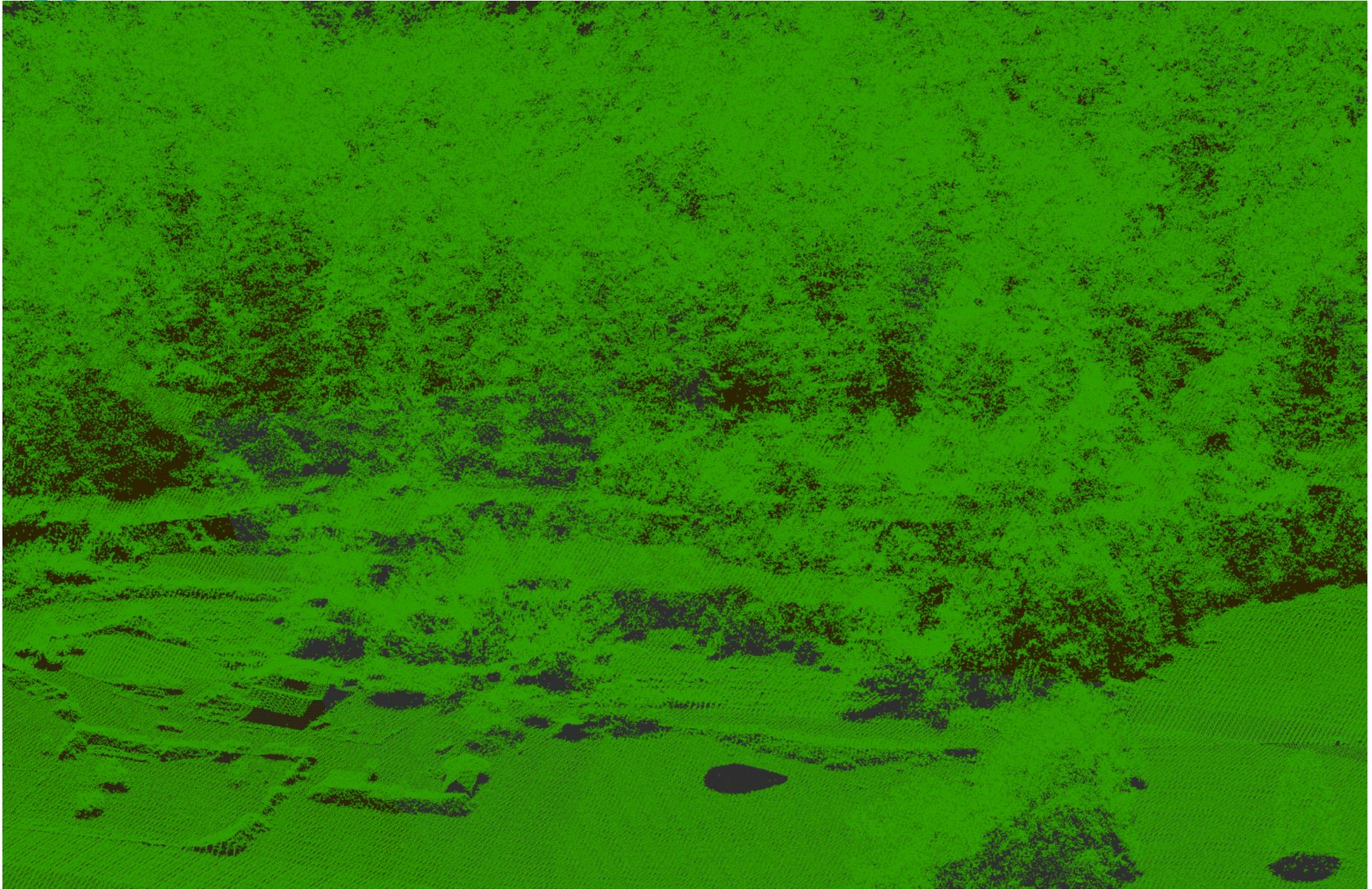
red – 1st and only - DSM

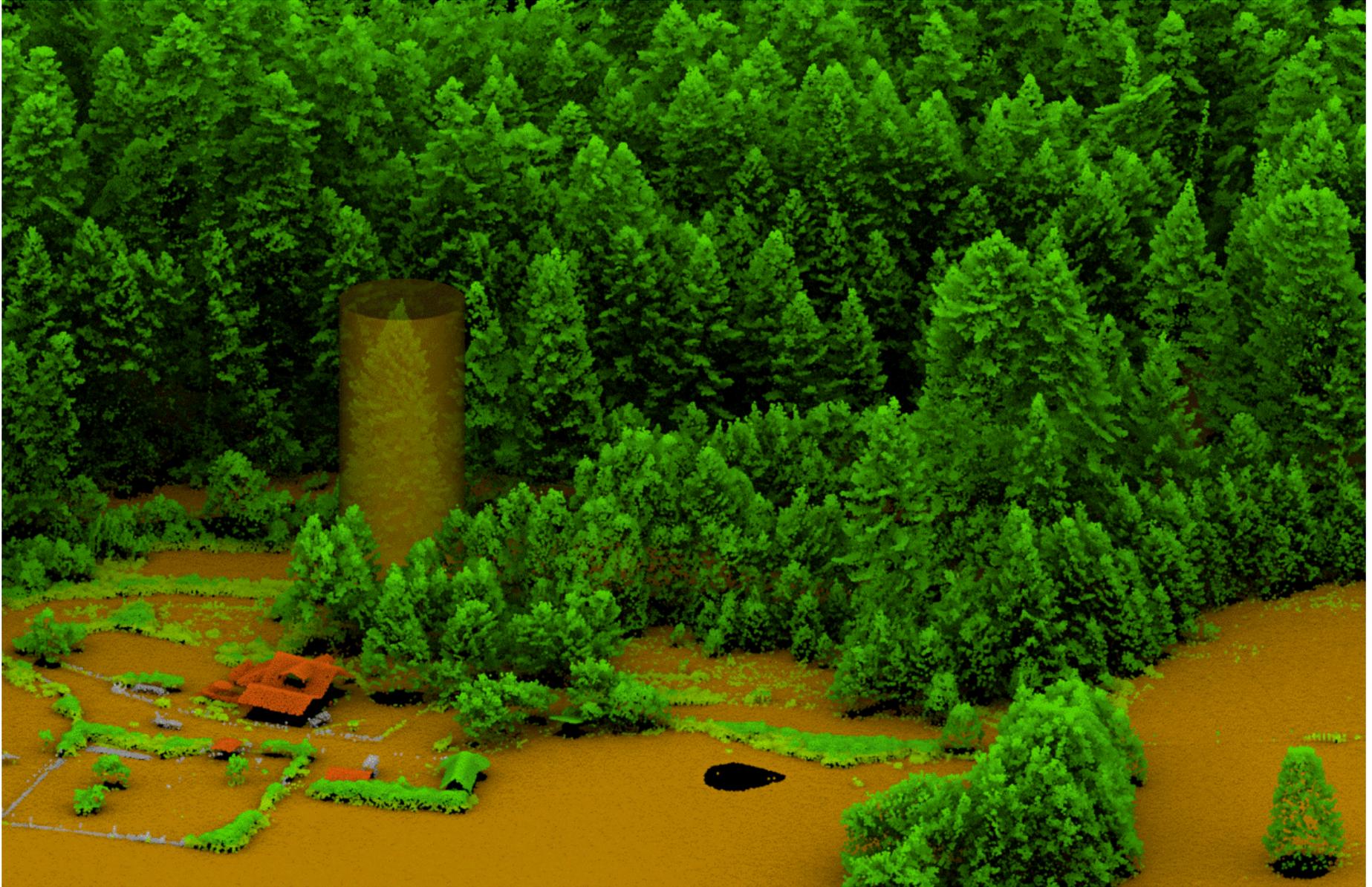
blue – 1st of many

green – 2nd or 3rd

yellow - last of many



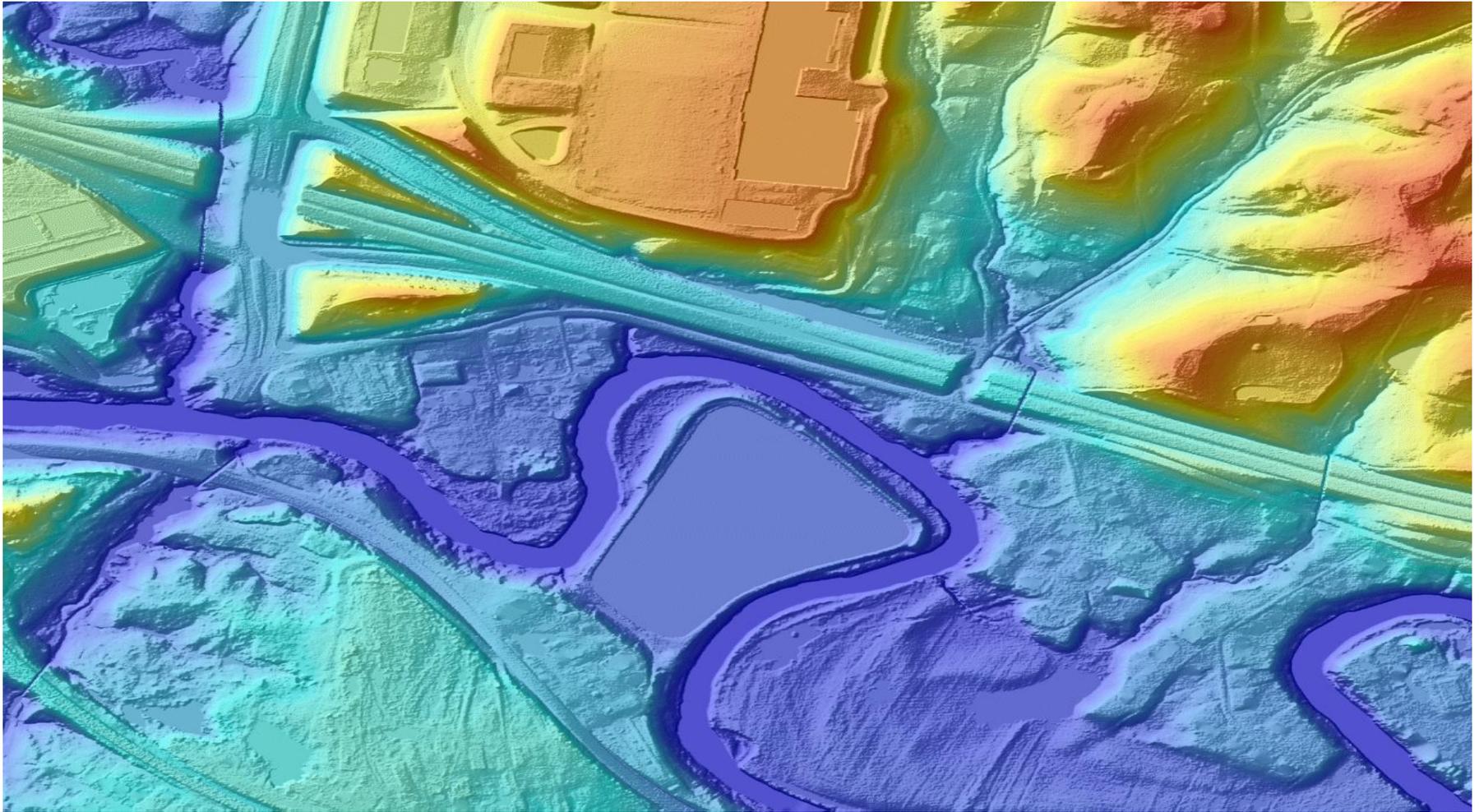






Many Ways to Define the Surface..





**Stereo
DTM**

**Pure
Lidar**

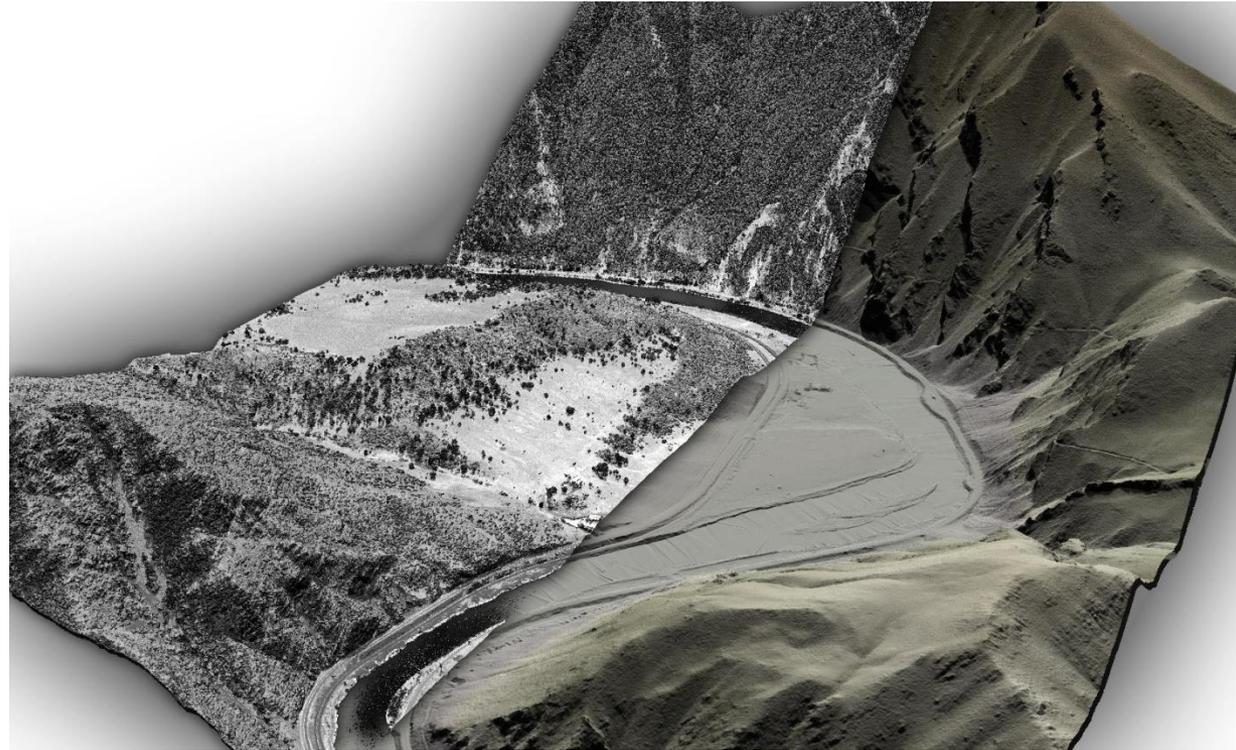
**Hydro
Flattened**

**Full
Breaklines**

