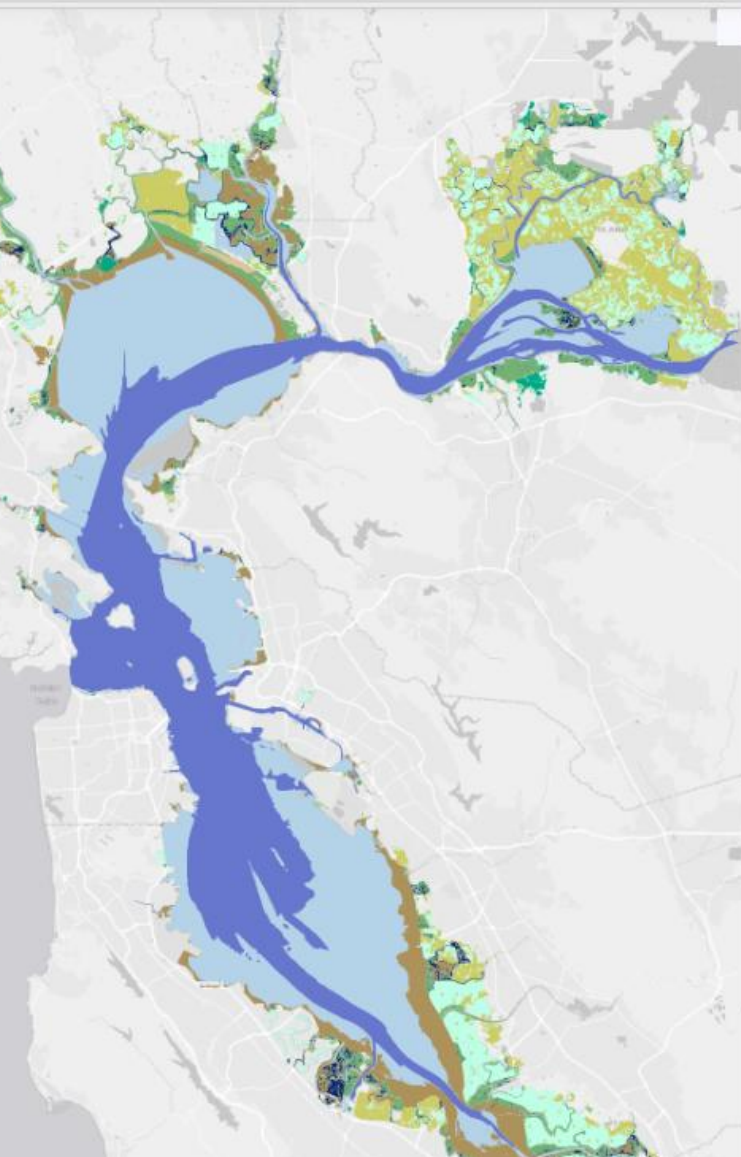# EcoAtlas WRMP Profile Tool and Geospatial Data Catalog Update Report

Landscape Profile

Operational Landscape Unit (OLU): Napa - Sonoma
**Total Profile Area:** 93,566 acres or 146 miles^2

🖶 Print Repo

The SF Estuary Wetlands Profile summarizes key metrics on indicators for tidal wetlan
tracked by the SF Wetlands Regional Monitoring Program.

– Tidal Wetland Extent

Tidal wetland extent in the San Francisco Bay based on the Baylands Habitat Map
2020. For more information, refer to this report.

Tidal Wetland Extent: 19,367 acres / 30.3 mi^2
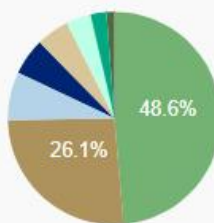
- Intertidal Channel (1,083 acres)
- High Marsh (9,415 acres)
- Tidal Flat (5,054 acres)
- Low Marsh (234 acres)
- Tidal Pond Panne (970 acres)
- Muted Open Water (728 acres)
- Muted Tidal Marsh (465 acres)
- Shallow Subtidal (1,417 acres)

48.6%
26.1%

+ Restoration Status

+ Unvegetated to Vegetated Ratio (UVVR)

+ Elevation Capital

View data source details

SF ESTUARY
Wetlands
Regional
Monitoring
Program

PREPARED FOR • Wetlands Regional Monitoring Program

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A PRODUCT OF

SF ESTUARY
**Wetlands
Regional
Monitoring
Program**

WRMP is co-managed by the San Francisco Estuary Partnership and SFEI

San Francisco
ESTUARY PARTNERSHIP

SFEI | **San Francisco
Estuary Institute**

August 2025

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Key Takeaways

- EcoAtlas WRMP Profile is an interactive online tool that quickly provides a quantitative and graphical summary of commonly referenced metrics from the Baylands Habitat Map 2020.

- The summary of metrics are provided at multiple scales of analysis, which are dynamic and chosen by the user.

- The WRMP uses the following hierarchy of spatial categories for scaling analyses of interest, representing finer to broader scale options: Analysis Units, Wetland Management Units, Operational Landscape Units (OLUs), and Subembayments. Establishing these spatial categories is essential for consistent, replicable analysis for tracking habitat change over time.

