



# Russian River Regional Monitoring Program

Comprehensive Basemap of Surface  
Waters and Riparian Areas

**SFEI**

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**June 17, 2025 - USEPA Region 9 WPDG Meeting**



# SFEI

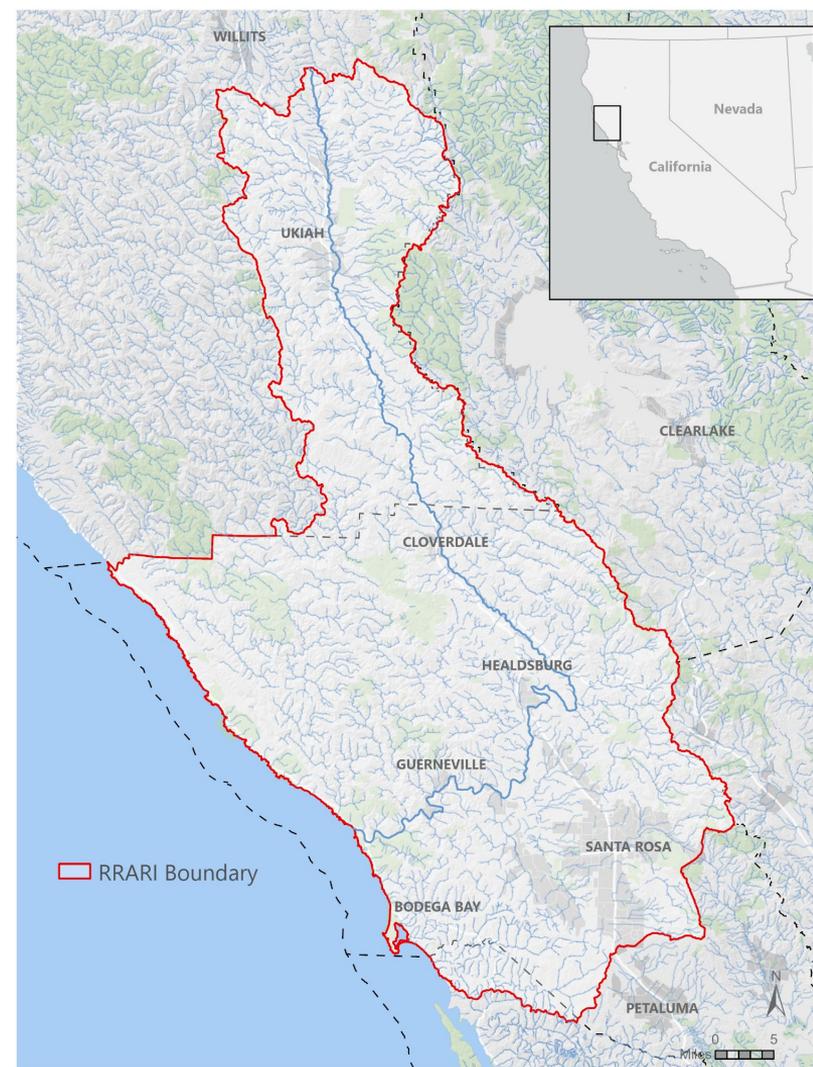
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- We **deliver visionary science** to revitalize nature

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# Agenda

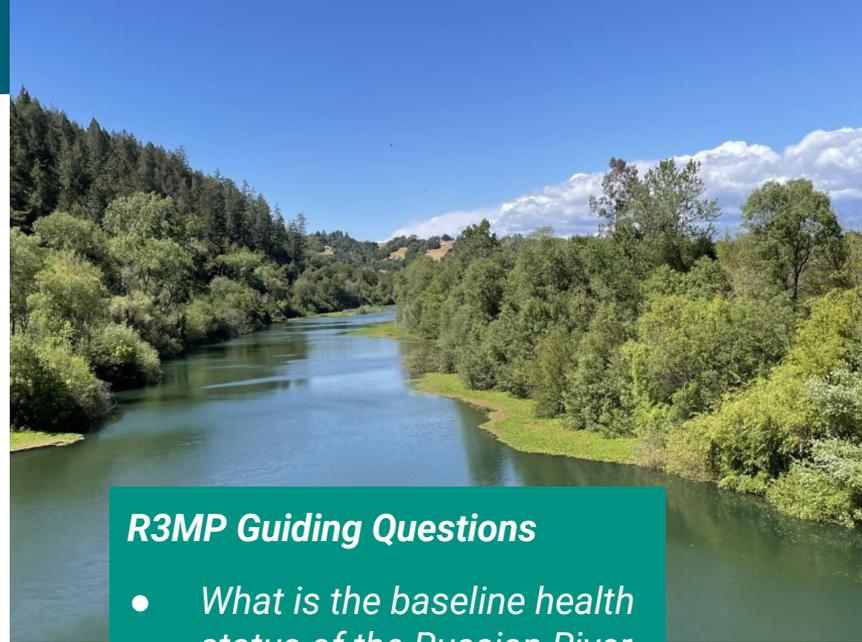
- Overview of Russian River Regional Monitoring Program (R3MP)
- Mapping project objectives and tasks
- Public data display and access
- Regional coordination



# Russian River Regional Monitoring Program

**PURPOSE:** **Coordinate regional entities** to support adaptive and coordinated environmental planning, regulation, and management of the Russian River Watershed to achieve and sustain its good health

**GOAL:** To **assess, forecast, and communicate** the health status of the Russian River Watershed in ways that are scientifically sound and that effectively inform environmental planning, regulatory and management decisions in the watershed context



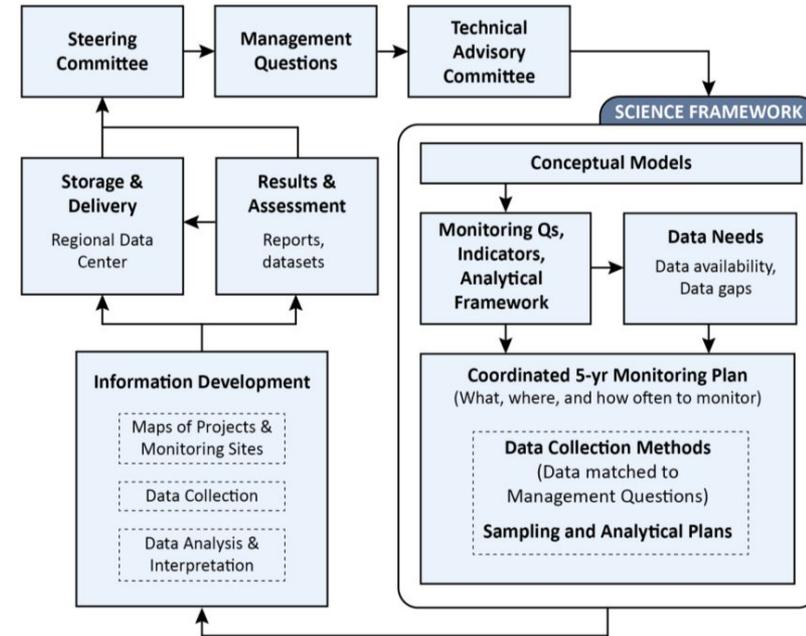
## *R3MP Guiding Questions*

- *What is the baseline health status of the Russian River watershed;*
- *What are the trends in watershed health; and*
- *How can the health of the watershed be improved?*