**Hydro
Enforced**

**Hydro
Conditioned**





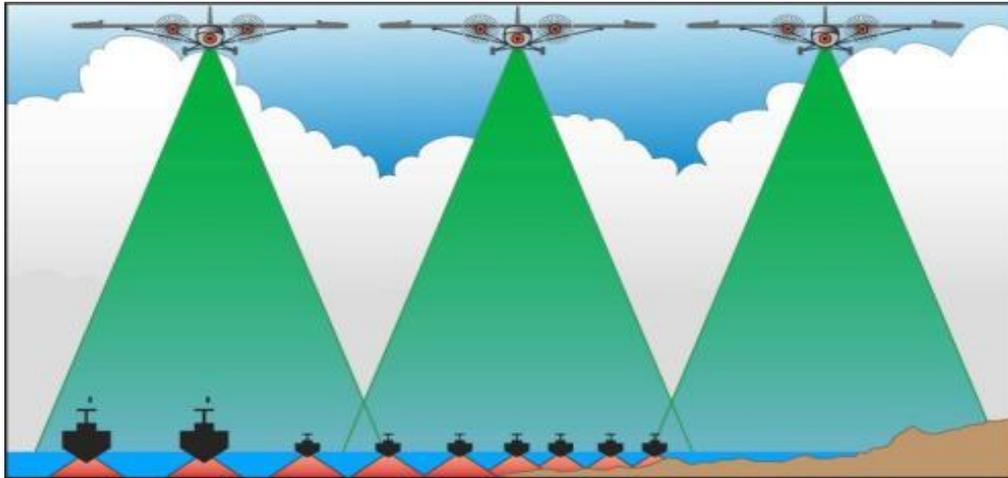
TOPO-BATHYMETRIC LIDAR





TOPO-BATHYMETRIC LIDAR

- Water Penetration (532 nm green λ)
- Rapid survey of shallow water areas that are difficult, dangerous, or impossible to get using water borne methods
- Collect both topographic and hydrographic data to provide a seamless dataset

