



# Fine-scale vegetation mapping & inventory across the Greater San Francisco Bay Area, California:

## With a focus on Alameda & Contra Costa Counties

Collaborators include:

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**Julie Evens, Mark Bibbo** *Calif. Native Plant Society*

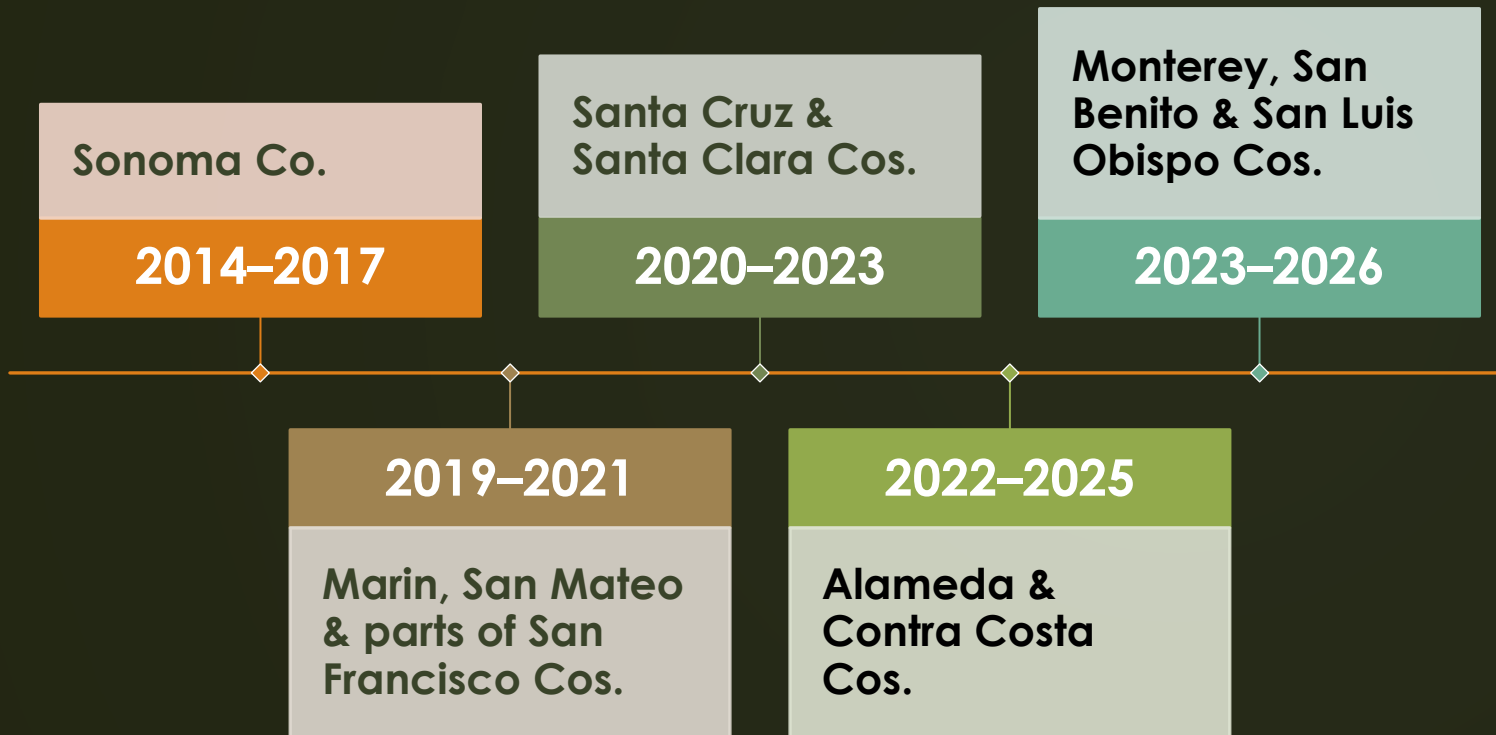
**Danny Franco** *Golden Gate National Parks Conservancy*

**Dina Robertson** *East Bay Regional Parks*

**Mark Tukman** *Tukman Geospatial, LLC*



# Fine-Scale Vegetation Mapping Projects in the Greater San Francisco Bay Area Region



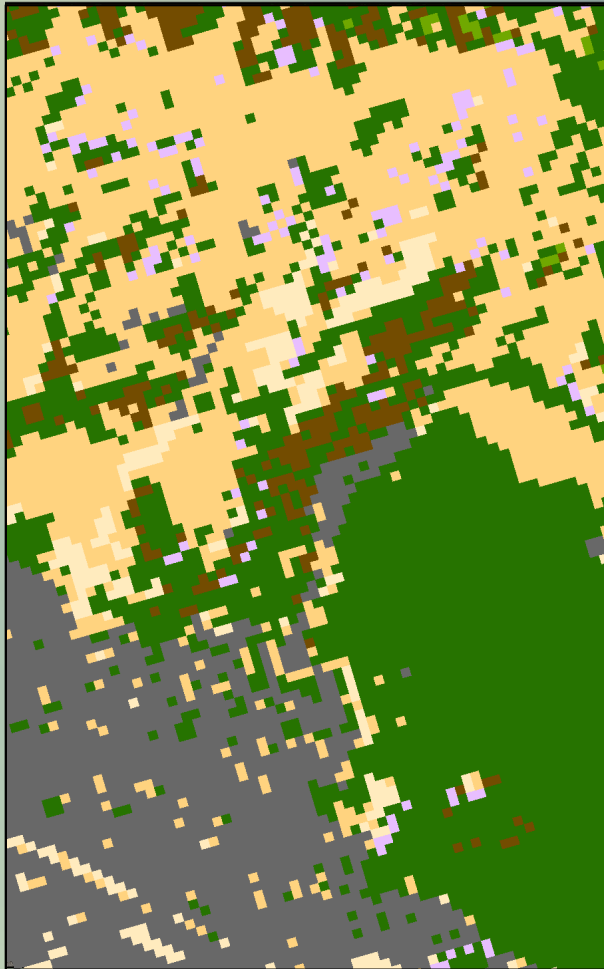
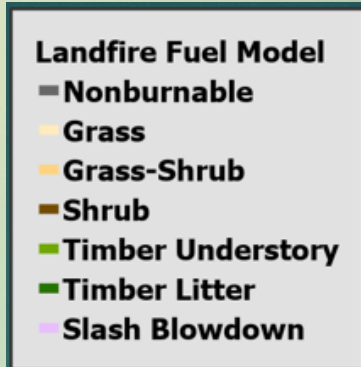


