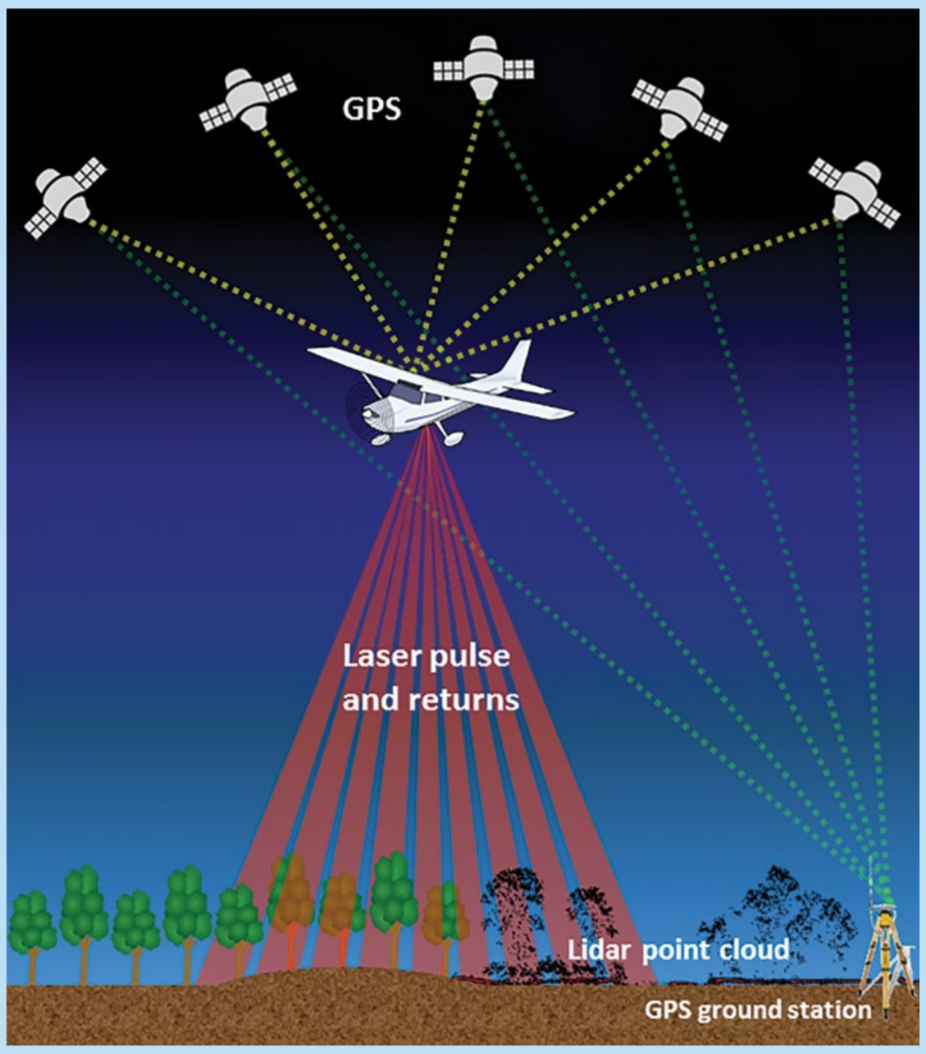
APPLICATIONS OF LIDAR

Across the geosciences, a technology called lidar is supporting innovative approaches to problem solving. Short for Light Detection and Ranging, lidar is a technology that uses light pulses to collect three-dimensional information. Lidar data is often collected from an airplane using a laser system pointed at the ground. The system measures the amount of time it takes for the laser light pulses to reach the ground and return. Billions of these rapidly-collected measurements (points) can create extremely detailed three-dimensional models of the Earth's surface (called bare earth) and of objects above the surface (such as trees and buildings).