- The WRMP Geospatial Data Catalog is a publicly available database, and the data intake process ensures the key metadata fields are collected for each dataset.

Introduction

[The San Francisco (SF) Estuary Wetlands Regional Monitoring Program](#) (WRMP) delivers coordinated regional monitoring of the San Francisco Estuary's wetlands to:

1. inform science-based decision-making for wetland restoration and adaptive management, and
2. increase the cost-effectiveness of permit-driven monitoring associated with wetland restoration projects.

One of the key goals of the WRMP is to disseminate data and monitoring results to inform science-based decision-making for wetland restoration and adaptive management. A variety of methods and formats will be used to ensure that monitoring results and data are accessible to project stakeholders, the Technical Advisory Committee and Steering Committee, regulators, project proponents, and the public. A new method of sharing results is a newly created Landscape Profile on EcoAtlas: the SF Estuary Wetlands Profile (Profile) tool. The purpose of the Profile is to support public policies and programs that protect aquatic resources and track regional progress towards meeting restoration targets.
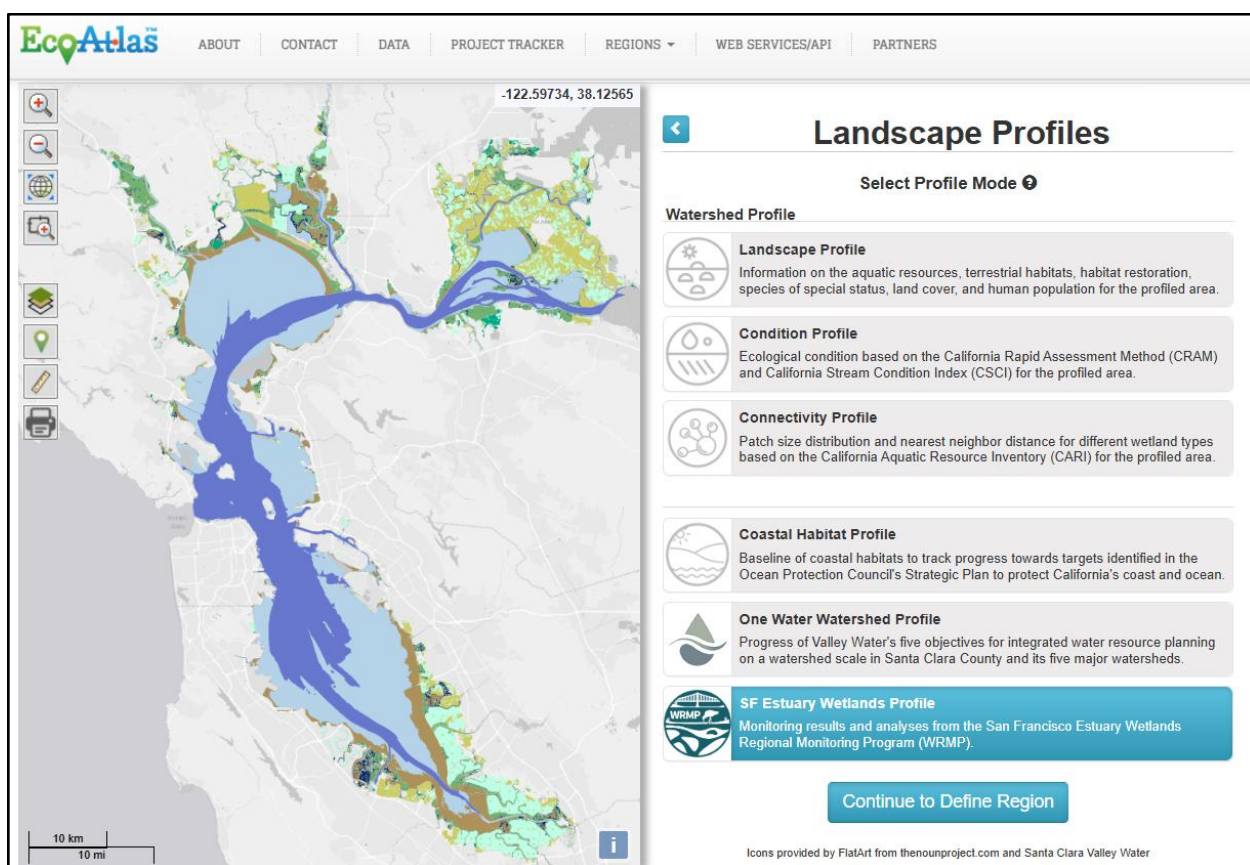
San Francisco Estuary Wetlands Profile

The Profile represents a new set of analyses that have been integrated into EcoAtlas, a public visualization tool, as a customized WRMP Landscape Profile (http://sfei.li/wrmp-lp; Figures 1 and 2). This Profile is a compilation of metrics about tidal wetlands based on the [Baylands Habitat Map (BHM) 2020](#), [Project Tracker Tidal Wetland Restoration Map 2020](#) layer, and [Tracking Tidal Wetland Extent in San Francisco Bay: A 2020 mapping update](#). The Profile currently includes metrics of tidal wetland extent, restoration status, unvegetated to vegetated ratio (UVVR), and elevation capital. Additional metrics may be added in the future.

