



Russian River Regional Monitoring Program

Comprehensive Basemap of Surface
Waters and Riparian Areas

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June 17, 2025 - USEPA Region 9 WPDG Meeting



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

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Agenda

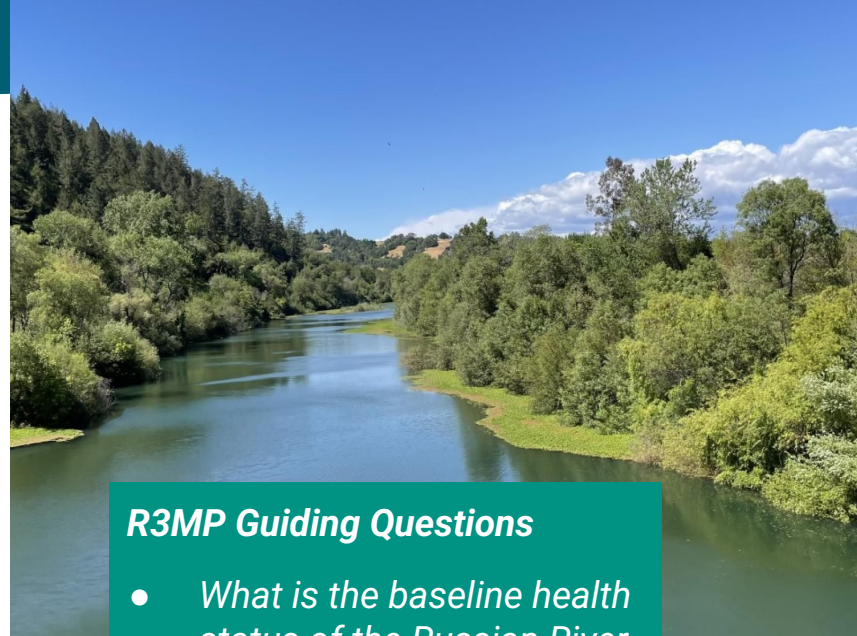
- Overview of Russian River Regional Monitoring Program (R3MP)
- Mapping project objectives and tasks
- Public data display and access
- Regional coordination



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



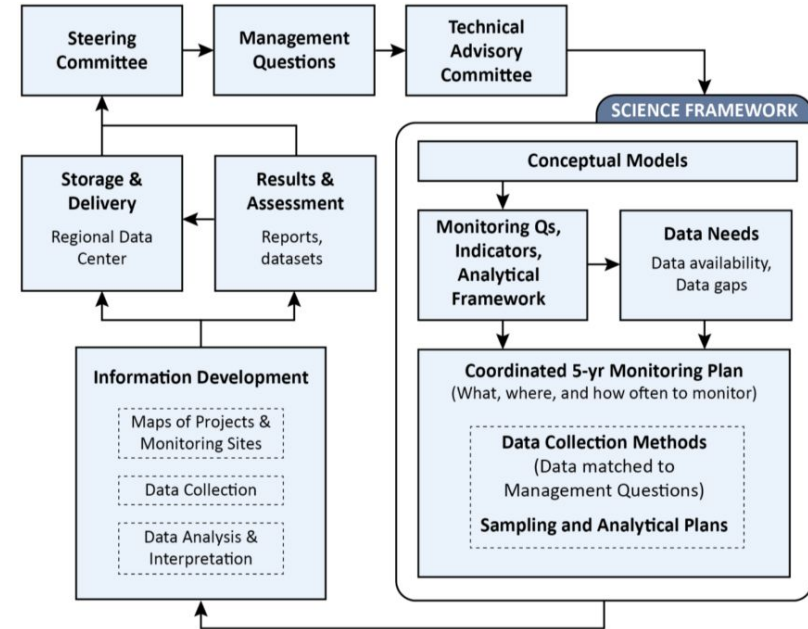
R3MP Guiding Questions

- *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

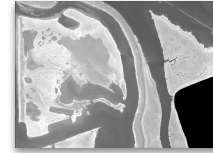
Automated and Repeatable Methods

- 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)