# Aligns with EPA Core Elements Framework

Informs the core elements by:

- serves as a coordinated regional monitoring and assessment program
- supports environmental regulatory decision making
- provides tools to support and track performance for voluntary restoration



# R3MP Partners



- CA Department of Fish & Wildlife
- City of Santa Rosa
- Gold Ridge Resource Conservation District
- Marin/Sonoma Mosquito & Vector Control District
- Mendocino County Water Agency
- Mendocino County Resource Conservation District
- North Coast Regional Water Quality Control Board
- NV5
- Pepperwood Foundation
- Permit Sonoma
- Pinoleville Pomo Nation
- Russian River Confluence
- Russian Riverkeeper
- Russian River Watershed Association
- San Francisco Estuary Institute/Aquatic Science Center
- Sonoma County Ag Preservation + Open Space District
- Sonoma County Ag Commissioner
- Sonoma Water
- Sonoma Resource Conservation District
- Town of Windsor
- Trout Unlimited
- Tukman Geospatial

# Wetland and Riparian Area Monitoring Program (WRAMP)

Data management framework and standardized methods for monitoring, assessing, and adaptively managing aquatic resources within a watershed or landscape context



# Wetland and Riparian Area Monitoring Program (WRAMP)

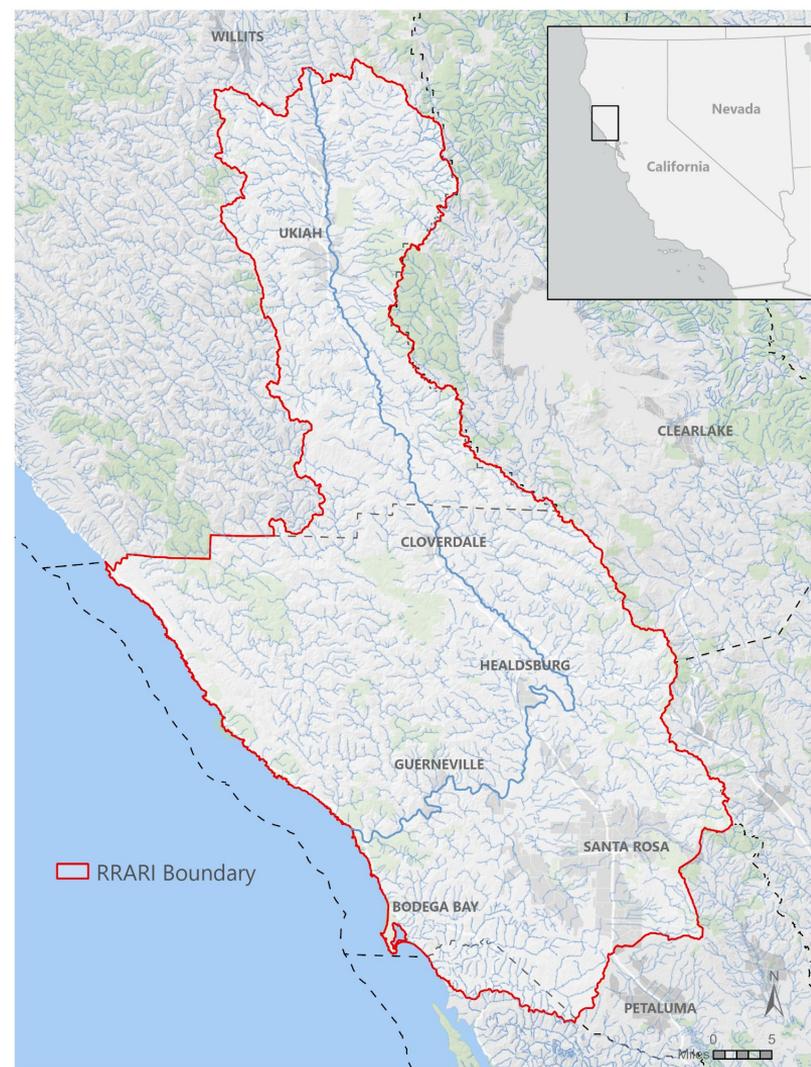
Data management framework and standardized methods for monitoring, assessing, and adaptively managing aquatic resources within a watershed or landscape context



# Aquatic Resource Mapping

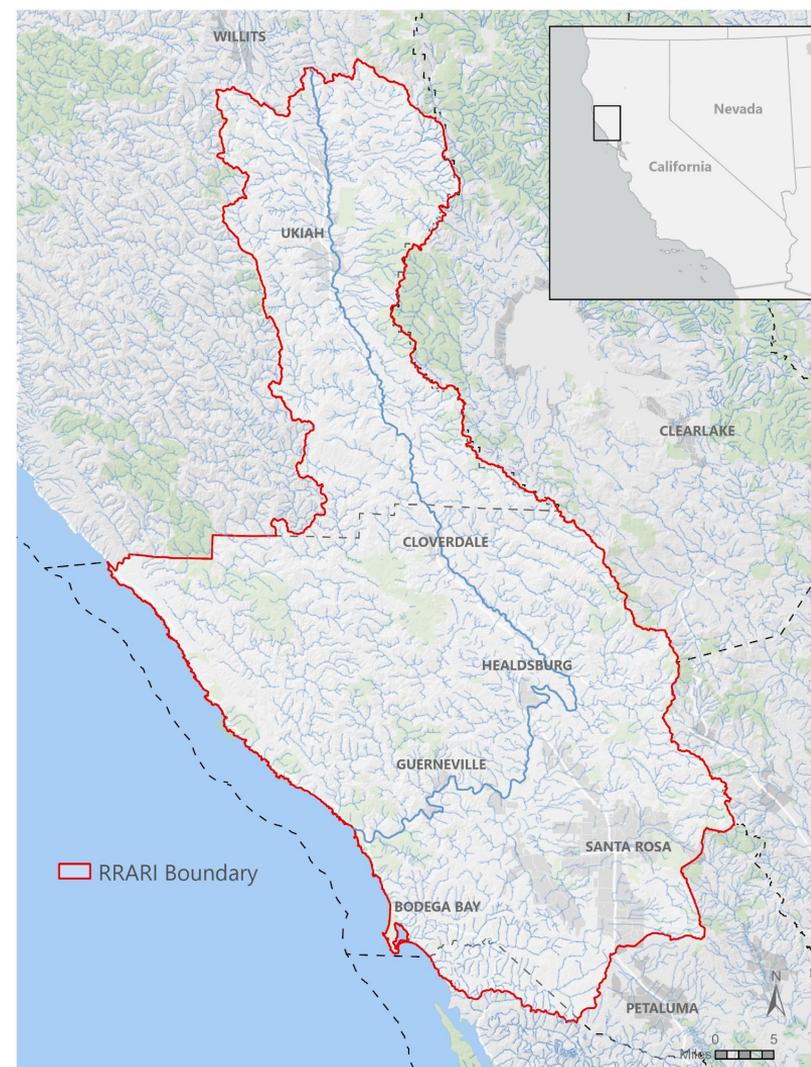
Produce a **new Aquatic Resource Inventory (RRARI)** for the Russian River Watershed and Sonoma County

