

GFNMS SAC Meeting



Tomales Bay Native Oyster Working Group Recommendations



August 15, 2019

Dr. Bibit Traut & Ms. Julia Royster

GFNMS SAC Request



Original Request:

Establish an Olympia Oyster Working Group to evaluate key information available for Olympic Oysters in Tomales Bay to optimize the selection of oyster enhancement sites for the purpose of creating a more resilient Tomales Bay for people and the ecosystem, focusing on living shorelines and increasing the native Olympia oyster population.

Action:

- Tomales Bay Native Oyster Restoration Working Group (TBNORWG) assembled in December 2018
 1. Met March 15, 2019 and May 15, 2019
 2. Finalized recommendations May 31, 2019

Working Group Process

Tomales Bay Interagency Committee

- CA State Lands Commission
- SF Water Quality Control Board
- National Park Service
- CA Dept. of Fish and Wildlife
- CA Dept. of Transportation
- CA Coastal Commission
- CA Boating and Waterways
- CA State Parks
- Marin County Sheriff's Department
- CA Dept. of Health Services
- NOAA (GFNMS Superintendent)

Office of National Marine Sanctuaries

Working Group

- Reviews and discusses options and makes recommendations to Sanctuary Advisory Council

GFNMS Advisory Council

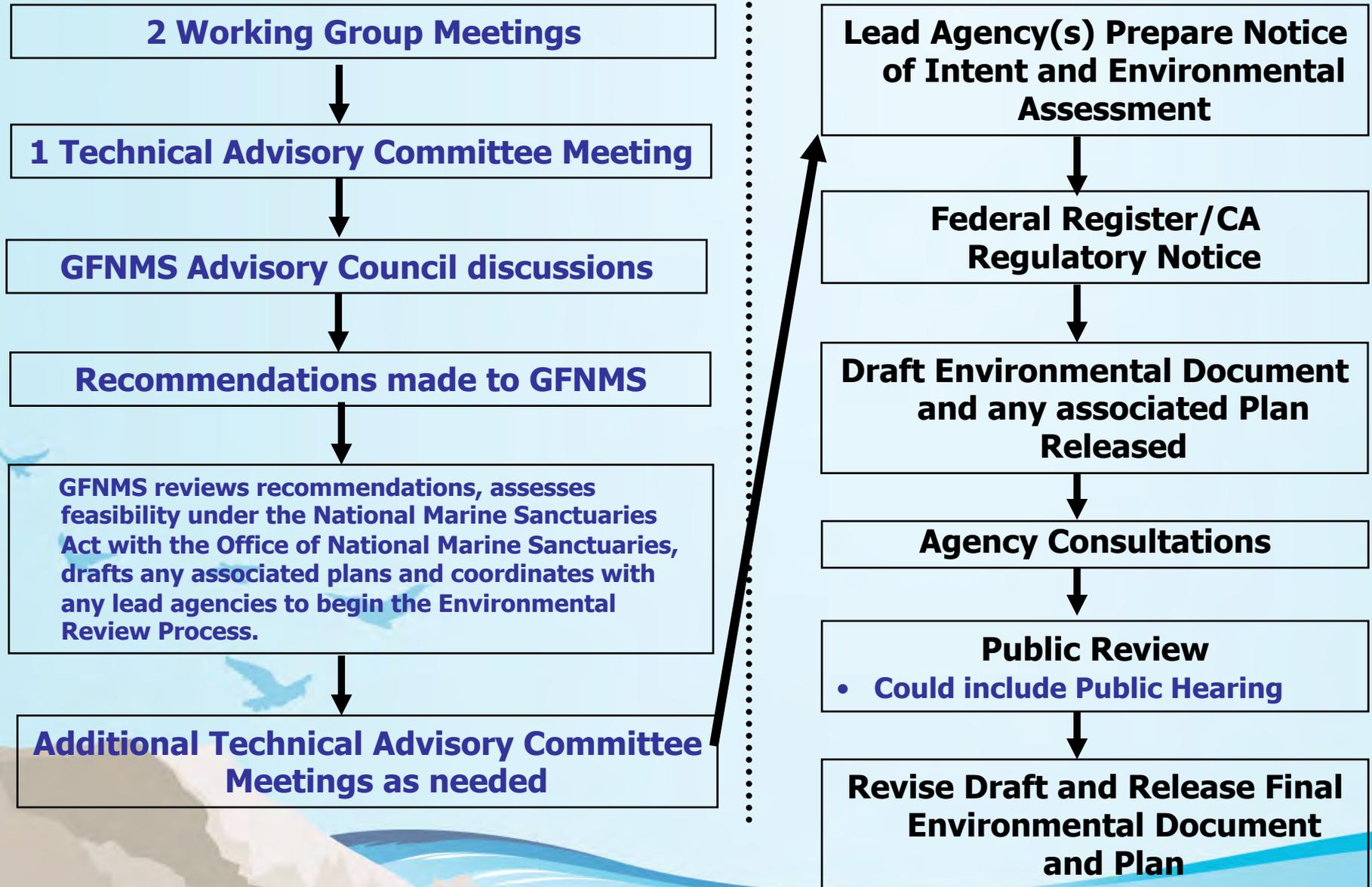
- Reviews and discusses recommendations from the Working Group during a public meeting and advises Superintendent on recommended actions.

