Tracking Tidal Wetland Extent in San Francisco Bay A 2020 mapping update



Lisa Beers and Kelly Iknayan San Francisco Estuary Institute

Photo: Shira Bezalel

WRMP Webinar Series

We celebrate the progress that has been made with tidal wetland restoration in the San Francisco Bay!

- Present new tidal wetland acreage numbers for the Bay
- Track regional progress
- Describe the standardized, repeatable Tidal Wetland Extent Protocol
- Share datasets and tools that went into this analysis



Tracking Tidal Wetland Extent in San Francisco Bay: A 2020 mapping update







Wetlands Regional Monitoring Program

The WRMP delivers coordinated regional monitoring of the San Francisco Bay's wetlands to:

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

Co-managed by the San Francisco Estuary Partnership and San Francisco Estuary Institute

Currently collecting monitoring data on vegetation, accretion, fish and fish habitats, water quality, and much more!

https://www.wrmp.org





RESTORATION AUTHORITY

Importance of Tracking Tidal Wetland Extent

Tidal wetlands provide numerous benefits to San Francisco Bay, including:

- Carbon sequestration
- Flood protection
- Habitat for native and endangered species
- Shoreline protection
- Improving water quality
- Supporting a range of cultural and recreational uses







Importance of Tracking Tidal Wetland Extent

- Over 75% of the Bay's tidal wetlands have been lost since the 1850s, and our collective investment in conservation & restoration since the early 1990s has reversed the trend of loss.
- The last Bay-wide mapping effort occurred 15 years ago and it is important to understand how and where these important ecosystems are changing over time.
- Tidal marsh extent is actively changing as a result of restoration and environmental variability, including sediment availability







Tidal Wetland Extent Protocol

- People regularly have questions about tidal marsh acreage & the last Bayland's tidal wetland mapping occurred in 2009
- The WRMP created this **Protocol** to ensure accurate mapping and tracking of tidal wetland extent and restoration progress
- Employs a **new tidal wetland classification** for restoring sites that are not yet vegetated
- Aim is to add transparency to the 2020 acreage with the way we are bringing the Baylands Habitat Map and Project Tracker restoration data together







Baylands Habitat Map (BHM) 2020

- Reflects Bayland habitats as of 2020
- First high resolution Baylands habitat map since 2009
- Created by the WRMP using automated, consistent & repeatable methods
- Uses Object Based Image Analysis, high resolution aerial imagery, LiDAR elevation data, tidal data, & other metrics to classify habitats
- Employs a standardized habitat classification scheme
- Map will be updated every 4-5 years
- Methods can be applied outside of the Bay

https://www.wrmp.org/introducing-the-baylands-habitat-map-2020-part-1





Project Tracker Tidal Wetland Restoration Map 2020

- Derived from the EcoAtlas Project Tracker webtool, this is a map of tidal wetland restoration sites that were intentionally or unintentionally restored through 2020
- Modified for this analysis to only include sites restored before January 1, 2020 to match BHM 2020 input data
- Kelly Iknayan is presenting in detail on this mapping effort shortly



The Protocol Baylands Habitat Map



other landcover types



Tidal Wetland Extent and Restoration Progress

- It is important to accurately track tidal wetland extent & restoration development over time & across regions
- Our classification scheme acknowledges site differences, including:
 - A fully vegetated site has different ecosystem functions than one that is mostly tidal flat
 - Depending on location, sediment availability can vary, influencing the rate of reaching vegetated elevations
 - Increases in the frequency of flooding & changes in sediment supply in the future may impact restoration trajectories





Redefining Tidal Wetland Habitat Classifications

Existing Tidal Wetland - Ancient or centennial tidal wetland occurring outside of restoration projects

Restored Tidal Wetland - Tidal wetland areas that have been restored to tidal flow and now support wetland vegetation and well-defined channels. Areas may include undifferentiated open water and tidal flat

Evolving Tidal Wetland - Tidal wetland areas that have resulted from recent or ongoing restoration activities but have not yet developed wetland vegetation and well-defined channels. Areas are often lower in elevation.