- Produce a map consistent in detail across watershed and Sonoma county
- Develop regional classification
- Integrate new map into CARI and NWI
- Provide WRAMP and CARI stewardship trainings to the Mapping Workgroup



# Mapping Methods

- Automate the process using remote sensing and employing **machine learning** and **ruleset-based** classification techniques
- Leverage **lessons learned** from other mapping efforts: Baylands Habitat Map 2020 (BHM) and San Diego Aquatic Resource Inventory (SDARI)
- Use of **repeatable techniques** that can be easily enhanced and used to assess and **track change over time**



# MAPPING WORKFLOW

## Classification Schema

RRARI Classifications

## Data Collection & Processing

### IMAGERY

NAIP 60cm raster

1. Composite (R, G, B, NIR)
2. NDVI
3. NDWI

### ELEVATION

Aggregated elevation data at 1m scale

1. Digital Elevation Model
2. Depth to Water
3. Topographic Wetness
4. Geomorphon Landform
5. Slope
6. Normalized Digital Surface Model
7. Flow Accumulation

### ANCILLARY DATA

Surface water data, crop data, building footprints, soil data, etc.

## Model Training & Development

### RULESET-BASED PROCESS

Tidally-Influenced Areas

Riverine Areas

Upland Areas

Post-Process Wetland Classification

Areas Selected for ML

### ITERATIVE ML PROCESS

TRAINING FEATURES

ML Model Classification Training

MODEL TEST AREAS

EVALUATION/  
PARAMETER TUNING

Validation Features

Trained Model

MODEL PREDICTIONS FOR SELECTED AREAS

## Final Output

Accuracy Assessment

Export final aquatic features

Update CARI Database

Crosswalk to NWI

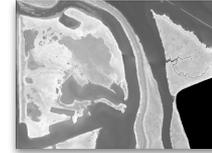
# Automated and Repeatable Methods

- Create map by using automated, consistent, and repeatable methods
- Use Object Based Image Analysis (OBIA), high resolution aerial imagery, LiDAR elevation data, and other sources to classify habitats
- Apply Ruleset-Based classification with transparent and updatable rules
- Process full study area by HUC12 (~100)

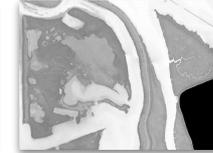
## INPUT LAYERS



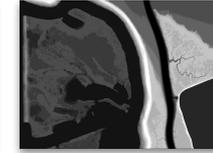
NAIP IMAGERY



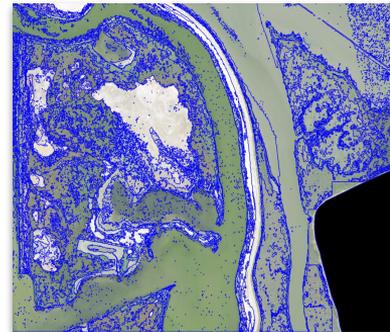
NDVI



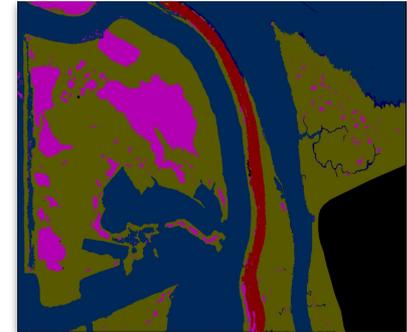
NDWI



DEM



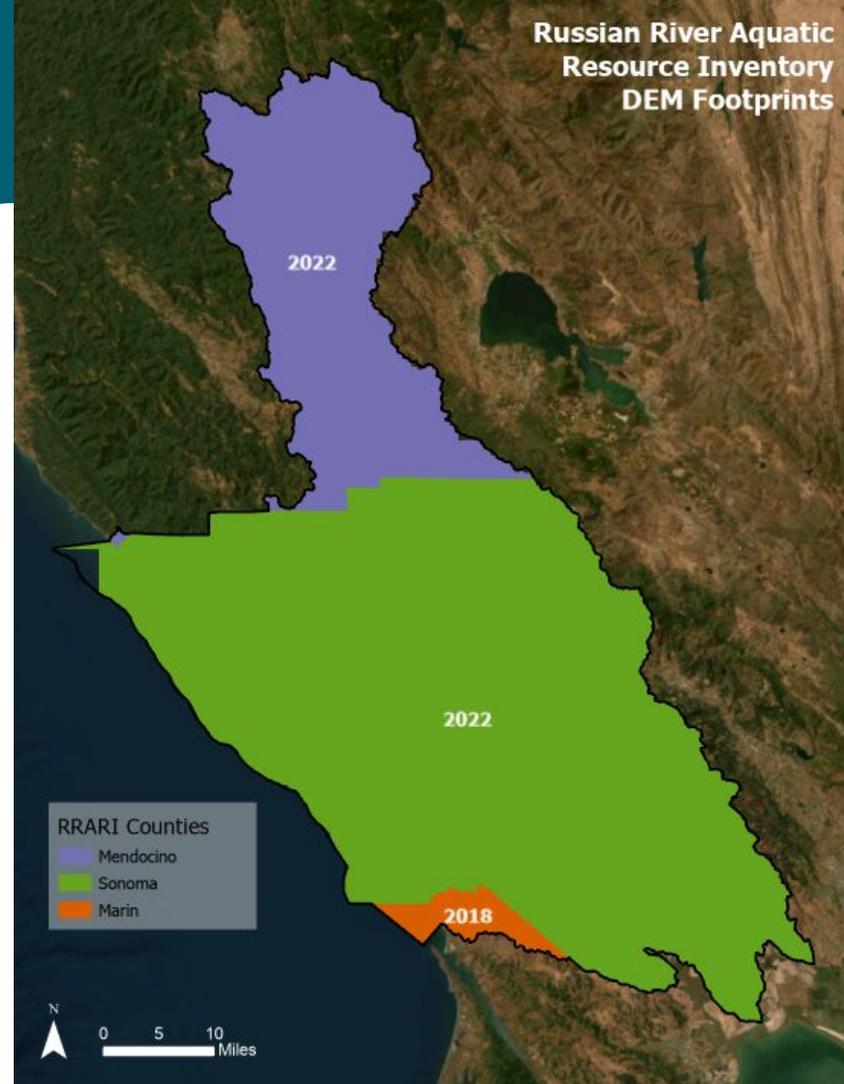
SEGMENTATION



CLASSIFICATION

# Updated Data

- Study Area extended
- LiDAR / DEMs
  - **Mendocino:** 2017 → 2023  
*42% of the study area*
  - **Sonoma:** 2013 → 2023  
*48% of the study area*
  - **Marin:** 2019  
*10% of the study area*
- Linework from NHD to 3DHP
- Align with broader North Coast initiatives



