Central Coast Fine-scale Vegetation Mapping Expert Review Kick-off

Partners:

CSLRCD, Tukman Geospatial, CNPS, AIS, NV5, USLTRCD, SBRCD, RCDMC, Nomad

FUNDED BY:

CDFW, SCC, USGS, & CNRA

Agenda

1. Overview – **CSLRCD**

3. Data Updates – what's available – **CNPS** + **Tukman Geospatial**

4. How are people using the data – **Tukman Geospatial**

5. Expert Review Kick Off– **Tukman Geospatial**

6. End and Q&A – **CSLRCD**

Land Acknowledgement

Amah Mutsun, Northern Chumash,
Costanoan Rumsen Ohlone, Esselen, & Salinan

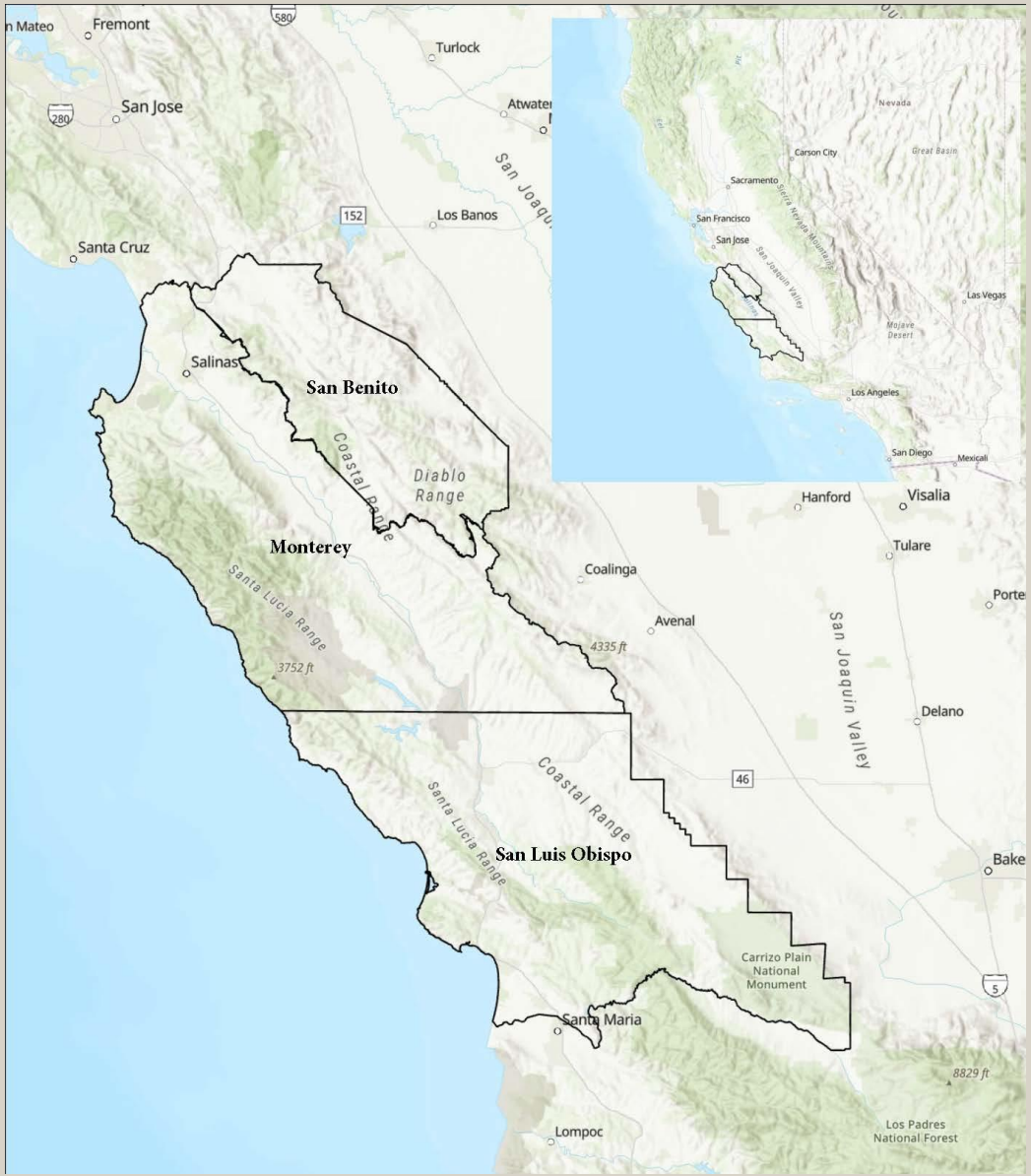


Indigenous Tribes of the Central Coast Project Area

Mapping Location

San Benito, Monterey, and San Luis Obispo Counties

5,135,889 Acres



Thank You to Our Collaborators & Supporters

Many Private Landowners

Thank You to All Who Worked on and Made This Project Possible

California Native
Plant Society

NOMAD ECOLOGY 20 YEARS OF SERVICE

Tukman Geospatial

Todd Keeler-Wolf

Dominic DiPaolo

Data Products Overview

Vegetation Sampling, Classification, Keys

- Releves and Rapid Assessments
- Herbarium Collections
- Classification & Floristic Key

Wildfire Products

- Lidar Derived Topography
- Lidar Derived Forest Structure
- Impervious Surfaces
- 5-Meter Fuel Model
- Wildfire Hazard
- Wildfire Risk to Structures

Vegetation Maps

- Enhanced Lifeform Map
- Fine Scale Vegetation Map

Pacific Veg Map

"One stop for California land cover and fuels data"

Downloads & Data | Project History | Contributing Orgs

Land Cover and Fuels Data and Downloads

Orthorectified Imagery - Santa Clara County

Map Category: Forest Structure

County or Region: Santa Cruz

Clear filters

Map Category	Dataset Name	County or Region	Ground Condition Year	Ground Condition Season	Datasheet	Details and Download
Forest Structure	Canopy Cover	Santa Cruz	2020	Winter	Datasheet	More Info
Forest Structure	Canopy Height Model	Santa Cruz	2020	Winter	Datasheet	More Info
Forest Structure	Digital Surface Model	Santa Cruz	2020	Winter	Datasheet	More Info
Forest Structure	Digital Terrain Model – Eastern Santa Cruz County	Santa Cruz	2020	Winter	Datasheet	More Info
Forest Structure	Digital Terrain Model – Western Santa Cruz County	Santa Cruz	2020	Winter	Datasheet	More Info
Forest Structure	Normalized Digital Surface Model	Santa Cruz	2020	Winter	Datasheet	More Info

Data Portal

pacificvegmap.org

Vegetation Sampling & Classification Update

Vegetation Sampling, Classification, Keys

- Releves and Rapid Assessments
- Herbarium Collections
- Classification & Floristic Key

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Survey of California Vegetation

VegCAMP

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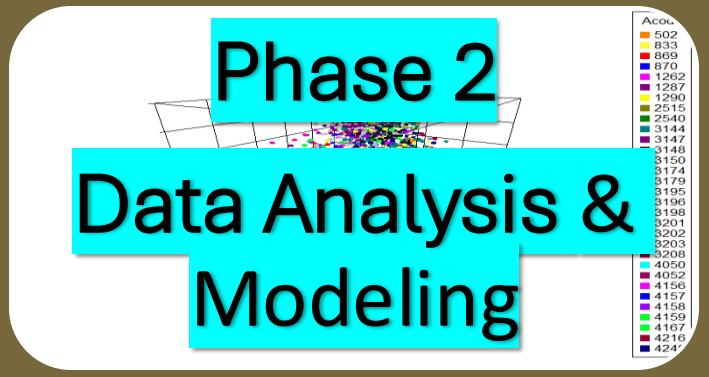
The Process

Phase 1

Data Collection



Phase 2

Data Analysis & Modeling

Phase 3

Fine-scale Map

Phase 1: Sample Vegetation 2023 – 2024

- **Monterey & SLO counties**
  - **2,230** surveys by CNPS and A&M
  - **400+** herbarium vouchers by CNPS and Cal Poly SLO
- **San Benito county & rest of CCC**
  - **415** surveys by UCSC

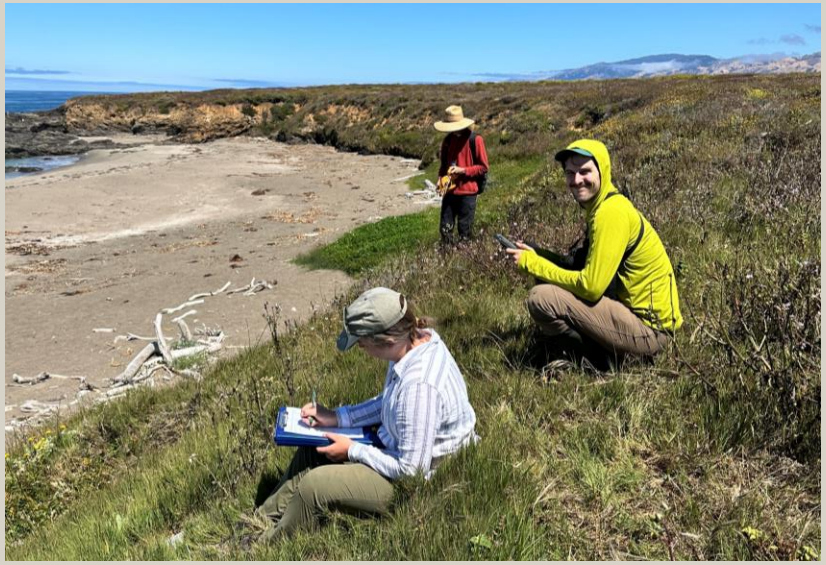


Photo L. Gardner

Phase 2: Classification & Keys & Report 2025 – 2026

- **Central CA Coast & Central CA Coast Ranges**
  - **>10,000** surveys in region
  - **~200** Alliances in the region
  - **>800** Associations in the region

Photo J. Heaphy

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Updates to Vegetation Classification

Stratum	Vegetation Community (Alliance Type)	Change Type	State Rank
Tree	Abies bracteata Alliance	New and revised associations = 3	S2
	Alnus rhombifolia Alliance	New association = 1	S4*
	Hesperocyparis sargentii – Hesperocyparis macnabiana Alliance	New associations = 2	S3
	Pinus coulteri Alliance	New and revised associations = 5	S4*
	Pinus muricata - Pinus radiata Alliance	New associations = 2	S3
	Pinus ponderosa Alliance	New association = 1	S4
	Platanus racemosa – Quercus agrifolia Alliance	New and revised associations = 4	S3
Shrub	*Arctostaphylos (crustacea, tomentosa)* Alliance	New and revised associations = 16	S3
	Arctostaphylos glauca Alliance	New and revised associations = 2	S4
	Ceanothus papillosus Alliance	New associations = 2	S3
Herb	*Hazardia squarrosa – Ericameria palmeri* Alliance	New associations = 2	S3
	Dudleya cymosa – Dudleya lanceolata / Lichen – Moss	New and revised associations = 3	S4*
	Ehrharta calycina Provisional Alliance	New alliance	SNR
	Lasthenia californica - Plantago erecta - Vulpia microstachys Alliance	New associations = 5	S4*
	Polygonum lapathifolium - Xanthium strumarium Alliance	New associations = 3	S4*

+85 more updates!