# I. Why?

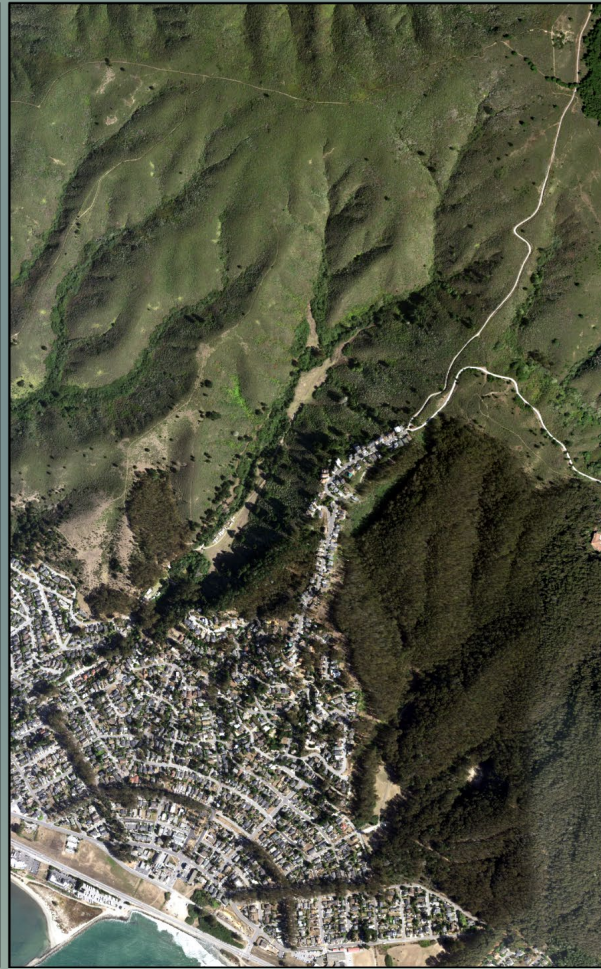
- To effectively care for their ecosystems and infrastructure, the general public, land owners, land managers, and government agencies **must know the location and distribution of natural resources across the landscape**
- To **improve** our understanding and fill in knowledge gaps about the landscapes of a county or ecological region
  - Existing vegetation maps are usually **piecemeal, out of date**, or at a **statewide scale** to support local decision making
  - When they exist, high resolution vegetation maps are **inconsistent** across jurisdictional boundaries
  - To improve topographic and vegetation data that are **coarse or non-existent**
- These dated and incomplete datasets result in managers and decision makers relying on and laboring with maps which are **severely out of date, crude, inconsistent, and often incorrect**



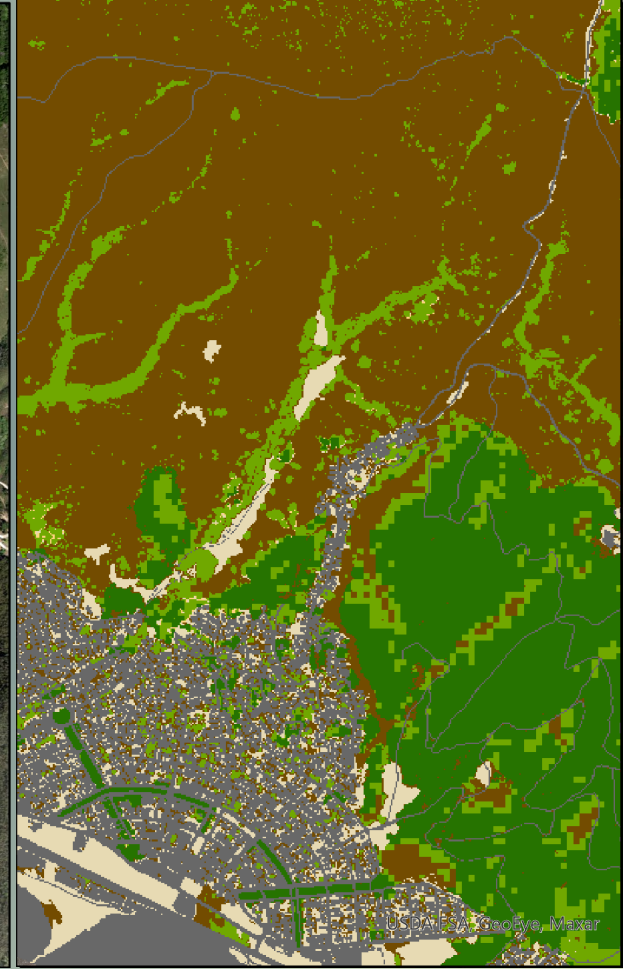
# Data at Scales Inappropriate for Local Planning