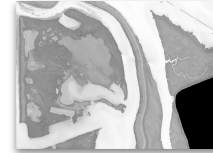
INPUT LAYERS



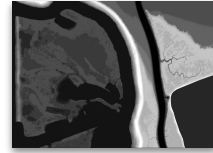
NAIP IMAGERY



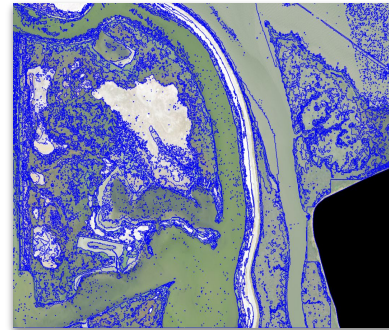
NDVI



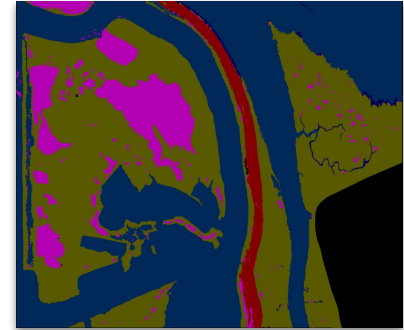
NDWI



DEM



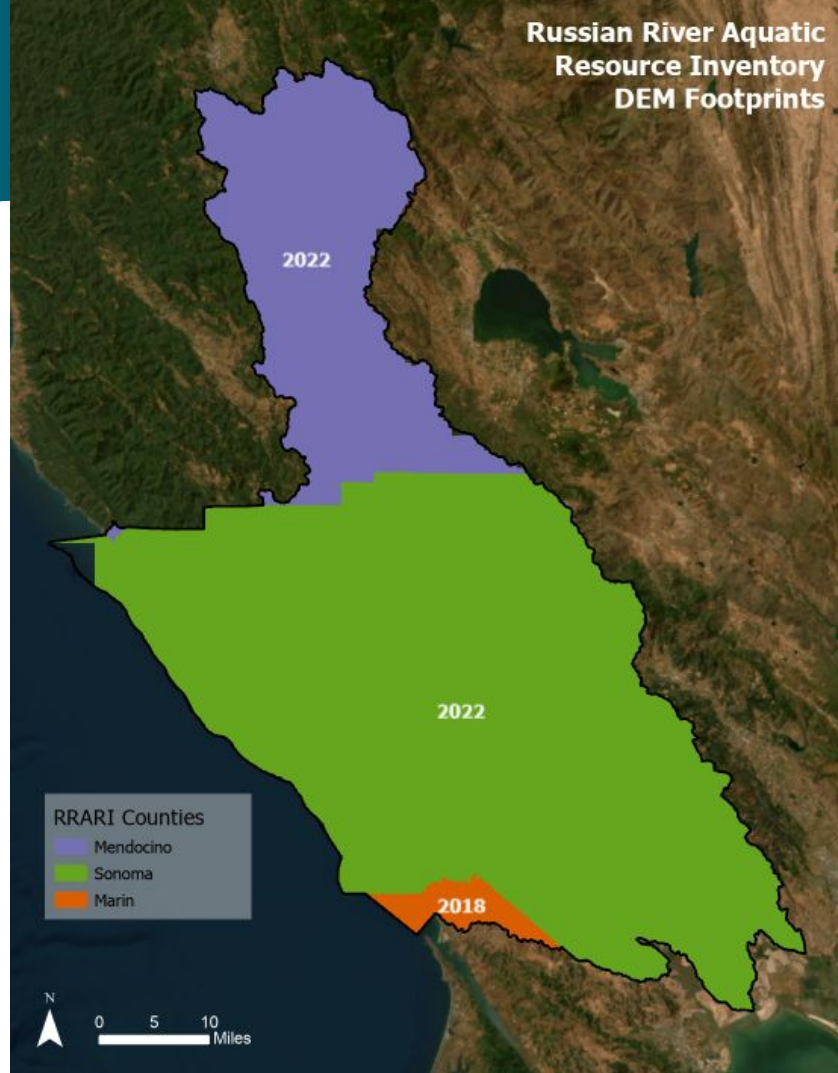
SEGMENTATION



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

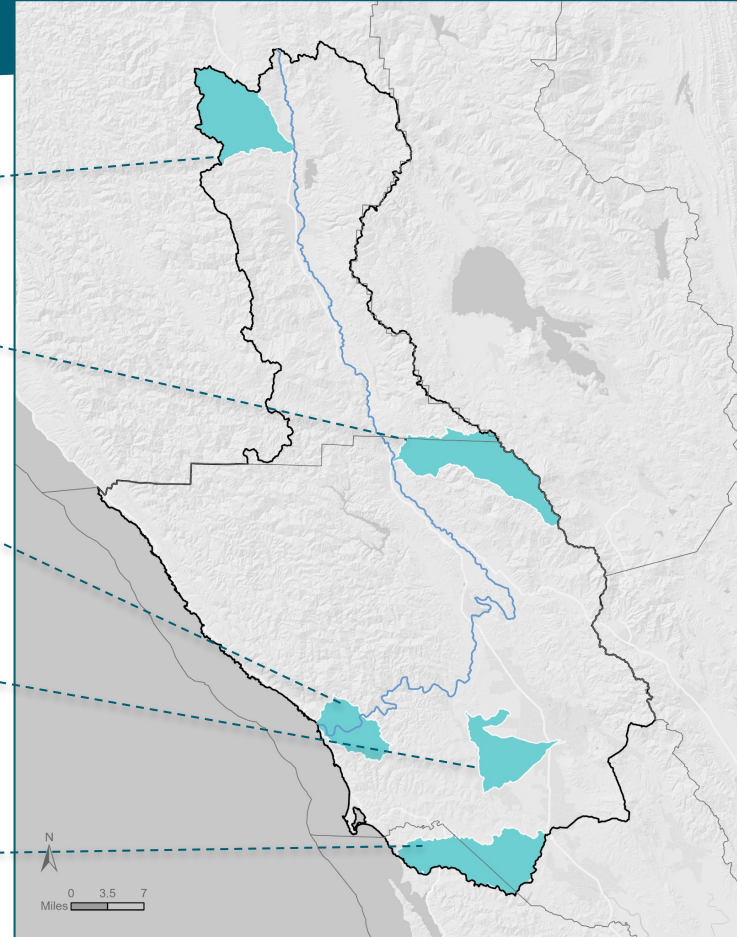
