




**AG +
OPEN
SPACE**
SONOMA COUNTY

L A N D F O R L I F E

Development of Riparian Maps for Sonoma County

Long Term Riparian Corridor Conservation

Mark Tukman & Dylan Loudon | Tukman Geospatial

- 
- **Mark**
 - Background on functional riparian mapping
 - **Dylan**
 - Data products
 - Methods
 - Challenges
 - Next steps



Functional Riparian Ecosystems

- **small % of landscape**
- **moist environment in Mediterranean climate**
- **conduit for movement of terrestrial and aquatic organisms**
- **$\frac{3}{4}$ of the amphibians and $\frac{1}{2}$ of the reptiles in California**
- **resident and migratory bird species**
- **critical for supporting salmonids**



Functional Riparian Ecosystems

Multiple benefits

- **Biodiversity**
- **Drought & climate resiliency**
- **Water quality & supply**
- **Flood attenuation**
- **Recreation & scenic value**





Floodplain Riparian Forests:

95% Loss

Since European Settlement



Conservation Prioritization | Riparian Corridors

We need to conserve this essential riparian habitat, but first we need to know where it is!



Data Investments | Partnerships

- LiDAR
- Imagery





Project | Team

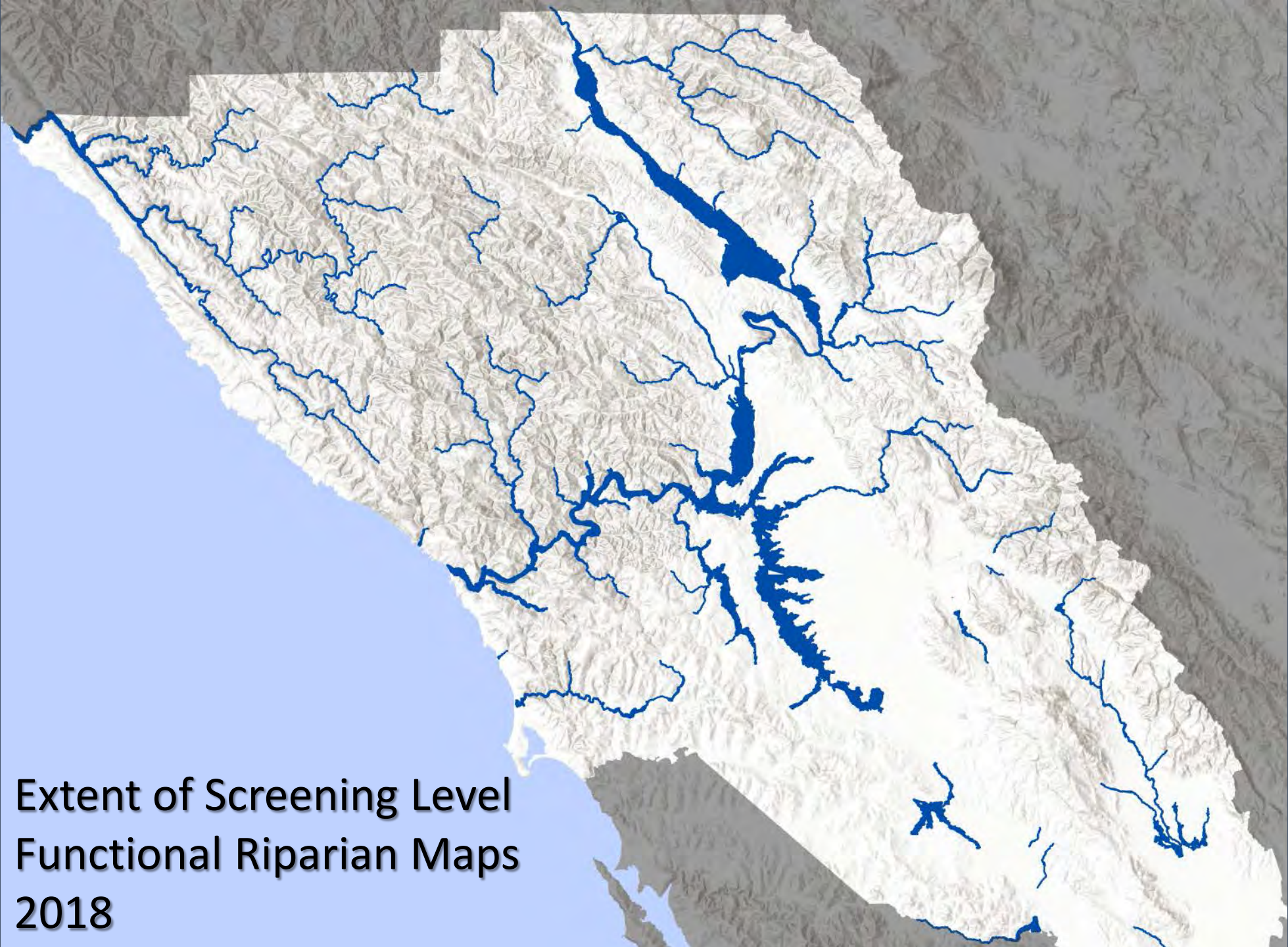
- **Mark Tukman, Dylan Loudon, Kass Green – Tukman Geospatial**
- **Matt O'Connor, Jeremy Kobor – O'Connor Environmental**
- **Joan Florsheim, UC Santa Barbara**
- **Karen Gaffney, Allison Schichtel, Alex Roa – Ag + Open Space**
- **Arthur Dawson**
- **NASA, University of Maryland, CA Fish & Wildlife**
- **Sonoma County: Water Agency & Information Services**
- **Sonoma County Board of Supervisors**