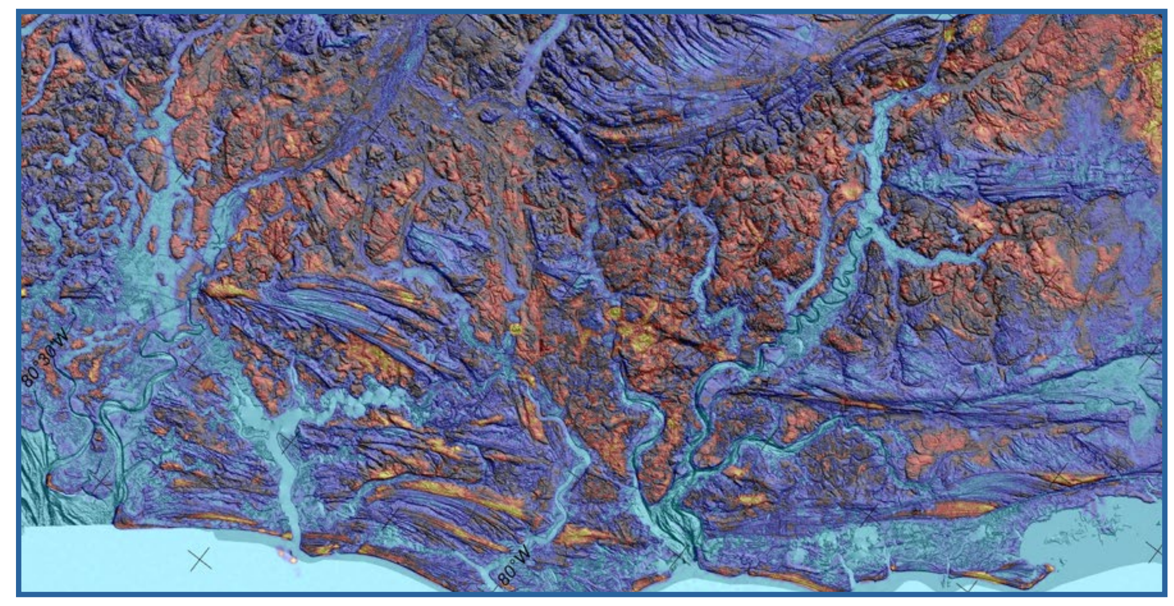
Lidar is an invaluable tool that geoscience professionals can use to see and study large areas of the Earth's surface, particularly in places where trees and vegetation obscure the landscape. Geoscientists can use lidar products to:

- map geology, landslides, and faults
- study volcanoes, glaciers, forests, and rivers
- model potential flood zones
- identify potential locations of critical minerals
- identify safe locations for infrastructure

Learn more about lidar and its many applications to the geosciences in “The Bare Earth” StoryMap (**bit.ly/3CjiLqB**).