# Training Watersheds

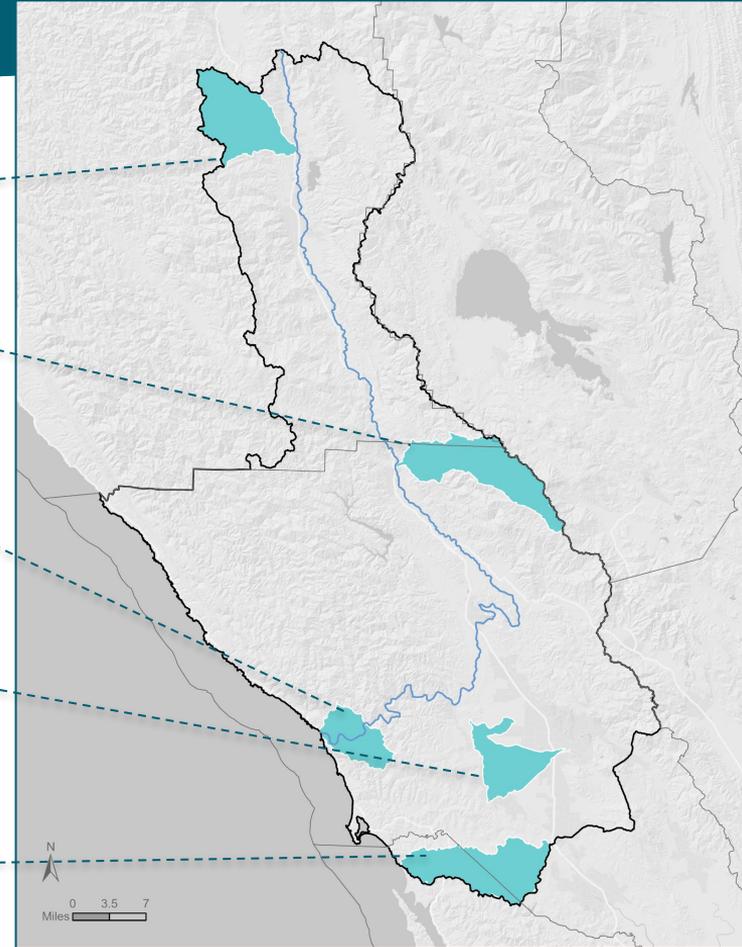
Forsythe Creek,  
Mendocino County

Alder Creek-Big Sulphur Creek,  
Mendocino/Sonoma County

Willow Creek-Russian River,  
Sonoma County

Lower Laguna De Santa Rosa,  
Sonoma County

Estero de San Antonio,  
Marin/Sonoma County

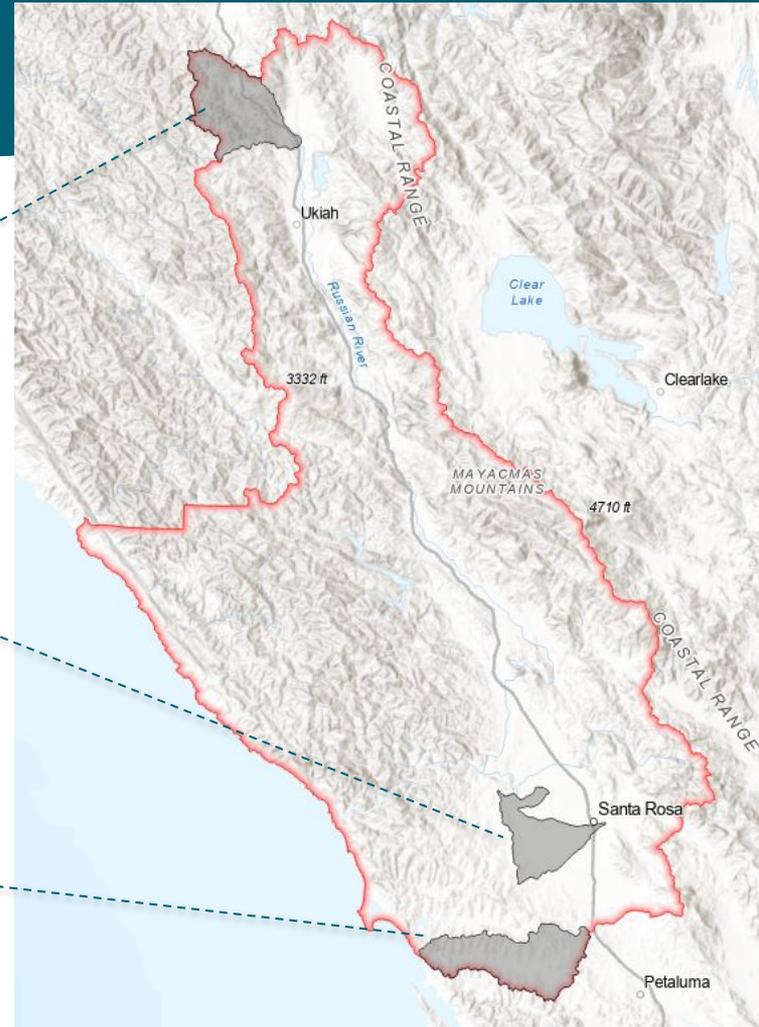


# Candidate Test Areas

Forsythe Creek,  
Mendocino County  
*High Relief Watershed*

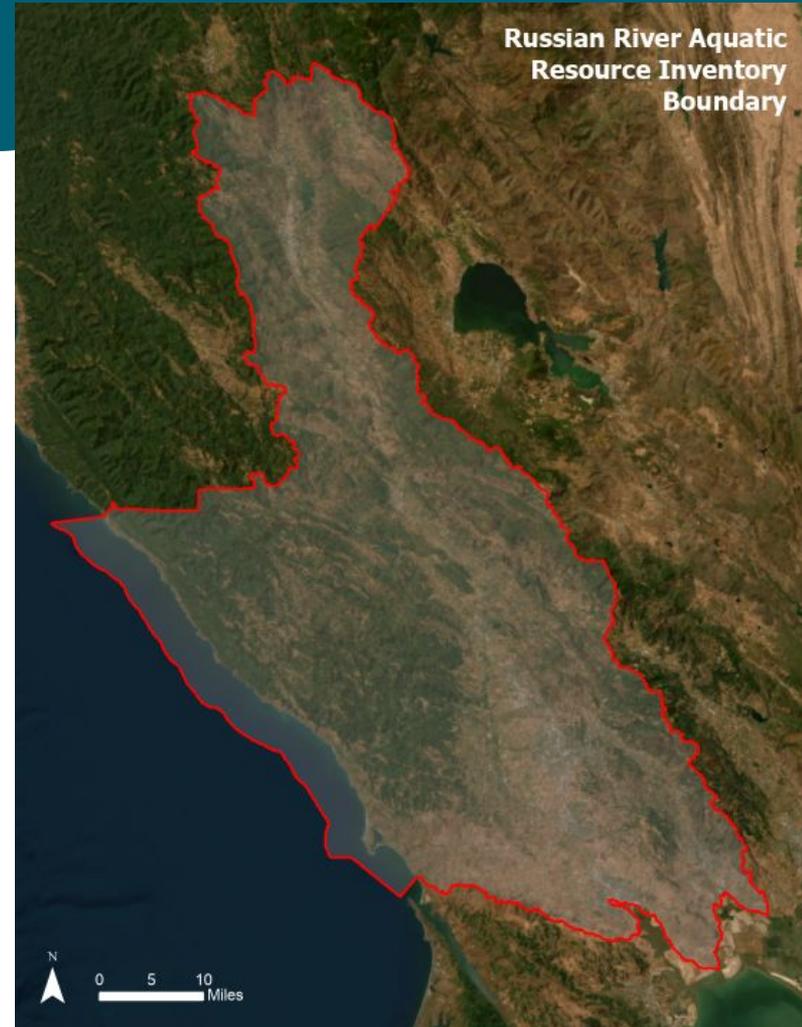
Lower Laguna De Santa Rosa,  
Sonoma County  
*Urbanized Watershed*

