

Identifying Salmonid Habitat Units Using High Resolution Imagery Acquired with a UAS in the Upper Eel River Watershed, California, USA

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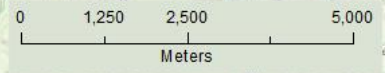
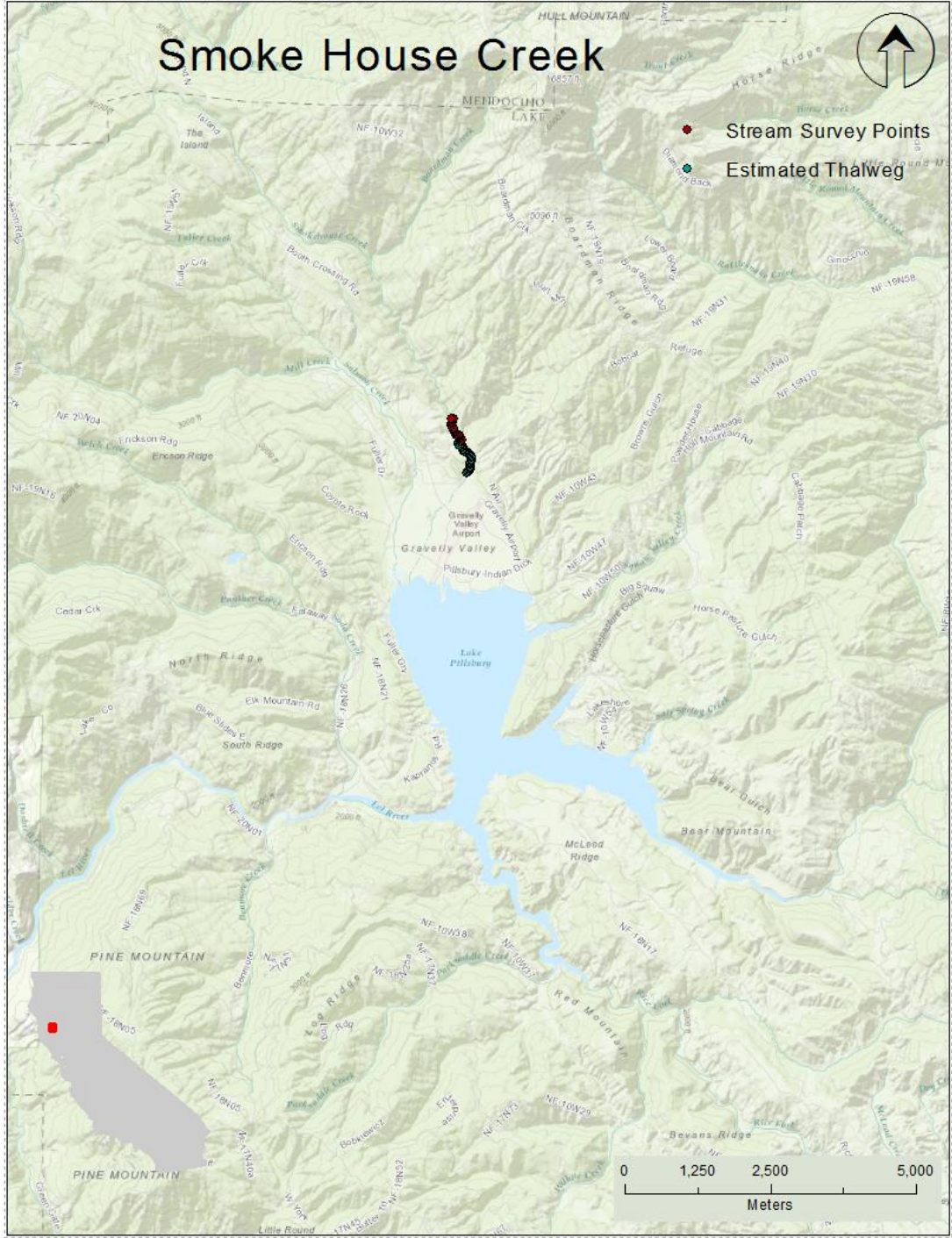
Goals of Pilot Study

- Collect aerial images using a UAS at low water
- Test identifying stream habitat units from UAS data
- Test creating <1 meter resolution elevation models
- Evaluate UAS data against other available data types