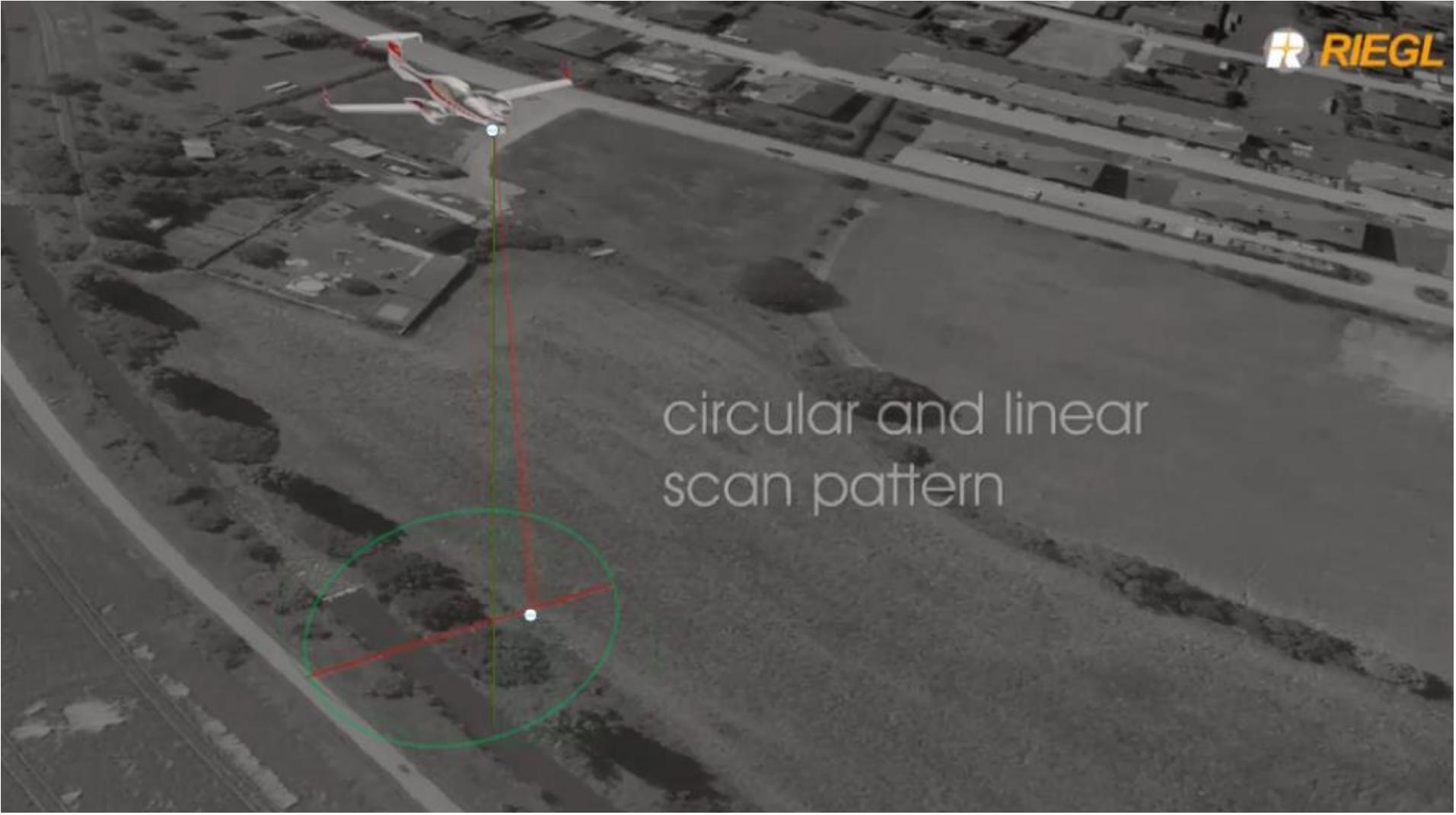


Guenther G. C., Cunningham G., Laroque P. E., Reid D. J., 2000. Meeting the accuracy challenge in Airborne Lidar bathymetry, Proceedings of EARSeL-SIG-Workshop Lidar, Dresden/FRG, June 16 – 17, 2000, pp. 27.

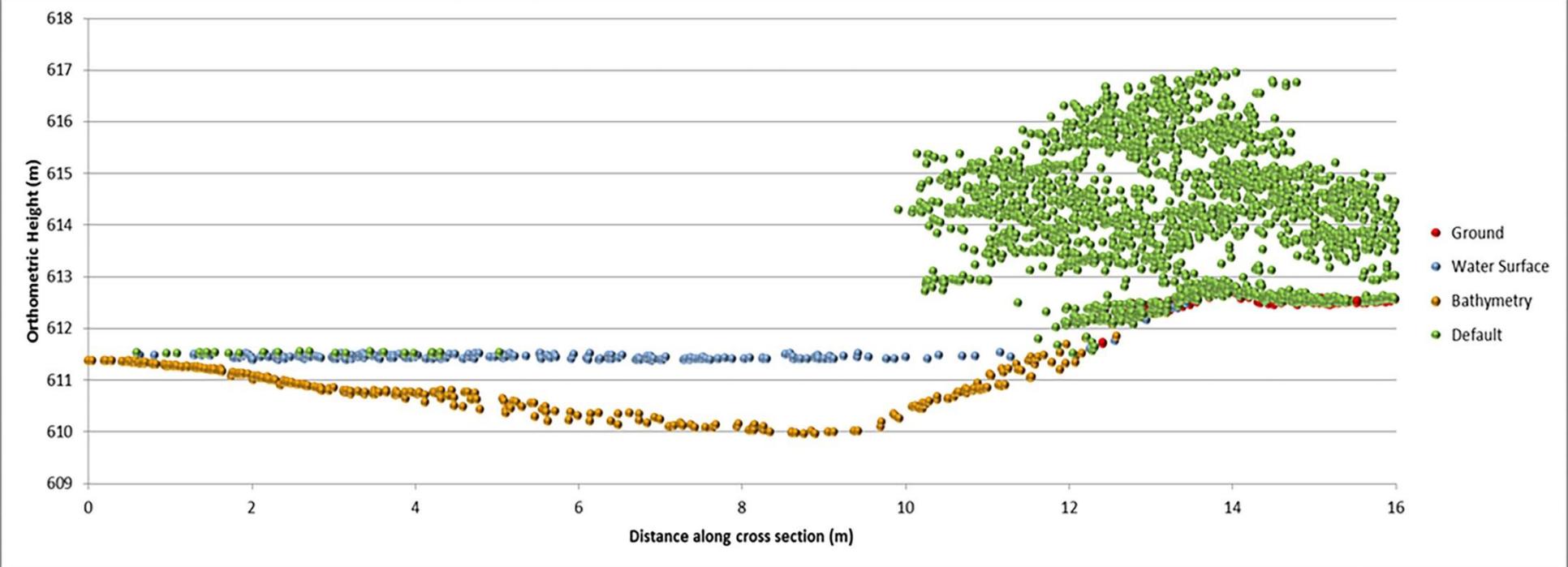
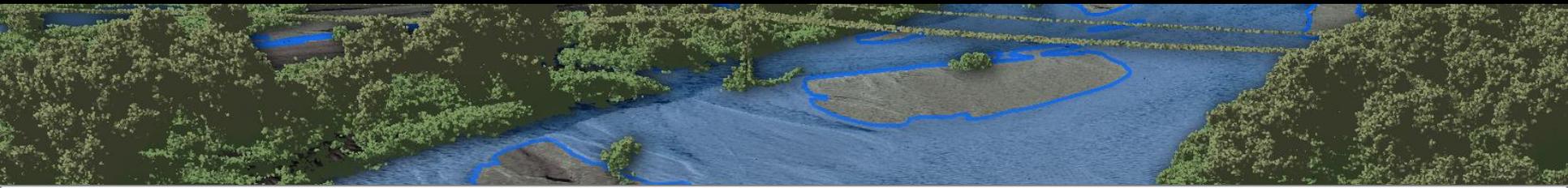