Floristic Key

FLORISTIC KEY TO NATURAL AND SEMI-NATURAL VEGETATION OF THE CENTRAL CALIFORNIA COAST

Class A. Vegetation dominated, co-dominated, or characterized by an even distribution of overstory trees. The tree canopy is generally greater than 10%, but may occasionally be less than 10% over a denser understory of shrubs and/or herbs or in arid types such as *Juniperus californica* **= Tree-Overstory (Woodland & Forest) Vegetation (Page 7)**

Class B. Vegetation dominated, co-dominated, or characterized by woody shrubs in the canopy. Shrubs usually have at least 10% cover. Tree species, if present, generally total less than 10% absolute cover. Herbaceous species may have higher cover than shrubs **= Shrubland Vegetation (Page 48)**

Class C. Vegetation dominated, co-dominated, or characterized by non-woody, herbaceous species in the canopy, including grasses, graminoids, and broad-leaved herbaceous species. Shrubs, if present, usually comprise less than 10% of the vegetation cover. Trees, if present, generally comprise less than 10% cover. However, sometimes vegetation is sparse (<10%) or variable in herbaceous cover on rock outcrops, open sand, and other substrates, and will key here. **= Herbaceous & Sparse Vegetation (Page 101)**

CLASS A. TREE-OVERSTORY (WOODLAND & FOREST) VEGETATION

Section I: Woodlands and forests dominated or characterized by needle or scale-leaved conifer trees. Includes *Abies, Juniper, Hesperocyparis*, *Pinus*, *Pseudotsuga*, and *Sequoia*.

1. Temperate rainforest dominated or co-dominated by *Sequoia sempervirens*. Found either at the bottoms with cold air drainage or along ridgetops with fog influence in the Central California Coast.

North Pacific Coastal Rainforest Macrogroup

Coastal Redwood Forest Group

1a. *Sequoia sempervirens* has >20% relative conifer cover (e.g., if a stand has 30% absolute conifer cover that is 24% *Pseudotsuga menziesii* and 6% *Sequoia sempervirens*, it would key to this type) and dominates, co-dominates, or characterizes (rarely with as little as 5% cover) stands near streams on terraces, along all slopes and aspects, or on ridges. Associated trees often include *Acer macrophyllum, Alnus* spp., *Arbutus menziesii, Notholithocarpus densiflorus, Pseudotsuga menziesii, Torreya californica*, and *Umbellularia californica*, which are typically sub to co-dominant but may occasionally exceed *Sequoia* in cover. *Vaccinium ovatum*, *Oxalis oregana*, *Dryopteris arguta, Polystichum munitum,* and *Woodwardia fimbriata* may intermix in the understory.

***Sequoia sempervirens* Alliance**

1a1. *Sequoia sempervirens* is strongly dominant in the stand without significant cover of other species in the overstory or understory.

Sequoia sempervirens Association

1a2. *Sequoia sempervirens* has significant cover in the overstory and shares the tree layer with *Arbutus menziesii,* which has higher cover than any other tree species besides redwood. *Vaccinium ovatum* is often present in the shrub layer.

Sequoia sempervirens – Arbutus menziesii / Vaccinium ovatum Association

1a3. *Sequoia sempervirens* has significant cover in the overstory and shares the tree layer with *Umbellularia californica,* which is co-dominant to sub-dominant.

Sequoia sempervirens – Umbellularia californica Association

1a4. *Sequoia sempervirens* has significant cover in the overstory as a dominant or co-dominant in which it shares the tree layer with *Notholithocarpus densiflorus,* which has a higher cover than any other tree species besides redwood. The understory generally lacks significant cover of shrubs. *Carex globosa* and/or *Iris douglasiana* is often present and may be co-dominant in the understory with various other dry to mesic herbs in the understory in upland settings. Rarely, *Quercus chrysolepis* and/or *Q. parvula* are present and share the tree layer with *S. sempervirens* for this association.

Sequoia sempervirens – Notholithocarpus densiflorus / Carex globosa – Iris douglasiana Association

1a5. *Sequoia sempervirens* has significant cover in the overstory and shares the tree layer with *Notholithocarpus densiflorus* which has a higher cover than any other tree species besides redwood. A significant shrub layer is present with *Vaccinium ovatum* usually present, though other shrubs including *Toxicodendron diversilobum* can be present. Herb cover is typically lacking or low in cover.

Sequoia sempervirens – Notholithocarpus densiflorus / Vaccinium ovatum Association

1a6. *Sequoia sempervirens* has significant cover in the overstory and shares the tree layer with *Pseudotsuga menziesii* and/or *Notholithocarpus densiflorus*. In combination these three species make up > 60% of the canopy.

Sequoia sempervirens – Pseudotsuga menziesii – Notholithocarpus densiflorus Association

1a7. *Sequoia sempervirens* has significant cover in the overstory and shares the tree layer with *Pseudotsuga menziesii* and/or *Umbellularia californica*. In combination these three species make up > 60% of the canopy.

Sequoia sempervirens – Pseudotsuga menziesii – Umbellularia californica Association

Diagnostic key for all alliances and associations documented (or likely to occur) in the ecoregion

- **~200** Alliances
- **>800** Associations

Vegetation Descriptions

***Arctostaphylos glauca – Adenostoma fasciculatum – Salvia mellifera* Association**

Common Name: Bigberry Manzanita – Chamise – Black Sage Association

Association CaCode: 37.104.10

Regional Vegetation Description: The Bigberry Manzanita – Chamise – Black Sage Association forms an intermittent to continuous shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is open. Dominant and characteristic shrubs include *Adenostoma fasciculatum, Arctostaphylos glauca*, and *Salvia mellifera*. Commonly associated emergent trees at sparse cover include *Pinus sabiniana*.

Membership Rule: *Arctostaphylos glauca* is co-dominant or sub-dominant when *Adenostoma fasciculatum* is dominant in the shrub canopy. *Adenostoma fasciculatum* and *Salvia mellifera* are present at significant cover.

Classification Comments: None

Rare taxa in samples: *Malacothamnus jonesii*

Average relative cover of non-natives: 2.1% (low)

Cover by Lifeform – Mean (Range):
Tree cover: 2.1% (0.0 – 5%)
Conifer: 0.5% (0 –1%)
Hardwood: 0.1% (0 – 0.2%)
Regenerating or Shrubby: 0.0% (0 – 0%)
Shrub Cover: 63.7% (46.0 – 85%)
Herb Cover: 5.0% (4 – 6%)

Environmental Description – Mean (Range) or (Count)

Elevation: 551 m (353 - 725 m)

Slope: 33° (30 - 35°)

Aspect: NE (1), NW (1), SE (1)

Macro-topography: Lower to Upper 1/3 of slope (1), Middle 1/3 of slope (1), Upper 1/3 of slope to Ridgetop (1)

Surface Covers – Mean (Range):
Large Rock: 0.6% (0.6 - 0.6%)
Small Rock: 15.4% (15.4 - 15.4%)
Fines: 13.0% (0 - 26%)
Litter: 32.5% (10 - 55%)

Soil Texture (field assessed): Fine sand (1), Medium loam (1), Moderately coarse, sandy loam (1)

Geology (field or map data): Sandstone (3)

References: Borchert et al. 2004, Evens et al. 2006

Conservation Status Rank
Global: GNR **State (CA):** SNR **State Rare:** N

Sample Size Distribution
Ecoregions: Central Coast Range: n = 3
Counties:
Fresno: n = 1 San Luis Obispo: n = 2

Surveys Used in Description (N = 3): CCBLM570, LPCH0722, MOSL2205

Association Stand Table Con = Constancy, Avg = Average Absolute Cover, Min = Minimum Absolute Cover, Max = Maximum Absolute Cover, Ch = Characteristic, D = Dominant, cD = Co-dominant, Oft = Often