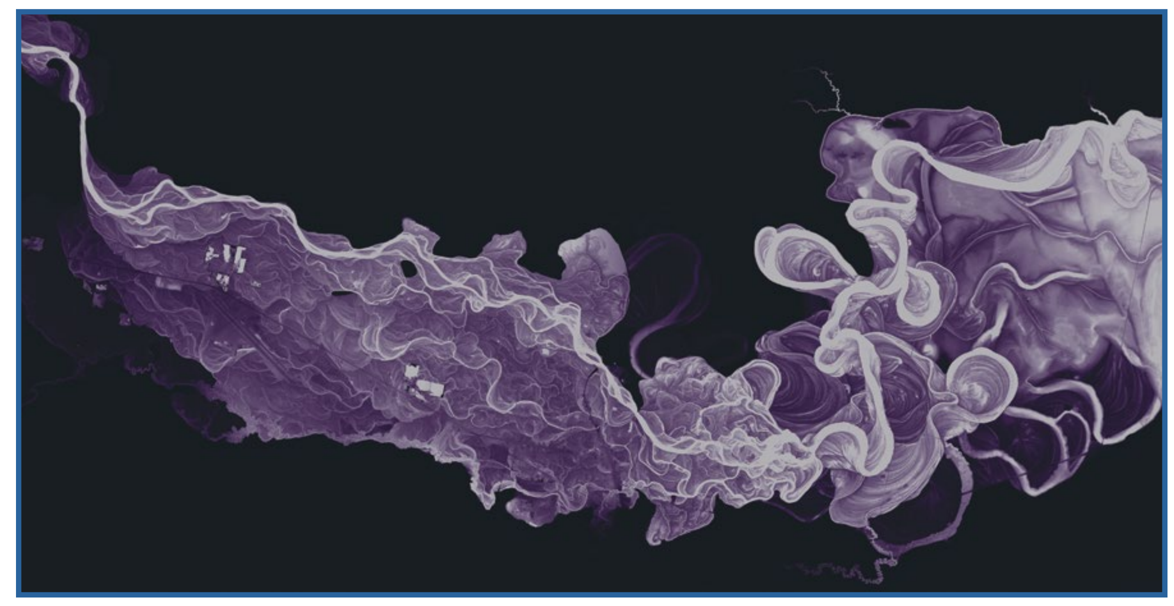


Source: Washington Department of Natural Resources
Credit: 3D Elevation Program



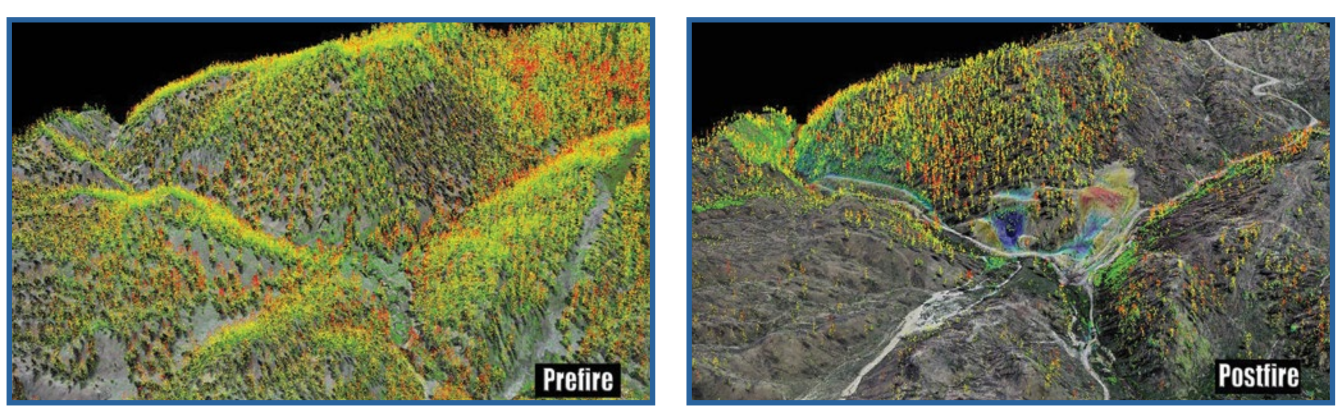
Airborne magnetic and radiometric data were collected over Charleston, South Carolina in a joint effort to locate sands containing critical mineral resources and to image deep faults that might rupture in an earthquake. This image displays equivalent thorium concentrations draped over lidar elevation data. Pairing lidar and radiometric data with elevation data helps identify the geomorphologic context of mineral deposits.

These data were collected by the USGS through the Earth Mapping Resources Initiative (Earth MRI), Earthquake Hazards Program, and National Cooperative Geologic Mapping Program.
Credit: Anjana Shah, U.S. Geological Survey



A Relative Elevation Model derived from lidar data collected in Flathead County, Montana reveals active and past river channels. The Flathead River meanders extensively near the lake, leaving behind dry channels filled with sediment. Some of these dry channels may fill during high waters, while others remain cut off from the main river.