Forsythe Creek,
Mendocino County

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

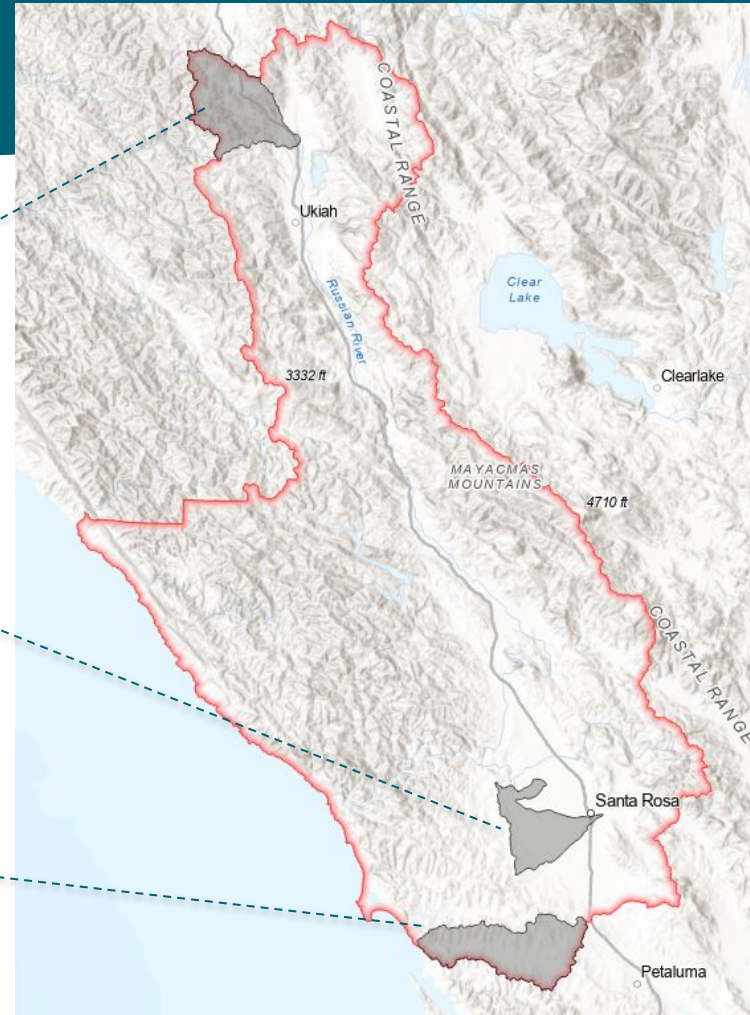


Candidate Test Areas

Forsythe Creek,
Mendocino County
High Relief Watershed

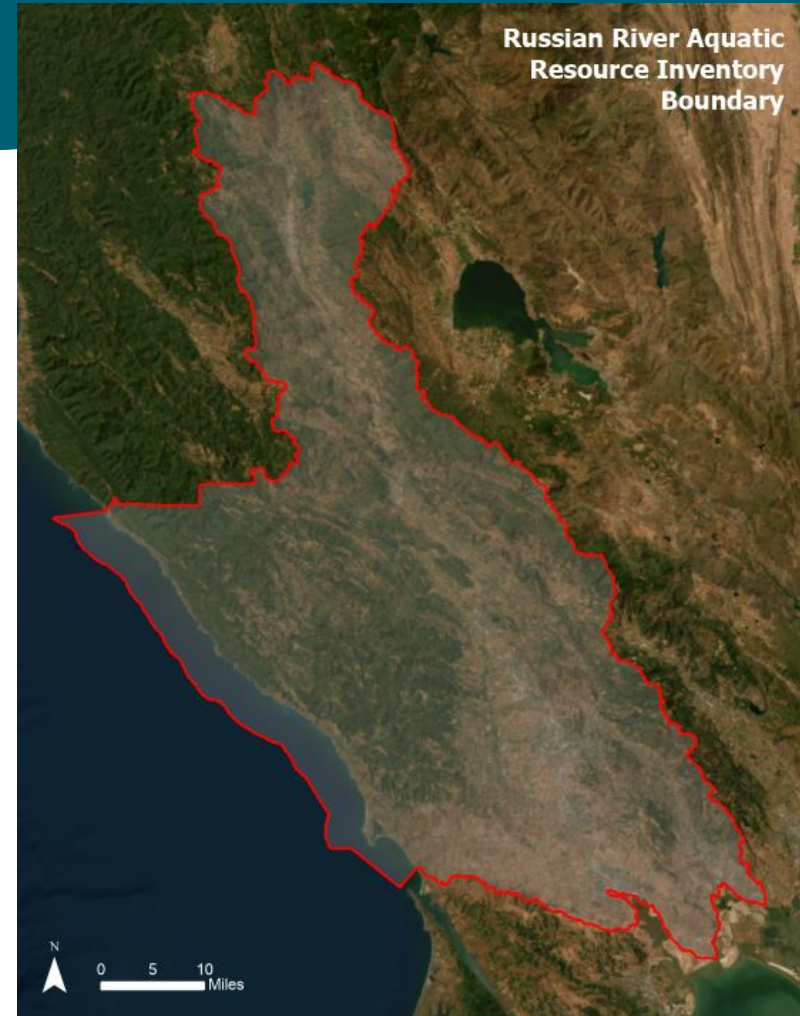
Lower Laguna De Santa Rosa,
Sonoma County
Urbanized Watershed

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