30 m Statewide  
Landfire Fuels



High Resolution NAIP  
Imagery

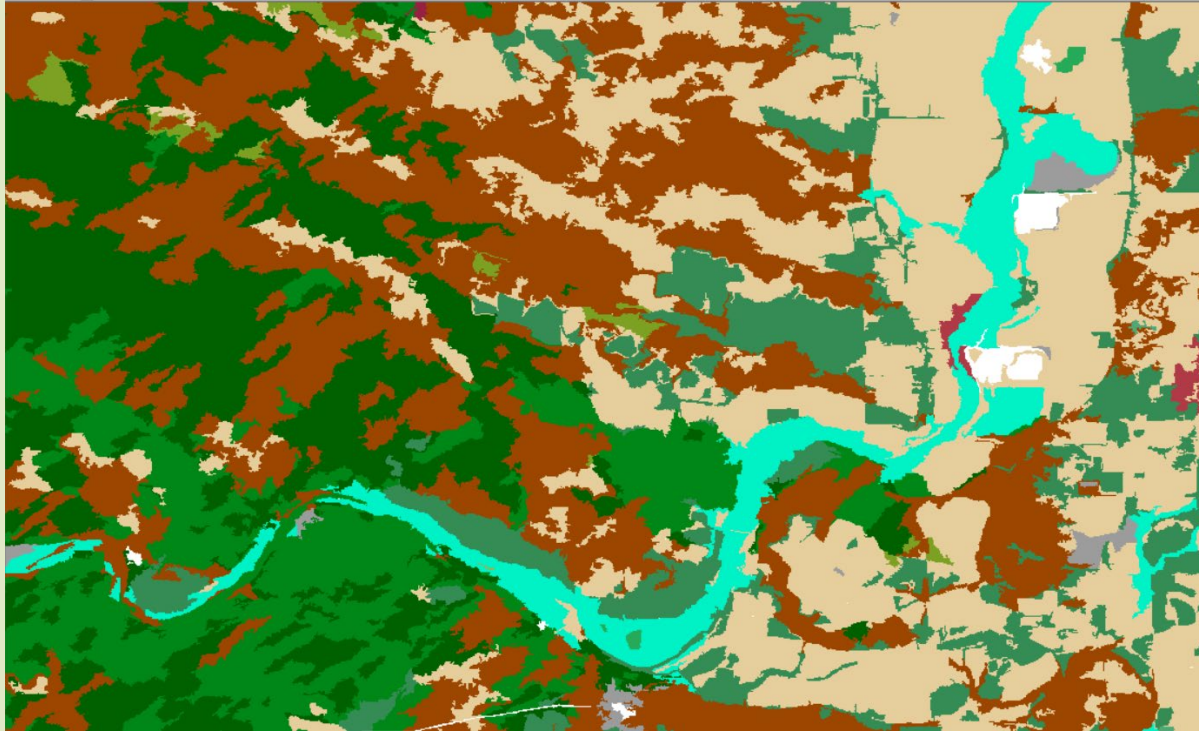


5m Santa Cruz County  
Fine-scale Fuels

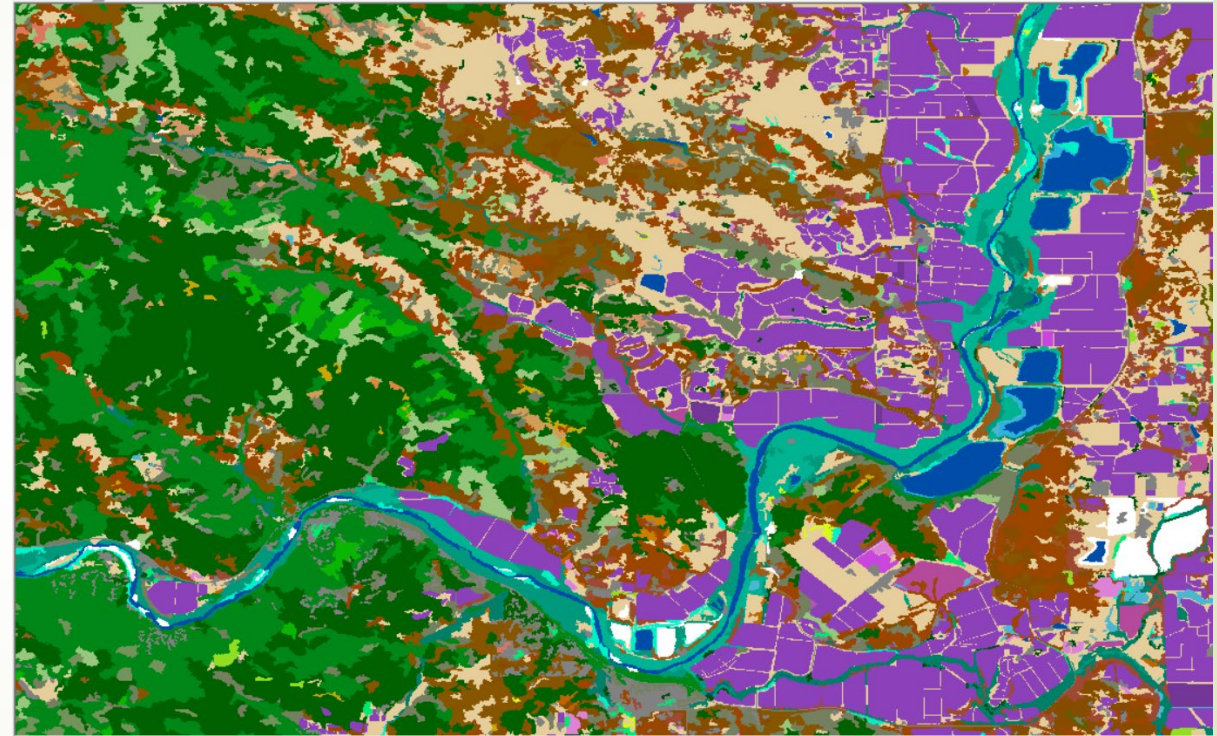


# Coarse and/or Out-Dated Vegetation Data

*Vegetation from Statewide CalVeg*



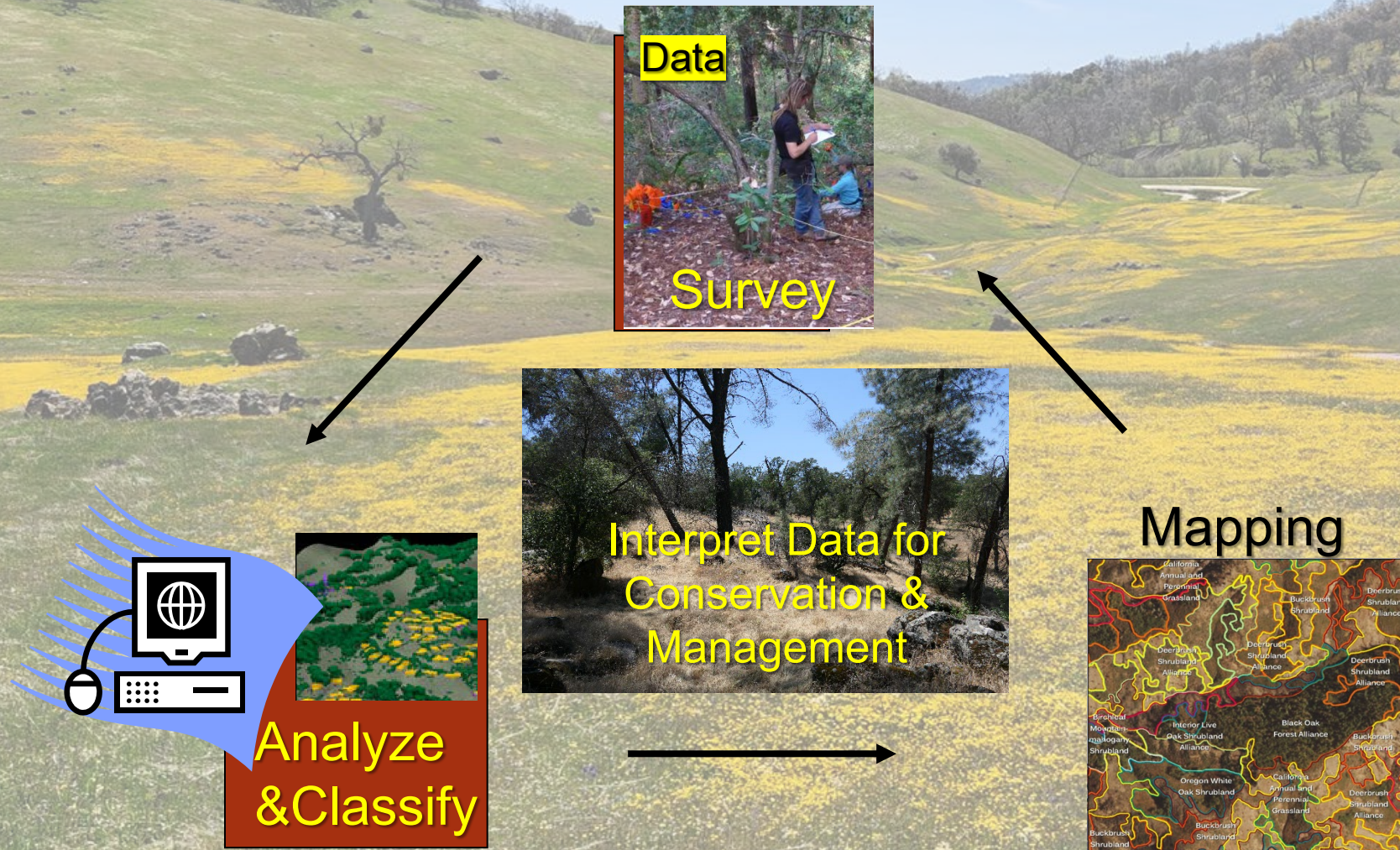
*Finescale Vegetation Map*



Sonoma County Example



# Vegetation Inventory & Mapping Approaches as an Integrated Process





# Vegetation Sampling Techniques

## Relevé

- Plot-based
- Full vascular plant list of the plot
- Standardized sizes
  - Herbaceous communities – 100 m<sup>2</sup>/10 m<sup>2</sup>
  - Shrubland communities – 400m<sup>2</sup>
  - Woodland/Forest communities – 1000 m<sup>2</sup>

## Rapid Assessment

- Plot-less – stand based
- Partial species list: up to 20 dominant/characteristic species
- Variable size (variable radius or length & width)
- For Both Methods, you look for homogeneity in:
  - Species composition
  - Structure / site history / environmental setting
  - Density / percent cover



Photo: Alexis LaFever-Jackson



Photo: Mark Bibbo