Layer	Taxon	Con	Avg	Min	Max	Ch	D	cD	Oft
T	*Pinus sabiniana*	67	3.0	1.0	5.0		Y	Y	Y
T	*Juniperus californica*	33	0.2	0.2	0.2				
S	***Arctostaphylos glauca***	**100**	**30.0**	**18.0**	**52.0**	**Y**		**Y**	
S	***Adenostoma fasciculatum***	**100**	**25.3**	**1.0**	**40.0**	**Y**		**Y**	
S	***Salvia mellifera***	**100**	**10.7**	**8.0**	**15.0**	**Y**			
S	*Heteromeles arbutifolia*	33	11.0	11.0	11.0				
S	*Eriogonum fasciculatum*	33	7.0	7.0	7.0				
S	*Lonicera interrupta*	33	4.0	4.0	4.0				
S	*Prunus ilicifolia*	33	4.0	4.0	4.0				
S	*Toxicodendron diversilobum*	33	0.2	0.2	0.2				
S	*Quercus berberidifolia*	33	0.2	0.2	0.2				
S	*Malacothamnus jonesii*	33	0.2	0.2	0.2				
S	*Clematis lasiantha*	33	0.2	0.2	0.2				
S	*Artemisia californica*	33	0.2	0.2	0.2				
H	*Bromus madritensis*	33	4.0	4.0	4.0				
H	*Salvia spathacea*	33	4.0	4.0	4.0				
H	*Galium andrewsii*	33	0.2	0.2	0.2				
H	*Apiastrum angustifolium*	33	0.2	0.2	0.2				
H	*Poa secunda*	33	0.2	0.2	0.2				
H	*Camissonia graciliflora*	33	0.2	0.2	0.2				
H	*Paeonia californica*	33	0.2	0.2	0.2				
H	*Lotus wrangelianus*	33	0.2	0.2	0.2				
H	*Logfia gallica*	33	0.2	0.2	0.2				
H	*Vulpia microstachys*	33	0.1	0.1	0.1				
H	*Pentagramma triangularis*	33	0.1	0.1	0.1				
H	*Pellaea andromedifolia*	33	0.1	0.1	0.1				
H	*Clarkia purpurea*	33	0.1	0.1	0.1				
H	*Centaurea melitensis*	33	0.1	0.1	0.1				
H	*Castilleja exserta*	33	0.1	0.1	0.1				

- **Summaries Include:**
  - Physical characteristics
  - Ecological settings
  - Rare species documented in surveys
  - Stand tables with plant species constancy and average, minimum, and maximum cover
  - Surveys used to generate the descriptions

All survey data and reporting now complete and public release imminent!

Field Survey Data Collection and Analysis	Estimated Delivery
Draft Mapping Key	Complete
Survey Database - Preliminary	Complete
Copies of Field Forms and Photos	Complete
Digital Copies of Permits	Complete
Survey Database - Final	Complete
Final Mapping Key	Complete
Final Classification, Key, Descriptions, Report - Draft	Complete
Final Classification, Key, Descriptions, Report - Final*	Complete

- **December 2024**
  - Survey Database – Preliminary; Copies of Photos, Permits, etc.
- **September 2025**
  - Survey Database – Final
  - Classification analysis of alliances/associations
  - Field map verification, final mapping key
- **July 2026**
  - Report on final classification, floristic key, vegetation descriptions
  - Rankings for sensitive natural communities

Vegetation Maps

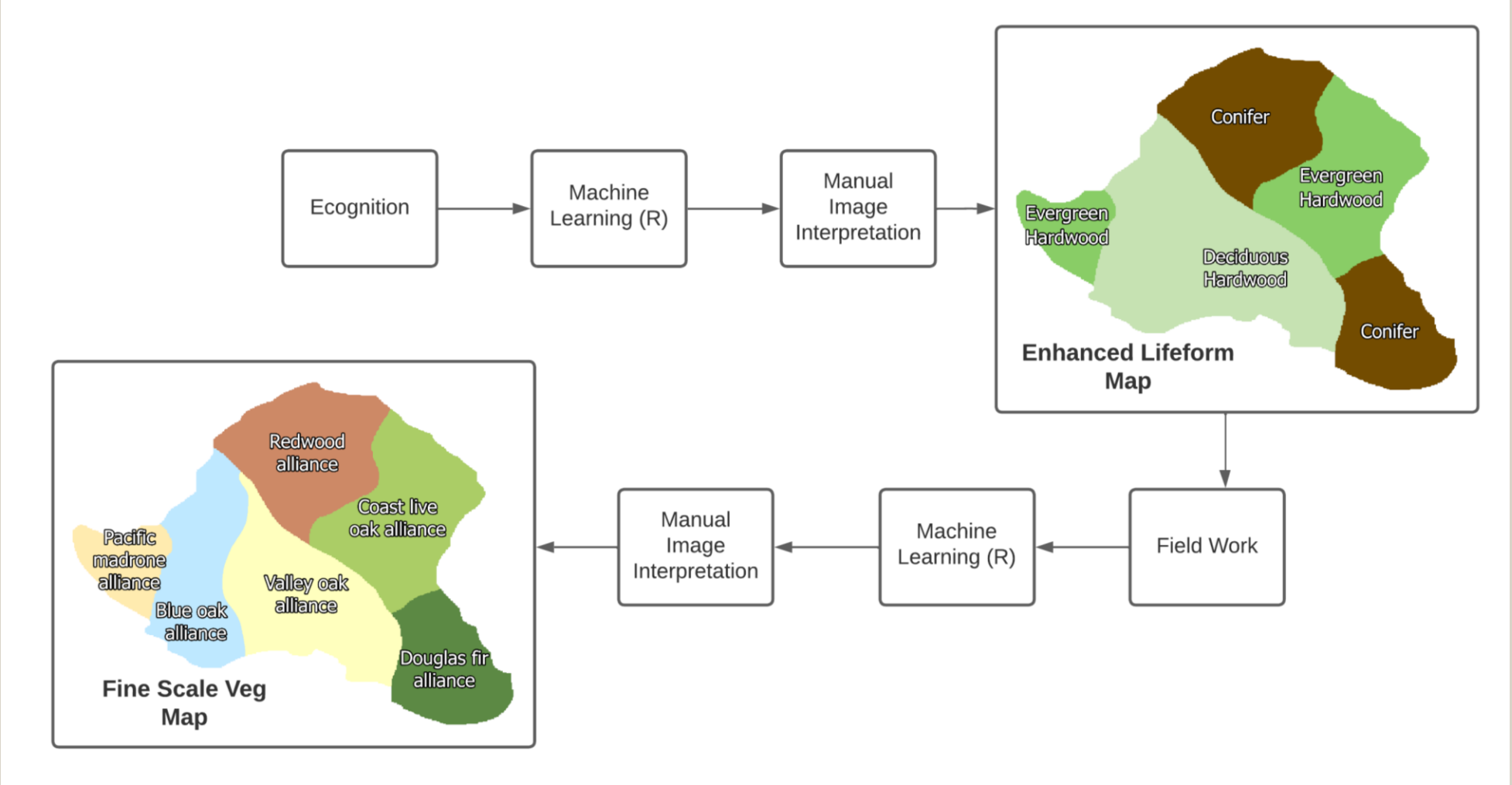
- Enhanced Lifeform Map
- Fine Scale Vegetation Map

Vegetation Mapping Update

Vegetation Mapping Schedule Update

Vegetation Mapping	Estimated Delivery
Enhanced Lifeform - Monterey County	Complete
Enhanced Lifeform - San Luis Obispo County	Complete
Enhanced Lifeform - San Benito County	Complete
Enhanced Lifeform - Entire Central Coast ER	Complete
Draft Finescale Maps - 3 Counties	June, 2026
Final Finescale Maps - 3 Counties	March, 2027