Project | Objectives

Functional Riparian Mapping - Objectives

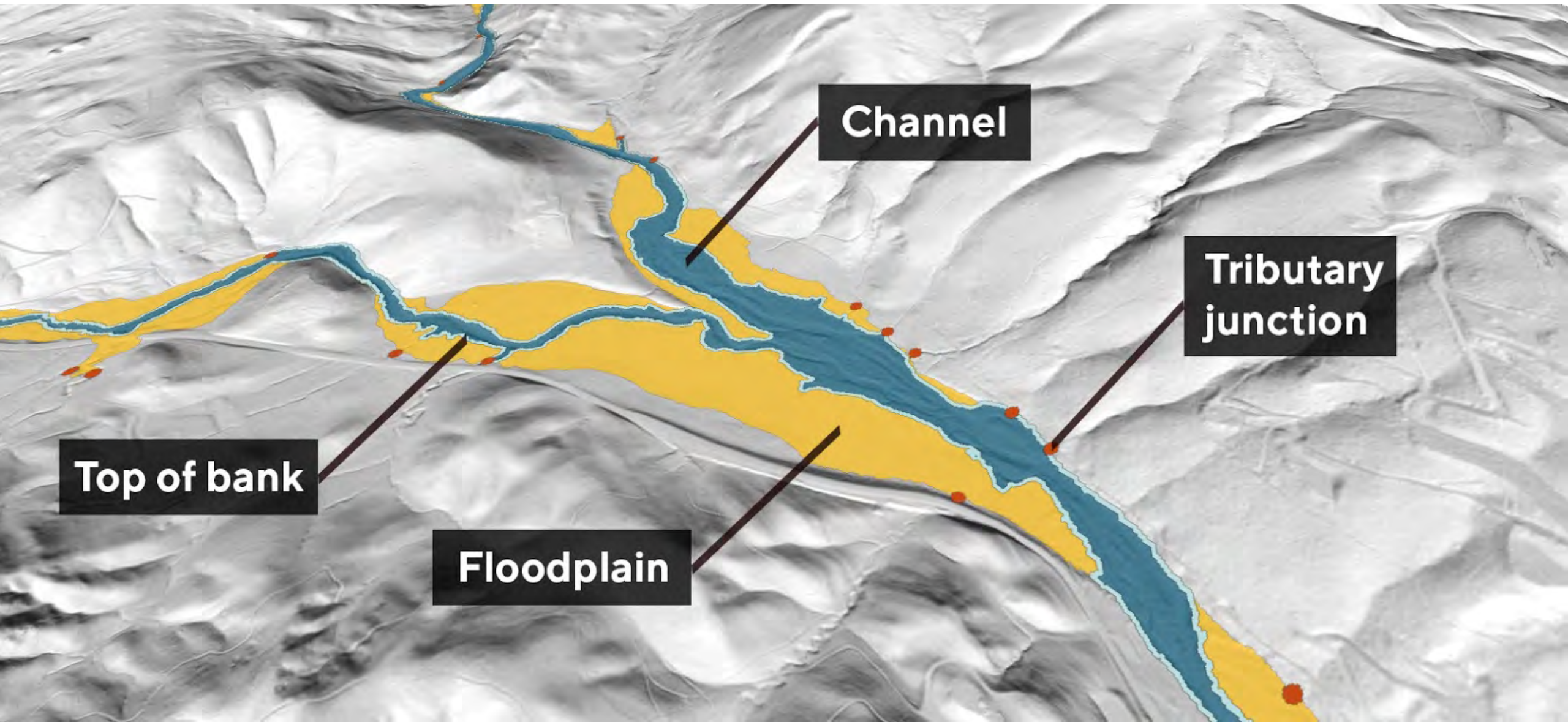
- Screening level maps for alluvial reaches countywide
- Channel, floodplain, top of bank and tributary junctions
- Very large systems mapped opportunistically
- Small systems (< 2500 acre upstream catchment area) not mapped