# National Vegetation Classification Hierarchical Classification

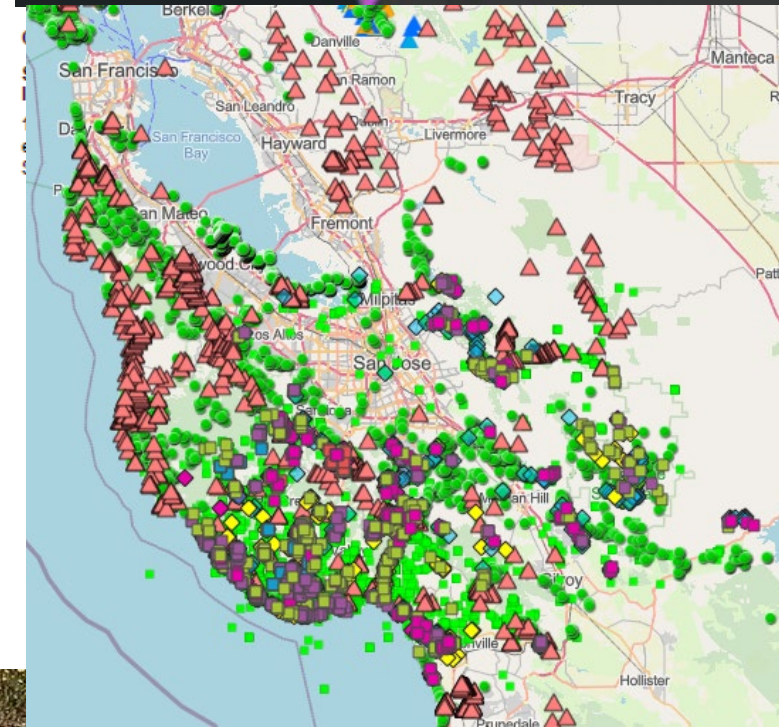
NVC Hierarchy	Example
Upper	
Class	Forest and Woodland
Subclass	Temperate Forest
Formation	Warm Temperate Forest
Middle	
Division	Madrean Forest and Woodland
Macrogroup	California Forest and Woodland
Group	Californian broadleaf forest and woodland
Lower	
Alliance	<i>Hesperocyparis (sargentii, macnabiana)</i> Woodland Alliance
Association	<i>Hesperocyparis macnabiana</i> / <i>Arctostaphylos viscida</i>
Association	<i>Hesperocyparis sargentii</i>
Association	<i>Hesperocyparis macnabiana</i> / <i>Arctostaphylos viscida</i>
Association	<i>Hesperocyparis sargentii</i> / <i>Quercus durata</i> (Mesic)



# Santa Cruz & Santa Clara County Fine Scale Vegetation Map

## ACCESS TO DATA

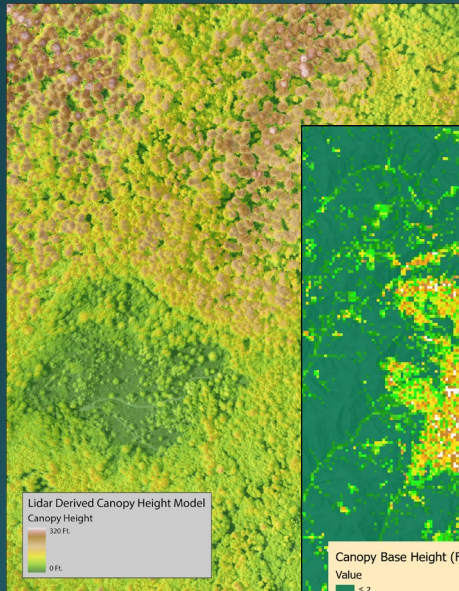
- Vegetation Map & Other GIS Layers:  
<https://pacificvegmap.org/data-downloads/>
- CDFW BIOS geospatial web portal:  
<https://apps.wildlife.ca.gov/bios6/>
- Classification reports:  
<https://www.cnps.org/vegetation>  
<https://wildlife.ca.gov/Data/VegCA>  
[MP/Reports-and-Maps](https://wildlife.ca.gov/Data/VegCA/MP/Reports-and-Maps)