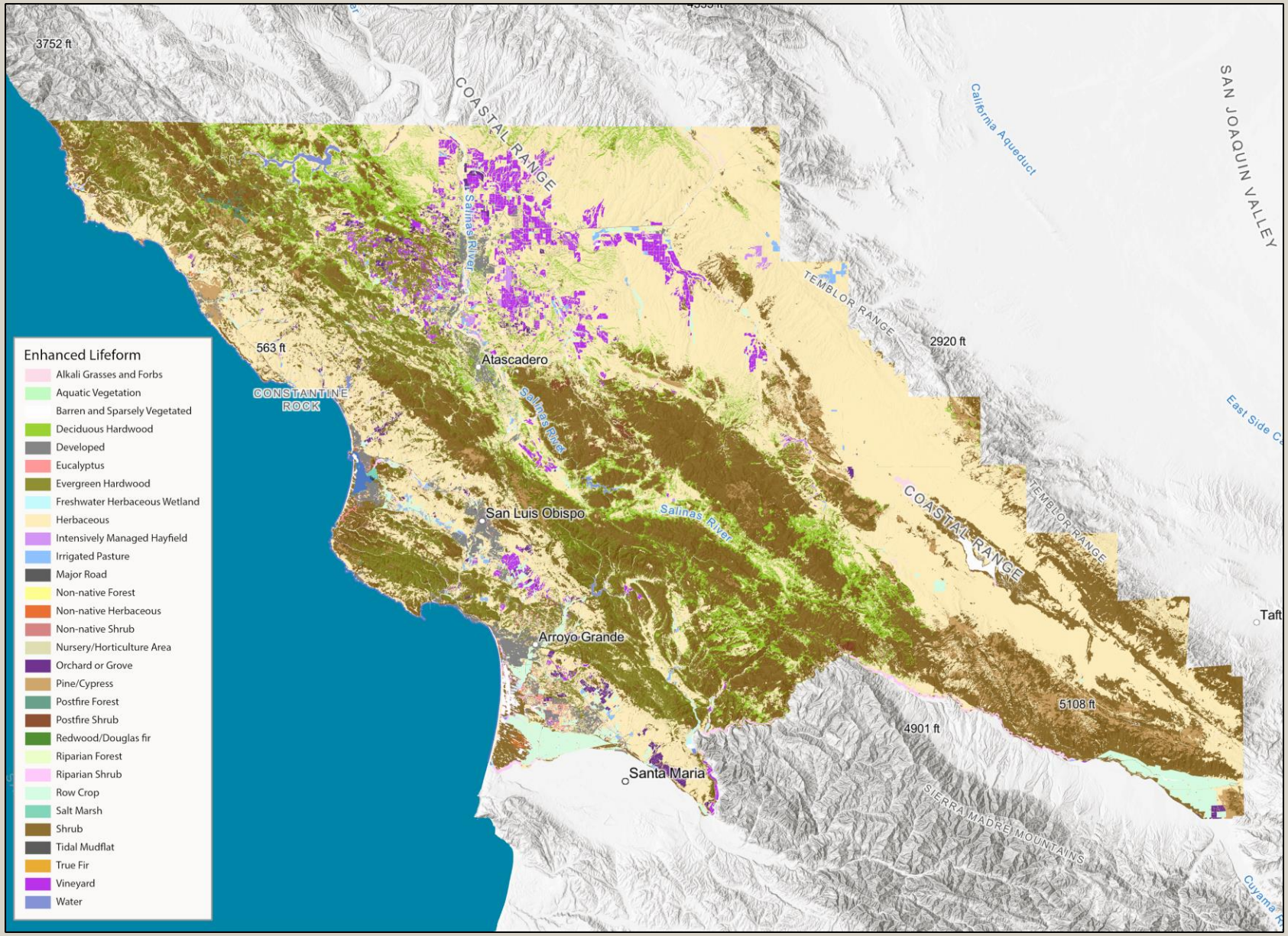
Vegetation Mapping Workflow



Vegetation Mapping - Enhanced Lifeform

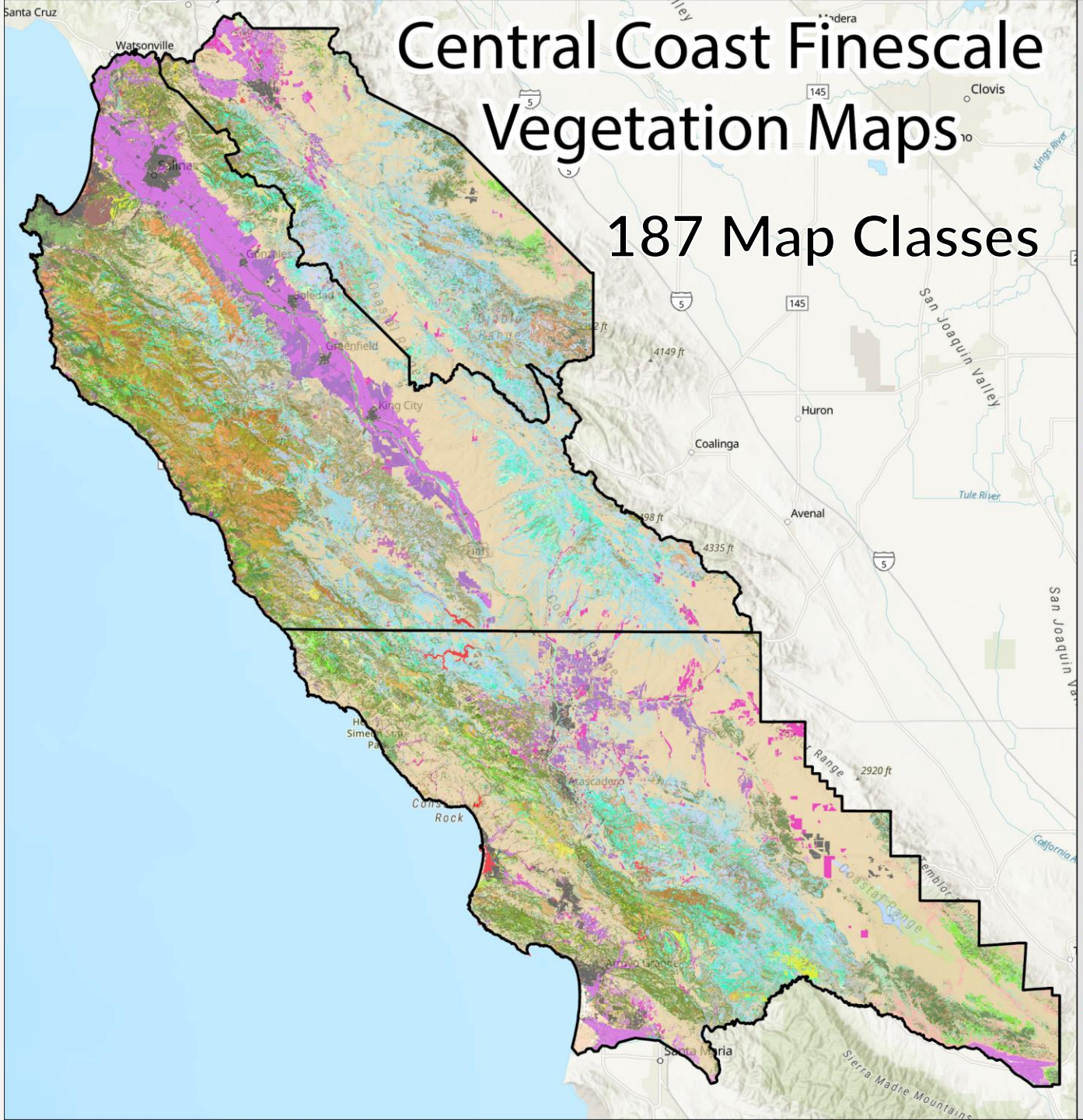
Methods

- Foundational data → imagery and lidar
- Semi-automated: Trimble Ecognition + machine learning + manual editing
- Forest areas mapped in groups, e.g., ‘Evergreen hardwoods’



Central Coast Finescale Vegetation Maps

187 Map Classes



Finescale Vegetation Classes

Agriculture
- Intensively Managed Hayfield
- Irrigated Pasture
- Nursery or Ornamental Horticulture Area
- Orchard or Grove
- Row Crop
- Vineyard

Developed and Built Up
- Developed
- Major Road

Hardwood
- Acer macrophyllum Mapping Unit
- Aesculus californica Alliance
- Arbutus menziesii Alliance
- Notholithocarpus densiflorus Alliance
- Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni) Alliance
- Quercus agrifolia Alliance
- Quercus chrysolepis (tree) Alliance
- Quercus douglasii Alliance
- Quercus kelloggii Alliance
- Quercus lobata Alliance
- Quercus wislizeni - Quercus parvula (tree) Alliance
- Umbellularia californica Alliance

Herbaceous
- Grindelia stricta Association
- Californian Annual & Perennial Grassland Macrogroup
- Pacific Coastal Beach & Dune Macrogroup
- Seasonally Saturated Herbaceous

Freshwater Herbaceous Wetland
- North American Pacific Intertidal Algal Flat Group
- North Pacific Lowland Marsh, Wet Meadow & Shrubland Macrogroup
- Western North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup
- North American Desert Alkaline-Saline Marsh & Playa Group
- Californian Vernal Pool Group
- Arid West Interior Freshwater Marsh Group
- Western North American Freshwater Aquatic Vegetation Macrogroup

Non-native Forest, Shrub, and Herbaceous
- Lepidium latifolium - Lactuca serriola Semi-Natural Alliance
- Acacia melanoxylon Provisional Semi-Natural Association
- Acacia spp. - Grevillea spp. - Leptospermum laevigatum Semi-Natural Alliance
- Ailanthus altissima Semi-Natural Association
- Ammophila arenaria Semi-Natural Alliance
- Atriplex prostrata - Cotula coronopifolia Semi-Natural Alliance
- Cakile (edentula, maritima) Provisional Semi-Natural Alliance
- Conium maculatum - Foeniculum vulgare Semi-Natural Alliance
- Cortaderia (jubata, selloana) Semi-Natural Alliance
- Cytisus scoparius - Genista monspessulana - Cotoneaster spp. Semi-Natural Alliance
- Eucalyptus (globulus, camaldulensis) Semi-Natural Association
- Hesperocyparis macrocarpa Ruderal Semi-Natural Association
- Mesembryanthemum spp. - Carpobrotus spp. Semi-Natural Alliance
- Non-native Trees
- Non-native Herbaceous
- Non-native Shrub
- Pinus radiata plantations Semi-Natural Association
- Rubus armeniacus Semi-Natural Association
- Opuntia ficus-indica Semi-Natural Mapping Unit
- Pennisetum setaceum - Pennisetum ciliare Semi-Natural Alliance
- Phragmites australis - Arundo donax Semi-Natural Alliance
- Salsola tragus - Isatis tinctoria - Bassia spp. Semi-Natural Alliance
- Tamarix spp. Semi-Natural Alliance
- Delairea odorata Provisional Semi-Natural Association
- Schinus (molle, terebinthifolius) - Myoporum laetum Semi-Natural Alliance
- Rubus armeniacus - Sesbania punicea - Ficus carica Semi-Natural Alliance

Other Map Classes
- Barren Mapping Unit
- Forest Fragment
- Unvegetated Wash, River Bottom, and Mudflat Mapping Unit
- Water
- Californian Coastal Cliff, Scree & Rock Outcrop Group
- Agricultural Roads
- Sparsely Vegetated Recently Burned Areas Mapping Unit

Riparian Forest
- Acer negundo / (Rubus ursinus) Association
- Alnus rhombifolia Alliance
- Juglans hindsii and Hybrids Alliance
- Platanus racemosa - Quercus agrifolia Alliance
- Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance
- Populus trichocarpa Mapping Unit
- Salix gooddingii - Salix laevigata Alliance
- Salix lucida ssp. lasiandra Association
- Quercus lobata Riparian Alliance
- Umbellularia californica Riparian Mapping Unit

Riparian Shrub
- Baccharis salicifolia Alliance
- Cornus sericea - Salix (lasiolepis, exigua) Association
- Frangula californica - Rhododendron occidentale - Salix breweri Alliance
- Rhus trilobata - Crataegus rivularis - Forestiera pubescens Alliance
- Salix exigua Alliance
- Salix hookeriana - Salix sitchensis - Spiraea douglasii Alliance
- Salix lasiolepis Alliance