Credit: Nate Wold, Montana State Library

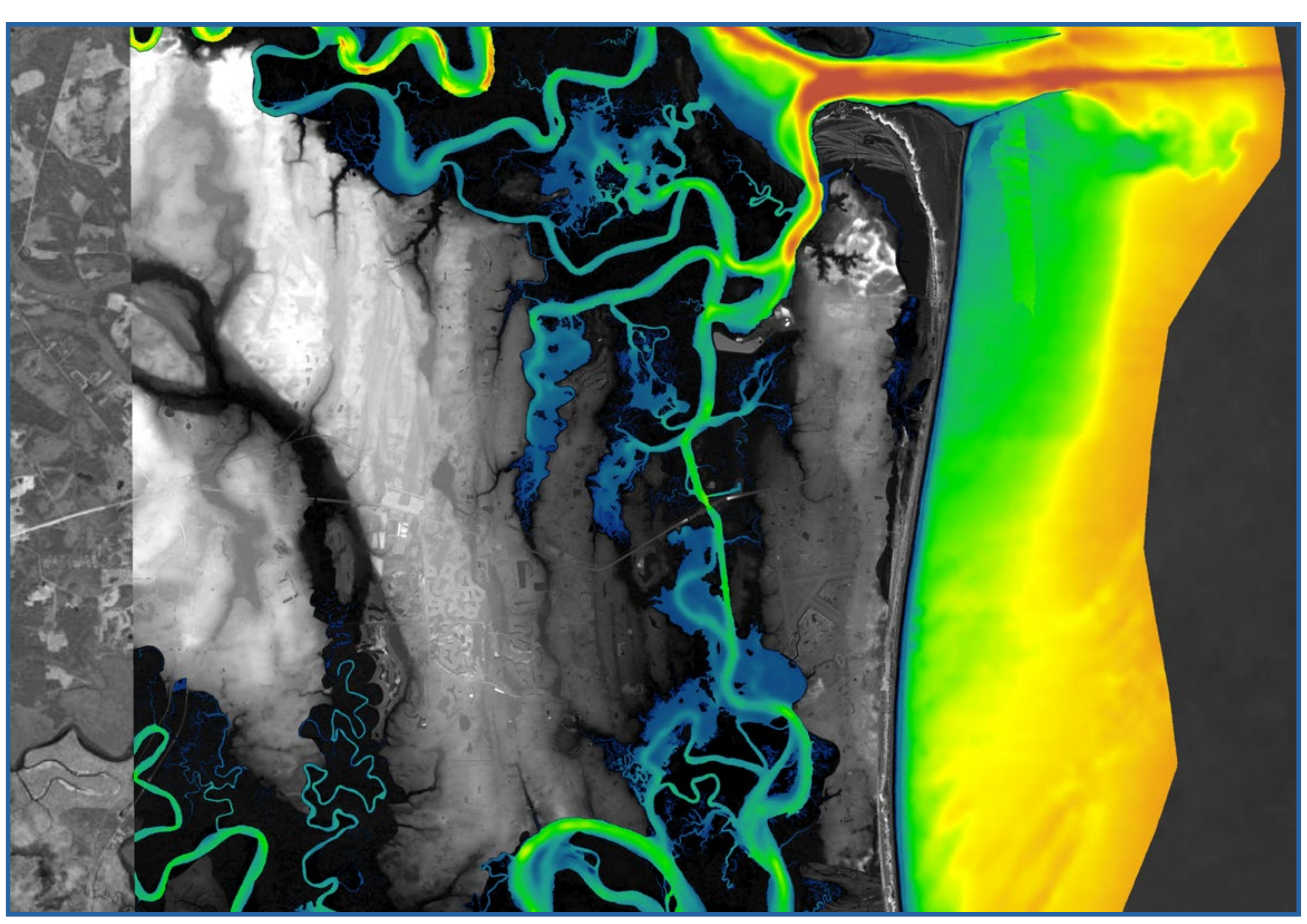


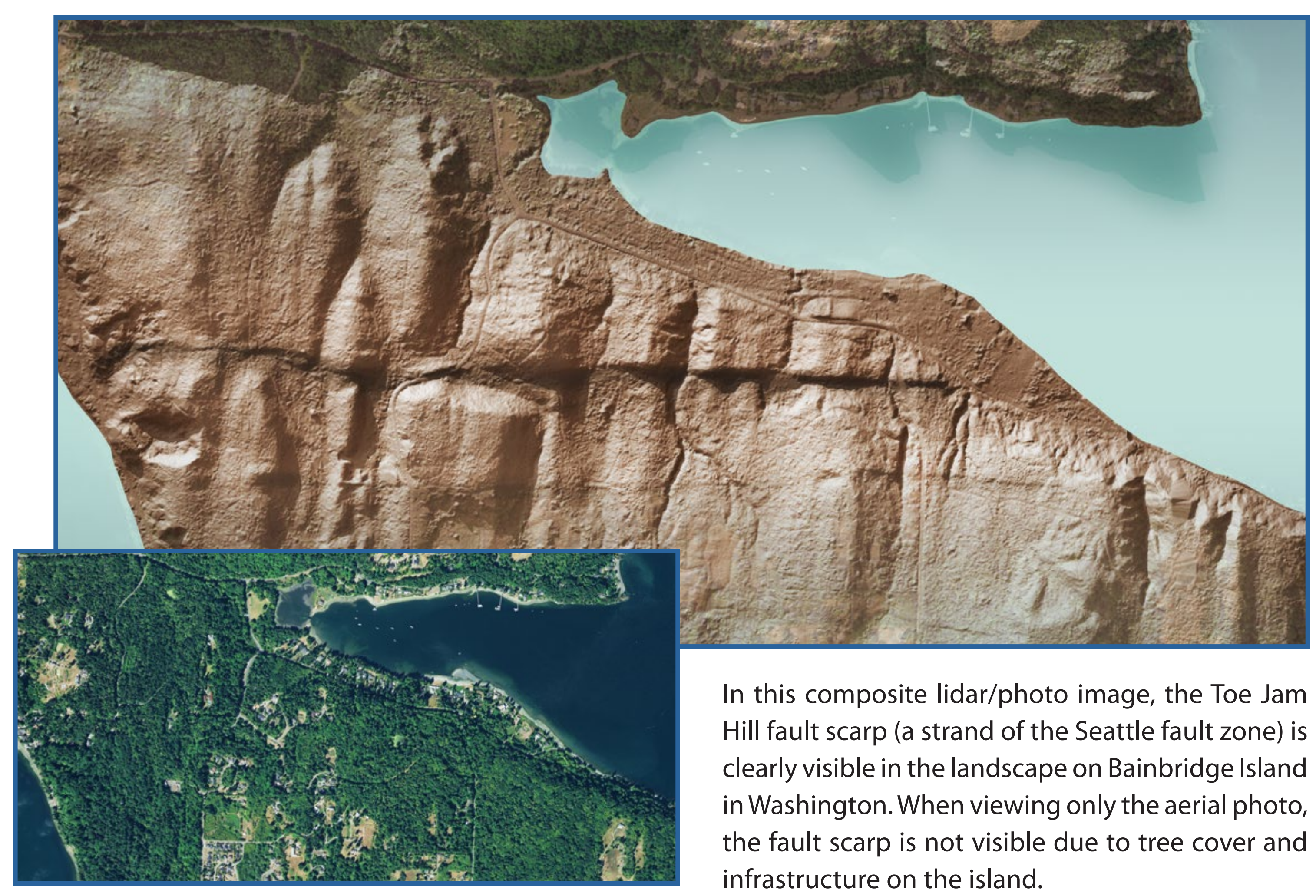
After the Hayman Fire in Colorado, lidar data was collected in order make comparisons to pre-fire data. Lidar points that were recorded on trees are color coded by their heights above ground (green=low, red=high). Changes in the bare earth that are statistically different than the prefire lidar are also displayed (blue=loss in elevation, red=gain in elevation). Areas not colored blue-red had not significantly changed after the fire.

Credit: Jason Stoker, U.S. Geological Survey

Lidar can help map bathymetry in shallow coastal areas. This data can assist with ship navigation, coastal change monitoring, tide modeling, and studying marine habitats such as coral reefs and estuaries. This example shows the coastal transition of a river estuary near Amelia Island, Florida.