Smoke House Creek



- Stream Survey Points
- Estimated Thalweg



Methods

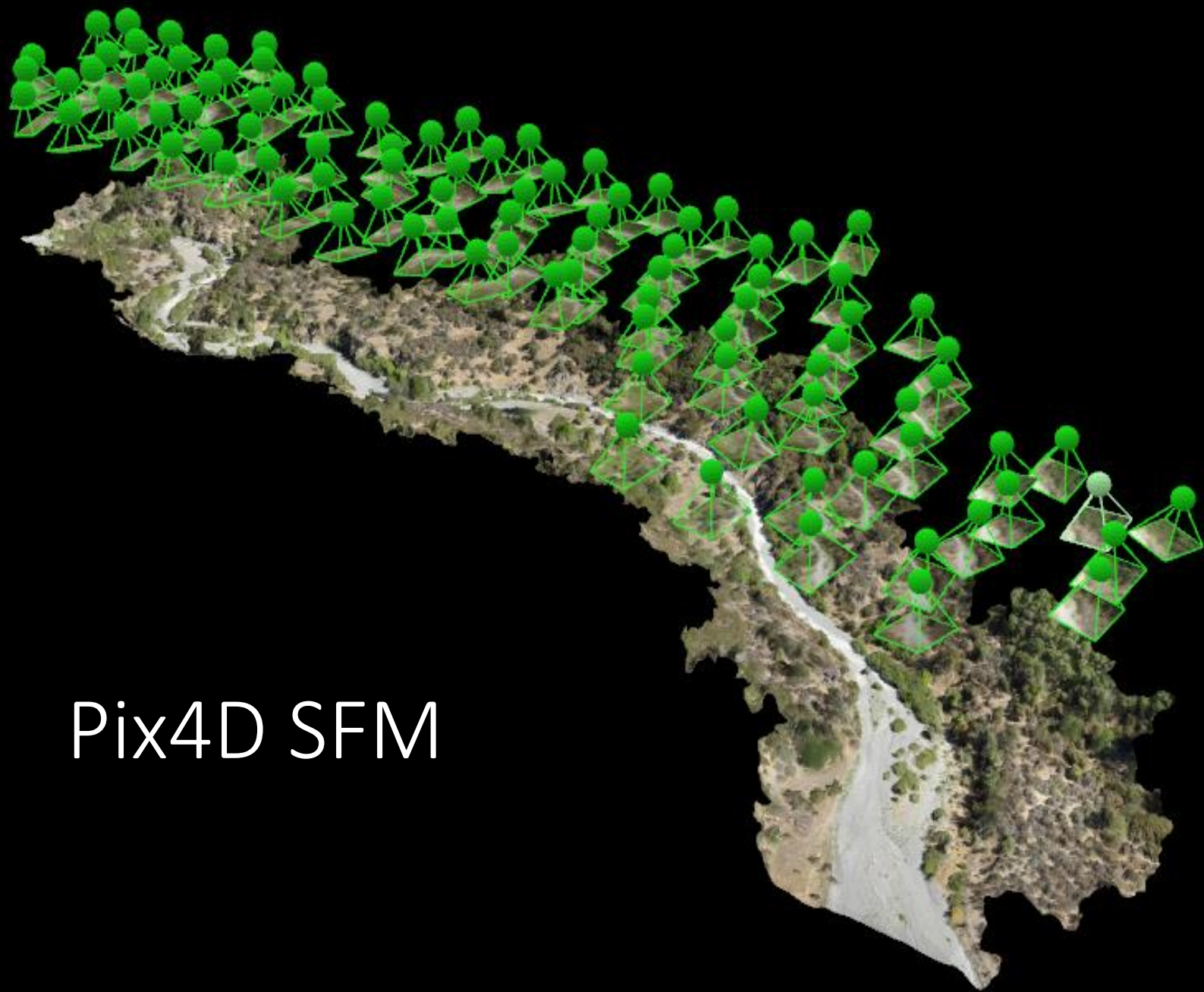
- Fly UAS to collect aerial imagery
- Process images in Structure From Motion (SFM)
- Create elevation production in SFM
- Process other available data in GIS
- Perform comparison analysis in GIS