Shrub
- Adenostoma fasciculatum Alliance
- Adenostoma fasciculatum - Salvia spp. Alliance
- Arctostaphylos (crustacea, tomentosa) Alliance
- Arctostaphylos (nummularia, sensitiva) - Chrysolepis chrysophylla Alliance
- Arctostaphylos glauca Alliance
- Arctostaphylos (canescens, manzanita, stanfordiana) Alliance
- Arctostaphylos glandulosa Alliance
- Artemisia californica - (Salvia leucophylla) Alliance
- Artemisia pycnocephala Association
- Baccharis pilularis Alliance
- Ceanothus oliganthus - Ceanothus leucodermis - Ceanothus tomentosus Alliance
- Ceanothus cuneatus Alliance
- Ceanothus thyrsiflorus Alliance
- Ceanothus papillosus Alliance
- Cercocarpus montanus Alliance
- Diplacus (aurantiacus, puniceus) Association
- Eriogonum fasciculatum Alliance
- Eriogonum wrightii - Eriogonum heermannii - Buddleja utahensis Alliance
- Eriophyllum staechadifolium - Erigeron glaucus - Eriogonum latifolium Alliance
- Frangula californica ssp. californica - Baccharis pilularis / Scrophularia californica Association
- Gaultheria shallon - Rubus (ursinus) Alliance
- Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance
- Lupinus arboreus Alliance
- Lupinus chamissonis - Ericameria ericoides Alliance
- Mesic Coastal Scrub Mapping Unit
- Prunus ilicifolia - Heteromeles arbutifolia - Ceanothus spinosus Alliance
- Quercus berberidifolia Alliance
- Quercus durata Alliance
- Quercus wislizeni - Quercus chrysolepis (shrub) Alliance
- Ribes quercetorum - Rhus trilobata - Frangula californica Alliance
- Rubus spectabilis - Morella californica Alliance
- Shrub Fragment
- Salvia mellifera - (Artemisia californica) Alliance
- Arctostaphylos Placeholder
- Arctostaphylos (cruzensis, edmundsii) Association
- Arctostaphylos pajaroensis - Arctostaphylos hookeri - Arctostaphylos crustacea Association
- Arctostaphylos hooveri Association
- Arctostaphylos montereyensis - Arctostaphylos (crustacea, tomentosa) - Adenostoma fasciculatum Association
- Arctostaphylos obispoensis - (Quercus durata - Ceanothus cuneatus) Association
- Arctostaphylos pumila - Arctostaphylos tomentosa - Adenostoma fasciculatum Association
- Ceanothus greggii - Fremontodendron californicum Alliance
- Ceanothus cordulatus - Ceanothus integerrimus Alliance
- Ericameria linearifolia - Cleome isomeris Alliance
- Hazardia squarrosa - Ericameria palmeri Alliance
- Hesperoyucca whipplei Mapping Unit
- Isocoma menziesii Alliance
- Lepidospartum squamatum Alliance
- Quercus john-tuckeri Alliance
- Toxicodendron diversilobum Alliance
- Atriplex lentiformis Alliance
- Garrya elliptica Provisional Association
- Ambiguous Shrub

Pine/ Cypress
- Juniperus californica Alliance
- Hesperocyparis goveniana - Pinus muricata / Arctostaphylos tomentosa Association
- Hesperocyparis macrocarpa Association
- Hesperocyparis macnabiana - Hesperocyparis sargentii Alliance
- Pinus attenuata Alliance
- Quercus agrifolia - Pinus sabiniana Mapping Unit
- Pinus sabiniana Alliance
- Pinus coulteri Alliance
- Abies concolor - Pinus lambertiana Alliance
- Pinus ponderosa Alliance
- Pinus muricata - Pinus radiata Alliance

Conifer
- Sequoia sempervirens Alliance
- Pseudotsuga menziesii - (Notholithocarpus densiflorus - Arbutus menziesii) Alliance

True Fir
- Abies bracteata Alliance

Salt Marsh
- Distichlis spicata - Frankenia salina Coastal Alliance
- Sarcocornia pacifica (Salicornia depressa) Alliance
- Deschampsia cespitosa - Festuca rubra Brackish Salt Marsh Provisional Alliance
- Bolboschoenus maritimus Alliance

Barren
- Beach Sand Mapping Unit
- Allium spp. - Streptanthus spp. Hesperolinon spp. Serpentinite Sparsely Vegetated Alliance

Fine Scale Vegetation Mapping Methods

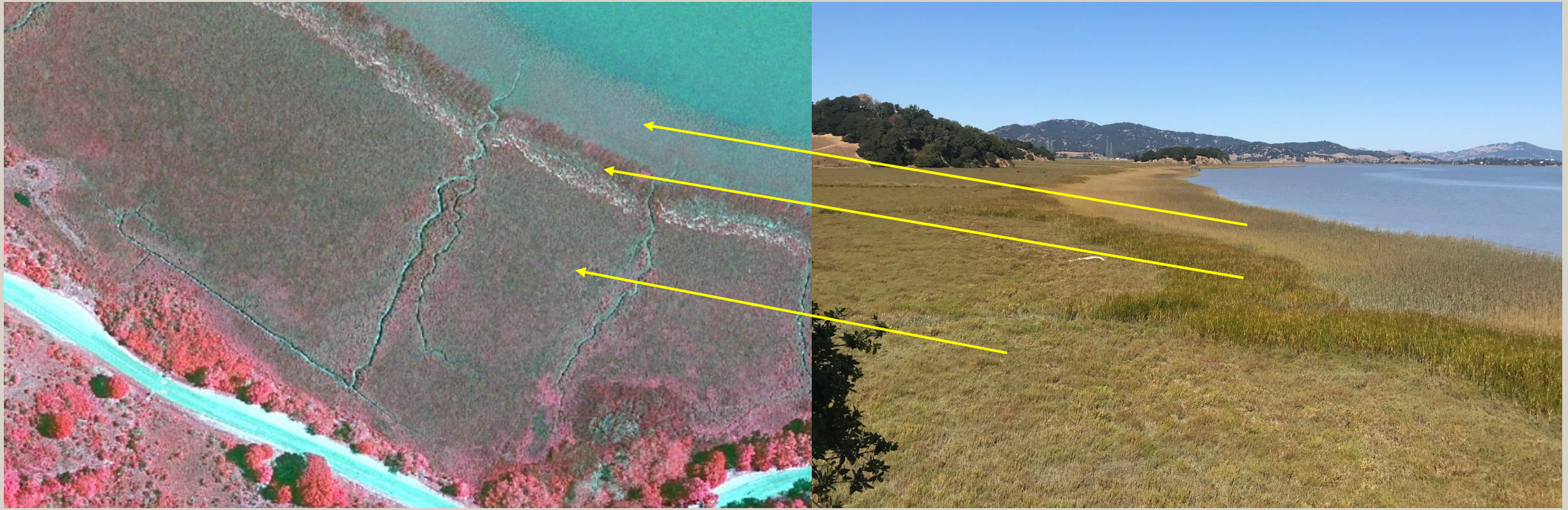
Methods

- Foundational data → enhanced lifeform map, imagery and lidar, field data and CNPS Surveys
- Semi-automated → Trimble Ecognition + machine learning + manual editing
- Approach → Adheres to NVCS and State of CA fine scale mapping standards

Fine Scale Vegetation Mapping Methods

Three Primary Objectives:

1. Understanding variation in vegetation on the ground
2. Understanding variation in the imagery and ancillary data
3. Linking variation on the ground with variation in the imagery and ancillary data



Fine Scale Vegetation Mapping Methods

Understanding Variation in Vegetation Patterns on the Ground

- **Targeted surveys** of local vegetation communities
  - Releves and RA's (CNPS)
- **Analysis of surveys**
  - Mapping/Floristic Keys, Alliance/Association Descriptions(CNPS)
- **Mapping Calibration/Validation Field Work**

Fine Scale Vegetation Mapping Methods

Understanding Variation in the Imagery & Ancillary Data

Image analysis

- **Multiple image types**
  - Landsat & Sentinel imagery for multi-temporal analysis
  - High resolution airborne imagery
- **Ancillary data**
  - Vegetation height (from lidar)
  - Canopy cover (from lidar)
  - Forest structure (from lidar)
  - Hydrology and distance to streams