Extent of Screening Level
Functional Riparian Maps
2018



Project | Data



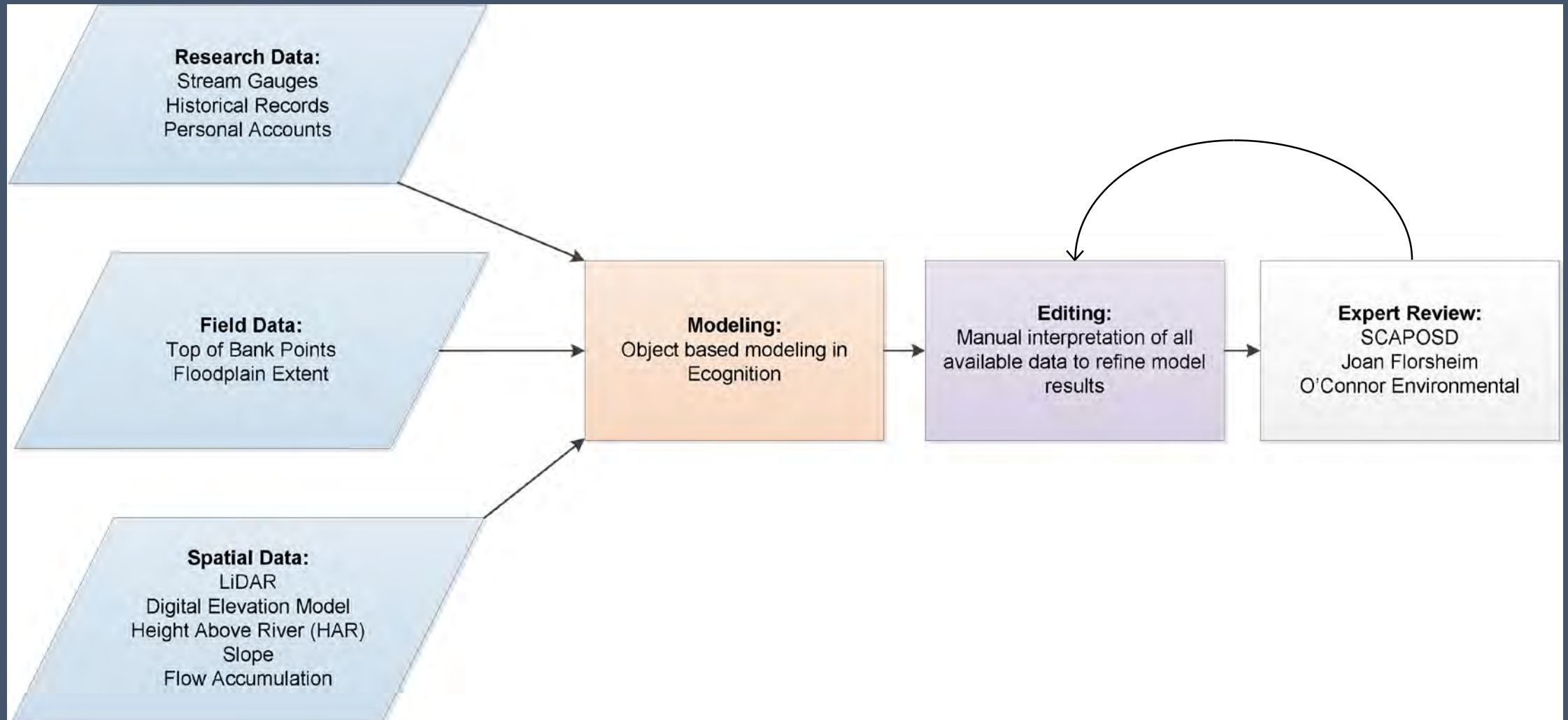


Map Attributes in Final Dataset

- Surface roughness of floodplain & channel polygons
- Height above river statistics for floodplain and channel polygons
- Flow accumulation statistics for floodplain and channel polygons
- Slope of floodplain & channel polygons
- Vegetation map statistics