Platform: SenseFly eBee
Flown by: Vertical Sciences



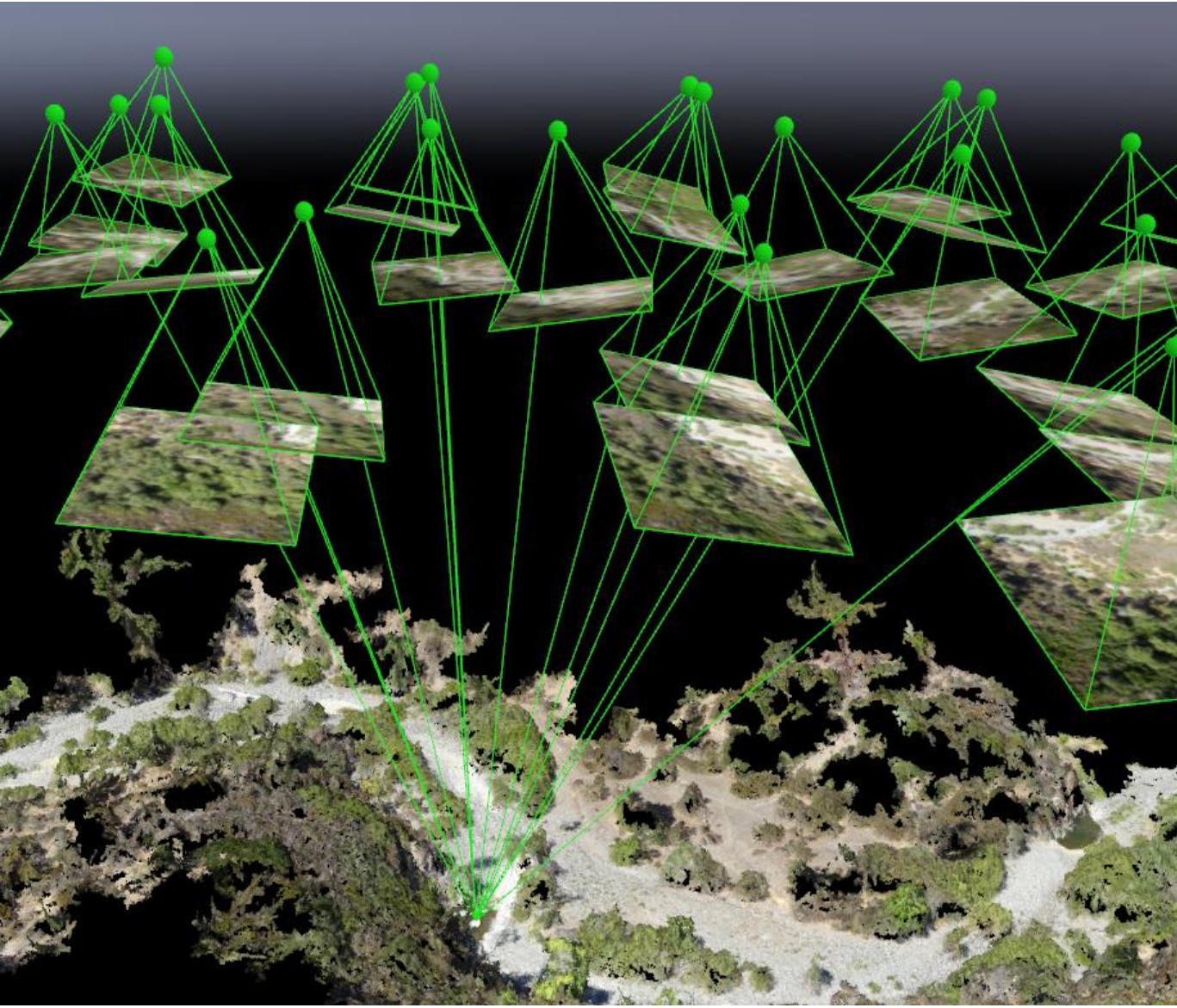
204 Digital Images ~3 cm resolution





Pix4D SfM

Photo Alignment

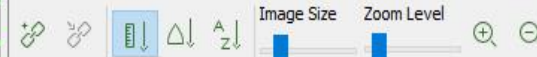


Densified Point

Number of Images Visible In: 14