The Profile summary can be viewed as an online report, which allows users to quickly generate an overview and compare areas across the Estuary, and as a printed pdf report for sharing information with others.
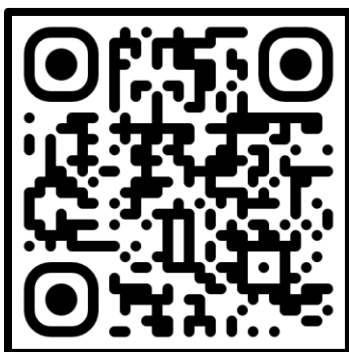
Figure 1. SF Estuary Wetlands Profile QR code.

Figure 2. SF Estuary Wetlands Profile Landing Page. The customized WRMP Profile is integrated into the EcoAtlas public visualization toolset and allows users to quickly generate summaries for an area of interest.

The EcoAtlas WRMP Profile Tool quickly summarizes the Baylands Habitat Map 2020 for a selected scale of analysis. Establishing consistent, replicable analysis units is essential for tracking habitat change over time.
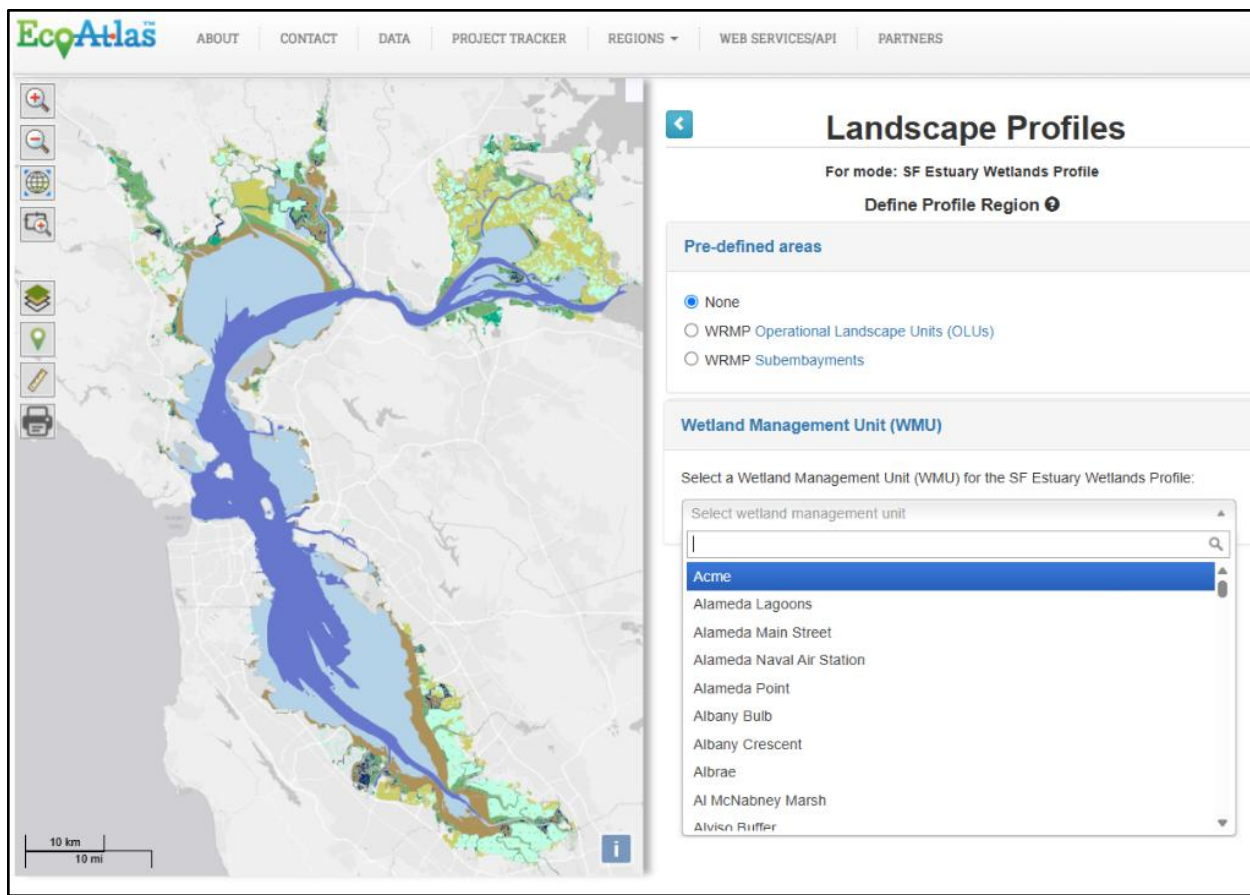
Pre-defined Profile Areas

Establishing consistent, replicable analysis units is essential for tracking change in wetlands over time. The WRMP uses the following hierarchy for scaling analyses of interest. These are also the units of analysis available in the Profile (Figure 3).