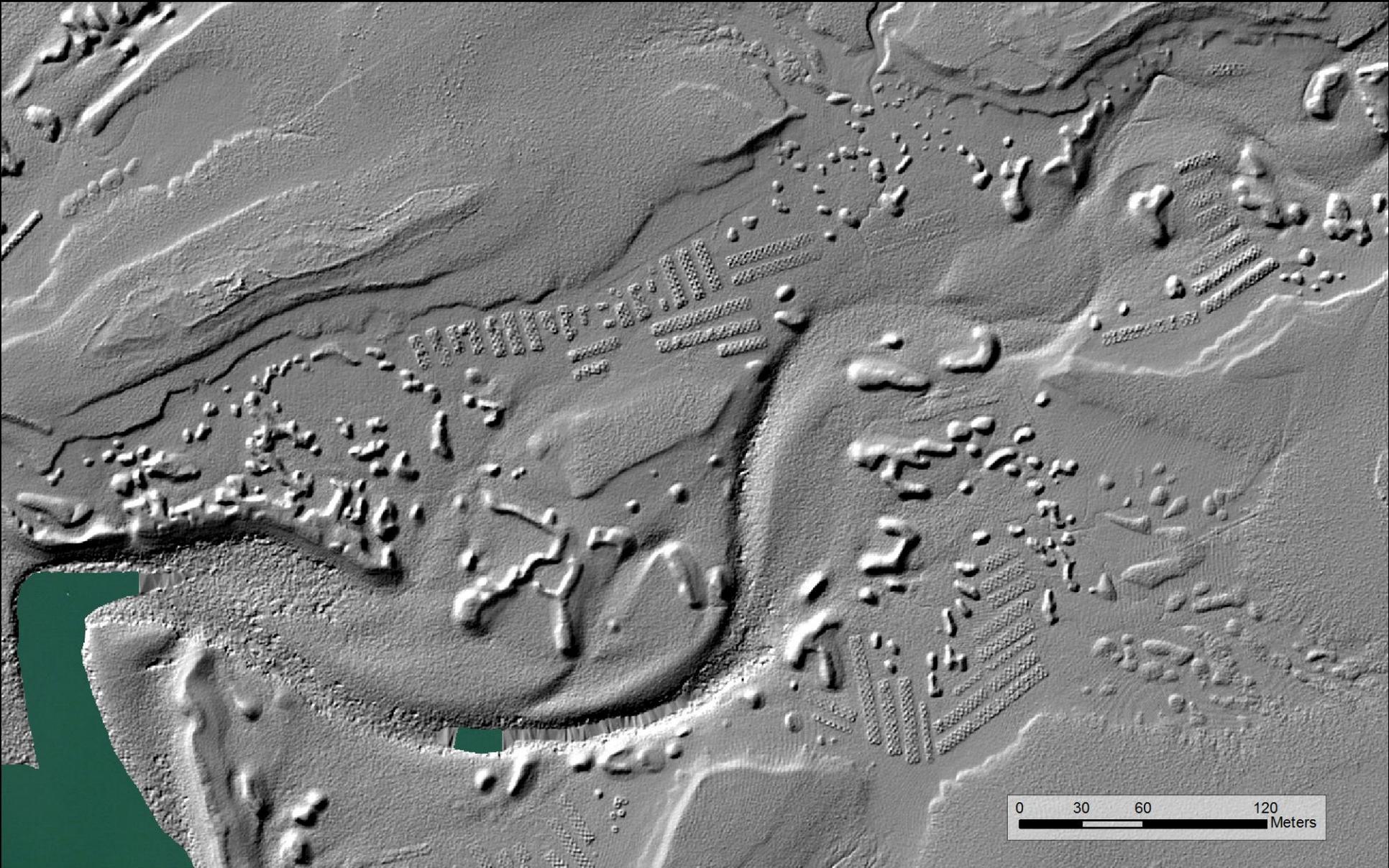
TOPO-BATHYMETRIC LIDAR



Topobathy DEM with above ground lidar returns



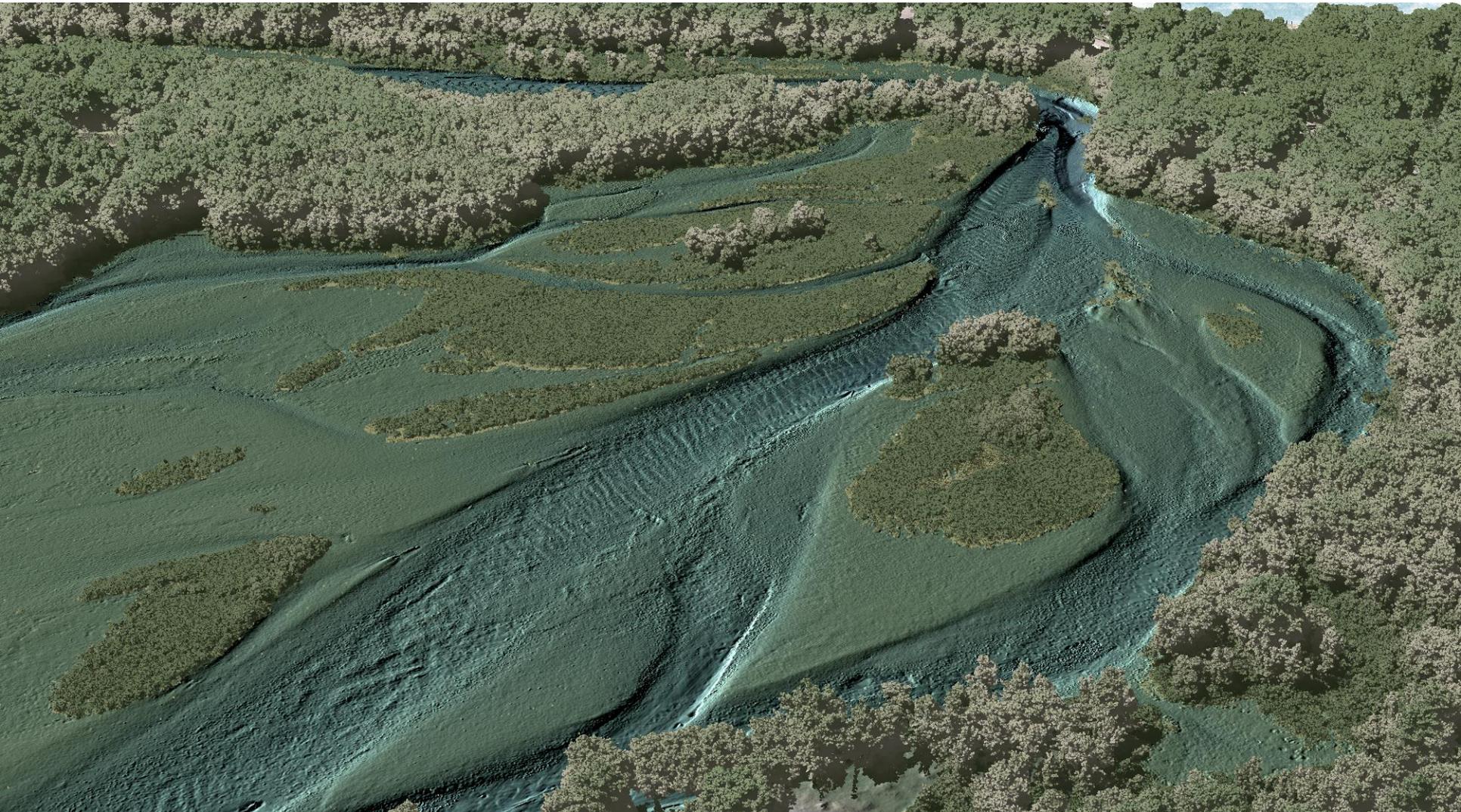
Back bay marshes and mudflats behind Kiawah Island, SC : 2009 SCDNR Charleston Co. lidar