GFNMS

- Superintendent reviews. The Superintendent will respond in writing with rationale to all recommendations that will not be acted upon.



The Working Group Role in the Environmental Review Process



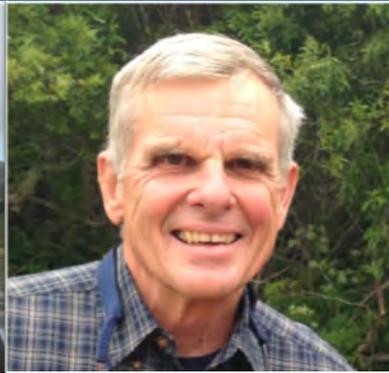
TBNOWG Members



Mr. Bruce Bowser



Dr. Andy Chang



Mr. George Clyde



Mr. Jeremy Lowe



Ms. Julia Elkin



Dr. Gary Fleener



Dr. Ted Grosholz



Chair: Dr. Bibit Traut



Mr. Richard James



Ms. Marilyn Latta



Mr. Jack Liebster



Mr. Andrew Weltz

TBNOWG Advisors



Ms. Sara Azat



Dr. Ben Becker



Ms. Natalie Cosentino - Manning



Mr. Chris Huitt



Dr. John Largier



Dr. Chela Zabin



Ms. Alayne Chappell



Ms. Sara Hutto



Ms. Karen Reyna



Project Manager:
Ms. Julia Royster

TBNOWG Foundation



Purpose

1. select pilot sites for oyster restoration in Tomales Bay,
2. create recommendations for increasing the Tomales Bay native *Ostrea lurida* population,
3. explore co-benefits of native oyster restoration, such as coastal protection for Tomales Bay communities via living shorelines.

Restoration Objective:

A sustainable, resilient Tomales Bay native oyster (*Ostrea lurida*) population to provide biotic and abiotic benefits. This nearshore and intertidal foundation species will enhance ecosystem function by providing food and refugia for birds, fish, and invertebrates. The oyster population will enhance ecosystem services that may contribute to coastal protection via oyster reefs that can attenuate wave energy, and reduce the rate of coastal erosion.

TBNOWG Recommendations



1. Tomales Bay Restoration Policy and Planning (8)
2. *Native Oyster, Ostrea lurida* Population Enhancement (1)
3. Threats to *Ostrea lurida* Populations (1)
4. Monitoring, Evaluation, and Adaptive Management of *Ostrea lurida* Restoration (3)
5. Research and Data Needs to inform Restoration (7)
6. Education and Outreach for *Ostrea lurida* in Tomales Bay (4)

Tomales Bay: Policy and Planning



PP1: Compile and analyze existing data focused on the ecology or habitat of the native Tomales Bay oyster, *Ostrea lurida*, to better understand if, why, where, and by how much the Tomales Bay *Ostrea lurida* population needs to be enhanced to ensure it functions successfully into the future.

PP2: Create a map of Tomales Bay that highlights the limiting factors for *Ostrea lurida* population growth to help guide the selection of pilot and demonstration restoration sites and techniques (e.g. spat vs. built substrate). Data collected as part of the Working Group will be shared with the champions.

Tomales Bay: Policy and Planning



PP3: Conduct a Tomales Bay habitat assessment to better understand current conditions, to inform regional prioritization, to develop restoration collaborations, and to clarify the extent of restoration required, as well as the funding needed for implementation. Refer to Working Group notes for details on what should be considered in a habitat assessment.