Project | Workflow





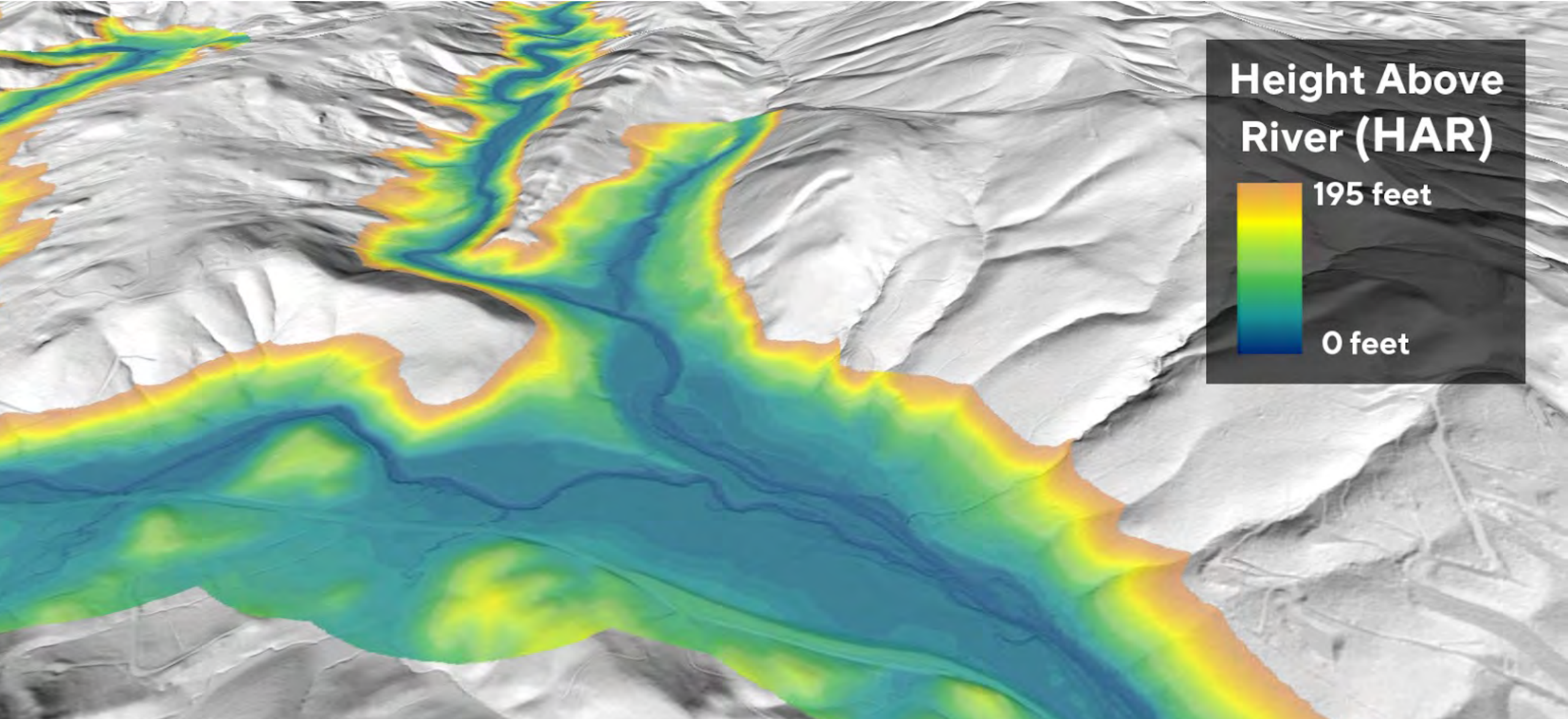
Project | **Methods and Modeling**

Reference Data and Resources

- Field observations
 - Photos
 - Channel/Floodplain Transects
 - Geomorphologic Assessment
- FEMA Flood Elevation Data and USGS Stream Gauges
- O'Connor Environmental, Inc.'s 100 year floodplain hydraulic models
- Historical flood extent data from Arthur Dawson, literature review and landowner interviews