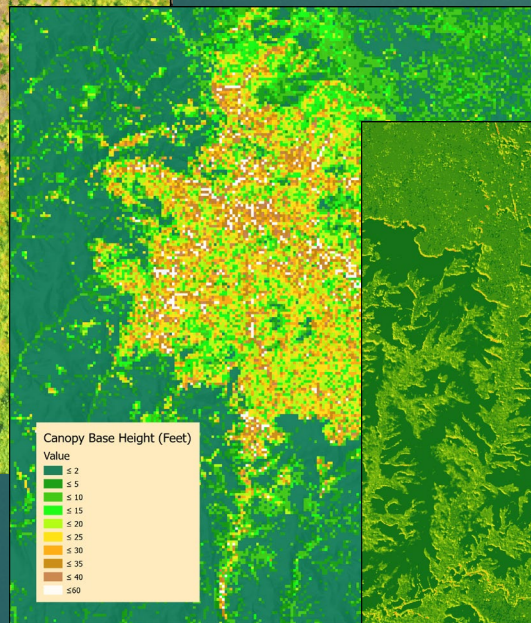


# Lidar Derived Fire Behavior Products

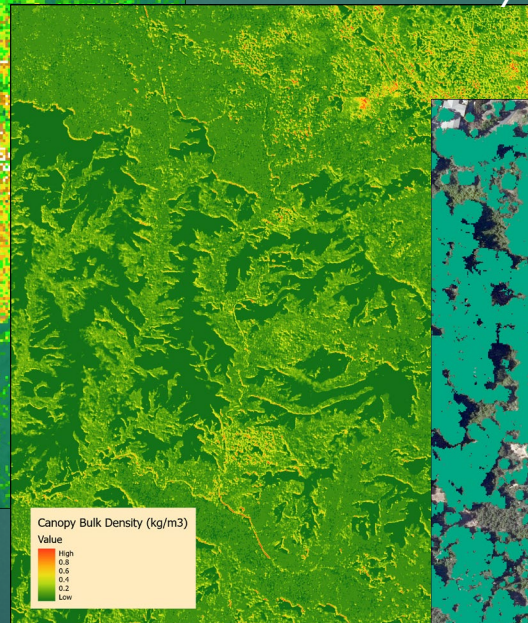
Canopy Height



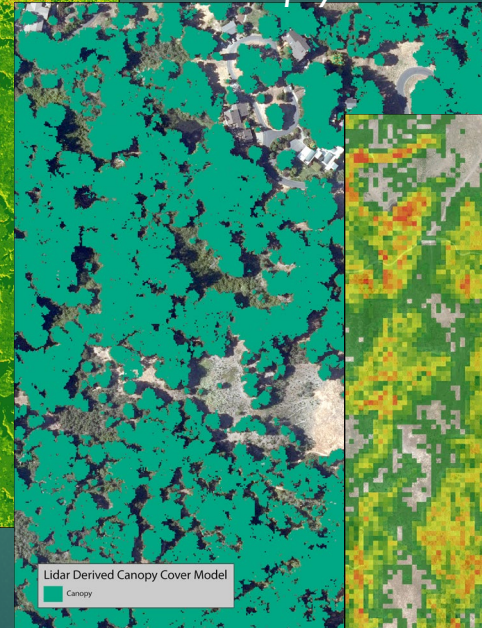
Canopy Base Height