More details about each analysis unit are provided in the following summary:

- Analysis Units (AUs) - smallest spatial scale in the hierarchy. Defined by hydrology and habitat class and often bounded by human engineered features like levees; each unit is classified as either a tidal wetland unit or a diked bayland unit.

- Wetland Management Units (WMUs) - group of analysis unit(s) that resembles how managers assess actions, based on geomorphology, ownership, or planning approach.

- WRMP Operational Landscape Units (OLUs) - connected areas along the shore with shared physical and ecological characteristics that are expected to support a coherent suite of ecosystem functions, along with the physical processes needed to sustain these functions (SFEI and SPUR, 2019). OLUs are a practical way to manage the physical and jurisdictional complexity of the Bay shoreline.

- WRMP Subembayments - largest spatial scale in the hierarchy that reflects broad-scale estuarine characteristics, such as salinity, sediment dynamics, and tidal influence.

Figure 3. SF Estuary Wetlands Profile: Pre-defined Areas. Multiple options exist for generating a Profile, including by WRMP Subembayment, WRMP Operational Landscape Unit, or Wetland Management Unit.

Methodology for Stratifying Analyses

The following describes the methodology behind the different units of analysis available in the Profile.

Analysis Units

Analysis Units are derived from the BHM and refined using the National Hydrography Dataset (NHD), the extended WRMP OLU boundaries (SFEI and SPUR, 2019), and the updated version of the Shoreline Inventory. Analysis Units include both tidal wetland and diked bayland units.

Tidal wetland units include tidal wetlands, muted wetlands, intertidal channels, and tidal ponds and pannes and enclose one or more tidal watersheds. In some cases, recently restored areas that have yet to accrete to vegetated elevations were added despite classification as tidal flat or shallow subtidal so that their evolution can be tracked over time. Diked bayland units are areas that historically had full tidal connection to the Bay, but today are cut off from full tidal action by dikes, levees, or other structures. This includes areas within the historical baylands boundary that are below extreme astronomical tides (approximately two-year flood return), areas disconnected from the tides,

and undeveloped areas. For the purposes of this study, diked baylands are considered to be areas that could be restored to tidal action in the future, whether intentionally or unintentionally. The diked baylands layer includes salt ponds (active and former), diked agricultural baylands, and diked seasonal wetlands, including duck clubs.

To create a manageable set of analysis units, small units less than 1,000 square meters (0.25 ac) were removed, as well as strips narrower than 10 meters (33 ft). In addition, units were split using an adapted version of the SFEI Shoreline Inventory (SFEI, 2016) to separate marshes divided by human-engineered features like berms and levees, including remnant levees. Ownership was not considered during the delineation of analysis units.

Wetland Management Units

WMUs are used to track change at a larger wetland scale than the Analysis Units. They generally align with the scale of wetland management (e.g., restoration projects) within the Estuary and can be characterized by their geomorphology, ownership, or planning approaches. WMUs typically comprise several hydrologic units, defined by hydrologic boundaries, grouped together to provide a larger consistent boundary based on physical, ecological, and jurisdictional factors. WMUs can be composed of a single analysis unit or multiple analysis units and can include a combination of tidal wetland and currently diked bayland areas.

WRMP Operational Landscape Units

Three major geomorphic unit types were used to delineate individual OLUs: (1) headlands and small valleys, (2) alluvial fans and alluvial plains, and (3) wide alluvial valleys. These distinct units are distinguished by different underlying geology and resulting landscape morphometrics, such as slope of the shoreline, the width of the baylands, and watershed size. Geomorphic units were further divided into individual Baylands OLUs based on topographic, bathymetric, and landscape morphology considerations.

For more information and detailed methods on how each geomorphic unit type and Baylands OLU were delineated, see the San Francisco Bay Shoreline Adaptation Atlas report (SFEI and SPUR, 2019).

Based on the Baylands Habitat Map 2020, the WRMP OLU boundaries were extended bayward to incorporate marsh accretion and erosion to better meet the needs of the WRMP and upstream in the Suisun/Western Delta to account for wetlands near Pittsburg, CA. The version used in the Profile is WRMP OLU v1.0 released June 2025.

WRMP Subembayments

The WRMP Subembayments were created by grouping the Operational Landscape Units (OLUs) into divisions of the SF Estuary that were similar from a natural process and ecological standpoint. The deep water portions of the Bay were split and merged with each respective subembayment.

The Subembayments are intended to be used for regional reporting, comparison, and planning purposes for the WRMP. The divisions are most closely aligned with the subregions defined in the Baylands Ecosystem Habitat Goals report.

The current version used in the Profile is WRMP Subembayments v1.1 released March 2025. More information on this version and the data file is available on this webpage.

Metrics

The Profile summarizes key metrics on indicators for tidal wetlands tracked by the WRMP. Below is a summary of the data inputs and analysis by indicator type.