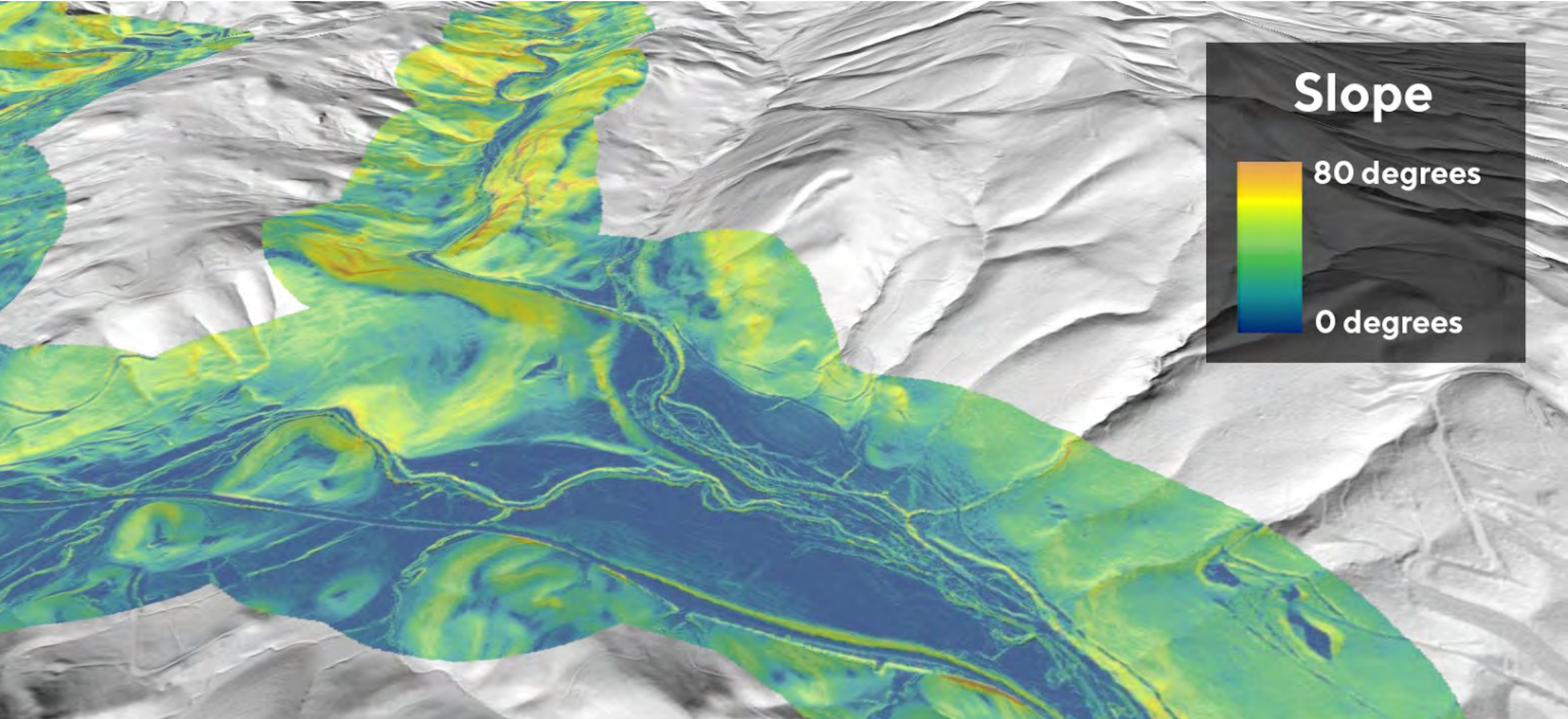


Project | Methods and Modeling





Project | Methods and Modeling





Project | Methods and Modeling

Analysis Library Classification Process Tools Export Window Help

100% main Primary

Name	State	Scale
Alder Creek-Big Sulphur Creek	Edited	3 m/pxl
Bodega Harbor-Frontal Pacific ...	Edited	3 m/pxl
Brooks Creek-Russian River	Edited	3 m/pxl
Buckeye Creek	Edited	3 m/pxl
Dutch Bill Creek-Russian River	Edited	3 m/pxl
Estero Americano	Edited	3 m/pxl
Estero De San Antonio	Edited	3 m/pxl
Fowler Creek	Edited	3 m/pxl
Franz Creek	Edited	3 m/pxl
Galloway Creek	Edited	3 m/pxl
Gill Creek-Russian River	Created	3 m/pxl
Green Valley Creek	Created	3 m/pxl
House Creek	Edited	3 m/pxl
Lake Sonoma-Dry Creek	Edited	3 m/pxl
Little Sulphur Creek	Edited	3 m/pxl
Lower Wheatfield Fork Gualala ...	Edited	3 m/pxl
Marshall Creek	Edited	3 m/pxl
Mill Creek	Edited	3 m/pxl
Pena Creek	Edited	3 m/pxl
Petaluma River	Edited	3 m/pxl
Porter Creek-Russian River	Edited	3 m/pxl
Rockpile Creek	Edited	3 m/pxl
Salmon Creek	Edited	3 m/pxl
San Antonio Creek	Edited	3 m/pxl
Sausal Creek-Russian River	Edited	3 m/pxl
Tolay Creek-Frontal San Pablo ...	Edited	3 m/pxl
Upper Laguna De Santa Rosa	Edited	3 m/pxl
Upper Santa Rosa Creek	Edited	3 m/pxl
Upper Sonoma Creek	Edited	3 m/pxl
Upper Wheatfield Fork Gualala ...	Edited	3 m/pxl
Warm Springs Creek	Edited	3 m/pxl
West Slough-Dry Creek	Edited	3 m/pxl
Willow Creek-Russian River	Edited	3 m/pxl
Windsor Creek	Edited	3 m/pxl