Estero de San Antonio,  
Marin/Sonoma County  
*Low Relief Watershed*



# Finalize RRARI Map

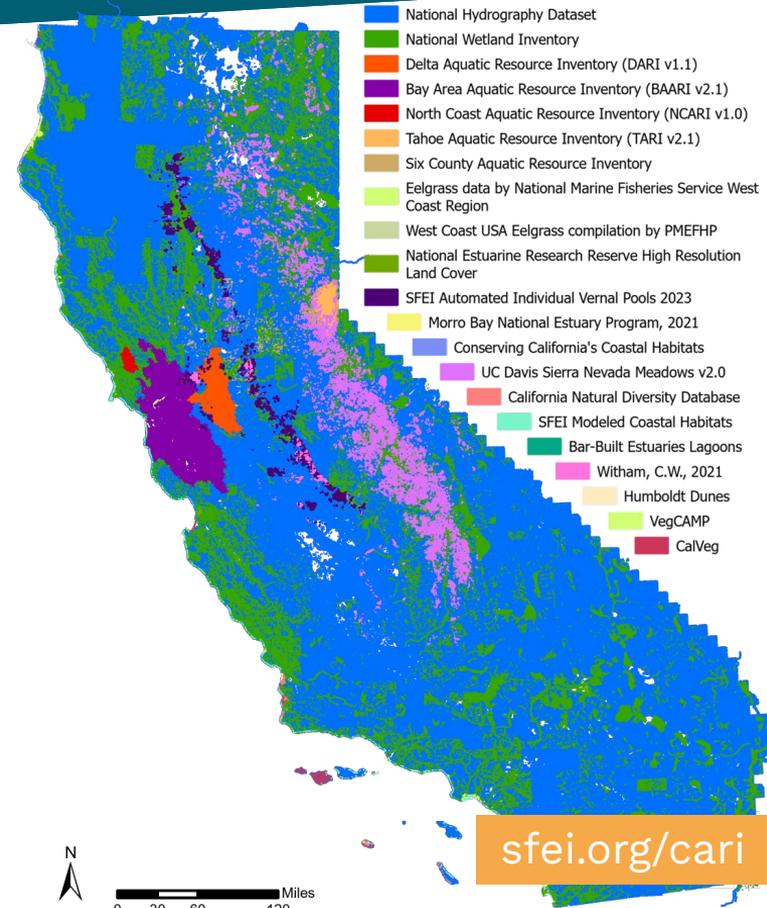
- Modify model as needed based on testing results
- Process the full study area
- Perform accuracy assessment for test points throughout watershed
- Complete SOPs
- Develop crosswalk with NWI
- Prepare dataset as standalone GIS dataset and for integration into CARI



# Integrate into CARI

## California Aquatic Resource Inventory

- Compilation of **best available maps** of wetlands, streams, riparian areas, coastal habitats
- **Automated scripts** compile/integrate national, state, and regional data sources
- Standardized to a **common classification** system and **crosswalked to NWI**
- Detail supports **local land use planning** and provides framework for condition assessments
- Visualize and **summarize in EcoAtlas**