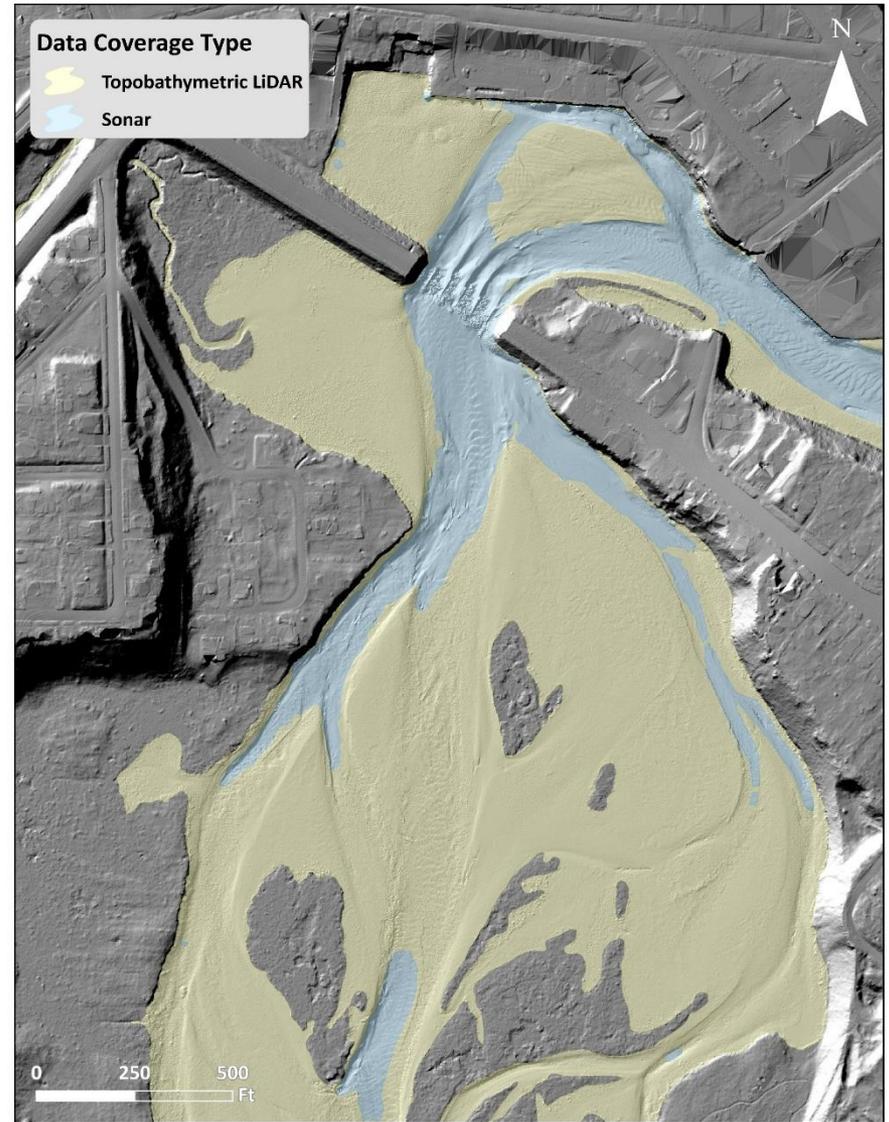
Kalamazoo River, MI

Topo-Bathy LiDAR + Sonar



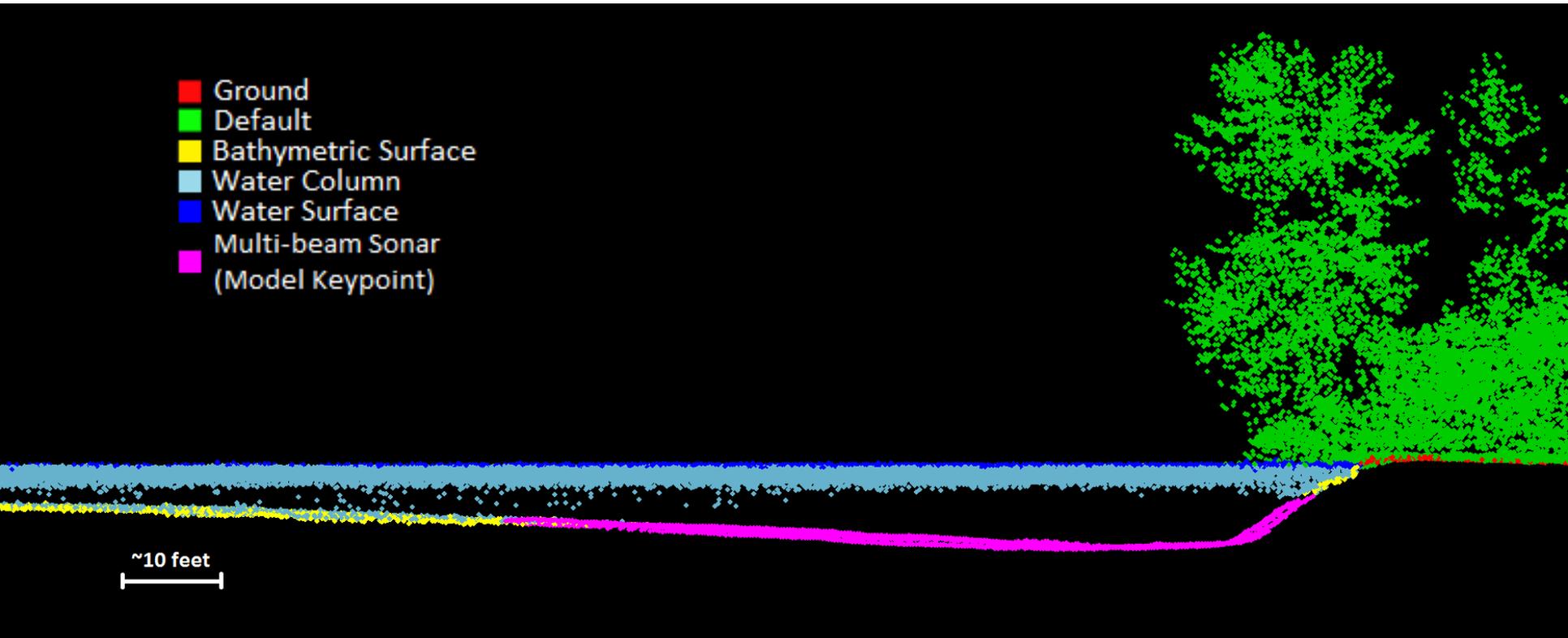


Kalamazoo River, MI Topo-Bathy LiDAR + Sonar





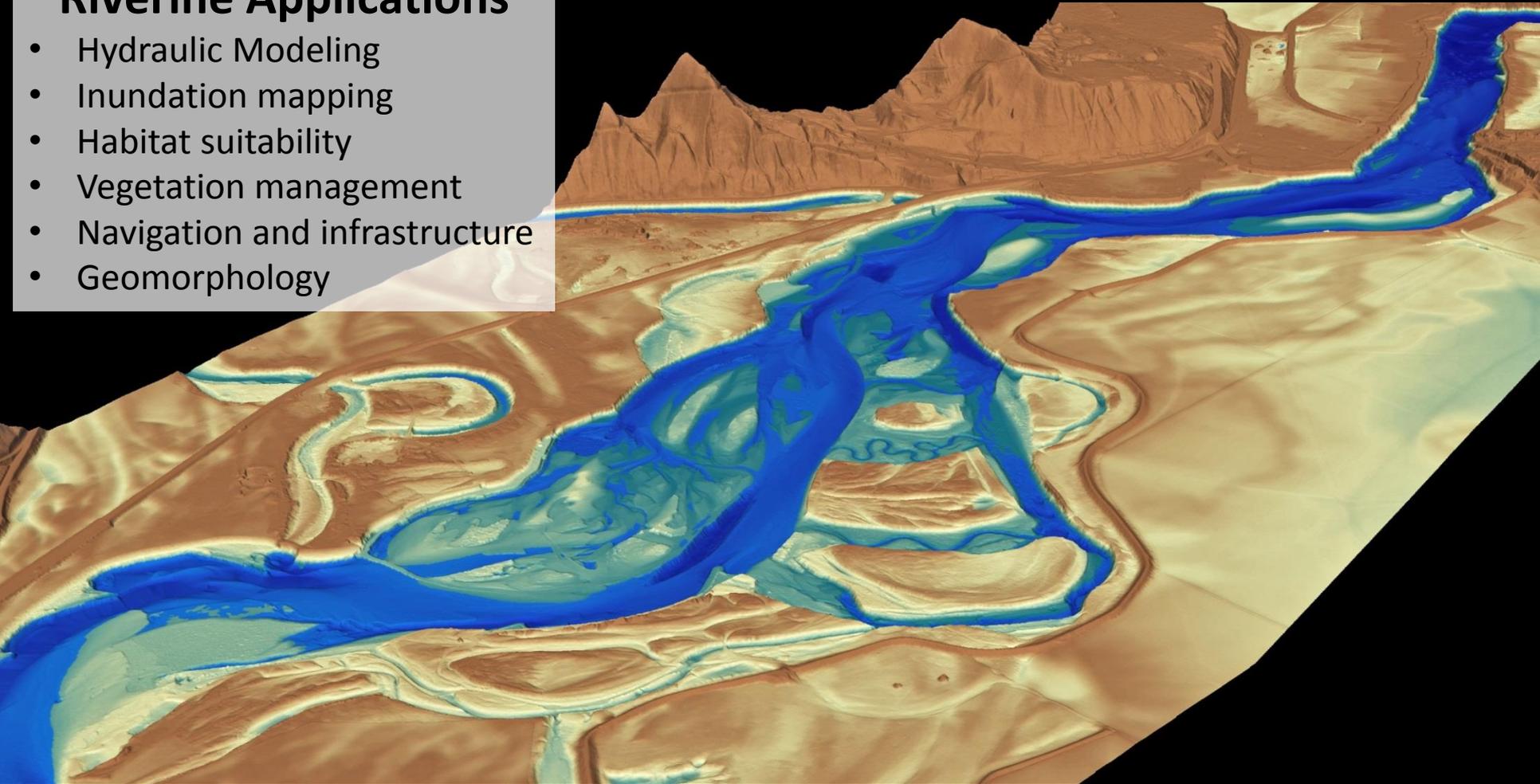
Cross Section Example of Integrated Lidar and Sonar Point Cloud





Riverine Applications

- Hydraulic Modeling
- Inundation mapping
- Habitat suitability
- Vegetation management
- Navigation and infrastructure
- Geomorphology