PP4: Conduct a Programmatic Cultural Resource Assessment

Tomales Bay: Policy and Planning



PP5: Use the Site Selection Criteria for *Ostrea lurida* in Tomales Bay developed by the Working Group to prioritize pilot sites and to identify additional potential restoration sites. Together, they will form a network of restoration sites within Tomales Bay to be developed as part of a Strategic Restoration Plan for *Ostrea lurida* in Tomales Bay. Furthermore, the Working Group encourages the assessment and potential use of artificial hard substrate (e.g. oyster shell structures, non-creosote piling, moorings piers, seawalls, bulkheads) that can act as oyster habitat. Lessons learned from Seattle's fish friendly seawall should be considered when designing, repairing, replacing, or modifying existing or future artificial structures so as to optimize the provision of oyster habitat in Tomales Bay. This would support the broader West Coast goals for the restoration of *Ostrea lurida*. Sites should be assigned to a restoration phase (e.g. pilot, demonstration, or large-scale), and the purpose of restoring each site and its success criteria should be clarified before implementation.

Tomales Bay: Policy and Planning



PP6: Develop a 10 year Strategic Restoration Plan for *Ostrea lurida* in Tomales Bay. It would outline restoration purposes, purpose-specific success criteria, restoration actions, research, and monitoring variables to ensure future restoration actions are appropriate and successful, and as needed adaptively managed to ensure future success of a resilient Tomales Bay ecosystem.

Tomales Bay: Policy and Planning



PP7: Develop an interagency approval process to streamline permitting for future multi-jurisdictional and collaborative restoration projects, especially with regard to identifying regulatory requirements of each agency that may be shared, similar or conflicting, as well as coordinating review responsibilities under NEPA and CEQA. Engage management entities within Tomales Bay watershed to ensure objectives and activities are aligned and inform each other.

Tomales Bay: Policy and Planning



PP8: Establish a committee to serve as long-term advisors on Tomales Bay native oyster, *Ostrea lurida*, restoration.



Native Oyster, *Ostrea lurida* Population Enhancement



PE1: Undertake phased restoration activities to augment the self-sustaining population of the Tomales Bay native oyster, *Ostrea lurida*, robust enough to be resilient to projected climate-related threats and episodic recruitment and mortality. Oyster restoration activities with potential to negatively impact sensitive habitats, like eelgrass, should be avoided.

This recommendation is supported by three phases.

Native Oyster, *Ostrea lurida* Population Enhancement



PE1

Phase 1: Implement and monitor pilot restoration projects in 2020 at six locations to better understand if these locations are appropriate for demonstration projects. Pilot projects should include experimenting with a range of restoration and monitoring methods to help managers better understand what are the most effective methods to use in Tomales Bay. Examples of methods to test are in the Working Group meeting materials. Evaluate pilot restoration projects against project-specific success criteria prior to Phase 2.

To the extent that the pilot sites involve the construction or modification of or otherwise altering the submerged lands of the Sanctuary in any way, the Sanctuary should, as part of its permitting process, require that all incidental consequences of the activity be considered and require appropriate mitigation measures (beyond the expected benefits of the project itself), as appropriate.