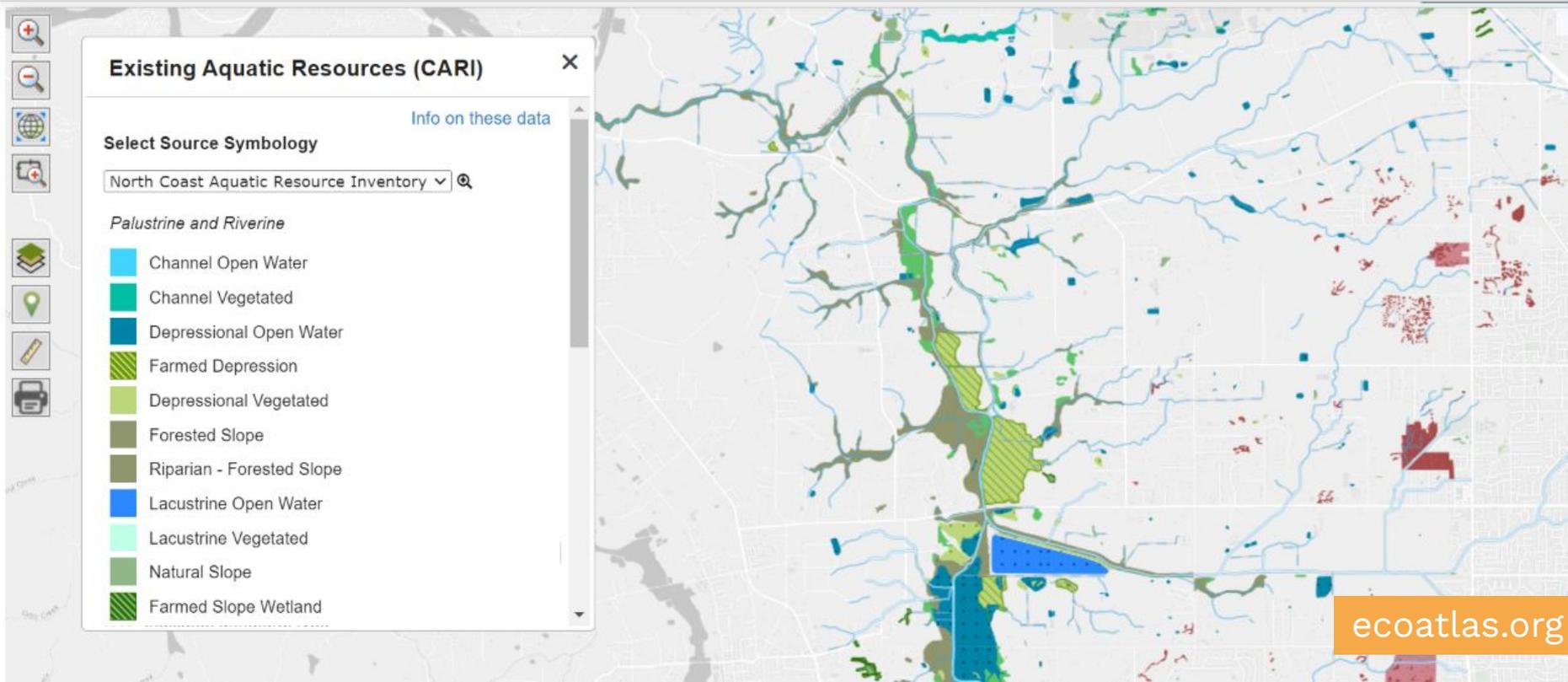


# What is EcoAtlas?

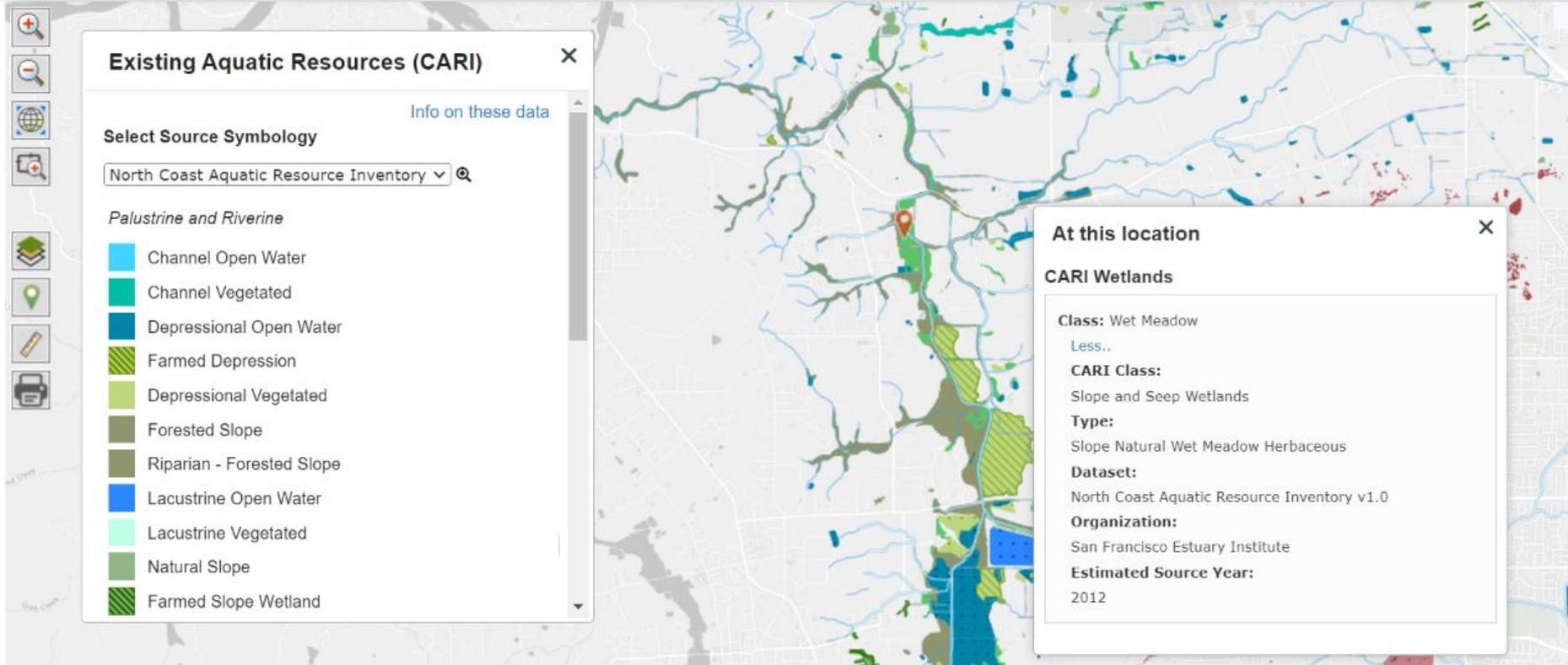


Scientifically produced toolset to visualize the abundance, diversity and condition of aquatic resources within a landscape

# Visualize in EcoAtlas

[ABOUT](#)[CONTACT](#)[DATA](#)[PROJECT TRACKER](#)[REGIONS ▾](#)[WEB SERVICES/API](#)[PARTNERS](#)

# Visualize in EcoAtlas

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# Summarize with Landscape Profile Tool



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Layers Legends Basemap Overlays

Hide Tools

## Landscape Profile

Hydrologic Region Name (HUC12): Porter Creek-Mark West Creek

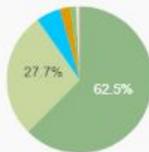
Print Report

Total Profile Area: 36,520 acres or 57.1 miles<sup>2</sup>

### Abundance and Diversity of Existing Aquatic Resources based on California Aquatic Resource Inventory (CARI)

Marine and Estuarine Resources: No marine or estuarine resources found

Palustrine Resources: 559 acres / 0.87 mi<sup>2</sup>



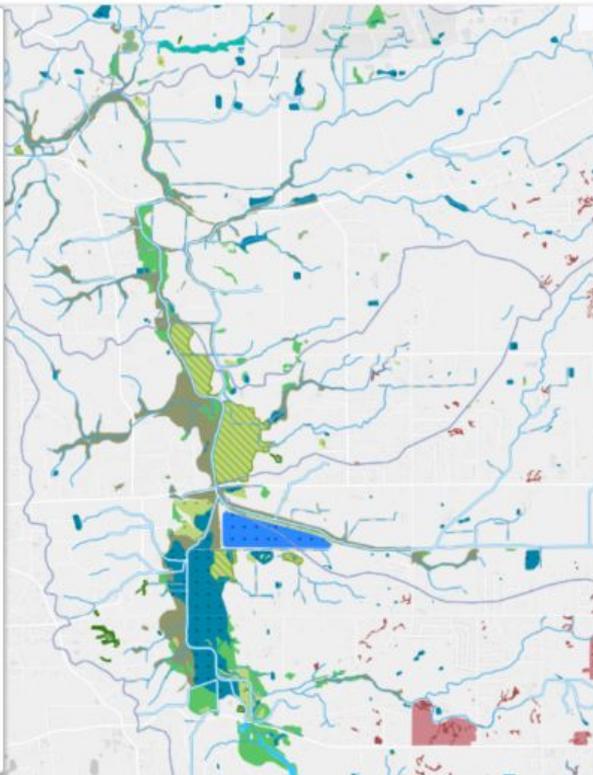
- Slope and Seep Wetlands (349 acres)
- Pond and associated vegetation (155 acres)
- Fluvial Channel (30.1 acres)
- Vernal Pool (13.2 acres)
- Riverine Vegetated (6.78 acres)
- Irrigated (4.48 acres)

\*based on CPAD/CCED

Wetland Type	Area (acres)	% area	% protected*
Slope and Seep Wetlands	349	0.96%	7.2%
Pond and associated vegetation	155	0.42%	16.9%
Fluvial Channel	30.1	0.083%	2.1%
Vernal Pool	13.2	0.036%	0.0%
Riverine Vegetated	6.8	0.019%	42.0%
Irrigated	4.5	0.012%	0.0%

Rivers, Streams, and Other Channel Resources: 177 miles

- Fluvial: 177 miles
- Tidal: None



## Landscape Profiles

Select Profile Mode

Watershed Profile



### Landscape Profile

Information on the aquatic resources, terrestrial habitats, habitat restoration projects, species of special status, land cover, and human population for the profiled area.