Floodplain Modeling with LiDAR



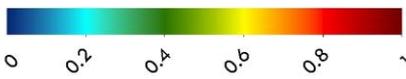


STURGEON HABITAT SUITABILITY INDEX*

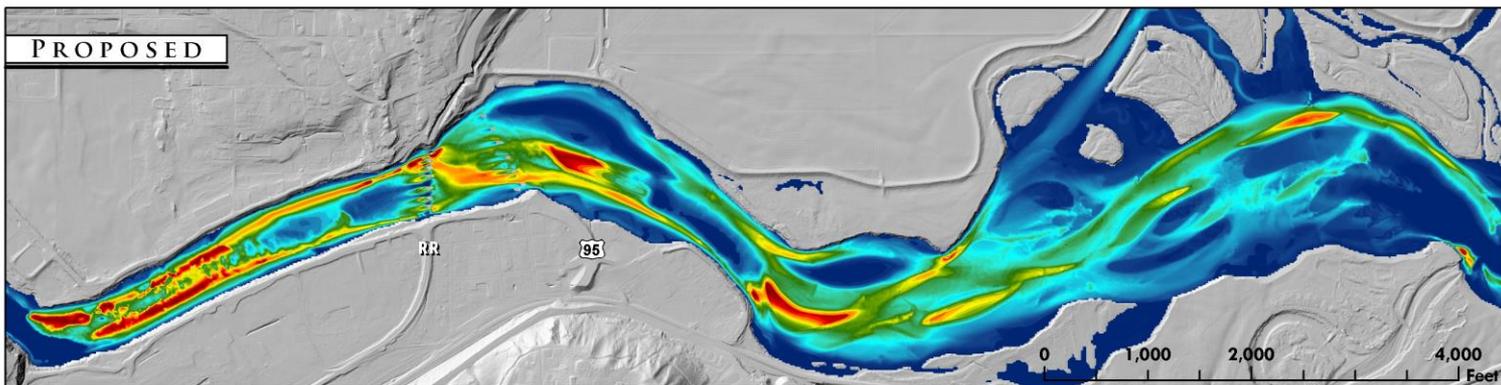
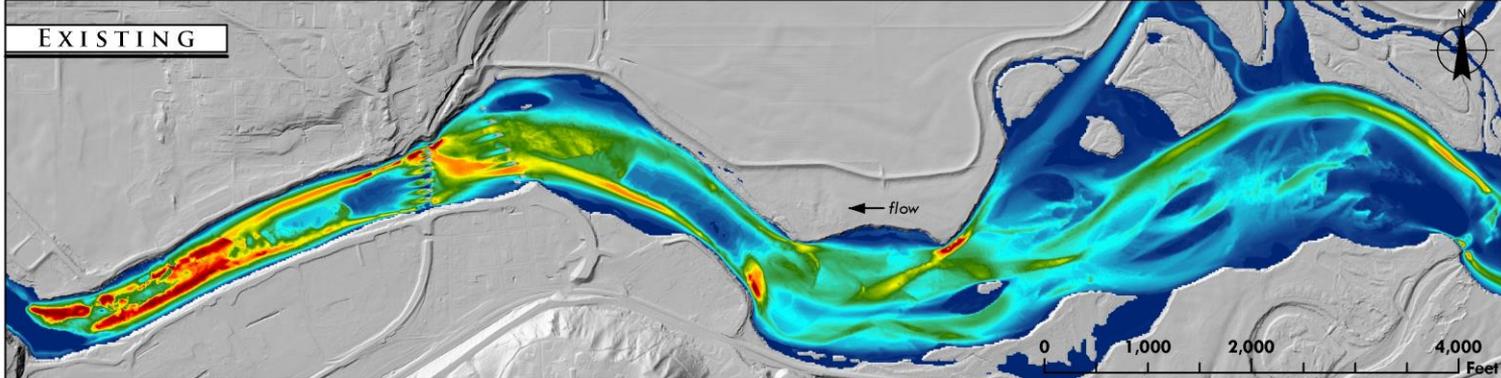
40 KCFS
50TH PERCENTILE LAKE LEVEL

* HSI curves developed for Sacramento River green sturgeon.

Habitat Suitability Index (HSI) Value*

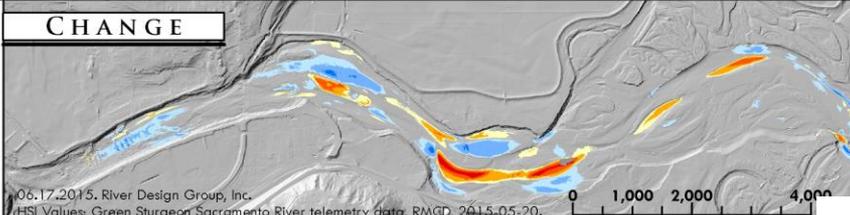
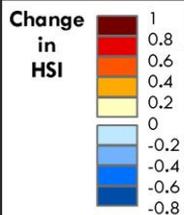


* Composite HSI values calculated using geometric mean of depth and velocity HSI.



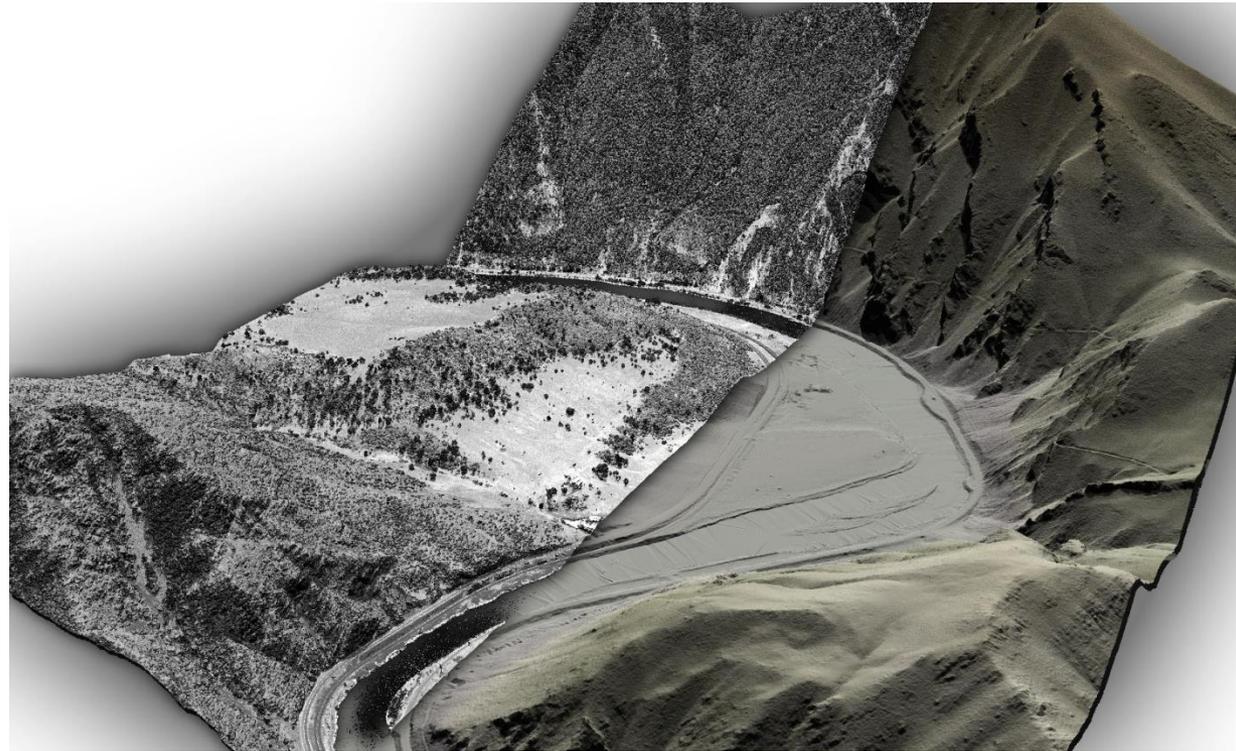
KOOTENAI RIVER
HABITAT RESTORATION PROGRAM

BONNERS FERRY ISLANDS,
STRAIGHT REACH FINAL DESIGN
LOWER MEANDER PRELIMINARY DESIGN



06.17.2015. River Design Group, Inc.
HSI Values: Green Sturgeon Sacramento River telemetry data, RMQD, 2015-05-20.





LIDAR TO PROTECT ASSETS





LiDAR for MT Floodplain Mapping Program



~140,000 sqmi of LiDAR in 47 states in 2017

~660 sqmi QL1 LiDAR in Montana for DNRC



LiDAR for MT Floodplain Mapping Program

LiDAR Point Cloud – 8ppsm

- Classified All returns, LAS 1.4 format

Surface Models

- Hydro-flattened Bare Earth DEM, 1 m

Vectors

- 1' foot contours
- 3D Building Footprint polygons
- Breaklines generated for hydro features and will follow FEMA PM61 for hydro-flattening requirements

Reporting

- Accuracy Assessment for QA/QC and calibration
- Survey report
- Pre and Post Flight Plan
- Technical Data Report
- Checkpoint Analysis
- FGDC-compliant Metadata