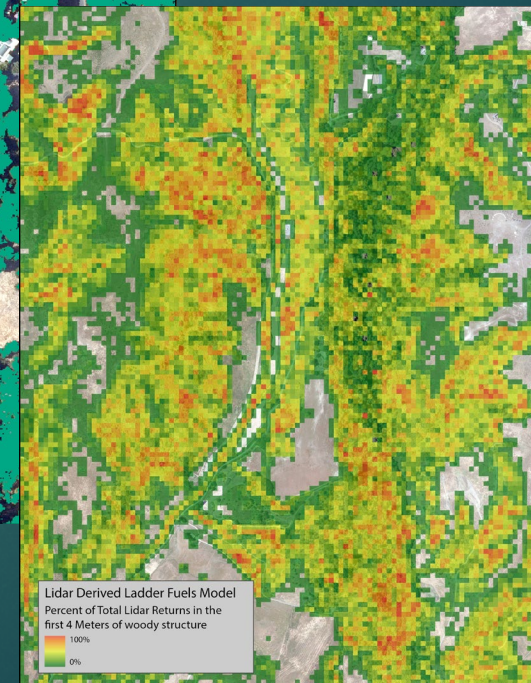
Bulk Density



Canopy Cover

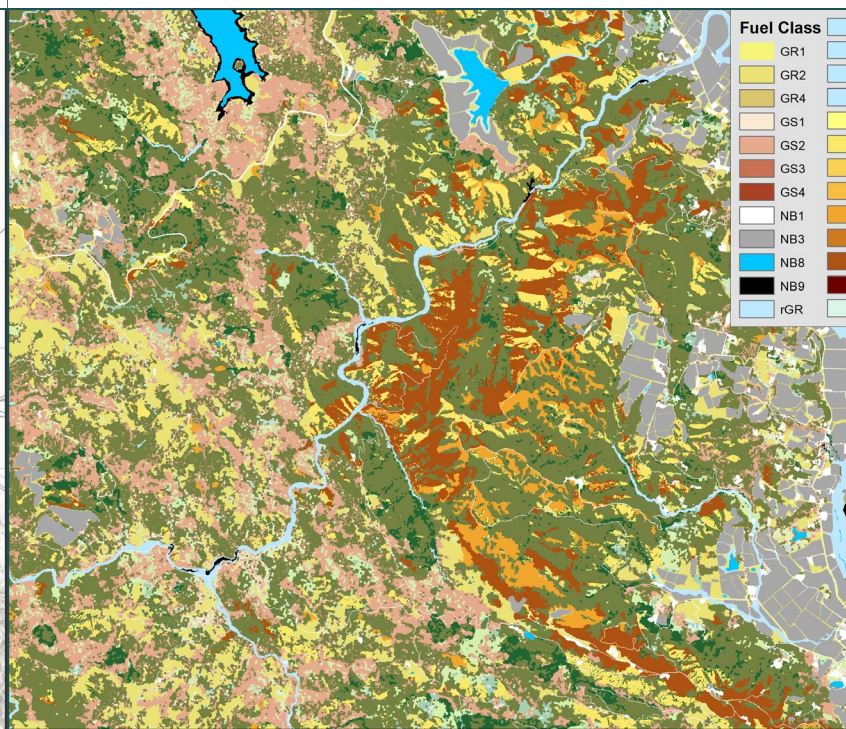
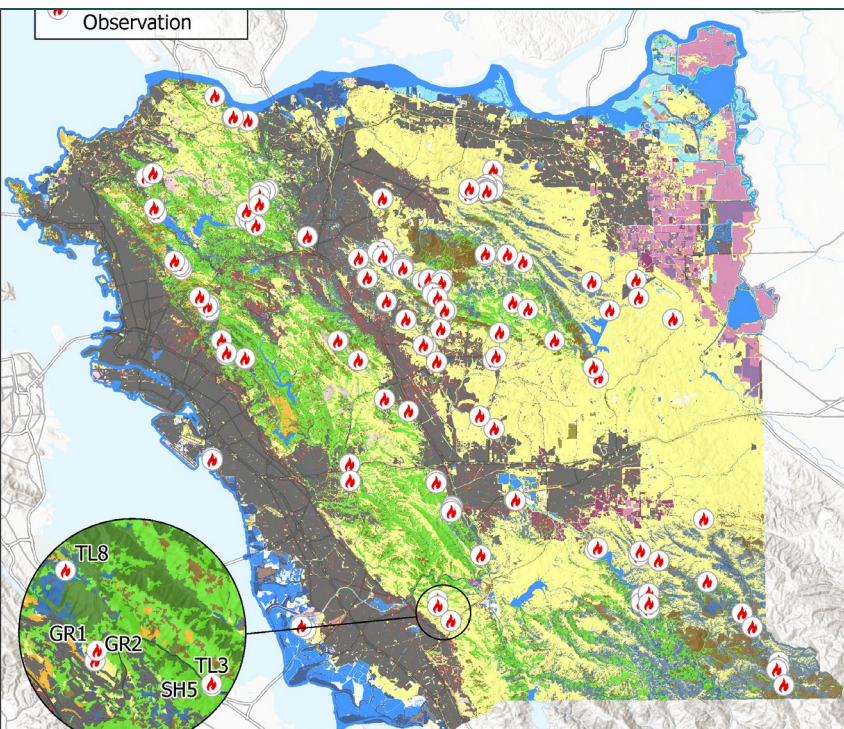
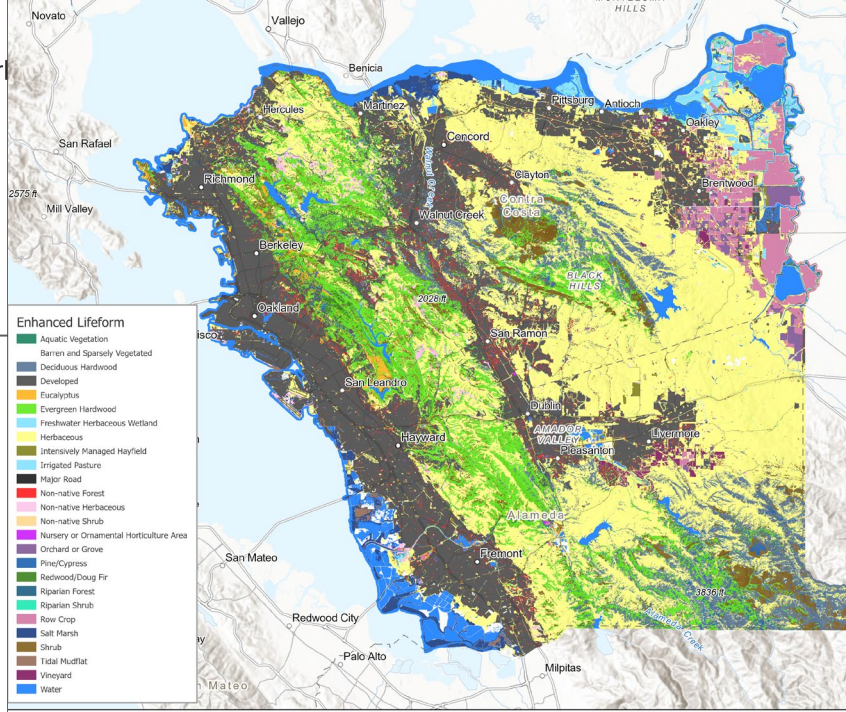
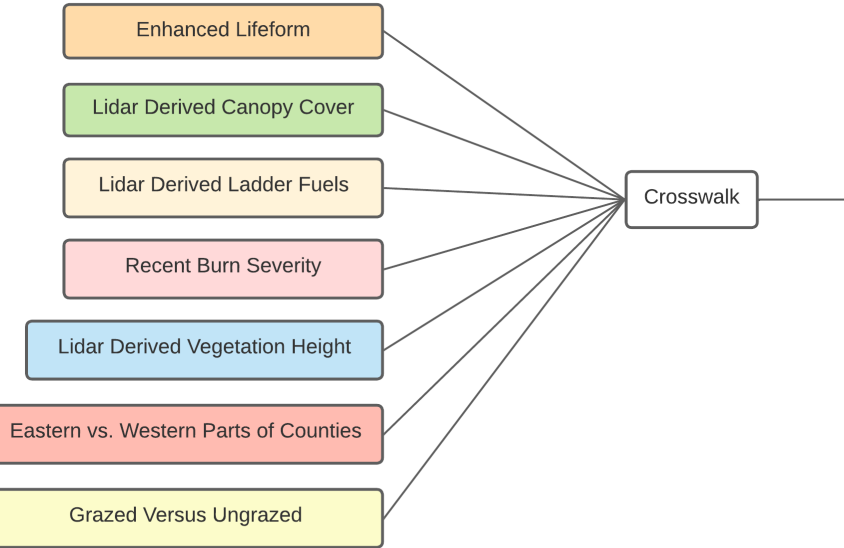