Tidal Wetland Extent

The tidal wetland extent, which is the total acreage of tidal wetlands in the SF Estuary, is based on the Baylands Habitat Map 2020. For more information, refer to this Tracking Tidal Wetland Extent in San Francisco Bay: A 2020 Mapping Update (Figure 4).
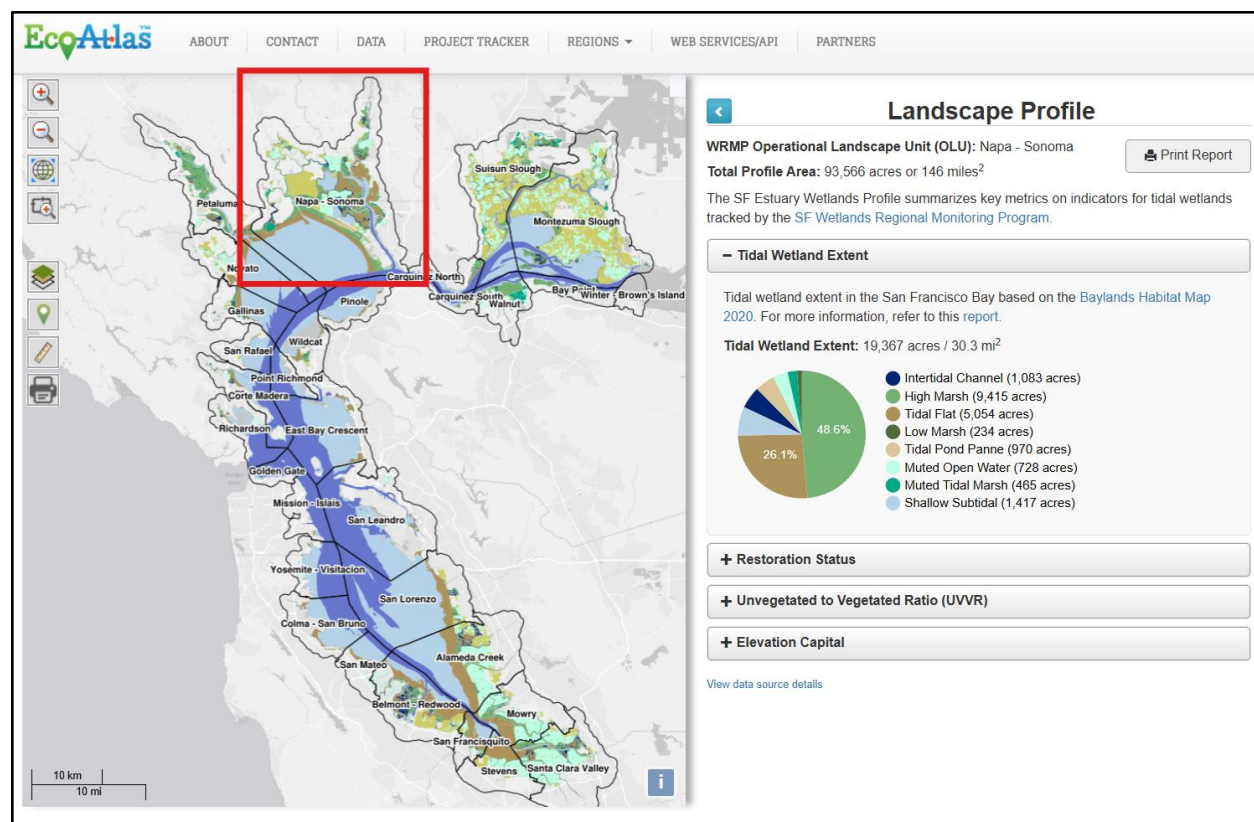

Figure 4. Tidal Wetland Extent. Summary of tidal wetland extent for the Napa - Sonoma Operational Landscape Unit.

Restoration Status

Restoration status indicates whether a tidal wetland is existing, restored, or evolving. Definitions of these terms include:

- **Existing** represents ancient or centennial tidal wetland occurring outside of restoration projects.
- **Restored** indicates tidal wetland that has been restored to tidal flow and now supports wetland vegetation and well-defined channels.
- **Evolving** is tidal wetland that has resulted from recent or ongoing restoration activities, but has not yet developed wetland vegetation and well-defined channels (Figure 5). For more information on the metadata, refer to www.sfei.org/pttwrm.
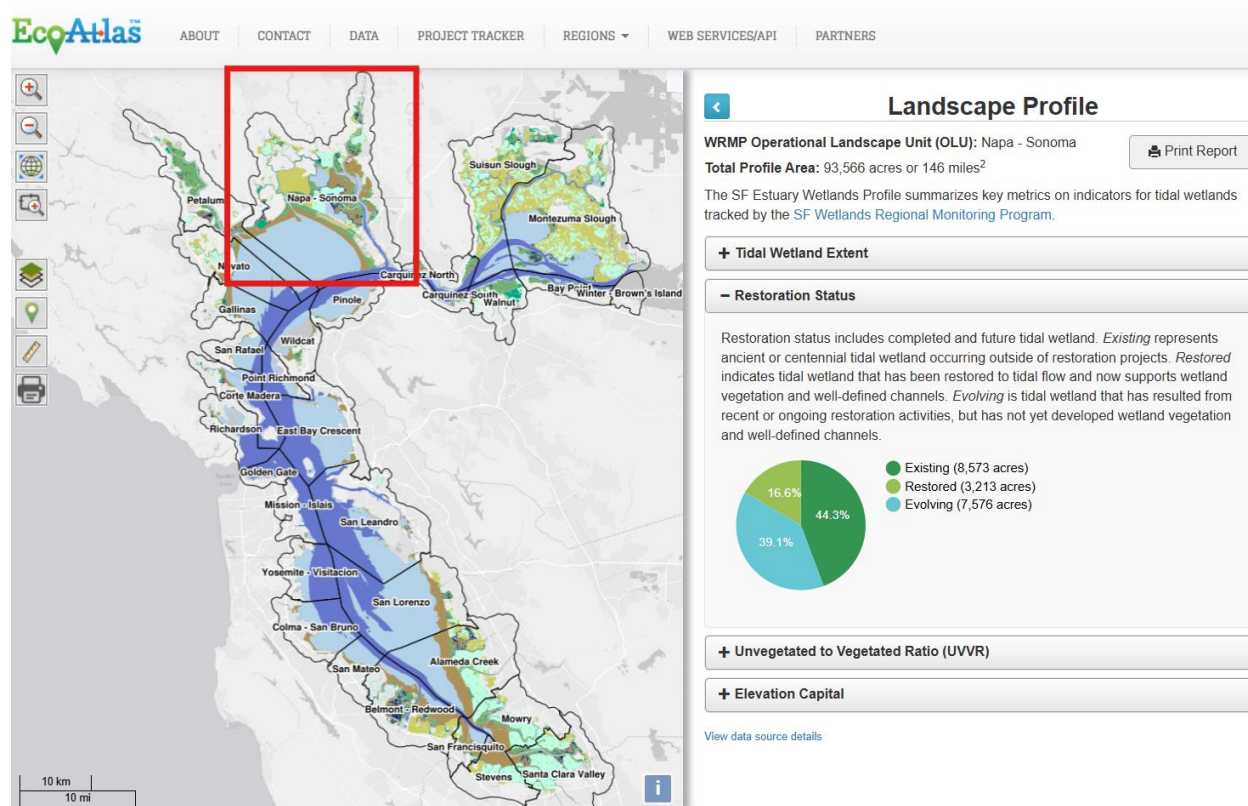
Figure 5. Restoration Status. Summary of restoration status for the Napa - Sonoma Operational Landscape Unit.

Unvegetated to Vegetated Ratio (UVVR)

UVVR is a ratio of unvegetated areas, including intertidal channels and wetland pannes, relative to the area of vegetated wetland. Lower values are positively associated with wetland resilience (Figure 6). UVVR can be implemented over time to document how a restoration site is maturing and can also be used to highlight where tidal wetlands are stressed and losing vegetation.
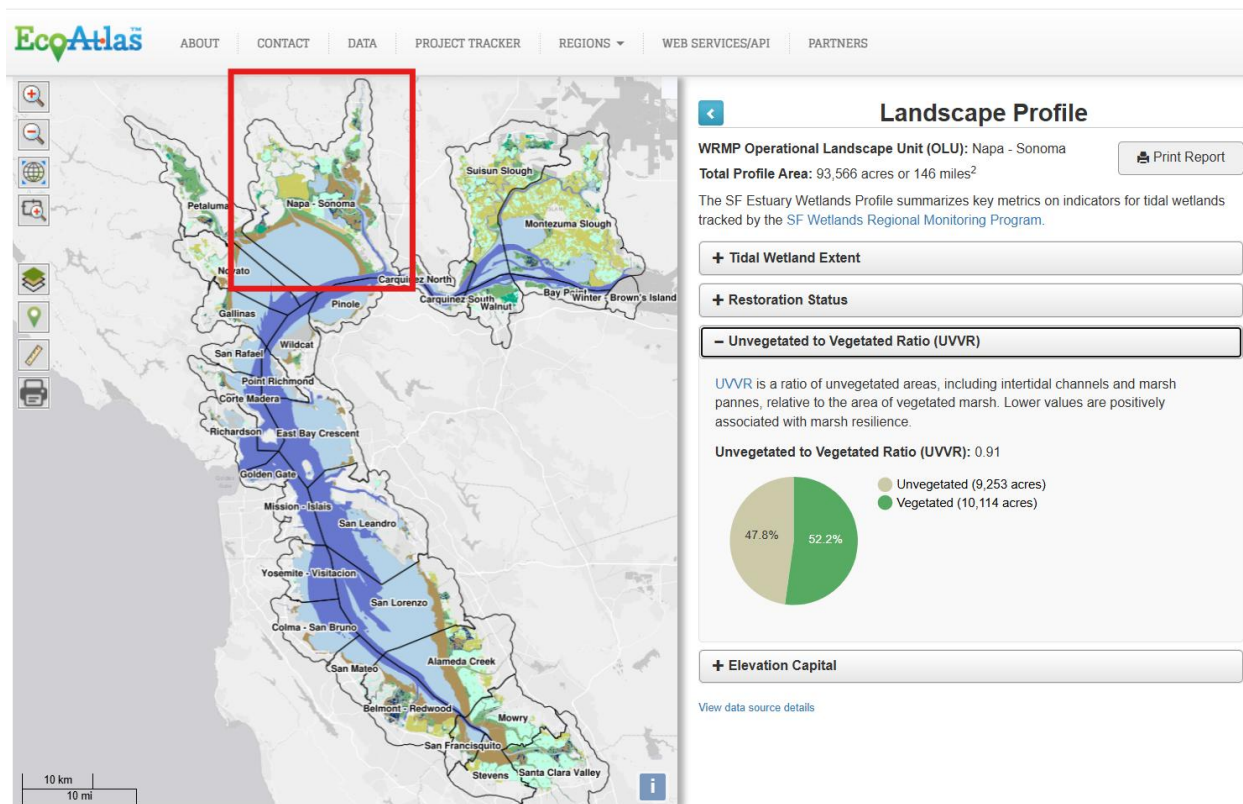