Computed Position [m]: -5.46, 99.48, -51.35

Images

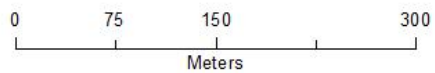




- Stream Survey Points
- Estimated Thalweg



~ 3 cm mosaic





Riffle

Dry

Pool

Pool

Riffle

Pool

Riffle

Flatwater



Riffle

Pool

Riffle

Flatwater

Riffle



Flatwater

Flatwater

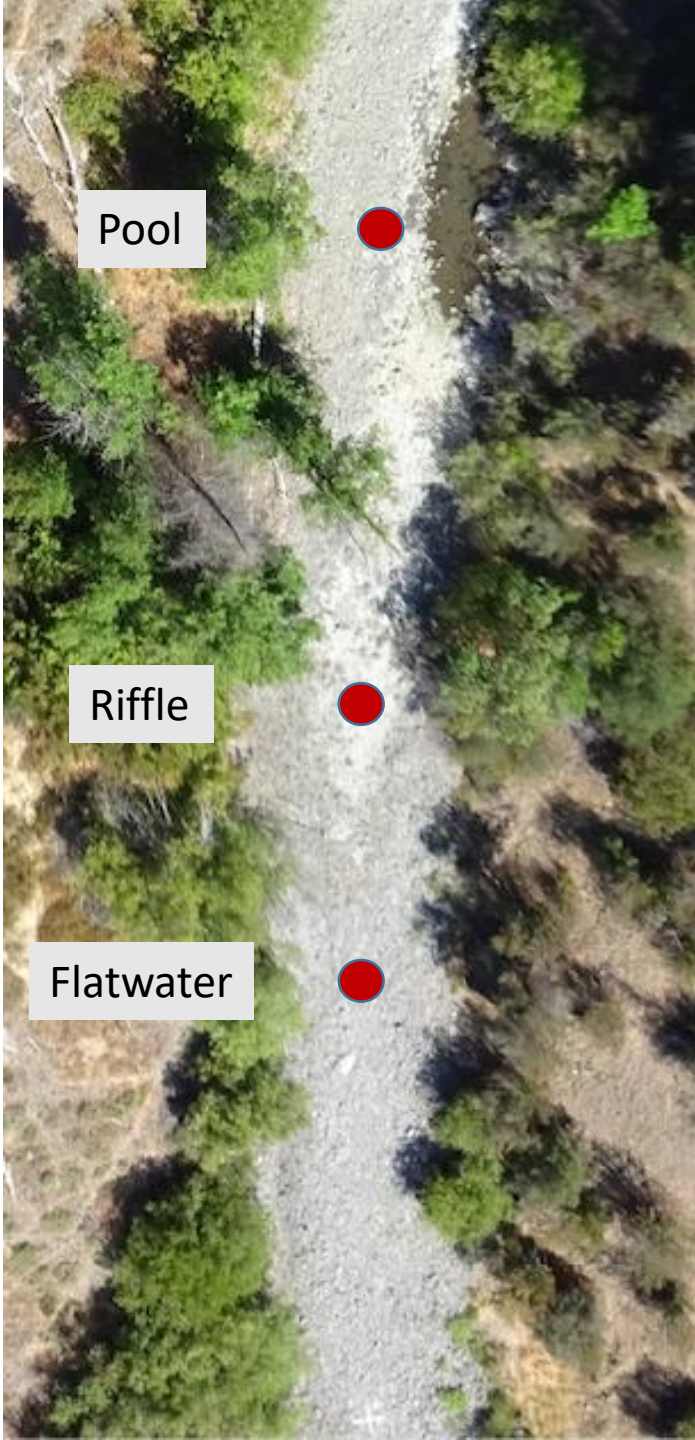
Pool

Pool

Pool

Pool

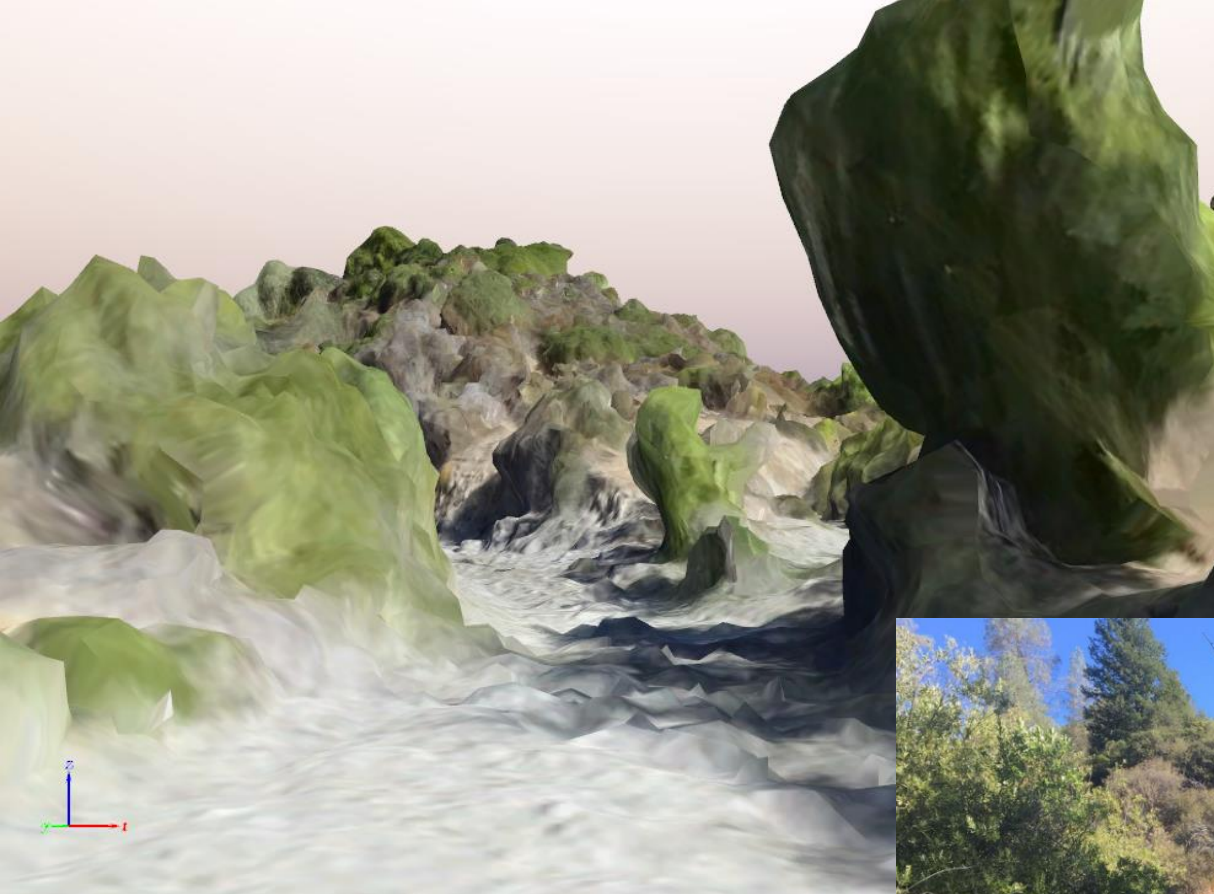
Riffle

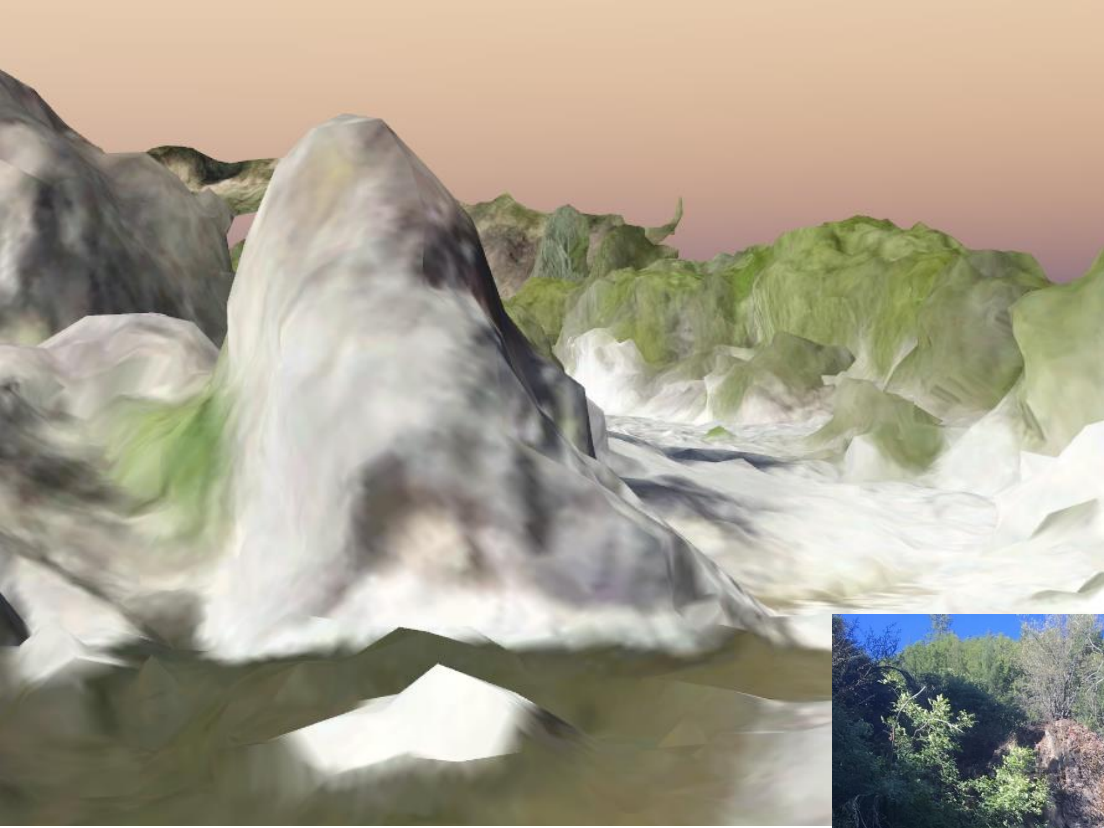


Pool

Riffle

Flatwater

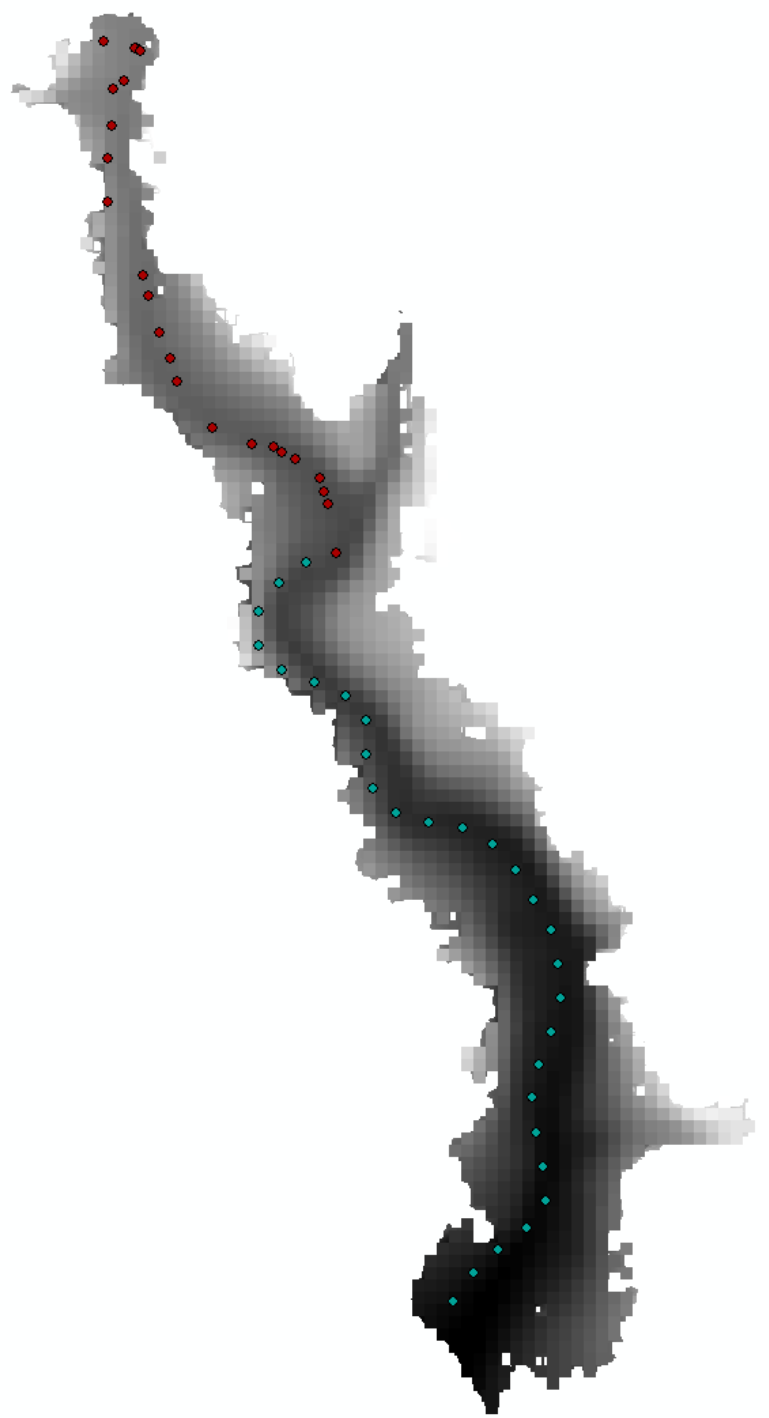