Finalize RRARI Map

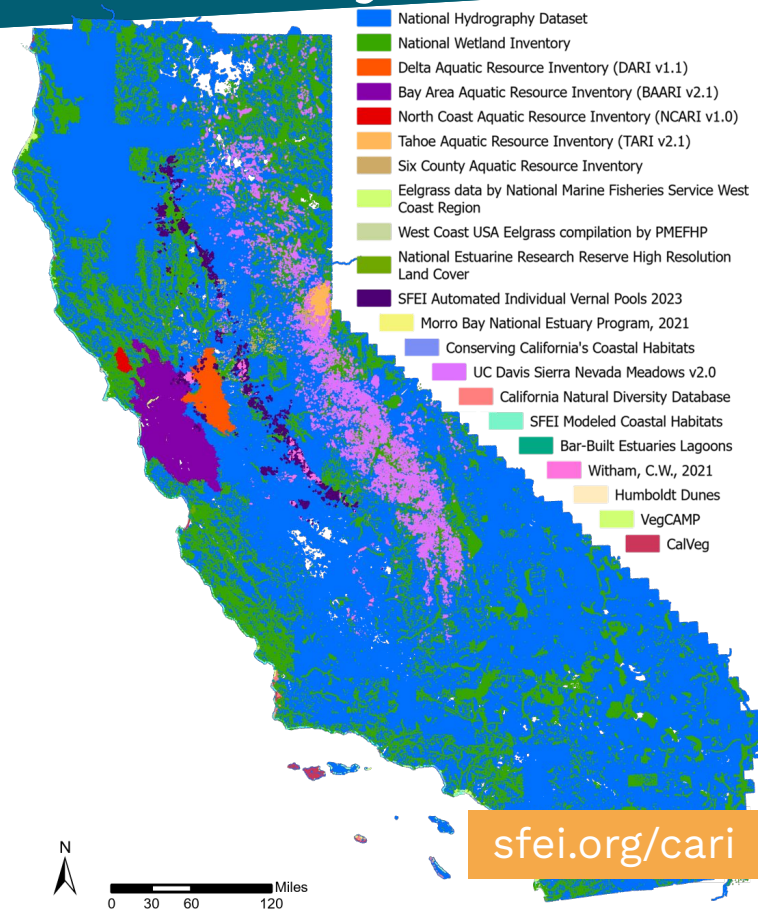
- Modify model as needed based on testing results
- Process the full study area
- Perform accuracy assessment for test points throughout watershed
- Complete SOPs
- Develop crosswalk with NWI
- Prepare dataset as standalone GIS dataset and for integration into CARI