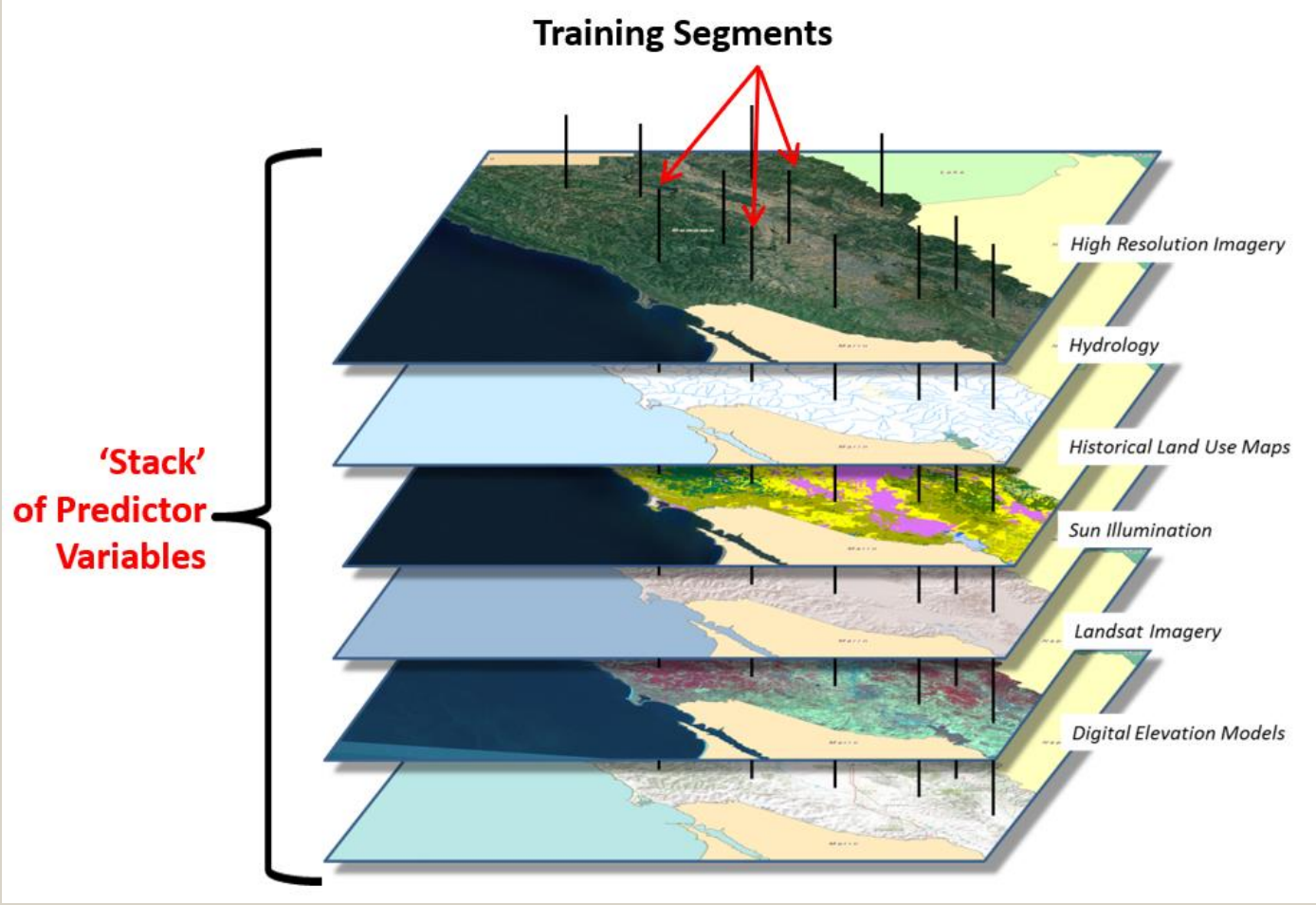
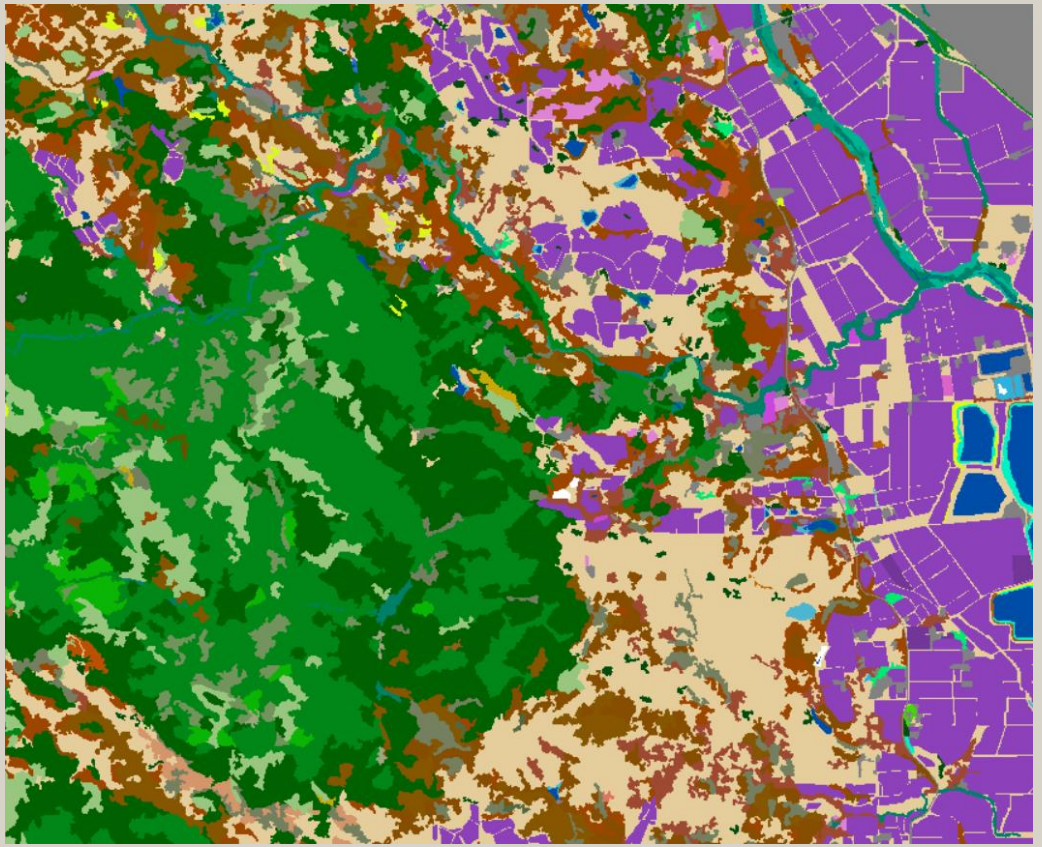


Figure Credit: Tukman Geospatial

Fine Scale Vegetation Mapping Methods

Linking Variation on the Ground to Variation in the Imagery & Ancillary Data

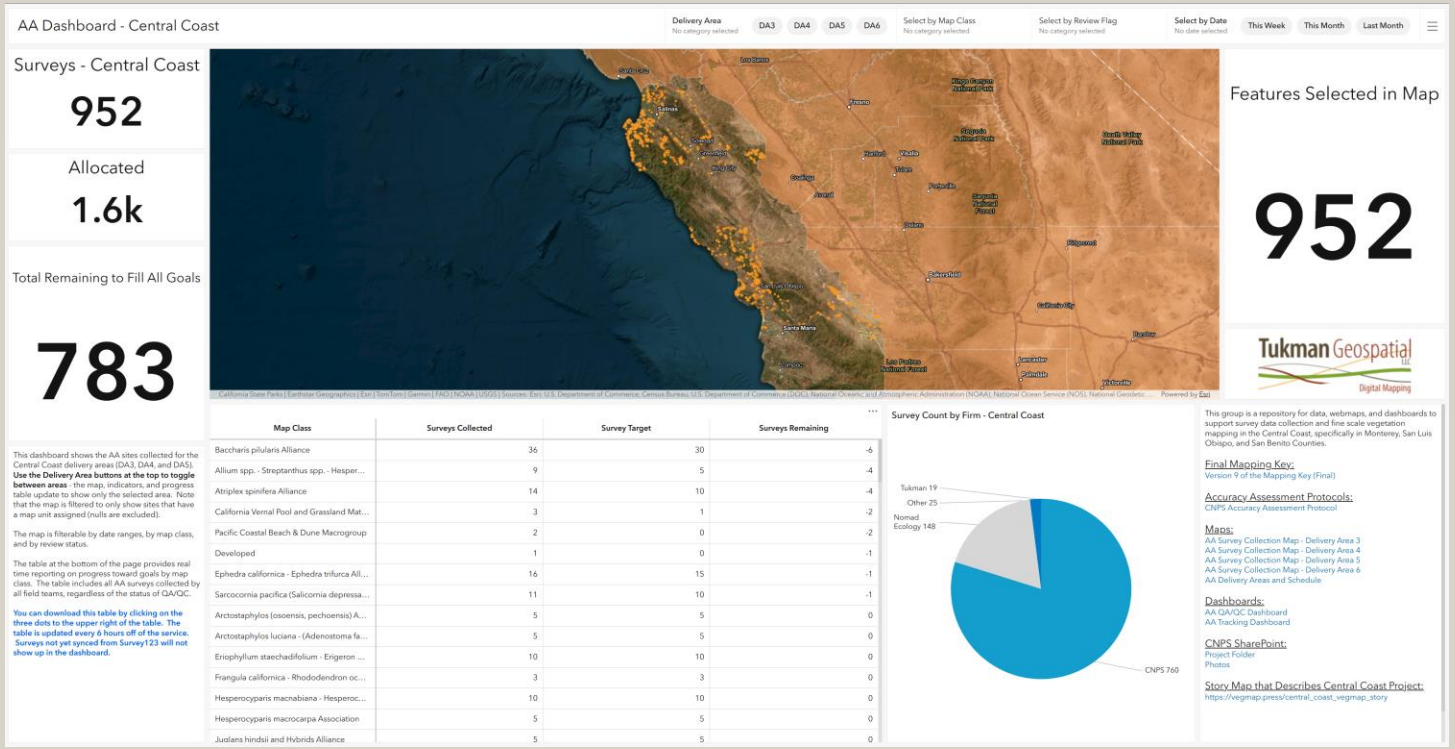
- **Machine learning** to automate initial mapping → field training sites used to predict the map class for unknown areas through modeling.
- **Expert manual image interpretation**
- **Local map review by land managers**
- **Formal accuracy assessment**



Fine Scale Veg Map Accuracy Assessment

Accuracy Assessment Surveys:

- Collected w/ Survey 123
- Dashboard tracks target surveys versus collected surveys
- Thorough QA/QC performed during + after data collection
- Approximately 1,700 AA surveys will be collected