### Condition Profile

Ecological condition based on the California Rapid Assessment Method (CRAM) and California Stream Condition Index (CSCI) for the profiled area.



### Connectivity Profile

Patch size distribution and nearest neighbor distance for different wetland types based on the California Aquatic Resource Inventory (CARI) for the profiled area.



### Coastal Habitat Profile

Baseline of coastal habitats used to track progress towards multiple targets identified in the Ocean Protection Council's Strategic Plan to protect California's coast and ocean.

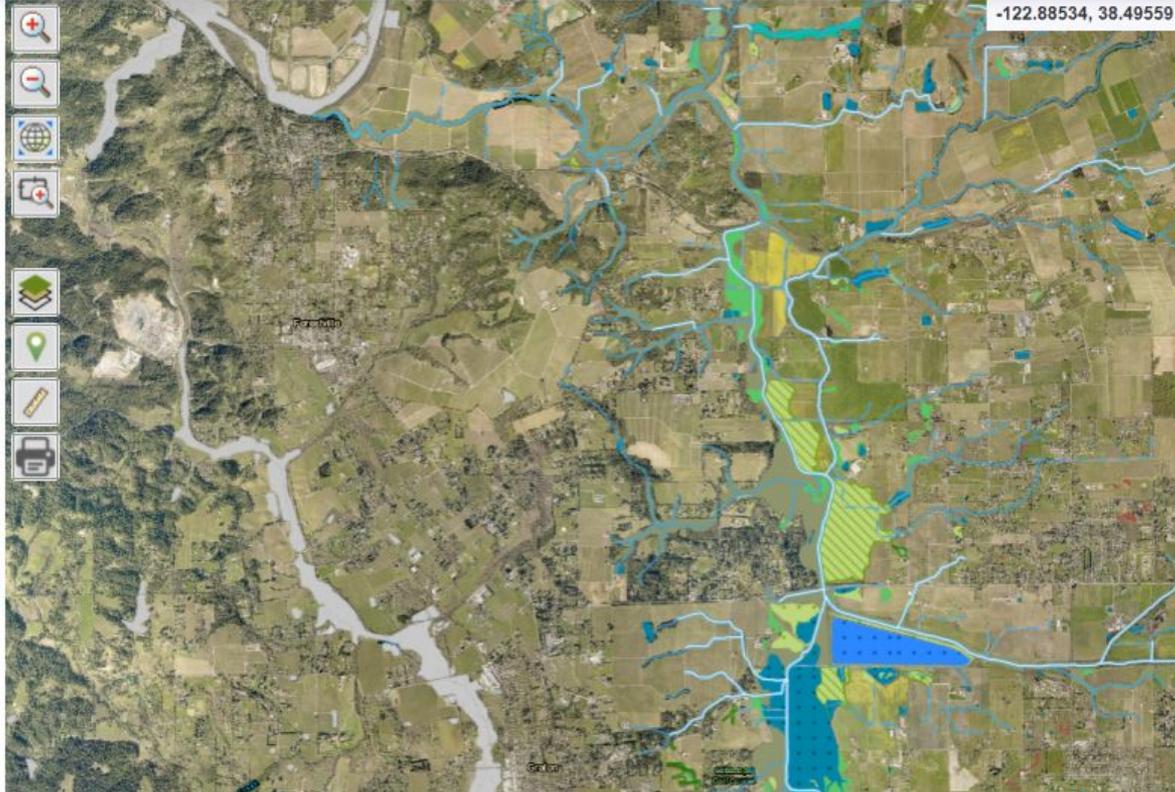


### One Water Watershed Profile

Progress of Valley Waters five objectives for long range integrated water resource planning on a watershed scale in Santa Clara County and its five major watershed areas.

Continue to Define Region

# Submit Map Updates

[ABOUT](#)[CONTACT](#)[DATA](#)[PROJECT TRACKER](#)[REGIONS ▾](#)[WEB SERVICES/API](#)[PARTNERS](#)

## CARI Editor

[Edit existing feature](#)

Stream  Wetland

Click on a wetland feature to edit the geometry on the map. Once finished editing, complete the form below. On submission, the highlighted area will be recorded as edited and reviewed for approval.

Clear

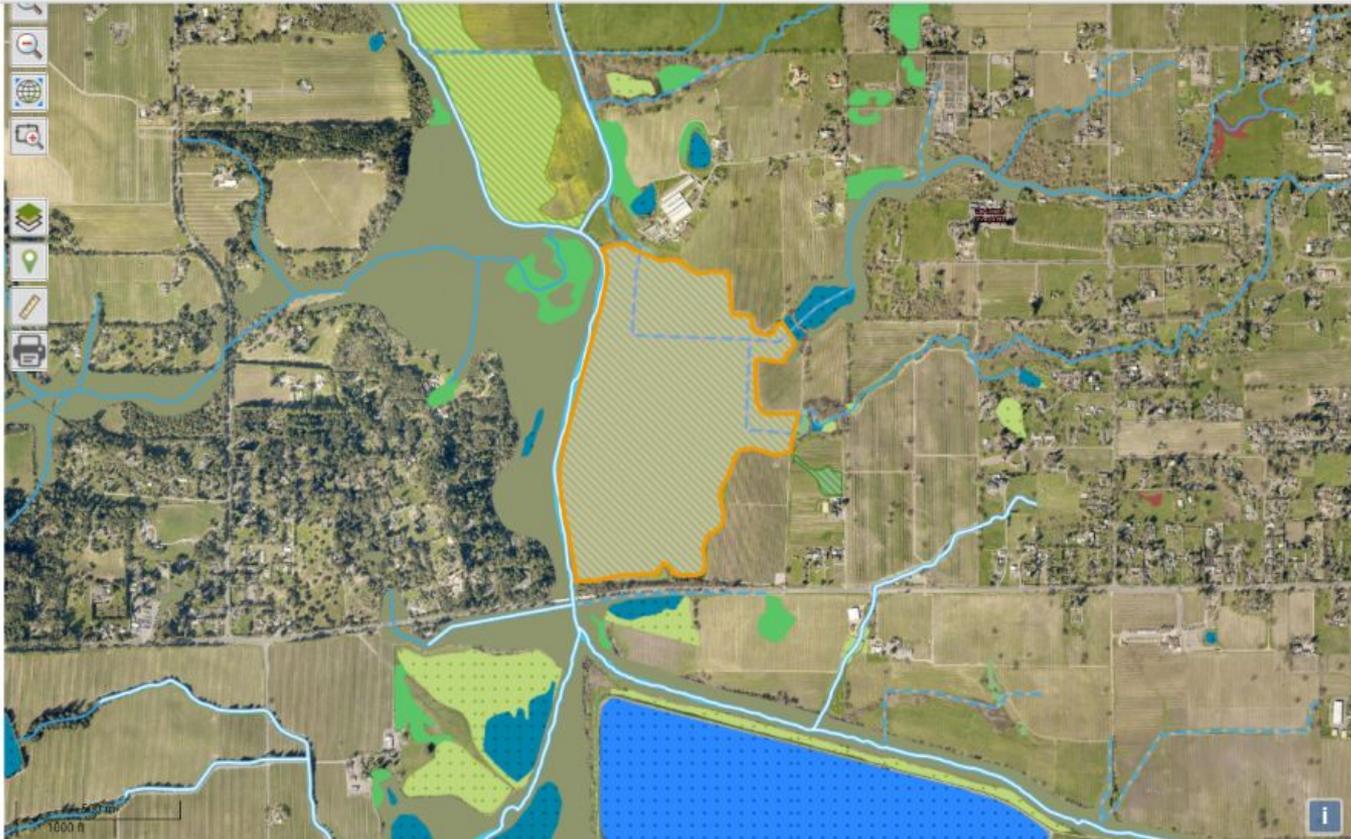
Submit

[Delete existing feature](#)

[Draw new feature](#)

[Import new feature](#)

# Submit Map Updates



## CARI Editor

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Stream  Wetland

Click on a wetland feature to edit the geometry on the map. Once finished editing, complete the form below. On submission, the highlighted area will be recorded as edited and reviewed for approval.