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

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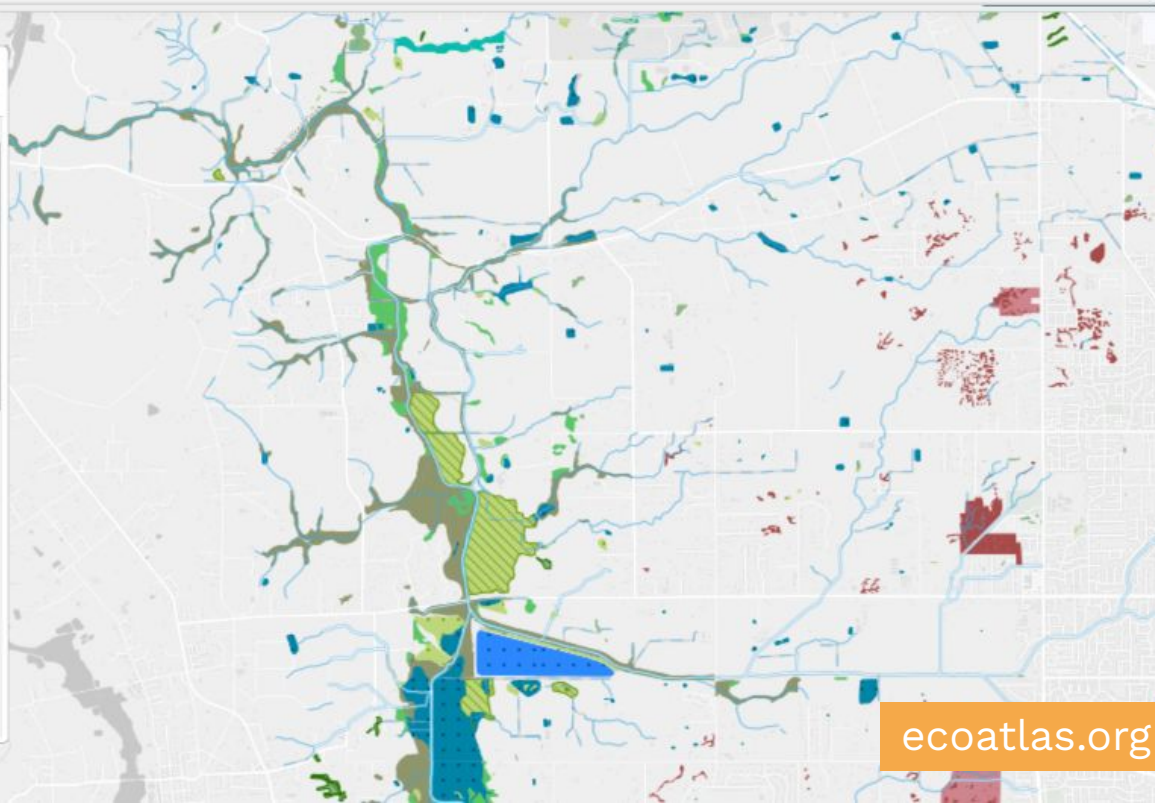
Existing Aquatic Resources (CARI) ×

[Info on these data](#)

Select Source Symbology

Palustrine and Riverine

- Channel Open Water
- Channel Vegetated
- Depressional Open Water
- Farmed Depression
- Depressional Vegetated
- Forested Slope
- Riparian - Forested Slope
- Lacustrine Open Water
- Lacustrine Vegetated
- Natural Slope
- Farmed Slope Wetland

ecoatlas.org

Visualize in EcoAtlas

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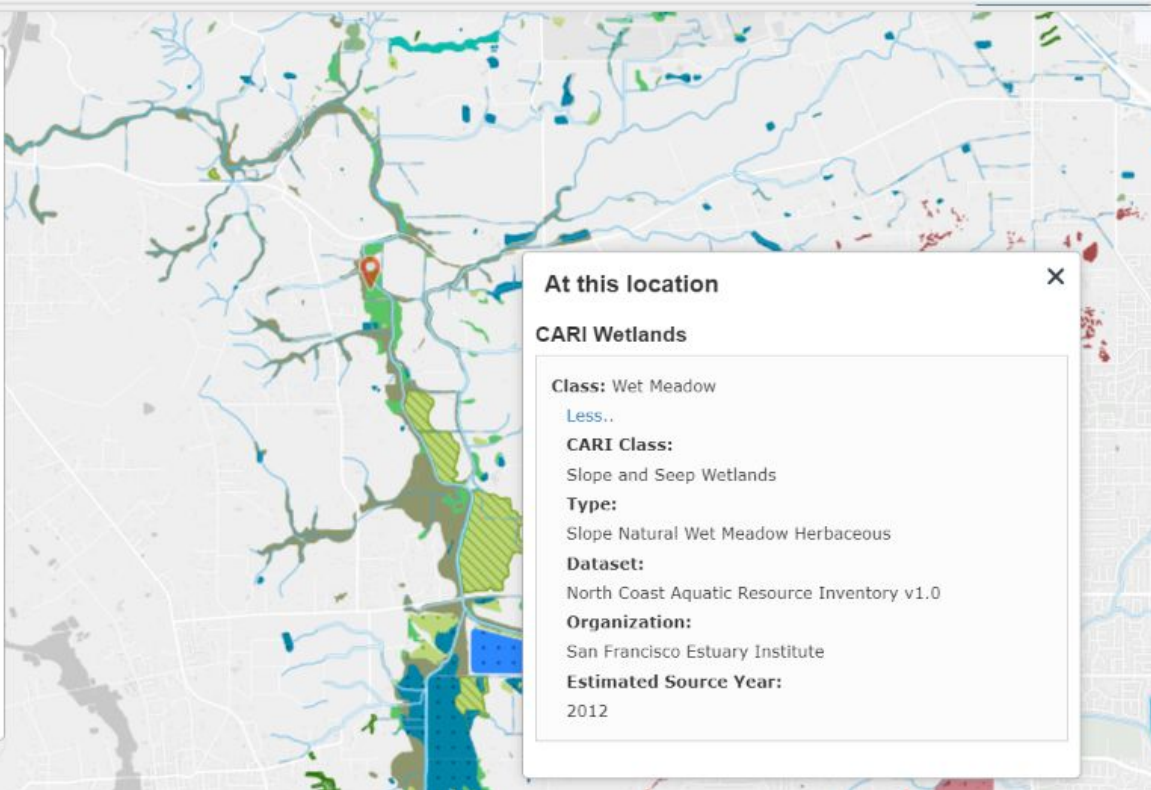
Existing Aquatic Resources (CARI) ✕