Process Tree

- do (Reset and Load)
 - do (RESET)
 - delete image layer 'BARE EARTH'
 - delete image layer 'FLOW ACCUM LARGE'
 - delete image layer 'FLOW ACCUM SMALL'
 - delete image layer 'FLOW ACCUMULATION'
 - delete image layer 'FLOW DIRECTION'
 - delete image layer 'HYDRO DEM'
 - delete image layer 'STREAM XY'
 - delete image layer 'STREAM Z SMALL'
 - delete image layer 'SOLAR RAD'
 - delete image layer 'NDVI MAY'
 - delete image layer 'PAVED ROADS'
 - delete 'New Level'
 - delete 'Primary'
 - delete image layer 'SLOPE'
 - delete image layer 'HAR LARGE'
 - do (Load Data)
 - create/modify project (PAVED ROADS)
 - create/modify project (SOLAR RAD)
 - create/modify project (NDVI MAY)
 - create/modify project (STREAM Z SMALL)
 - create/modify project (STREAM XY)
 - create/modify project (HYDRO DEM)
 - create/modify project (FLOW DIRECTION)
 - create/modify project (FLOW ACCUM LARGE)
 - create/modify project (FLOW ACCUMULATION)
 - create/modify project (BARE EARTH)
 - create/modify project (HAR_LARGE)
 - create/modify project (SLOPE)
- Initial
 - do (Channel Segmentation - Main Channel)
 - 75 [shape:0.2 compct.:0.3] creating 'Primary'
 - unclassified with Mean HAR LARGE < HAR_Test and Mean FLOW ACCUM LARGE > 1100 and Mean STREAM XY > 120 at Primary: unclassified
 - Channel with Mean STREAM XY > 120 at Primary: unclassified
 - Channel at Primary: merge region
 - Channel with Area < 800 Pxl at Primary: unclassified
 - unclassified with Mean HAR LARGE < Har_FP and Mean FLOW ACCUM LARGE > 1110 at Primary: Floodplain
 - Floodplain at Primary: merge region
 - Floodplain with Area < 800 Pxl at Primary: unclassified
 - unclassified with RelativeBorder > 0.85 at Primary: Floodplain
 - unclassified at Primary: 35 [shape:0.3 compct.:0.1]
 - at Primary: export object shapes to D:\TGS\projects\72 - Riparian\Ecognition\Outputs\Buckeye_9_6_17.shp



Project | **Methods and Modeling**

Editing Methods

- Use slope and elevation data to verify top of bank and floodplain boundaries
- Validate FEMA data and merge with riparian model
- O'Connor Environmental, Inc.'s 100 year floodplain hydraulic models to improve floodplain boundaries
- Historical flood extent data from Arthur Dawson, literature review and landowner interviews to validate and improve the data.