Ladder Fuels





# Alameda and Contra Costa County 5-meter Fuelscape Work

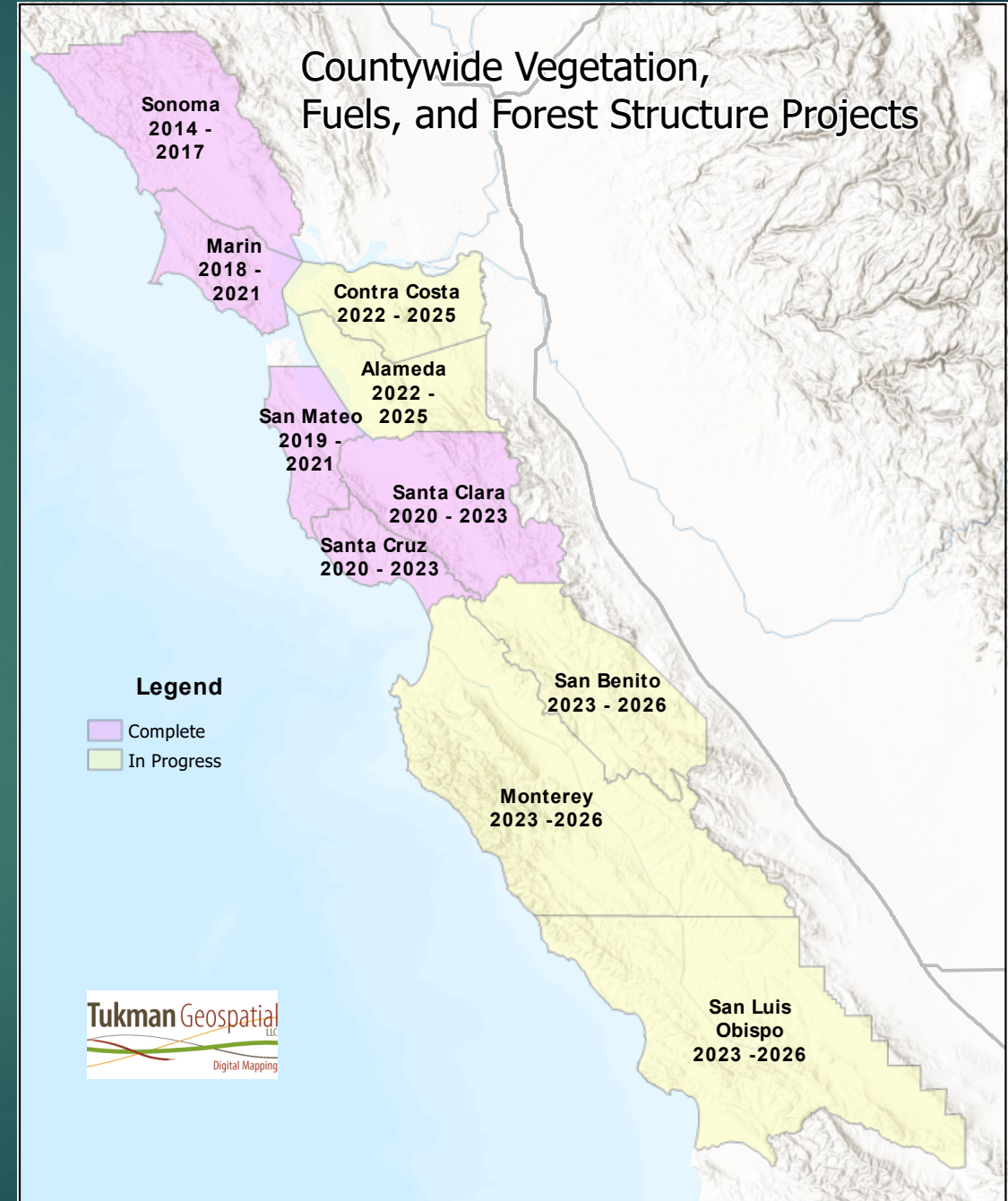


# Fuel Model



Projects from Across the  
Greater Bay Area since  
the last NCB update

Informing Statewide  
Vegetation Classification





# Marin County & San Mateo County



Photo: Jennifer Buck-Diaz



Midpeninsula Regional Open Space District





# Recently Described & Sensitive Natural Communities

## ***Eriophyllum staechadifolium* – *Erigeron glaucus* – *Eriogonum latifolium* Alliance**

*Eriophyllum staechadifolium* – *Eriogonum latifolium* Association



## ***Arctostaphylos (nummularia, sensitiva)* – *Chrysolepis chrysophylla* Alliance**

*Arctostaphylos (montaraensis, imbricata)*  
Association





# Santa Cruz & Santa Clara Counties



Photo: Kelsey Guest





# Recently Described & Sensitive Natural Communities



***Pinus ponderosa* Forest & Woodland Alliance**

*Pinus ponderosa* / *Chorizanthe pungens* Association



***Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Shrubland Alliance**

*Lupinus albifrons* – *Lotus scoparius* / *Chorizanthe pungens* Association



***Quercus wislizeni* – *Quercus parvula* (tree) Forest & Woodland Alliance**

*Quercus parvula* var. *shrevei* Association



# Alameda & Contra Costa Counties Fine-Scale Vegetation Mapping Project



Photo: Erin McDermott



CALIFORNIA  
NATIVE PLANT SOCIETY

Benson Bio Consulting



NOMAD  
E C O L O G Y



# Types Recently Described or To Be Described



Photo: Erin McDermott

***Corethrogyne filaginifolia* – *Eriogonum*  
(*elongatum*, *nudum*) Herbaceous Alliance**

*Viola pedunculata* – (*Eschscholzia californica*  
– *Nassella pulchra*) Provisional Association

***Eschscholzia (californica)* – *Lupinus*  
(*nanus*) Herbaceous Alliance**

*Lupinus (microcarpus, succulentus)*  
Association [proposed]

Photo: Shelly Benson



Photo: Erin McDermott

***Lasthenia californica* – *Plantago*  
*erecta* – *Vulpia microstachys*  
Herbaceous Alliance**

*Leptosiphon ambiguus* – *Lasthenia*  
*californica* Association [proposed]