[Info on these data](#)

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- Natural Slope
- Farmed Slope Wetland



At this location ✕

CARI Wetlands

Class: Wet Meadow

[Less..](#)

CARI Class:

Slope and Seep Wetlands

Type:

Slope Natural Wet Meadow Herbaceous

Dataset:

North Coast Aquatic Resource Inventory v1.0

Organization:

San Francisco Estuary Institute

Estimated Source Year:

2012

Summarize with Landscape Profile Tool

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Landscape Profile

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

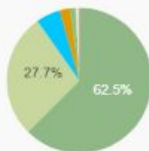
[Print Report](#)

Total Profile Area: 36,520 acres or 57.1 miles²

– 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 mi²



- 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.

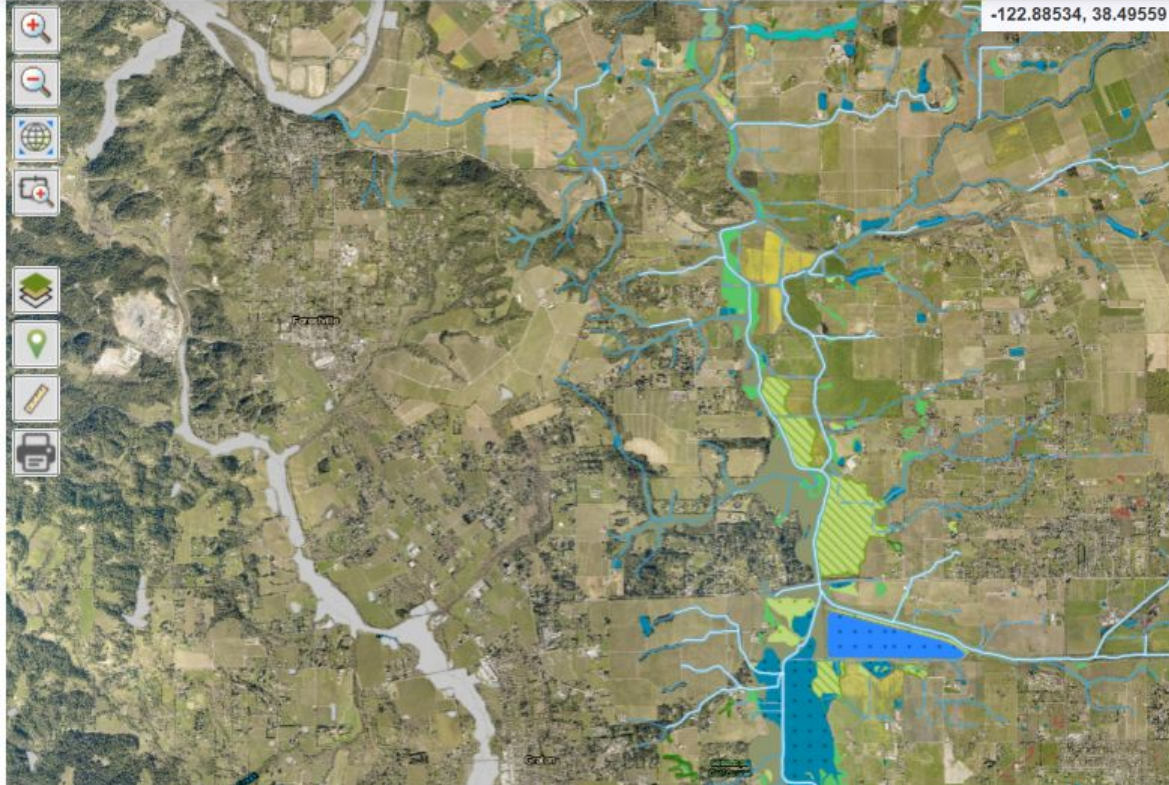


One Water Watershed Profile

Progress of Valley Water's 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

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CARI Editor

Edit existing feature

☐ Stream ☒ Wetland

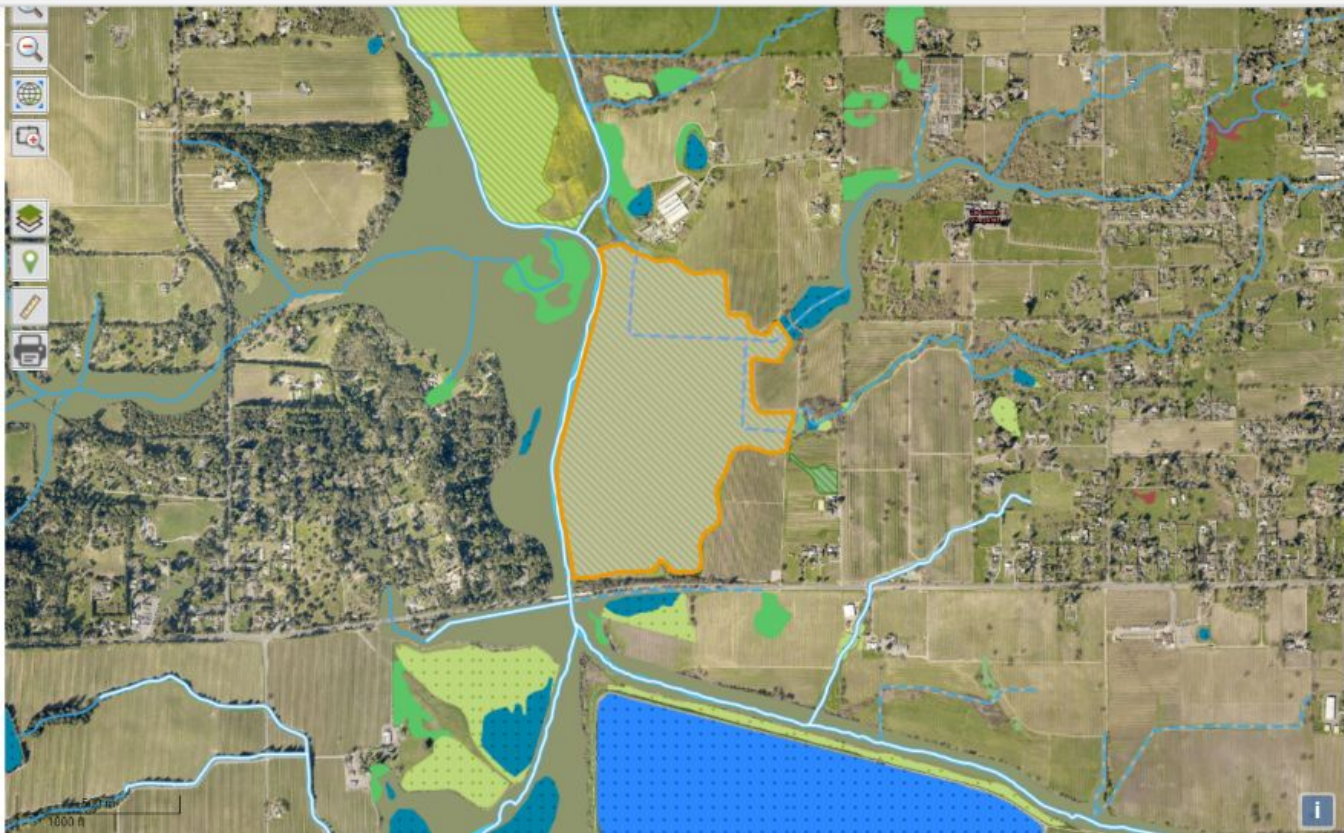
Click on a wetland feature to edit the geometry on the map. Once finished editing, complete the form below. On submission, the highlighted area will be recorded as edited and reviewed for approval.

Delete existing feature

Draw new feature

Import new feature

Submit Map Updates

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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.