Figure 6. Unvegetated to Vegetated Ratio. Summary of the unvegetated to vegetated ratio (UVVR) for the Napa - Sonoma Operational Landscape Unit.

Elevation Capital

Tidal wetland surface elevation relative to the tides is a fundamental driver of plant distribution, abundance, and condition. The ability of a wetland to maintain its elevation relative to the tides as sea levels rise depends on its initial elevation and mineral and organic accretion rate. Wetlands that have high "elevation capital" (i.e., are located higher in the tidal frame) are more likely to persist with sea level rise. Elevation capital metrics allow comparison of ground elevation relative to the tides to assist in targeting restoration site locations and where sediment placement projects may have the most benefit and when.

A unitless value called z* is used to allow comparison of wetland elevations relative to the tides across the Bay and enables comparison across sites with different tidal amplitudes. Histograms showing the frequency distribution of z* values in a tidal wetland are a clear way to compare and understand the relative differences in elevation across wetlands (Figure 7).
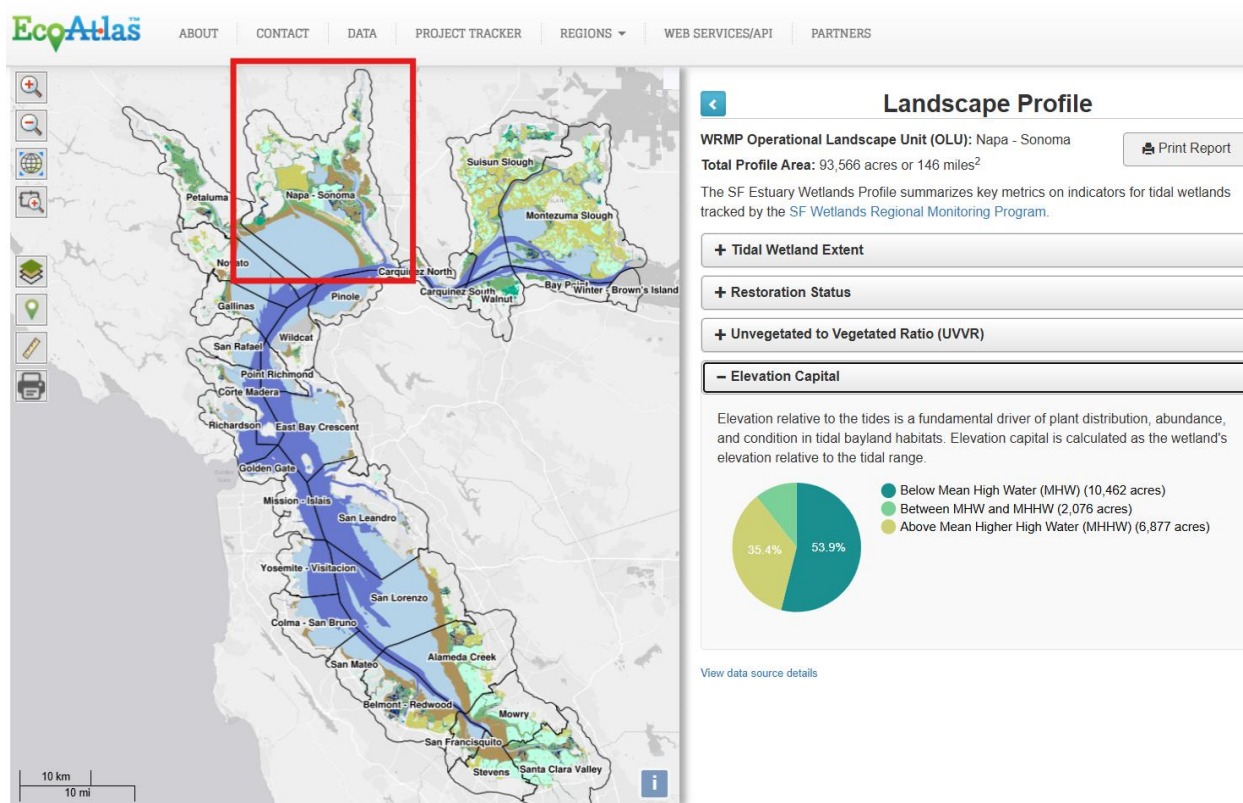
Figure 7. Elevation Capital. Summary of the elevation capital for the Napa - Sonoma Operational Landscape Unit.