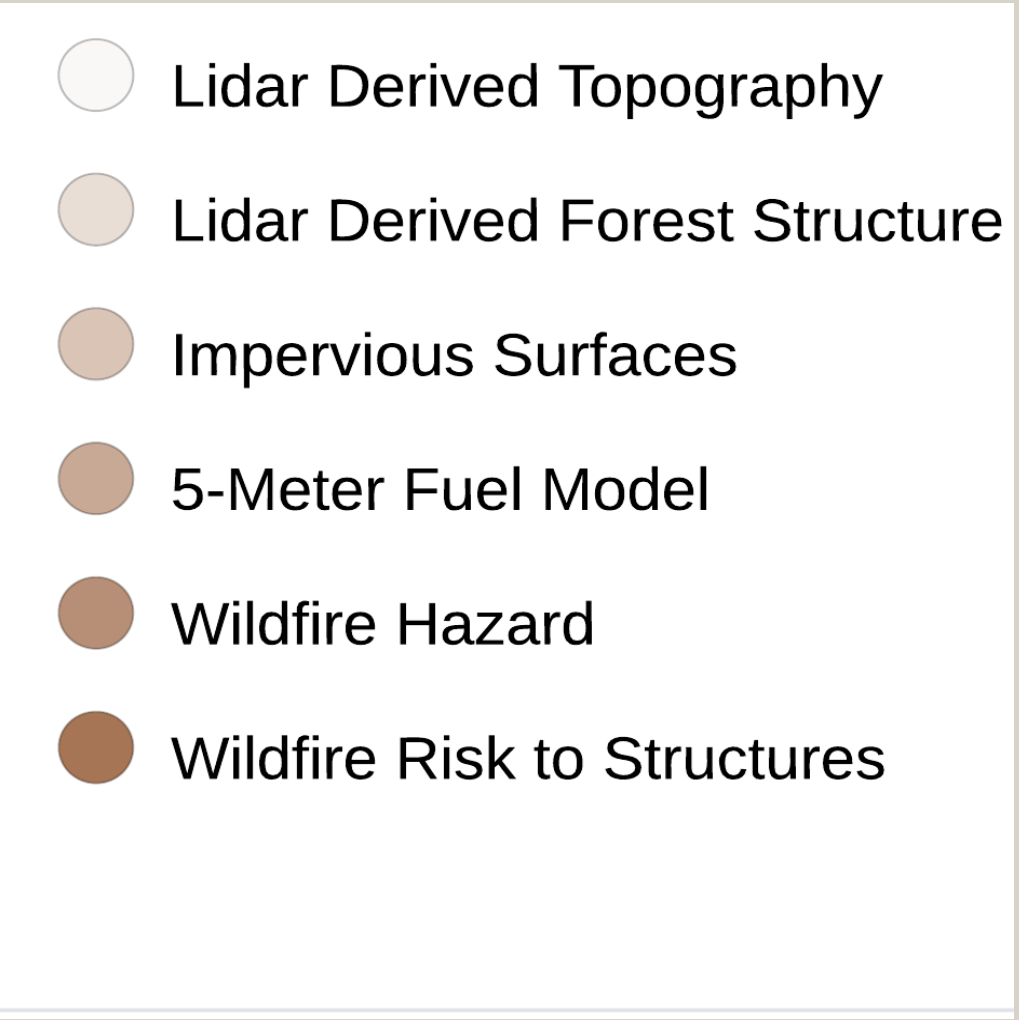


Fine Scale Veg Map Accuracy Assessment

Accuracy Assessment Results:

- Error matrixes
- Fuzzy accuracies for each map class
- CDFW requires overall fuzzy >= 80%

Lidar + Wildfire Products



These data products were funded by a recent grant from the **State Coastal Conservancy**.

Coastal Conservancy

Thank You Coastal Conservancy!!

Central Coast Landscape Data Project

New Vegetation Maps, Wildfire Products and lidar for the Central Coast

Coastal San Luis Resource Conservation District
May 15, 2025

Introduction

Story Map

https://vegmap.press/central_coast_vegmap_story

Voices from the Field

PRACTITIONER TESTIMONIALS ON LIDAR & FINE-SCALE VEGETATION MAPPING

TUKMAN GEOSPATIAL • NORTHERN CALIFORNIA RESTORATION COMMUNITY

Maryrose Kulick

GIS Program Manager · Sonoma Land Trust · June 2026

“The fine-scale vegetation map is an invaluable resource to Sonoma Land Trust.”

The fine-scale vegetation map is an invaluable resource to Sonoma Land Trust. We use it as an input to fine-scale wildlife movement models. It helps us prioritize forest health treatment efforts and understand our "portfolio" of lands, including aboveground carbon storage. It's also a resource to help advocate for nature-smart development. This dataset is a huge improvement over what is available from state and federal agencies, and because there is regional data in the same format, it allows regional and statewide efforts to speak the same language. It is a vital and necessary tool in our work as a land protection agency.

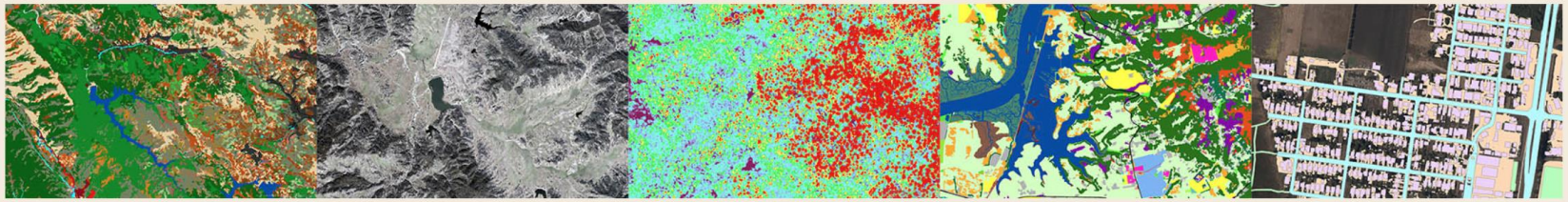
Steve Auten

Principal · Auten Resource Consulting · April 2026

“Lidar-derived data and fine scale vegetation maps increased our fuels treatment development accuracy in the office from ~60–70% to ~90%.”

The level of detail in these data has been a game changer for landscape-level resilience treatment design. Because the pre-design is so much stronger, field verification of treatment units takes far less time — coarser, non-lidar derived data forces lengthy in-field polygon readjustment. The savings are real: hours of field time eliminated and costs reduced, which matters most when assembling grant applications with little money budgeted for pre-planning. Higher confidence in pre-planned treatment layouts also frees up grant budget for implementation.

Land Cover and Fuels Data and Downloads



Map Category : Fuels/Fire, Land Cover ...

County or Region : Monterey, San Benito, ...

Clear filters

Map Category	Dataset Name ▲	County or Region	Ground Condition Year	Ground Condition Season	Datasheet	Details and Download
Fuels/Fire	5-meter Fuel Model and Fuelscape	Monterey	2022	Summer	Datasheet	Get Data
Fuels/Fire	5-meter Fuel Model and Fuelscape	San Benito	2022	Summer	Datasheet	Get Data
Fuels/Fire	5-meter Fuel Model and Fuelscape	San Luis Obispo	2022	Summer	Datasheet	Get Data
Fuels/Fire	Classified Wildfire Hazard 20-meter	Monterey	2022	Summer	Datasheet	Get Data
Fuels/Fire	Classified Wildfire Hazard 20-meter	San Benito	2022	Summer	Datasheet	Get Data
Fuels/Fire	Classified Wildfire Hazard 20-meter	San Luis Obispo	2022	Summer	Datasheet	Get Data
Topography, Fuels/Fire + Forest Structure	Countywide Lidar Derivatives	Monterey	Various	Various	Datasheet	Get Data
Topography, Fuels/Fire + Forest Structure	Countywide Lidar Derivatives	San Benito	Various	Various	Datasheet	Get Data
Topography, Fuels/Fire + Forest Structure	Countywide Lidar Derivatives	San Luis Obispo	Various	Various	Datasheet	Get Data
	Elkhorn Slough Watershed					

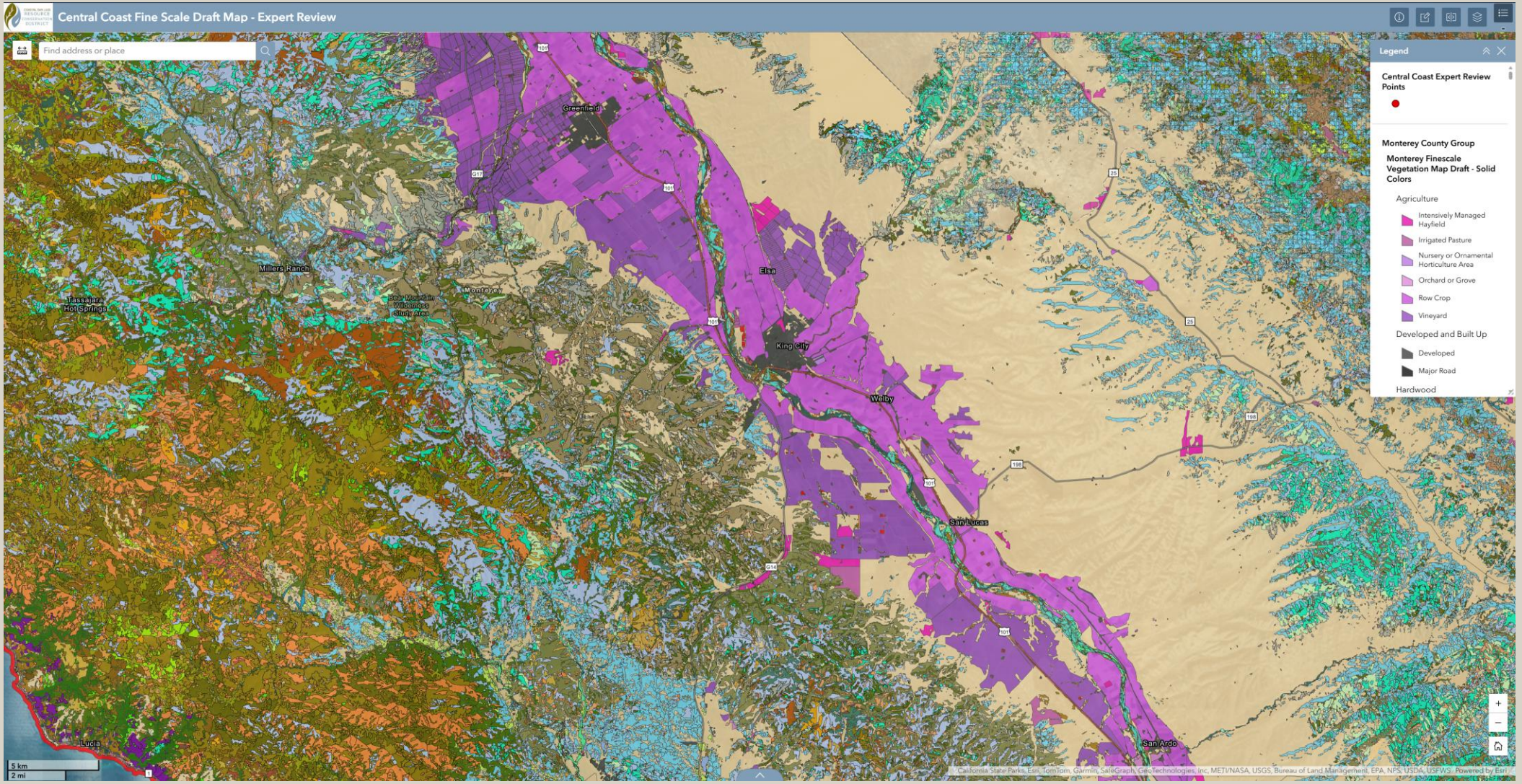
Download all data products at Pacific Veg Map

https://pacificvegmap.org/data-downloads

We Need Partner & User Input

- **Project Progress Meetings**
  - Partner workshops to provide info and receive input
  - Final project product roll-out workshop; training on data access and use
- **Solicit Partner Data**
  - Existing fine scale vegetation maps for integration into countywide maps
- **Partner Review**
  - Fine-Scale Vegetation Map
  - Wildfire Products

Expert Review



Countywide Map Review

- Input requested from YOU – **DUE BY Friday October 30**
- Please read the **Review Guidelines (https://vegmap.press/central_coast_review_guidelines)** for additional information, instructions on how to access/review the map, and what to look for when you review
- Please review fine scale map class in your area of familiarity. Your knowledge of specific areas of the county will help us to improve the map. Reference the Mapping key to understand the rules that define map labels/classes.