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)



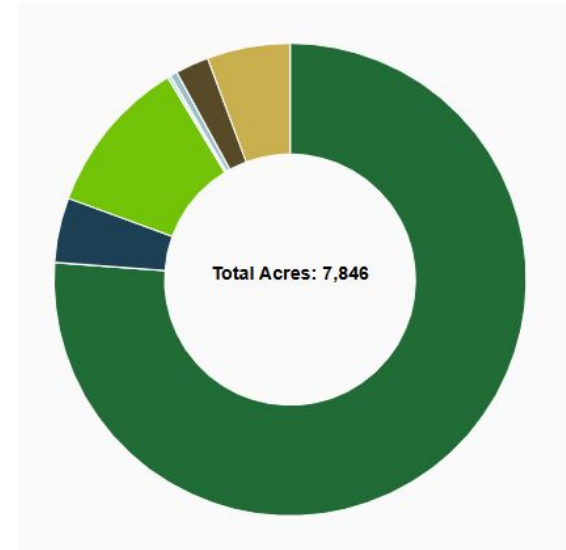
Riparian Mapping

- 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



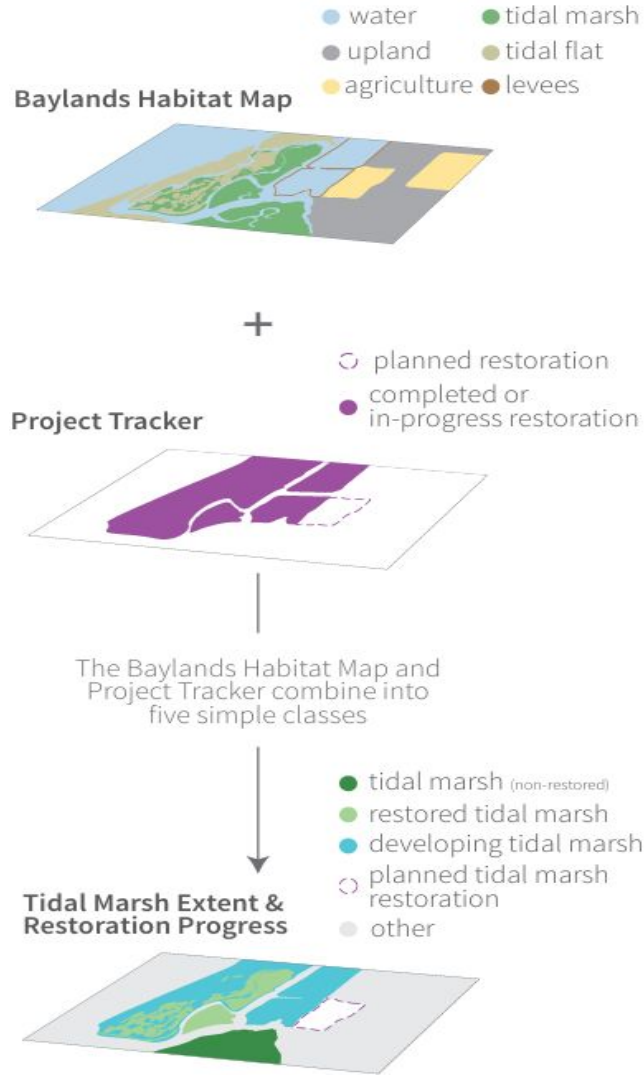
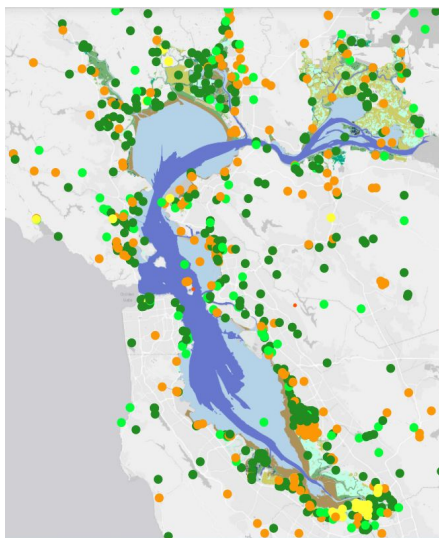
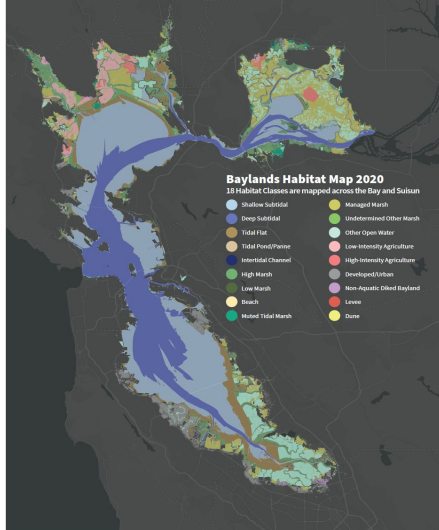
Regional Coordination Needs

- 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**



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

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