Email Address \*

Confirm Email Address \*

Organization

Supporting Comments (512 chars. max.)

Feature Name ⓘ

Wetland Type (NCARI)

Farmed Depression Unnatural ▾

CARI Classification

Depressional Unnatural Farmed

# Riparian Mapping

Apply **Riparian Zone Estimator Tool** (RipZET) functional riparian delineation tool where riparian width is driven by adjacent hillslope gradient and vegetation height

- Run hillslope and vegetation modules for study area
- Compare RipZET and other riparian mapping methods in test areas
- Provide recommendations for future riparian mapping



# Riparian Mapping

- Conversations with Permit Sonoma to build on prior efforts and address **needs for riparian ordinance**
- Approach ideas for **comparing mapping methods** in test areas thus far
  - RipZET (hillslope and vegetation module)
  - Ag & Open Space floodplain mapping
  - SEC regional curve and buffer
  - Simple buffer
  - Vegetation mapping (VegCAMP)



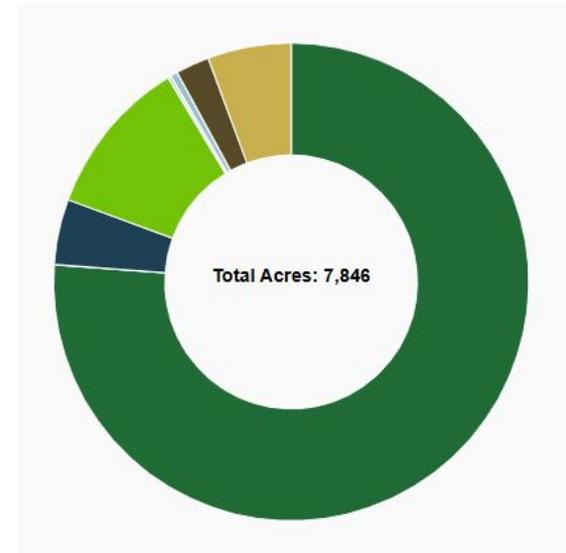
# Riparian Mapping

- Worked with partners to secure funding for additional work
- Work will begin once channel line mapping complete
- Will seek advice and review by Mapping Workgroup members and R3MP TAC



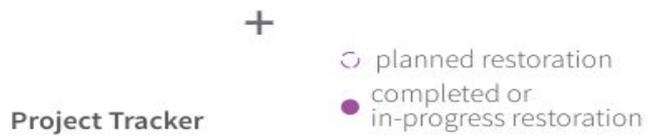
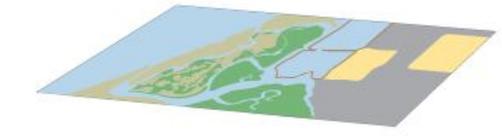
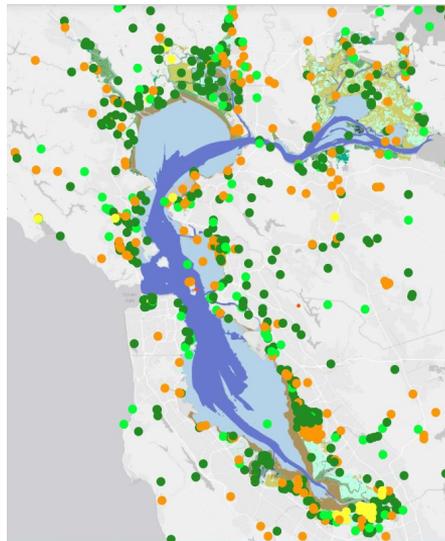
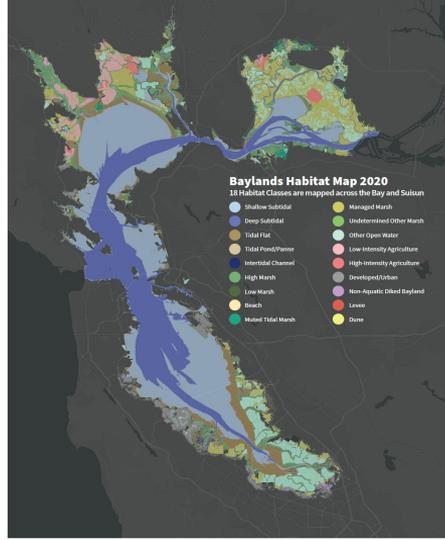
# Regional Coordination Needs

- Greater transparency on what everyone is doing in the watershed
- Common base map of aquatic resources
- Access to information:
  - Monitoring data
  - Restoration projects
  - Data summaries
- Track regional progress towards goals

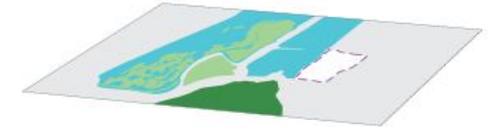
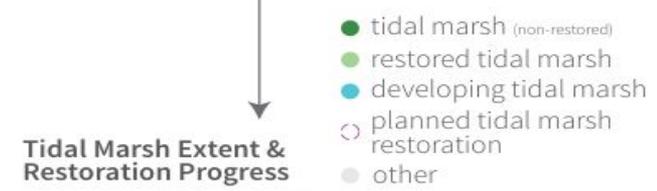




Track change  
in tidal  
marsh  
extent and  
progress  
towards  
**regional  
restoration  
goals**



The Baylands Habitat Map and Project Tracker combine into five simple classes



# Closing Notes

- New LiDAR data and linework for study area  
**Benefit:** *Using more recent imagery and linework will make the map a more trusted and useful resource.*
- Evaluating mapping/modeling options for mapping riparian extents across Sonoma County  
**Benefit:** *Single consistent updated channel layer for the County will better support decision making for their riparian corridor protection ordinance.*



# Closing Notes

- Using WRAMP Level 1-2-3 framework  
**Benefit:** *Provides data management framework and standardized methods for monitoring, assessing, and adaptively managing aquatic resources within the Russian River Watershed.*
- Using automated mapping methods  
**Benefit:** *Enables detecting and tracking habitat change across time and leveraging methods being developed by the SF WRMP.*



# Thank you

**Cristina Grosso**

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