

Mapping California's Bay-Delta Like Never Before

INFORMATION SHEET



**Delta
Science
Program**

DELTA STEWARDSHIP COUNCIL

Good decisions come from good data.

Until now, scientists and agencies working across the Bay-Delta have relied on patchworked elevation maps collected at different times with different methods, making it hard to accurately assess things like flood risk, restoration needs, and subsidence patterns in our changing estuary. This project demonstrates the ways modernized mapping is improving how decisionmakers see the Bay-Delta.



Collaboration led to the development of the first high-quality elevation map of the entire estuary.

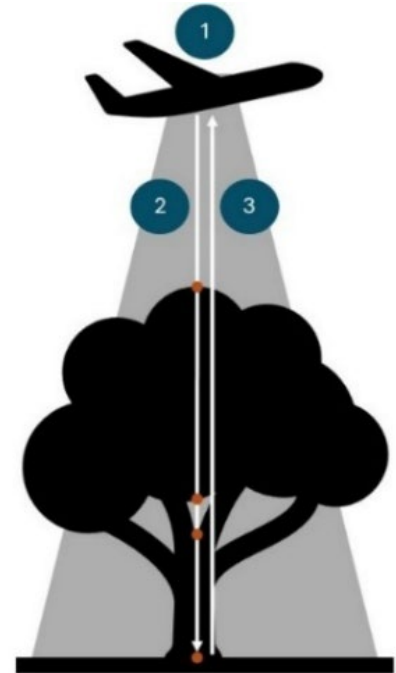
In 2025, the Delta Stewardship Council partnered with the Wetlands Regional Monitoring Program (WRMP), the California Department of Water Resources (DWR), and the San Francisco Estuary Institute to modernize mapping of the San Francisco Estuary. This collaboration has resulted in a comprehensive Light Detection and Ranging – or “lidar” – Digital Elevation Model (DEM) a highly detailed, three-dimensional model of the landscape, showing the landscape in extraordinary detail and providing precise elevation information that reveals how water moves, where flood risks exist, how landscapes are changing over time, and more. The Council has already started putting preliminary data to work in our climate and flood management initiatives, tracking land sinking and wetland recovery, improving flood maps, and more.

Lidar is a remote sensing technology that uses lasers.

The lasers “see” the land and objects above it.

1. Airplane flies back and forth over the survey area
2. Laser pulses sent down to bounce off Earth’s surfaces
3. Laser pulses return to the plane

The laser “returns” (or data) are processed and cleaned using a combination of automated techniques and manual review to create a highly accurate three-dimensional model of the landscape. Lidar can even penetrate tree canopies to reveal the ground below, giving scientists a clear picture of both surface structures and the underlying topography.



The airplane surveyed an area the size of Delaware!

Below are more details for those interested in the data collection flights.

- **Area:** ~1.25 million acres
- **Timing:** Coordinated at low tides and low water
- **Aircraft:** Cessna Caravan
- **Sensor:** Riegl VQ-1560ii-S
- **Accuracy:** Precise to less than 10 cm (about the height of a soda can)
- **Quality:** Level 1 (which is an improvement from the 2017 lidar collection)



A note from the Delta Lead Scientist

“California relies on the Delta. If we want to protect what matters, we need more than good intentions. We need good information. This project shows the power of partnership, pooling resources and expertise to give the region something it has never had before: one consistent, high-quality map of the entire system.”