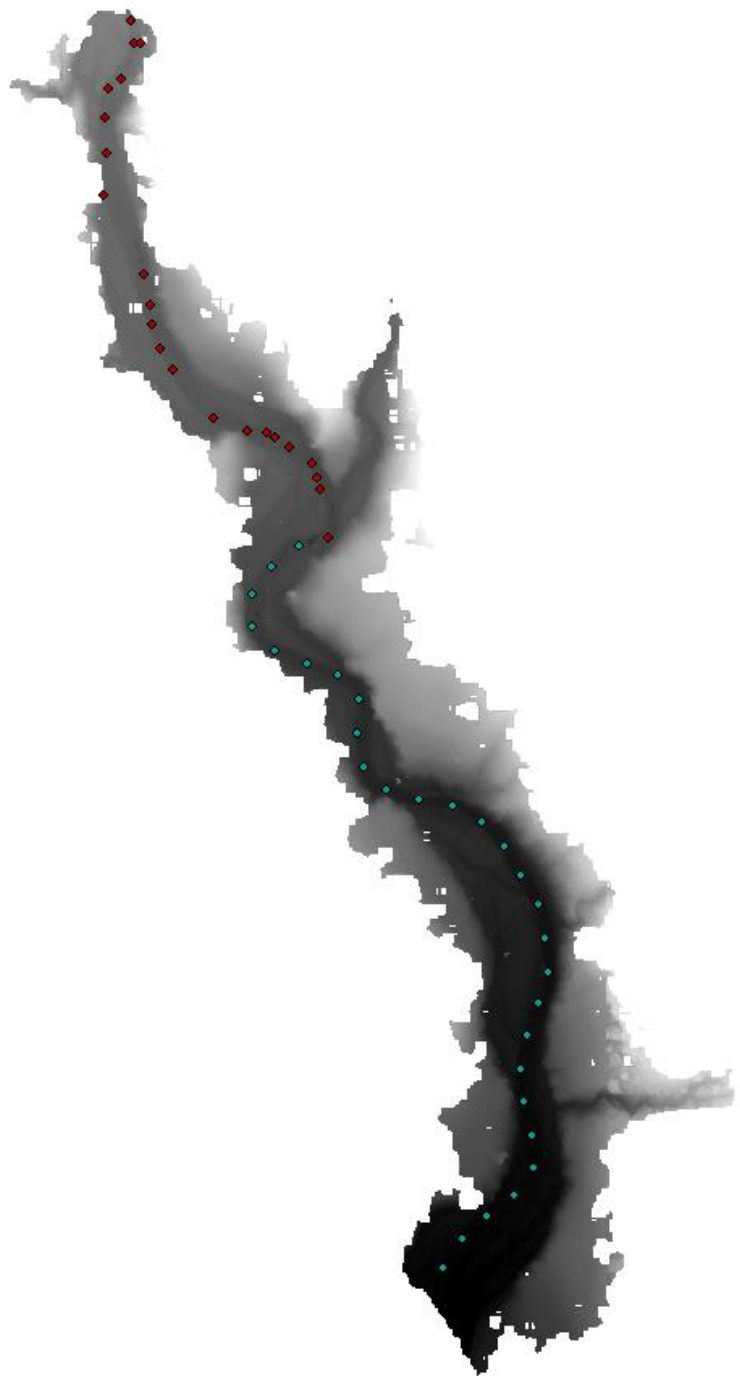
Available Spatial Data

- 10 meter DEM
- < 1 meter airborne and terrestrial lidar
- 1 meter NAIP Images
- 0.3 meter Backgrounds in ArcGIS (Digital Globe)
- Traditional ground survey techniques