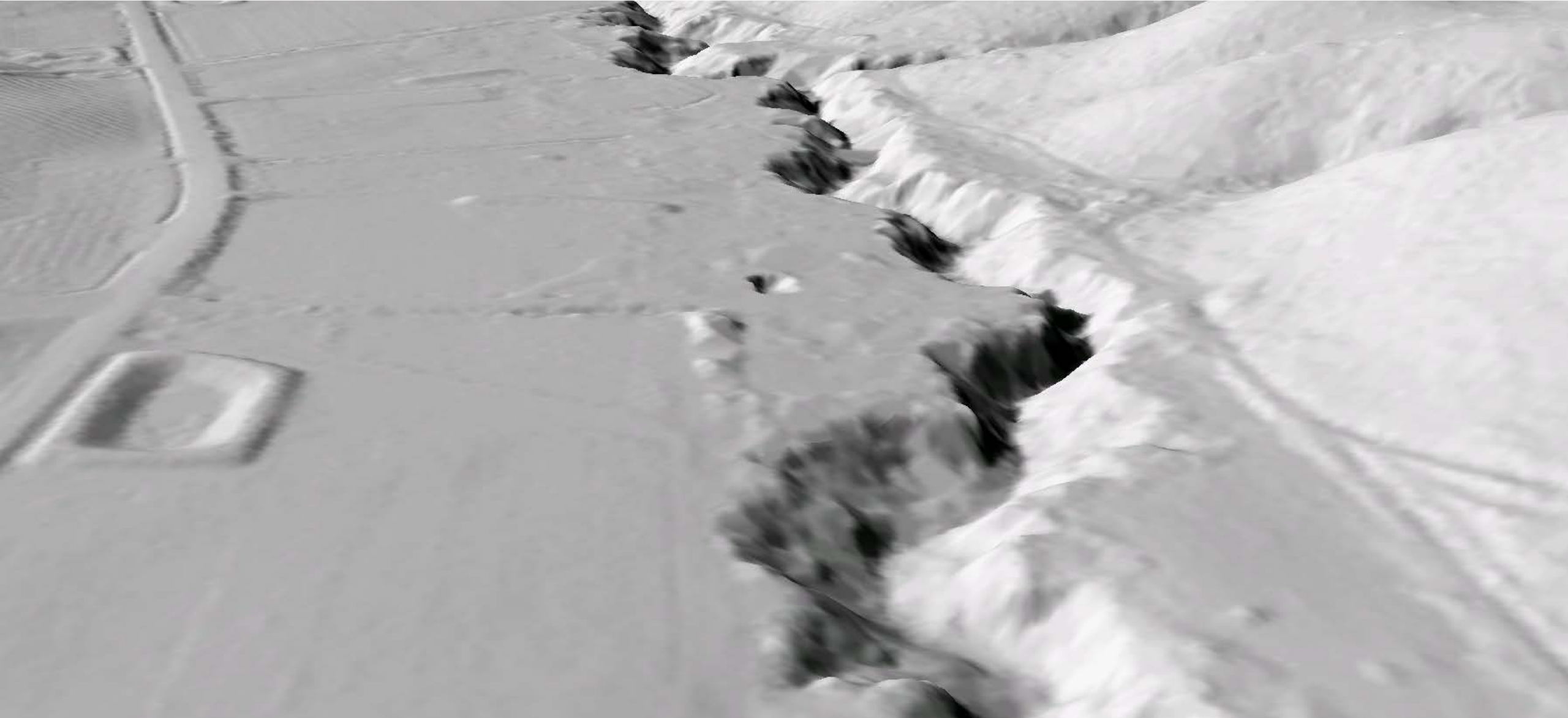
Project | Methods and Modeling

Challenges

- Really flat areas (poor definition between floodplain and hillslopes)
- Areas of heavy human manipulation (e.g., Lower Sonoma Creek and Lower Santa Rosa Creek)
- Highly incised reaches and areas of very dense shrub
- Standing water causing false elevation values