– Delta Lead Scientist Dr. Lisamarie Windham-Myers

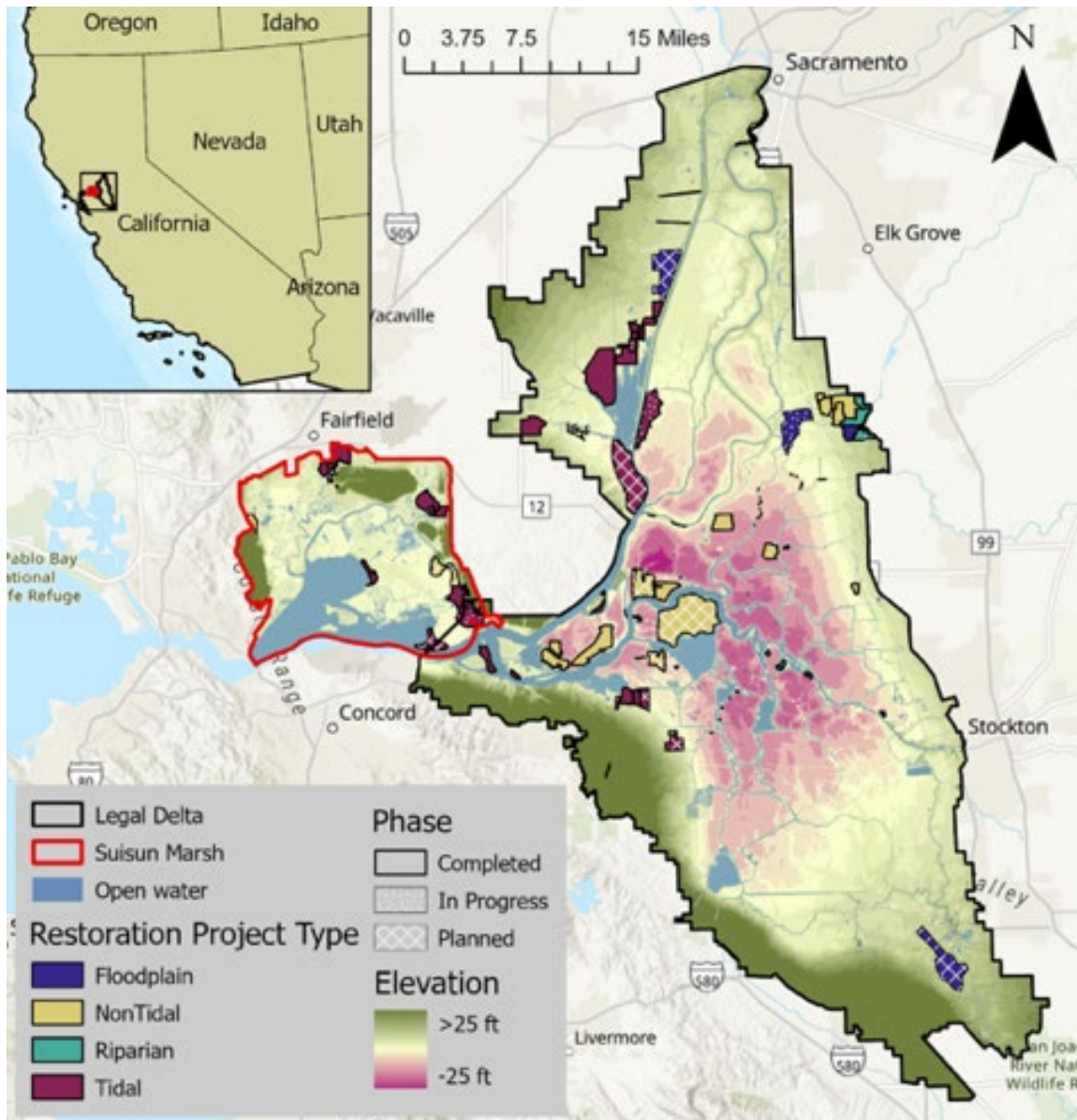
The data collected can generate four types of maps.