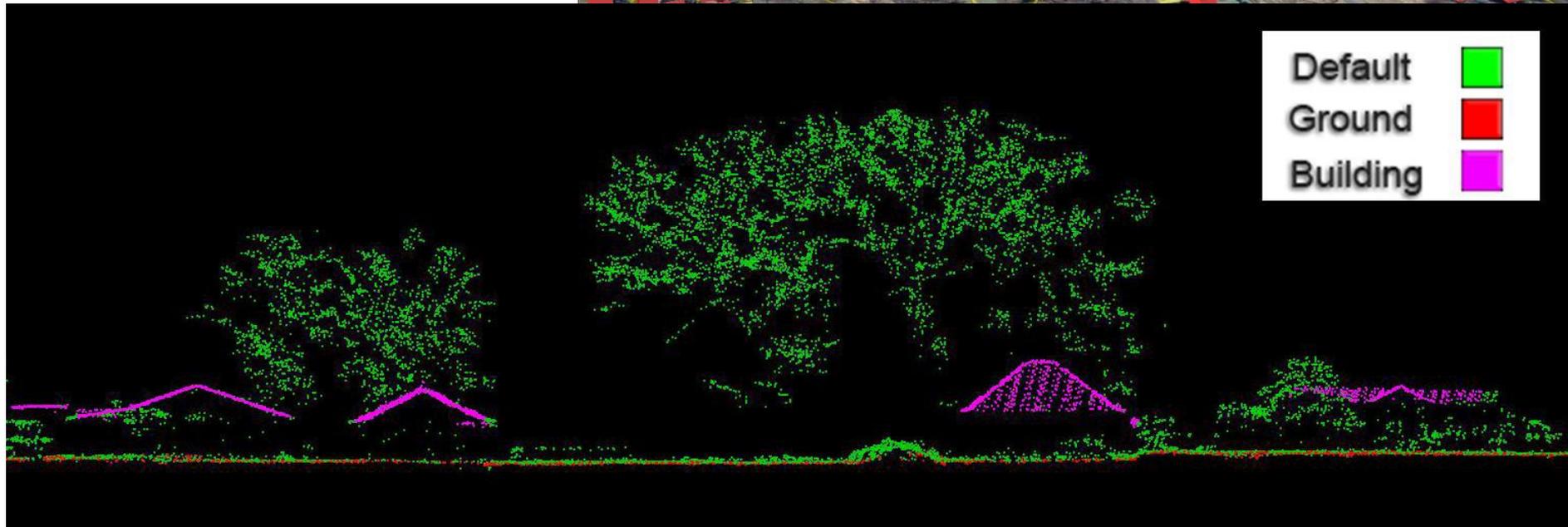
Accuracy Specifications

Accuracy _z (1.96 σ), slope <20°	≤ 20 cm
Vertical Accuracy (σ), slope <20°	≤ 10 cm
Horizontal Accuracy (σ)	≤ 30 cm



3D Buildings Feature Attribution

- Average elevation
- Highest elevation
- Lowest Adjacent Grade (LAG)
- Parcel data





Lowest Adjacent Grade (LAG) Pilot



Harlowton, Montana created from the gridded highest hit model colored by elevation.



Lowest Adjacent Grade (LAG)

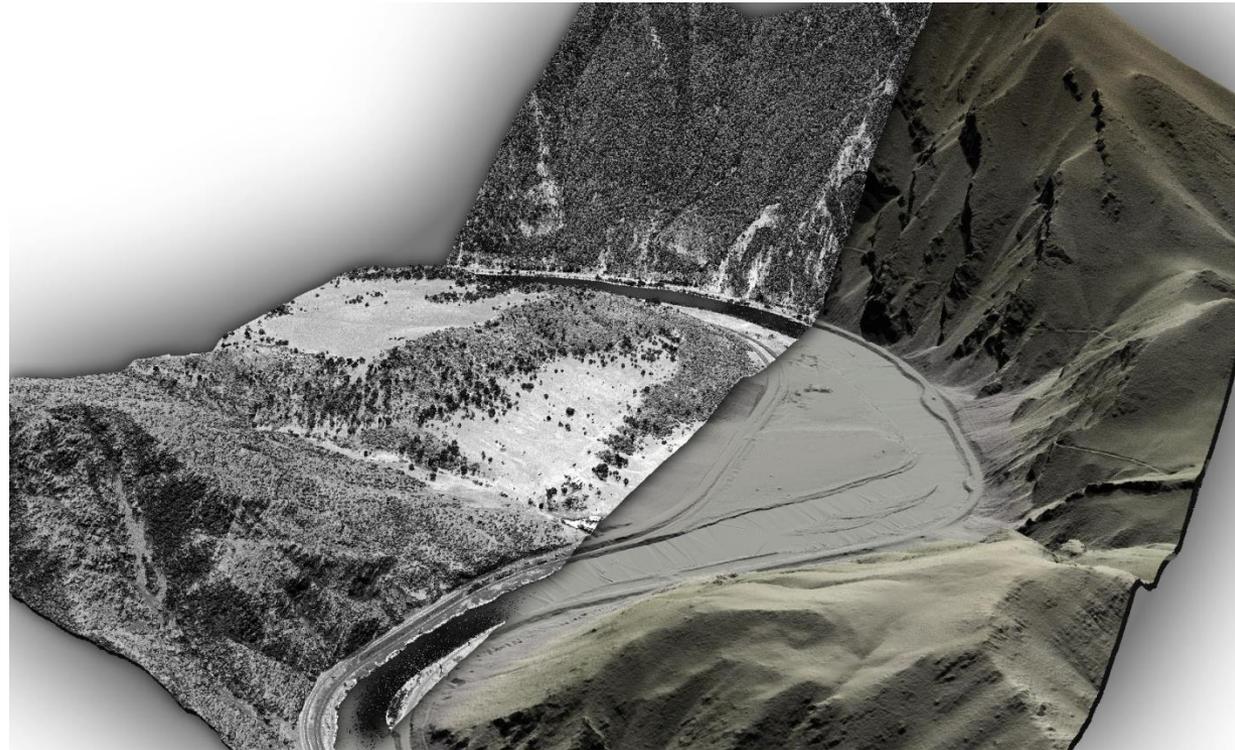


Structures selected based on location to floodplain.

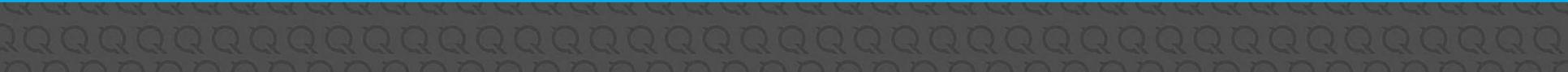


Lowest Adjacent Grade (LAG) Pilot



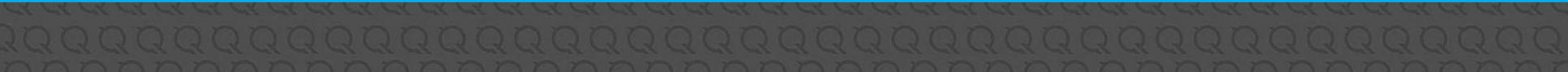
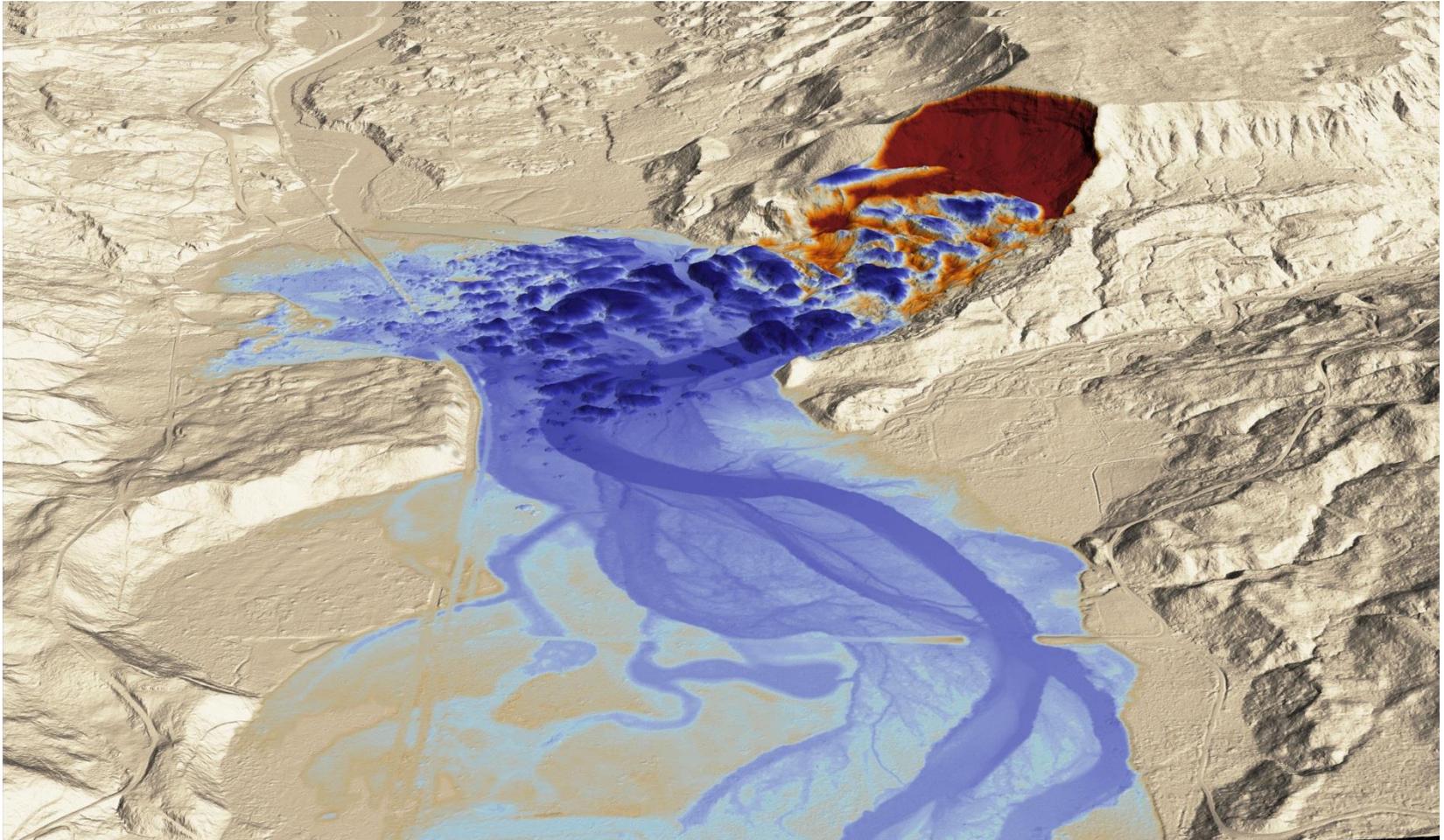