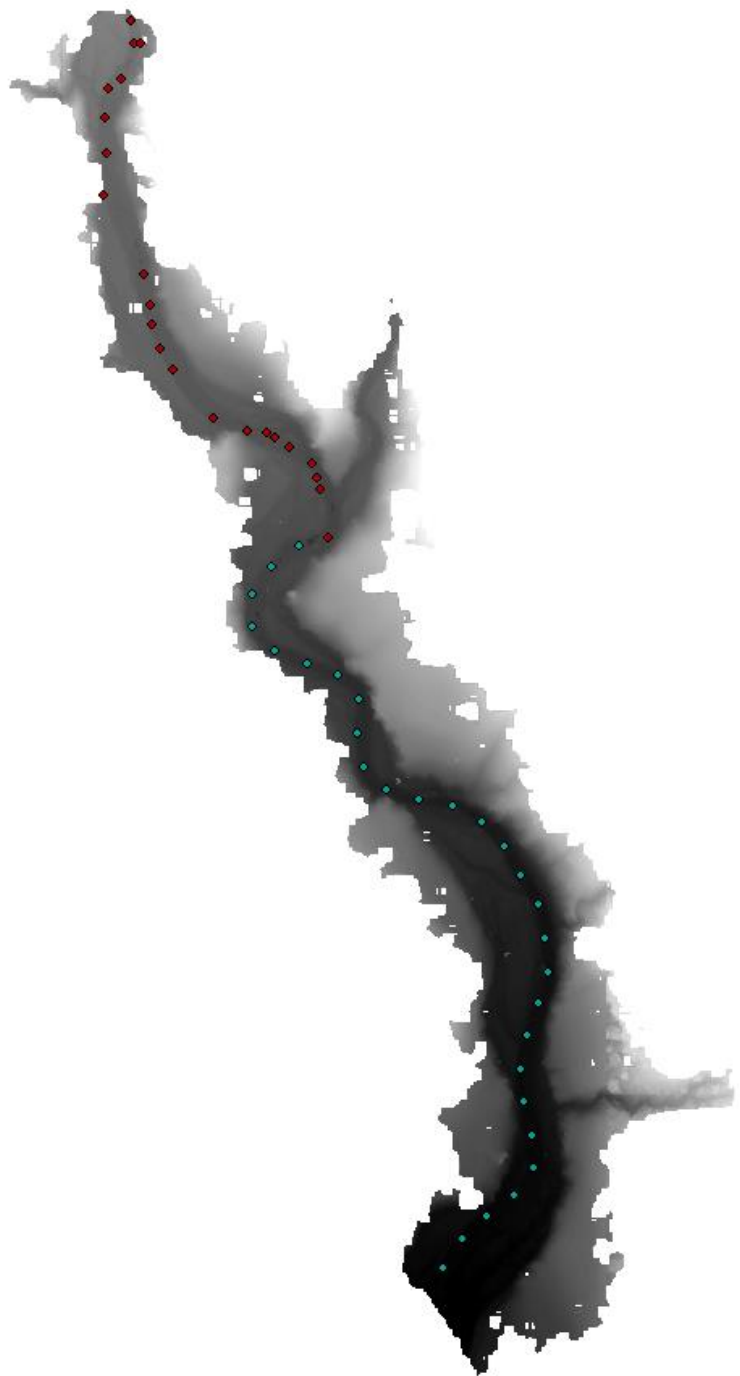
10m DEM



10cm Lidar



10cm SFM



0.3 Meter RGB from DigitalGlobe



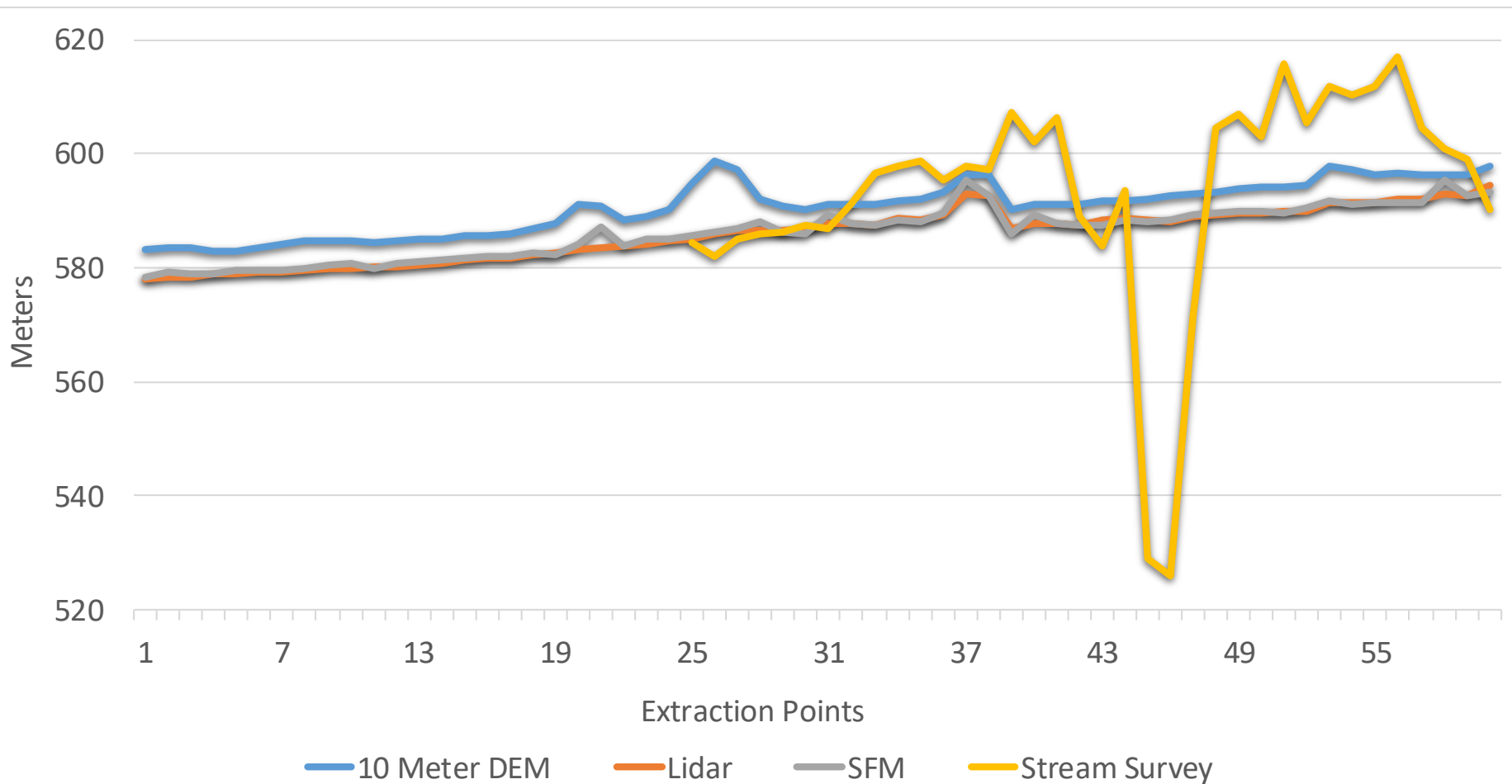


SFM

SFM

The image displays a 3D surface reconstruction (SFM) of a textured surface. The scene is dominated by a dark, irregularly shaped object in the foreground, which appears to be a rock or a biological specimen. This object has a bright, reflective spot on its surface, possibly a mineral inclusion or a point of interest. The background consists of a light, textured surface, likely a rock face or a biological structure, with a complex, porous appearance. The overall image has a high-contrast, somewhat grainy quality, characteristic of SFM data. The text "SFM" is overlaid on the left side of the image.

Comparison of Elevations



Lessons Learned

- Need tight integration between the field survey crews and the UAS pilot(s)
 - HSU now has a faculty pilot and three more in training
- UAS Equipment selection, equipment maintenance, flight planning, flight operations, and data processing are all critical to research success
- Need high resolution GPS to ground truth to UAS data

Acknowledgements & Questions



CALIFORNIA TROUT



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VERTICAL **SCIENCES**