1. Digital Elevation Models show the ground surface only.

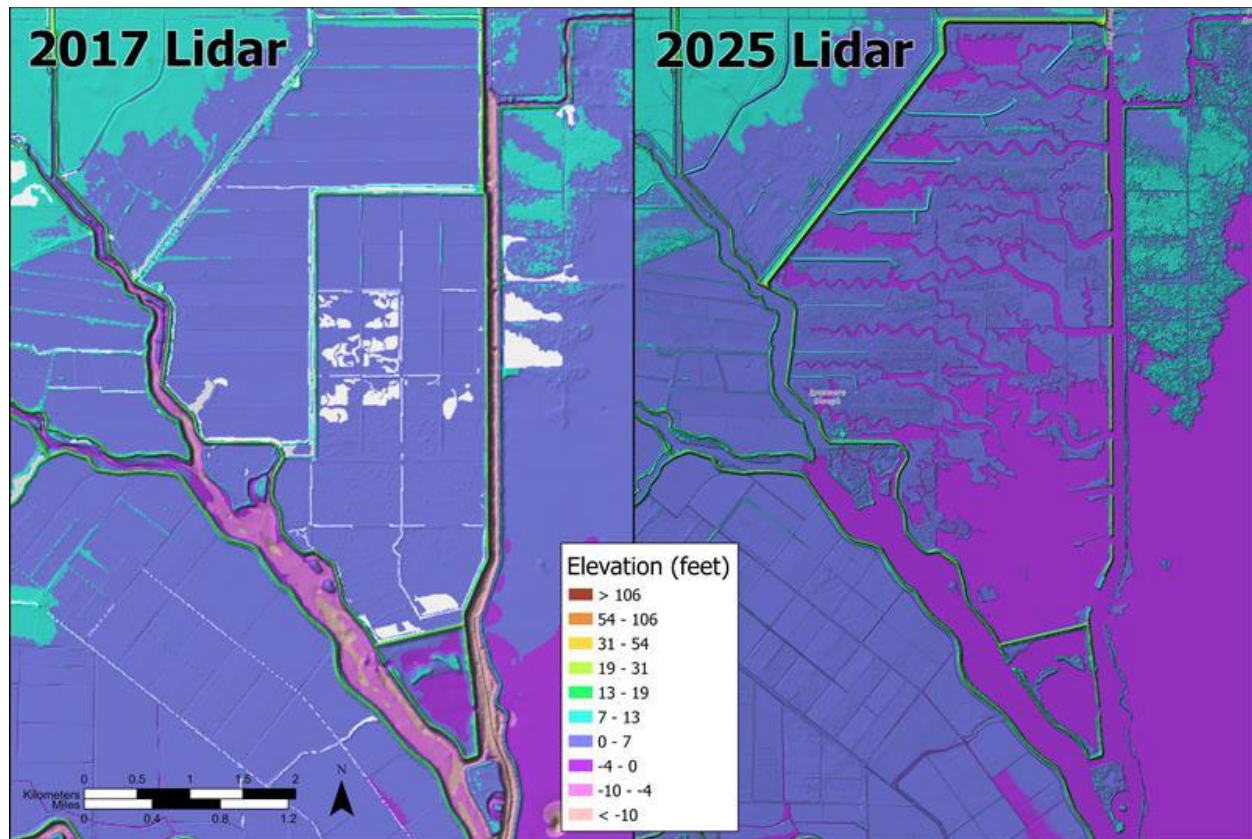
2. Digital Surface Models show the tops of trees, buildings, and other features.

3. Normalized Digital Surface Models show how tall objects are above the ground.

4. Canopy Height Models show the height of vegetation.



A restoration synthesis map using digital elevation models provided by the Delta Science Program



2017 vs. preliminary 2025 lidar DEM, showing landscape changes at Lookout Slough Tidal Habitat Restoration Project in Solano County. Flown at low tide with greater accuracy, the 2025 survey reveals terrain details that matter for flood planning, wetland restoration, and community protection.

These maps can be used in many ways, including:

Reducing flood risk for communities by improving flood maps and emergency planning.

Protecting homes, farms, and infrastructure by identifying areas at risk before disasters happen.

Improving public safety through better hazard mapping (flooding, levee failure, earthquakes).

Studying the impacts of climate change, like sea level rise.

Increasing coordination across agencies by using the same high-quality data.

Improving planning for levees, floodplains, and habitat restoration.

Tracking changes to the landscape due to sinking land or earthquakes.



A note from the WRMP Co-Lead Scientist

“Accurate elevation data has become increasingly important for understanding and mapping tidal habitat dynamics and their change over time. This lidar supports foundational products like the Baylands Habitat Map, which helps track tidal wetland extent, restoration progress, and other metrics that inform science-based decision-making through the WRMP.”

– WRMP Co-Lead Scientist Dr. Lisa Beers

What are the next steps?

- ✓ The flights to collect elevation data are complete, and the data have been processed into preliminary surface and elevation models.
- Once the data are reviewed and approved, final datasets will be publicly available online.
 - The WRMP, DWR, California Natural Resources Agency, and National Oceanic and Atmospheric Administration will share data across multiple sites in 2026 for the public to access and download.
 - U.S. Geological Survey will add data to its National Map – a suite of products, services, and applications that provides access to geospatial information representing the topography, natural landscape, and the United States’ built environment and territories – in 2027, making it publicly available for download. The National Map is used by government, industry, and academia, as well as the general public to make life-saving decisions, support scientific missions, enhance recreational experiences, and more.

To learn more, email our team at researchfunding@deltacouncil.ca.gov.



CALIFORNIA DEPARTMENT OF
WATER RESOURCES