Native Oyster, *Ostrea lurida* Population Enhancement



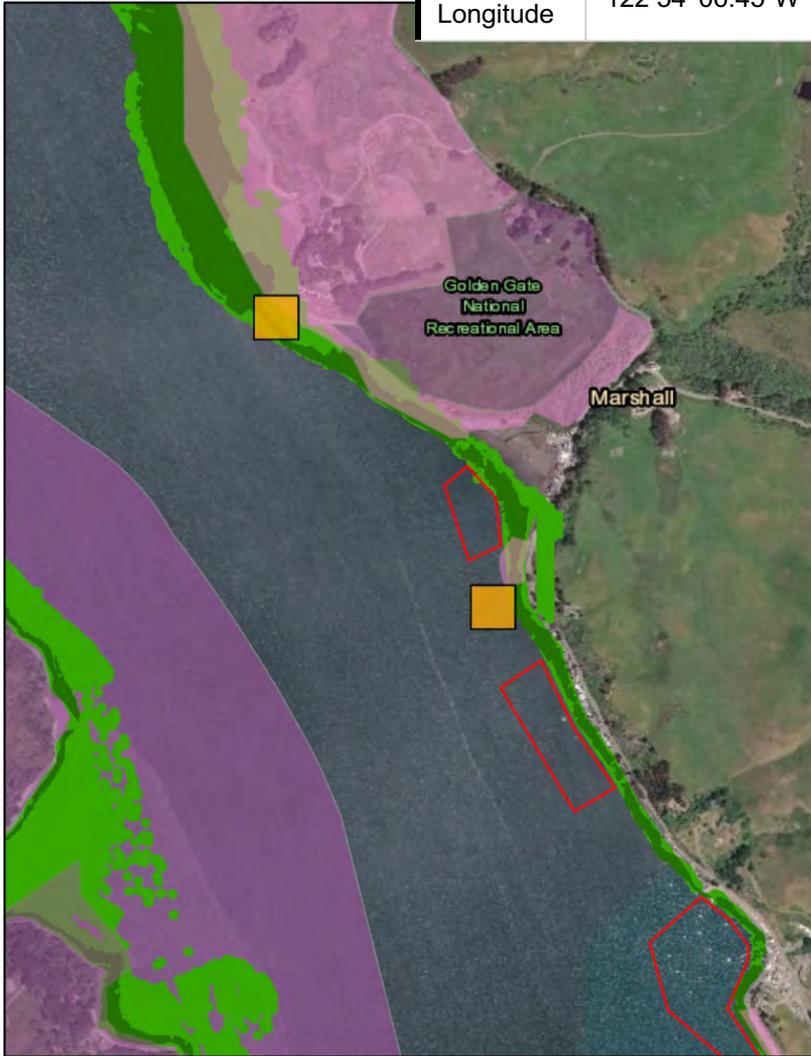
Restoration Site Criteria:

- ✓ Tomales Bay location
(Upper, Mid, Lower and Eastside vs. West side)
- ✓ Size of area to restore
- ✓ Site benefit: max habitat success or co-benefit of protection value
- ✓ Impact to recreational use or scenic uses
- ✓ Susceptibility to harvest
- ✓ Current substrate type
- ✓ Threat from non-native Drills
- ✓ Accessibility
 - Public
 - Research/monitoring
 - General public limited as on protected lands
- ✓ Research Value
- ✓ Structure addition
(type, performance, removable)
- ✓ Larval Reservoir (aquaculture nearby)
- ✓ Impact to sensitive habitat
- ✓ Maximize nearby habitat protection
- ✓ Community Engagement
- ✓ Landowner
- ✓ Lead Jurisdictional Authority
- ✓ Consultations and Permitting Considerations

Cypress Point

| | |
|---------------------|-----------------|
| Estimated Latitude | 38 09' 53.44"N |
| Estimated Longitude | 122 54' 06.45"W |

| Site Name | Cypress Point |
|---|--|
| Tomales Bay location | Mid-mid Bay; Eastside |
| Size of area to restore | Scalable in area without restrictions of other uses (e.g. moorings, aquaculture) |
| Site benefit: max habitat success or co-benefit of protection value | Managed retreat of salt marsh |
| Impact to recreational use or scenic uses | No recreational use |
| Susceptibility to harvest | Low |
| Current substrate type | Rocky |
| Threat from non-native Drills | Not extreme, no drill or minimal |
| Accessibility <ul style="list-style-type: none"> • Public • Research/monitoring • General public limited as on protected lands | Accessible to the public by boat only and not often accessed. The shoreline is owned and controlled by Audubon Canyon Ranch and is accessible both throughout that property and the GGNRA property inland. |
| Research Value | Good habitat (Rocky Point) |
| Structure addition (type, performance, removable) | Viable to add structure |
| Larval Reservoir (aquaculture nearby) | Larval Reservoir (aquaculture to the north) |
| Impact to sensitive habitat | Minimal Eelgrass conflict |
| Maximize nearby habitat protection | Yes (maximize marsh integrity) |
| Community Engagement | Native American Heritage Commission (NAHC), local Tribal groups, Environmental Justice Outreach, community groups/recreation communities |
| Landowner | CA State Lands (H2O side) , Audubon Canyon Ranch |
| Lead Jurisdictional Authority | CA State Lands , GFNMS, CA Coastal Commission, Possibly Audubon Canyon Ranch depending on how close to shore. |



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Protected Areas (CPAD2017a)

- Audubon Canyon Ranch
- United States National Park Service

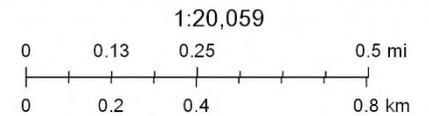
- Updated Recommended Restoration Sites
- Mooring Zone (February 2018)
- Eelgrass (Collected by Merkel Aug. 2017)