Existing Tidal Wetland Classification



Not Included in Classification

Included in Classification



Existing Tidal Wetland Classification

Reclassified according to the Protocol







Restored & Evolving Tidal Wetland Classifications



Shallow Subtidal

Intertidal Channel

Tidal Pond/Panne

Project Tracker Tidal Wetland Restoration Map 2020

Included in Evolving Tidal Wetlands

Included in Restored Tidal Wetlands



Restored Tidal Wetland Classification

Reclassified according to the Protocol







Evolving Tidal Wetland Classification

Reclassified according to the Protocol







2020 Tidal Wetland Extent using the Protocol



2020 Tidal Wetland Extent in the San Francisco Estuary





Tidal Wetland Extent

2020





TIDAL WETLAND RESTORATION OVER TIME



Year of initial restoration (breach date)



Intentional vs Unintentional Tidal Wetland Restoration

- Restoration of tidal flow can be both intentional and unintentional
- Intentional restoration occurs through a coordinated effort and often entails site work to prepare for the return of tidal flows
- Unintentional breaches can occur from levee failures, floods, and tide gate failures, among others, and often do not get repaired due to high costs
- Since the outcome is still the same, both should be tracked and provide a unique opportunity to examine restoration outcomes





Tidal Restoration Over Time





Caveats to 2020 Tidal Wetland Extent Acreage

- Muted tidal wetlands and managed wetland acreage is not included
- The BHM 2020's San Francisco Estuary extent is delineated by Operational Landscape Units
 - As such, Browns and Winter Islands are not included 1,086 acres
 - BHM 2025 extent will be modified based on the Regional Water Board district boundary
- In-progress restoration site area construction begun but not tidal - is not included



2020 Lower Estuary Boundary



Technical Details in Report Appendix

- Step-by-step approach for calculating the 2020 tidal wetland extent
- Comparison of BHM and Bay Area Aquatic Resource Inventory (BAARI 2009) mapping methods & habitat classifications
- Accounting for restoration in tidal wetland estimates
- Comparing current and previous tidal wetland extent estimates





Importance of Mapping and Continued Monitoring

Highlighting expected changes and the need for regular, consistent mapping





Acknowledgments

2020 Tidal Wetland Extent Report Authors

April Robinson, Lisa Beers, Kelly Iknayan, Denise Walker, Jennifer Symonds, Cristina Grosso and Alex Braud

Thank you to the WRMP TAC for your thoughtful review!

www.wrmp.org/resources/#technical



Tracking Tidal Wetland Extent in San Francisco Bay: A 2020 mapping update





Project Tracker Tidal Wetland Restoration Map

Presenter: Kelly Iknayan



Tracking Tidal Restoration: Habitat + Project Sites



Baylands Habitat Map 2020



Project Tracker Tidal Wetland Restoration Map 2020



Project Tracker Tidal Wetland Restoration Map

- A curated dataset of tidal wetland restoration efforts across the region
- Created from entries in Project Tracker
- PTTWRM 2020:
 - All projects completed <12/31/2020 (Supports the WRMP 2020 Tidal Wetland Extent Report update)
- PTTWRM 2024:
 - All projects completed or in-progress by <12/31/2024





PTTWRM





Why Is the PTTWRM So Important?

- Helps answer: Where and how much wetland area is being restored?
- Supports regional planning, restoration tracking, and policy decisions
- Brings consistency to how we count and categorize restoration







Big Picture

Visualization, Habitat Condition, and Ecosystem Context.

Project Details

Who's doing What, Where, and Why.

Feeds into EcoAtlas.



What is Project Tracker?

- **Purpose:** Tracks aquatic habitat projects throughout California.
- **Focus:** Restoration, mitigation, and enhancement projects.
- Features:
 - Detailed project info (goals, status, location, partners)
 - Supports planning, reporting, and performance tracking
 - Integrated into EcoAtlas





What is PTTWRM?