Countywide Map Review

- Options for providing input:
  - Use the **Review Web Map** and add points directly to it
  - Download draft veg map spatial data and send us:
    - Bookmarks exported from ArcMap or ArcGIS Pro with comments about errors associated with each bookmark
    - Lat/Longs with error comments about each location
    - Point features as a shapefile or feature class with error comments for each point

Countywide Map Review

- We are specifically interested in input on the following types (either places on the map where these types are mapped but shouldn't be, or places where the types should be mapped but aren't):
  - Quercus parvula (***Quercus wislizeni – Quercus parvula*** **(tree) Alliance)**
  - Spatial boundaries between native and planted/naturalized stands of Pinus radiata and Hesperocyparis macrocarpa
  - Salix stands – differentiation between S. laevigata, S. lucida, S. lasiolepis
  - Chrysolepis chrysophylla (***Arctostaphylos (nummularia, sensitiva) – Chrysolepis chrysophylla*** **Alliance)**
  - Quercus berberidifolia vs Quercus wizliseni shrub stands
  - Unique manzanita stands (hooveri, montereyensis, pajaroensis, hookeri, pungens)
  - ***Gaultheria shallon – Rubus*** **(*ursinus*) Alliance**

Countywide Map Review

Regions of Interest

- Monterey
  - Monterey/Fresno border – Reason Mtn, Smith Mtn, Frames Peak, Pancho Creek – Monterey Shale areas
  - Hunter Liggett
  - Carmel Highlands – Unusual *Arctostaphylos crustacea*, pygmy redwood, and chinquapin stands
- San Luis Obispo
  - Diablo Canyon
  - Hearst Ranch
  - Hubbard Hills
- San Benito
  - Any info on private ranches
  - Clear Creek Monocline asbestos area

Countywide Map Review Tips

- ## Be aware of MMU:
  - Small islands of vegetation may go unmapped and/or are aggregated into other map types because they do not meet the minimum mapping unit to be pulled out. MMUs vary by lifeform.
- ## Review map class descriptions and dominance rules:
  - Map classes can occasionally be counter-intuitive, or the alliance name may not fully describe what you're seeing.
    - **e.g.** You may see a stand of "Platanus racemosa – Quercus agrifolia Alliance" without any visible *Platanus* in it, because this alliance also includes QUAG dominating in a riparian setting
    - **e.g.** the endemic *Arctostaphylos x benitoensis* is mapped under the *Arctostaphylos glauca* Alliance

Countywide Map Review Tips

Map is of 2022 conditions:

- We are often aware of changes in vegetation type and structure due to fires, clearing, etc that happen after 2022, but the fine scale veg map is always mapped to a single consistent ground condition (2022 NAIP)
- Comments such as “This stand was cleared in 2024 for development and is now a building” or “These invasive species were removed during a restoration last year” are **not actionable** for this map

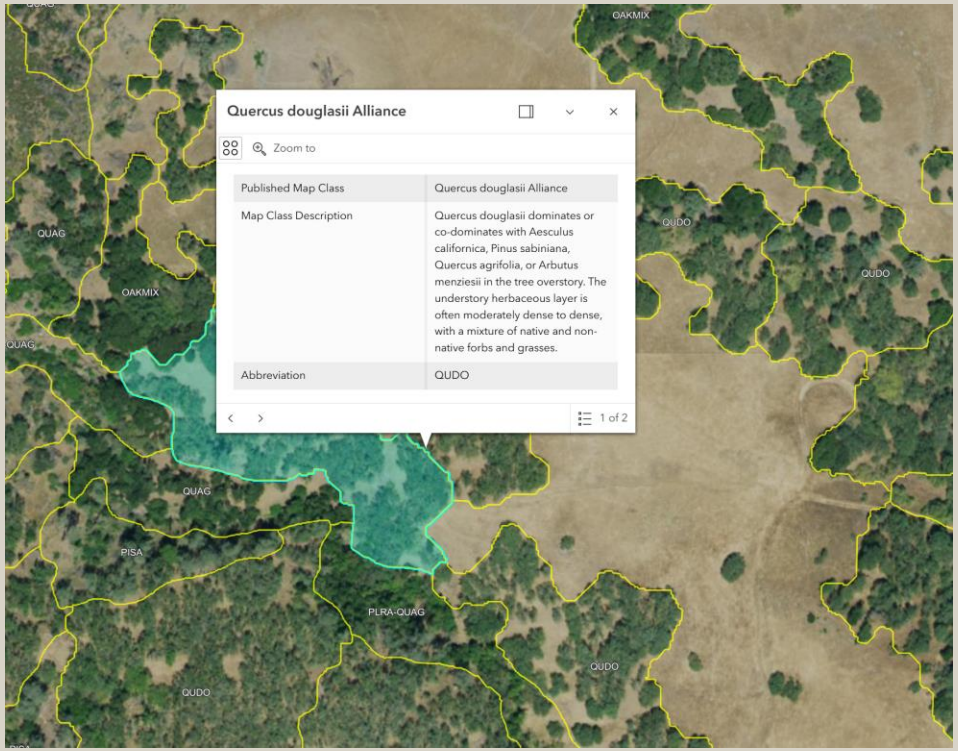
Countywide Map Review Tips: Known Issues

A non-comprehensive list of types with higher error probabilities – any expert help for these issues is gladly welcomed.

- **Recent burns:** Challenging to photointerpret and balance what's there in 2022 imagery vs. what is predicted to be there based on pre-burn veg type
- **Shrub oaks types:** Difficult to differentiate via photointerpretation; presence of many hybrids (e.g. *Q. alvordiana*)
- **Salix spp:** Difficult to differentiate species via photointerpretation
- **Riparian corridors e.g. Salinas River:** Frequent change
- **Diverse stands, e.g. shrubs on the immediate coast:** Many species mixing in small, undelinateable stands can make it challenging to determine dominance
- **Stands That Don't Line Up on County Borders:** Border issues will be rectified after expert review

Countywide Map Review
Data Access Links

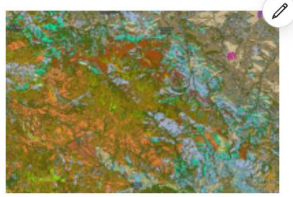
- **Review App –**
  https://vegmap.press/central_coast_review_app
- **Review Guidelines –**
  https://vegmap.press/central_coast_review_guidelines
- **Veg Map Feature services –**
  https://vegmap.press/Monterey_fine_scale_draft_FS_solid
  https://vegmap.press/San_Benito_fine_scale_draft_FS_solid
  https://vegmap.press/SLO_fine_scale_draft_FS_solid
- **Download File geodatabase Feature Class –**
  https://vegmap.press/Monterey_fine_scale_draft_FGDB
  https://vegmap.press/San_Benito_fine_scale_draft_FGDB
  https://vegmap.press/SLO_fine_scale_draft_FGDB
- **Issue Locations –**
  https://vegmap.press/central_coast_expert_review_pts



Review App Demo

Central Coast Fine Scale Draft Map - Expert Review App

Overview | Usage | Settings



This web app is for stakeholder review of the draft fine scale vegetation map of Monterey, San Benito, and San Luis Obispo Counties. The draft was published in August 2026.

Edit

Web experience

Item updated: Aug 21, 2026

View
Edit
Share
View metadata
Show more

Owner Edit

SA S Alvarez
salvarez_CSLRCD

Details

View count
131

URL
https://experience.arcgis....

Size
9.846 MB

Item information

Low High

Top improvement

Add tags

Tags Edit

This item has no tags.

Description Edit

To provide input on the fine scale vegetation map using this review app, see these expert review guidelines.

This review app contains a draft of the fine scale vegetation map for stakeholder review. The vegetation map represents the state of the landscape in 2022. The map includes information about fine scale map class using the National Vegetation Classification. This map will be reviewed by stakeholders and input provided to the project team. The map will be refined and finalized for a 2027 release. The decision rules for the fine scale map class are in the mapping key.

Direct Links for Layers in Web App:

Monterey Fine Scale Draft Map - Solid Colors

San Benito Fine Scale Draft Map - Solid Colors

San Luis Obispo Fine Scale Draft Map - Solid Colors

Monterey Fine Scale Draft Map - Hollow Outlines

San Benito Fine Scale Draft Map - Hollow Outlines

San Luis Obispo Fine Scale Draft Map - Hollow Outlines

Expert Review Points

2022 NAIP Imagery

Next Steps

- Stakeholder input due **October 30**
- Refinements to countywide map based on stakeholder input
- Final QA/QC procedures, consistency checks for all attributes
- **Final Map delivery – April 2027**
- **AA and final report public release – April 2027**

Contacts

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- **San Benito RCD**
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- **Upper Salinas-Las Tablas RCD**
  - Spencer Gordon - spencer@us-ltrcd.org

Thank You Again To Our Funders

VegCAMP

California Department of Fish and Wildlife

California Natural Resources Agency

Coastal Conservancy
State of California

USGS
science for a changing world

California Department of Conservation


Questions?
Thank you for your time.