WRMP Geospatial Data Catalog

The Profile displays the summarized data that are already in the WRMP database. To improve how data are brought into the database, the WRMP created a Geospatial Data Catalog (Data Catalog; data.wrmp.org) to make datasets relevant to wetland monitoring easily discoverable, browsable, accessible, and understandable. Though covering many topics, data formats, and standards, the datasets are all related to wetland monitoring of the SF Estuary's baylands, and include historical monitoring data and related data characterizing the region.

For each dataset, metadata is collected from the data submitter for the following seven sections of the WRMP Data Upload Form: Overview, Topics & Data Types, Spatial Information, Temporal Information, Links & References, Terms of Use, and File Upload (Figure 8).

The WRMP Geospatial Data Catalog ensures the key metadata fields are collected for each dataset.

Figure 8. WRMP Geospatial Data Catalog - Home Page. Fields within the Data Catalog ensure partners submit the necessary metadata for each dataset.

Summary of Updates

Several recent updates were made to the WRMP Geospatial Data Catalog Data Upload Form (www.dataupload.org) to improve the completeness of the metadata collected for each dataset and the user interface for entering information.

Additional fields were added to increase the transparency, browsability, and discoverability of WRMP data. These included fields to store generated Source and Publisher IDs, a field for required citations for all datasets to better classify the origin of a particular dataset. Modifications to the data entry fields and the data upload form are listed below.

Modifications to data entry fields

- Added a new required "Dataset Category" field to indicate the category of a dataset (e.g., pre-existing data, collected for the WRMP, or compiled from stand-alone datasets) (Figure 9).

- Added a new, not required field "Source ORCID" to store the Open Researcher and Contributor ID (ORCID) of the person who created the dataset (Figure 9).

- Added a new, not required field "Publisher ROR ID" to store the Research Organization Registry ID (ROR ID) to distinguish the organization that produced the research (Figure 9).

- Revised the list of "Topic(s)" that can be associated with a dataset (Figure 10).

- Added a required "Citation" field to collect the preferred citation for the dataset (Figure 11).

- Renamed the "Availability Status" field to "Data Availability Status" for clarity and expanded the selections for the status of a dataset (e.g., available to the public or pending review before the dataset appears in the WRMP Geospatial Data Catalog) (Figure 11).

- Enabled the "Geometry Type" field to accept multiple values.

Modifications to the Data Upload Form

- Revised the landing page for the Data Upload Form to include a progress bar for completion of the seven sections of the Data Upload Form (Figure 8).

- Enabled the "Save & Resume" feature within the data entry forms (Figure 9).

- Integrated the "File Upload" within the Data Upload Form to have one form for all data collection (Figure 12).

Figure 9. WRMP Geospatial Data Catalog - Section 1: Overview. Additional Dataset Category and ID fields and Save & Resume button.

Dataset Name: WRMP Dataset

Section 2: Topics & Data Types

Topic(s) *

☐ birds   ☐ carbon
☐ climate   ☐ demographics
☐ elevation   ☐ fish
☐ habitat   ☐ imagery + basemaps
☐ isotopes   ☐ land use and land cover
☐ mammals   ☐ monitoring stations
☐ mosquitoes   ☐ natural resources
☐ nutrients   ☐ physical processes
☐ political boundaries   ☐ recreation
☐ restoration   ☐ sea/water level
☐ sediment   ☐ traditional ecological knowledge
☐ vegetation   ☐ water quality

Select one or more themes or topic keywords that describe the dataset. Topics can be used for searching data in the Geospatial Data Catalog.

Keywords

Informative word(s), phrase(s), acronym(s), or marsh name(s) used to describe the primary content of the dataset. Please separate by commas.

Figure 10. WRMP Geospatial Data Catalog - Section 2: Topics & Data Types. Revised list of Topic(s) that can be associated with a dataset.

Figure 11. WRMP Geospatial Data Catalog - Section 6: Terms of Use. Expanded the selections for Data Availability Status to include availability delayed due to pending publication (embargo).

Figure 12. WRMP Geospatial Data Catalog - Section 7: File Upload. Integrated the uploading of data within the metadata form to have one form for all data collection.

Future Enhancements

The Profile was developed using a modular structure to allow the summary section to expand over time as the WRMP's priorities evolve. Additional information will be incorporated into future versions of the Profile, based on input and guidance from the WRMP's Committees, Workgroups, and user community.

The workflow for the review and dissemination of WRMP data will be augmented to develop a script that automatically ports relevant datasets into the Environmental Data Initiative (EDI) national data

repository (i.e., datasets collected by the WRMP). Within EDI, a Digital Object Identifier (DOI), which is a persistent unique identifier for the dataset, will be assigned. Scripts will then automatically retrieve and populate the WRMP Geospatial Data Catalog with the DOI. While datasets will be duplicated across both the WRMP and EDI repositories, the official copy will reside in the WRMP Geospatial Data Catalog. The benefits of this workflow model are the increased discoverability of WRMP data and reduced costs of issuing and maintaining DOIs.

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