LIDAR TO MITIGATE THREATS TO SAFETY





Oso Landslide



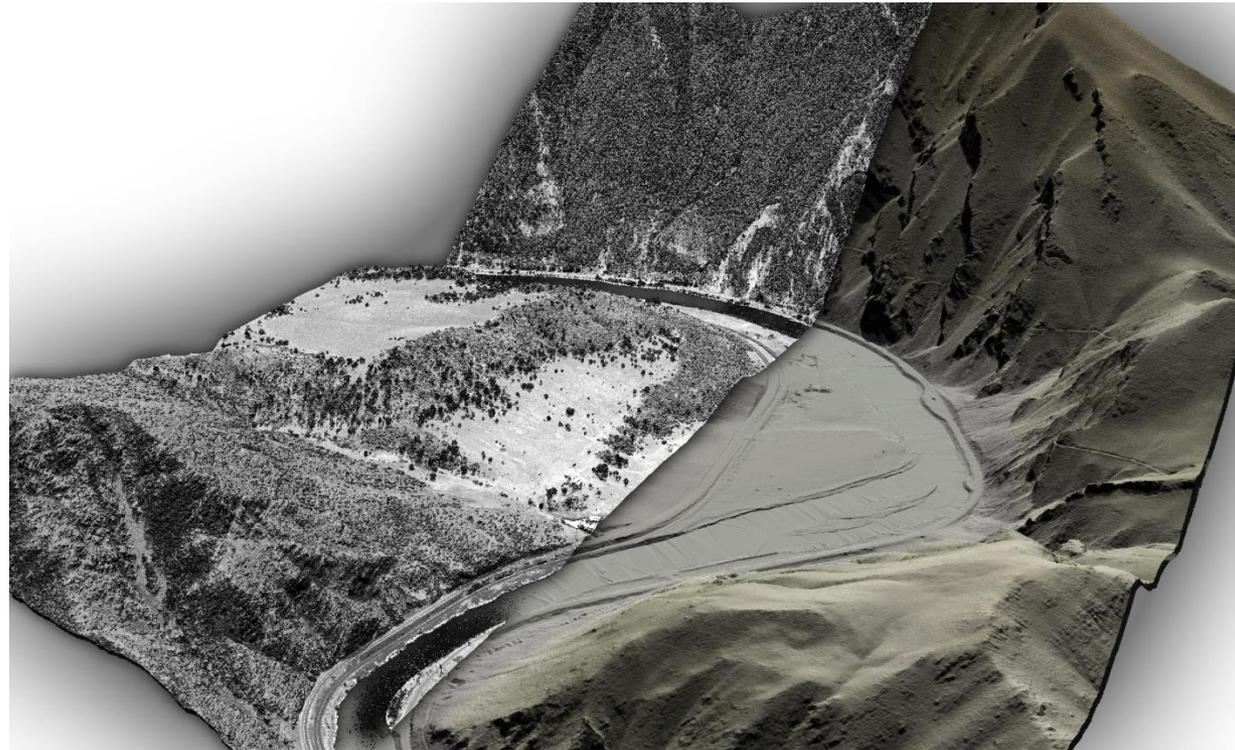


ONE COLLECTION - MULTIPLE USES

LIDAR turns up new Bitterroot fault line

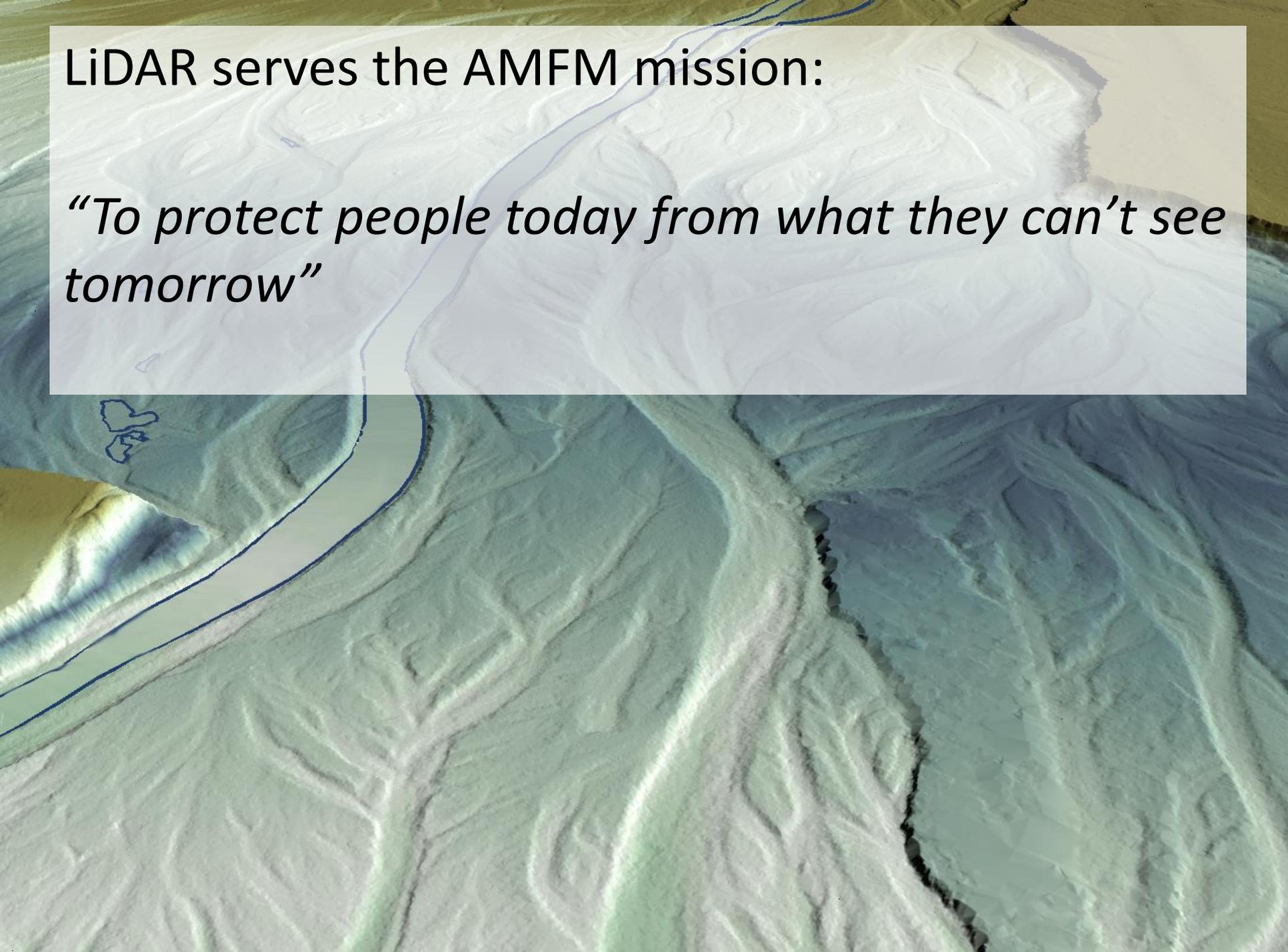
“A mapping method used to look at floodplains in the Bitterroot Valley turned up something unexpected: a new fault line that just might cross under the Lake Como Dam.”

“With tall grasses covering a landscape that’s dotted with trees, it’s easy for the untrained eye to miss the scarp. But a closer look shows where an earthquake offset the surface of the earth, dipping the east side down and pushing the west side up.”



CONCLUSION



A 3D topographic map of a river valley, rendered in shades of green and blue. The terrain is shown with depth, highlighting the river's path and surrounding hills. A semi-transparent white rectangular box is overlaid on the upper part of the image, containing text.

LiDAR serves the AMFM mission:

“To protect people today from what they can’t see tomorrow”



THANK YOU!

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