# Recently Described & Sensitive Natural Communities



Photo: c/o Megan Keever

## ***Arctostaphylos (crustacea, tomentosa)* Shrubland Alliance**

*Arctostaphylos (andersonii, pallida)*  
Association



Photo: Melissa Patten

## ***Malacothamnus faciculatus* - *Malacothamnus* spp. Shrubland Alliance**

*Malacothamnus (aboriginum, fremontii, hallii)*  
Association



# San Luis Obispo, Monterey, and San Benito Counties Fine-Scale Vegetation Mapping Project

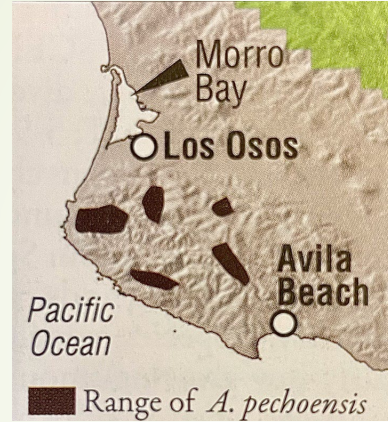


Photo: Alexis LaFever-Jackson

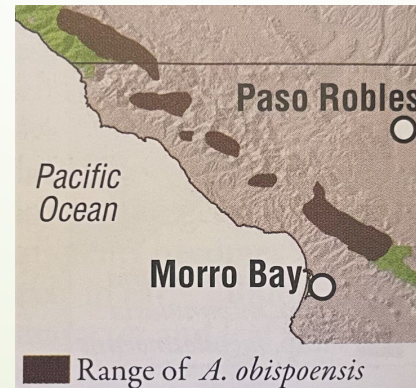


# Sensitive Natural Communities To Be Described

*Arctostaphylos pechoensis*  
chaparral association



*Arctostaphylos obispoensis*  
chapparral association



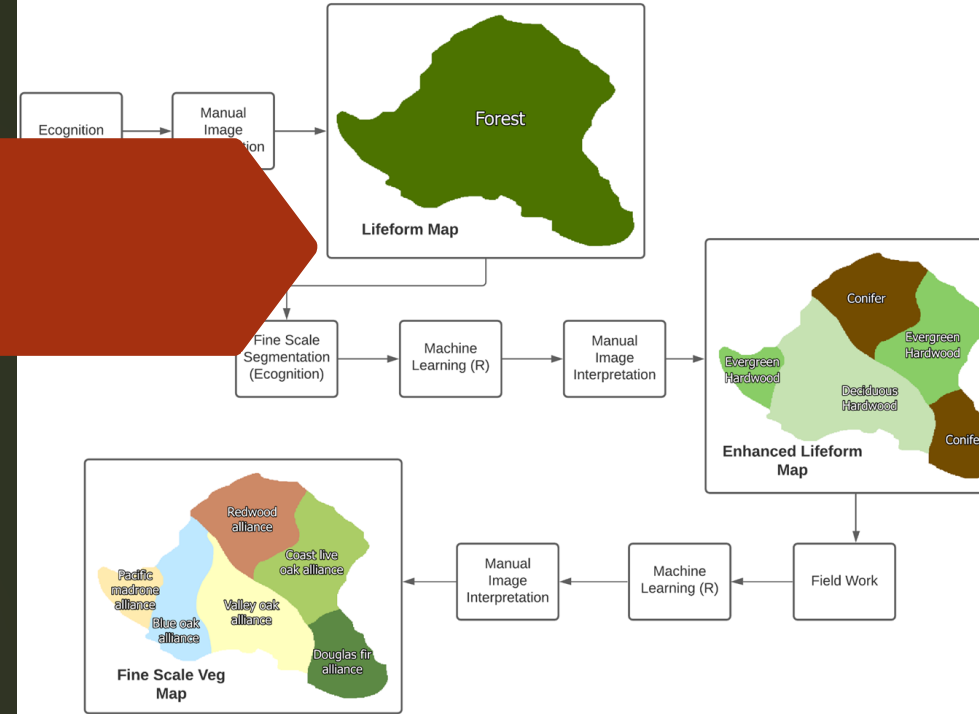
[Maps from Kaufmann et. al]



# Integrated Vegetation Mapping ~ Repeatable Methodologies

- Lidar-derived Topographic layers (1-m scale)
- Lidar-derived Forest & Vegetation structure layers
- Enhanced lifeform maps
- Wildfire hazard & wildfire risk to structures maps
- Baseline / monitoring vegetation data
- Floristic classification with summary descriptions
- Fine-scale vegetation maps

Better Maps Lead to Better Land Management Decisions!



## East Bay Regional Parks - Deliverables Schedule Updated October 15, 2023

Task 1. Wildfire Risk Products & Tools	Estimated Delivery
Enhanced Lifeform	Complete
Canopy Cover (1 and 5 meters)	Complete
Canopy Height (1 and 5 meters)	Complete
Ladder Fuels (20 meters)	Complete
Topographic Layers (1 and 5 meters)	Complete
Impervious Surfaces	Complete
Historic Ignitions	Complete
Enhanced Wildland-Urban Interface (20 m)	Complete
Extreme Fire Weather Potential (1 km)	Complete
Canopy Base Height (5 meters)	Complete
Canopy Bulk Density (5 meters)	Complete
Wildland Fuel Model (5-meter)	November 15, 2023
Building Density	November 30, 2023
Roads	Complete
Powerlines & Distribution Lines	Complete
Wildfire Hazard / Wildfire Risk to Structures	November 30, 2023
Data Portal	November 30, 2023
Fuel mapper PDF maps	December, 2023
Fuel mapper enhancements	June, 2024

Task 2. Vegetation Sampling, Classification, Keys, Descriptions
Field Database for Survey Collection
Training of Field Crews
Survey Database - Preliminary
Draft Mapping Key
Survey Database - Final
Final Mapping Key
Copies of Field Forms and Photos
Digital Copies of Permits

Task 3. Fine Scale Vegetation Mapping
Classification Analysis
Rarity Rankings, MCV Updates, Floristic
205 Releves Entered into CNPS Database
Revisit Subset of Releves and Update
Final Fine Scale Grasslands Map (10K)
Grasslands Final Report
Alliance/Assoc Descriptions - Final Rep
Final Fine Scale Veg Map
AA Data and Analysis
Final Veg Map Report



**Thank You!**

**Questions?**

**Contact:**

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Photo: Julia Murphy