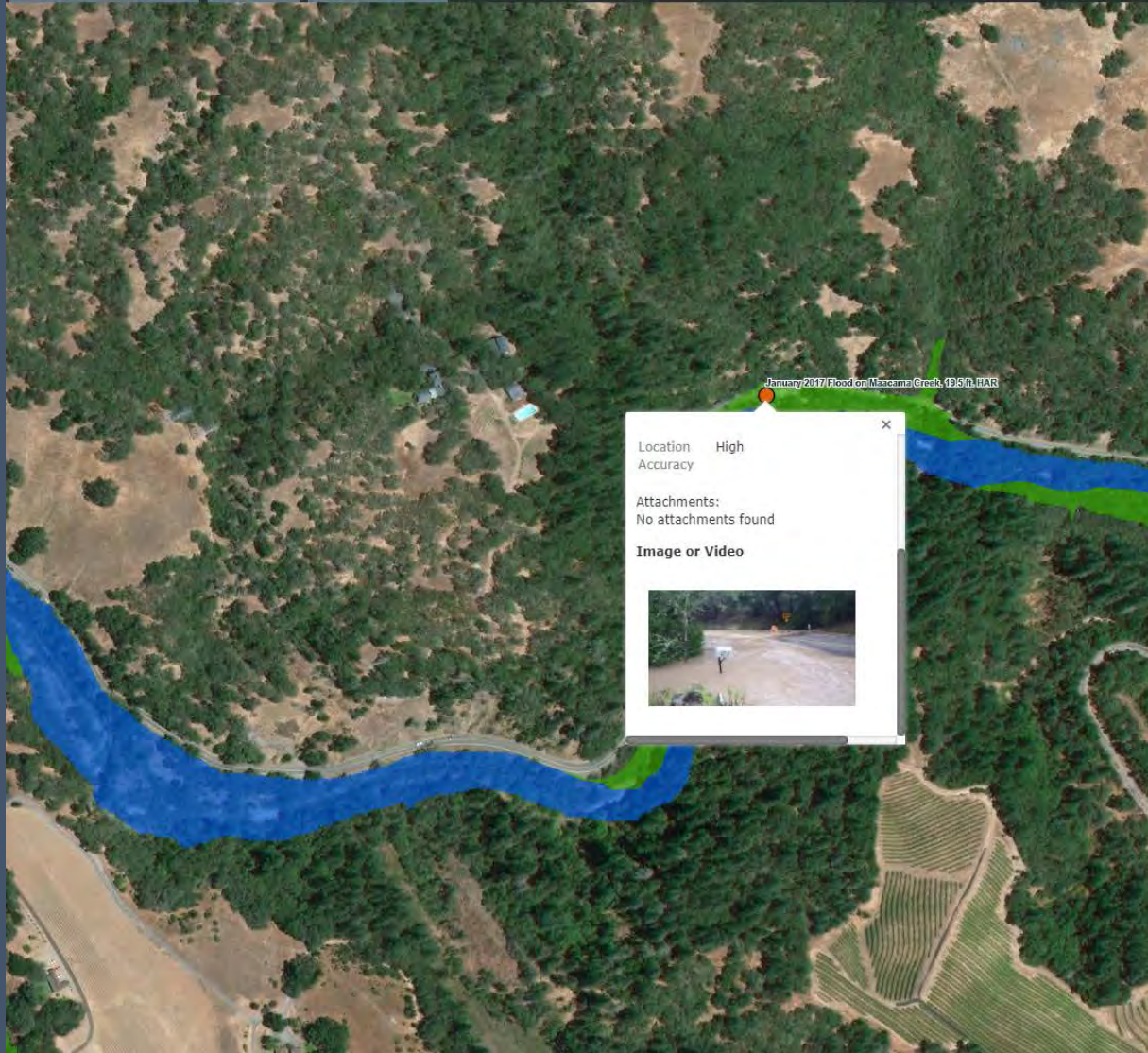
Project | **Methods and Modeling**





Project | Methods and Modeling

Atascadero-Green Valley Dry Creek Big-Little Sulphur



Location High
Accuracy

Attachments:
No attachments found

Image or Video

Maacama Creek

The Maacama Creek watershed has its headwaters high in the Mayacamas. Large tributaries include Briggs Creek, McDonnell Creek, and Redwood Creek. Land cover in the upper watershed includes rangeland, oak woodland, Douglas-fir forest, and some higher elevation shrubland and conifer forests.

The lower part of the watershed - and Knight's Valley - are dominated by vineyard and oak woodland. The lower portions of Maacama Creek have some very significant areas of floodplain, some of it with well developed riparian forest. There is scattered rural residential and winery development, especially in the lower watershed.

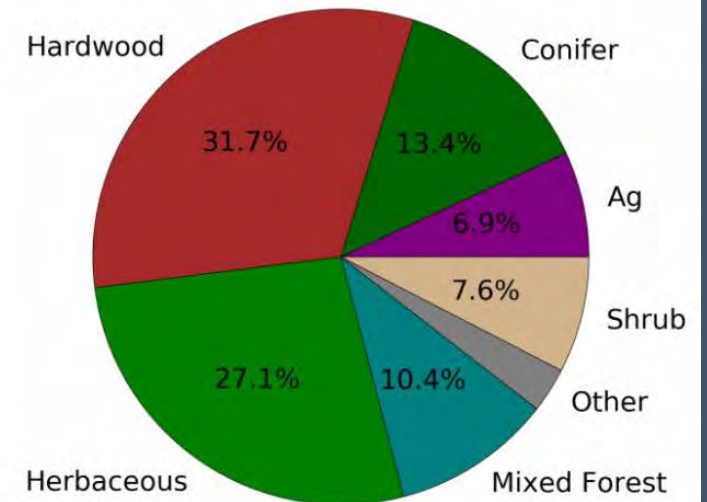
Total imperviousness of the Maacama Creek watershed is 1%.

The USGS stream gauge near Kellogg reached its peak flow of 8,920 cfs on December 22, 1964 (during one of the greatest North Coast rain events in the past century). The stage was 17.6 feet.

Functional Riparian Polygons

- Channel
- Floodplain
- Riparian Margin

Land Cover - Maacama Creek Watershed





Project | Moving Forward

- **Peer review of final draft riparian products**
- **Development of large woody debris models**
- **Further down the road?**
 - **Map riparian in smaller systems**
 - **Develop habitat quality ratings for each riparian polygon**

Discussion



Mark Tukman and Dylan Loudon | **Tukman Geospatial**