- Tracks tidal wetland restoration in the Bay
- **148 In-progress and completed** restoration sites that:
 - Restore tidal action
 - Lead to a net increase in habitat area
- Includes dates of restoration events





What is Tidal Restoration?



Intentional Levee Breaches

Unintentional Levee Breaches

Fill Removal & Channel Construction

Terminated Dredging Operations



What is Tidal Restoration?



Intentional Levee Breaches

Unintentional Levee Breaches

Fill Removal & Channel Construction

Terminated Dredging Operations



What Isn't in the PTTWRM

- What We Hope to Include in the Future
 - Muted Wetland Restorations
 - Enhancements Projects
 - Planned Construction
 - Restorations in the Delta Region



Available for Download: www.sfei.org/pttwrm

Estuary Institute

WHAT WE DO PROJECTS & RESOURCES

DONATE Q

ABOUT

PROJECT TRACKER TIDAL WETLAND RESTORATION MAP IN SAN FRANCISCO BAY



The Project Tracker Tidal Wetland Restoration Map (PTTWRM) dataset provides spatial boundaries and key attributes of restored tidal wetlands in the San Francisco Bay.

The San Francisco Estuary Wetlands Regional Monitoring Program (wrmp.org ¹/₂), in collaboration with the San Francisco Estuary Institute, has developed new data layers for tidal wetland restoration. These layers were created by systematically reviewing and refining records from EcoAtlas Project Tracker ¹/₂. This stand-alone dataset compiles tidal wetland restoration information into a standardized, citable resource for the region's restoration community that can be reviewed and updated annually. Each data package includes an Excel file, geodatabase, metadata, and change log.



How can this be used?

- Track restoration progress: age of breaches, restoration trajectories (including unintentional restorations)
- Analyze, monitor, and troubleshoot restoration efforts
- Show regional accomplishments and impacts (e.g., Measure AA)





South Bay Salt Ponds Pond A6

2011



2024

Systematic Review Process

- Reviewed: >575 Project Tracker Records
- Checked and updated project attributes to standardized values





Systematic Review Process

 Updated site boundaries using improved mapping from the Baylands Habitat Map



Previous

PTTWRM









Monitoring



Monitoring







Monitoring

What We are Doing in the Future!

- Baylands Habitat Map data collection for next update starting **this summer**
- PTTWRM updates will be **annual**



Tracking Tidal Wetland Extent in San Francisco Bay: A 2020 mapping update





Thank You!

- Call for feedback: we need this to be a shared, restoration community-supported effort
- Thank you to the restoration practitioners on the ground, the regional administrators, and the funders who make this work possible



Tracking Tidal Wetland Extent in San Francisco Bay: A 2020 mapping update





Available for Download: www.sfei.org/pttwrm

Estuary Institute

WHAT WE DO PROJECTS & RESOURCES

DONATE Q

ABOUT

PROJECT TRACKER TIDAL WETLAND RESTORATION MAP IN SAN FRANCISCO BAY



The Project Tracker Tidal Wetland Restoration Map (PTTWRM) dataset provides spatial boundaries and key attributes of restored tidal wetlands in the San Francisco Bay.

The San Francisco Estuary Wetlands Regional Monitoring Program (wrmp.org ^C), in collaboration with the San Francisco Estuary Institute, has developed new data layers for tidal wetland restoration. These layers were created by systematically reviewing and refining records from EcoAtlas Project Tracker ^C. This stand-alone dataset compiles tidal wetland restoration information into a standardized, citable resource for the region's restoration community that can be reviewed and updated annually. Each data package includes an Excel file, geodatabase, metadata, and change log.



Contact Us

- Lisa Beers: lisab@sfei.org
- Kelly Iknayan: <u>kellyi@sfei.org</u>
- PTTWRM questions: <u>ptwetlands@sfei.org</u>