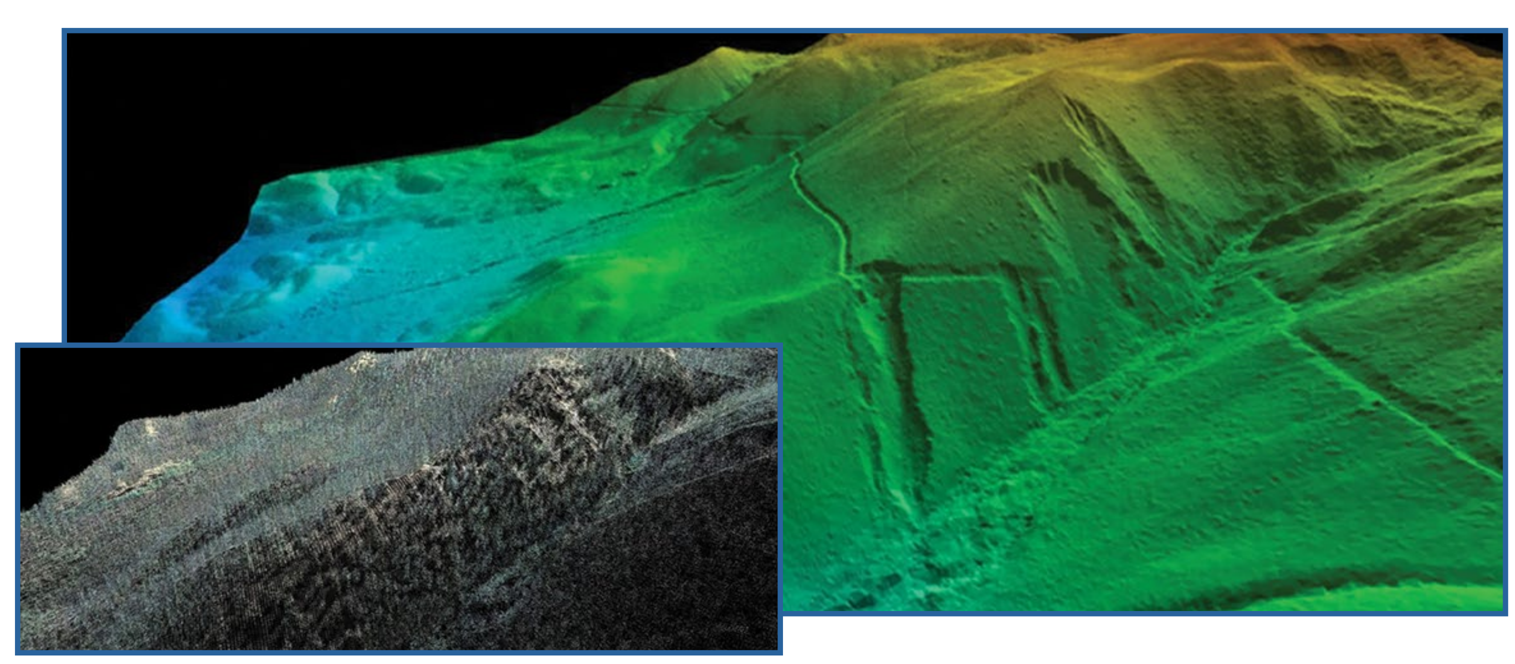
This model was created for the USGS Coastal National Elevation Database (CoNED). Credit: Florida Geographic Information Office





In this composite lidar/photo image, the Toe Jam Hill fault scarp (a strand of the Seattle fault zone) is clearly visible in the landscape on Bainbridge Island in Washington. When viewing only the aerial photo, the fault scarp is not visible due to tree cover and infrastructure on the island.

Credit: Daniel Coe, Washington State Department of Natural Resources



High-resolution elevation data can aid in locating where and when landslides occur. In this image, small-scale landslides are visible through lidar bare earth data that were previously unknown due to tree cover.

Credit: Jason Stoker, U.S. Geological Survey

AGI is grateful to the following individuals and organizations who contributed images, resources, and guidance during the development of this poster: Daniel Coe and Abigail Gleason (WA-DNR); Jason Stoker, Vicki Lukas, Anjana Shah and Warren Day (USGS); Aaron Koelker (FL GIO); and Troy Blandford (MT State Library).