South Pelican Point



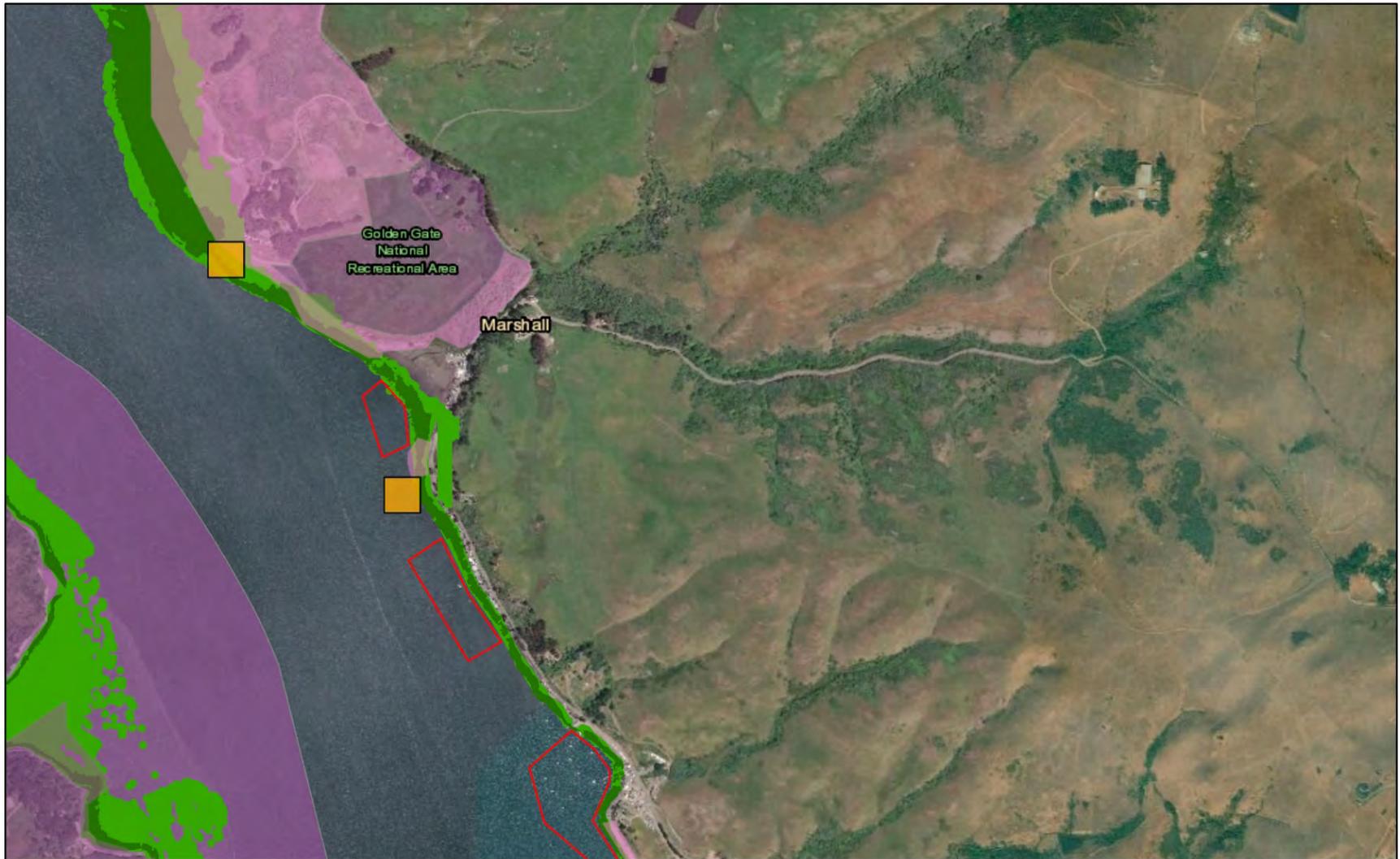
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-  Updated Recommended Restoration Sites
-  Eelgrass Maximum Observed Extent (CDFW-ds2795)
-  Hydrographic Sectors of Tomales Bay (Smith et al. 1989)
-  PRNS Offshore Mgmt Area
-  Eelgrass (Collected by Merkel Aug. 2017)



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Cypress Point and Marshall Mile



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Protected Areas (CPAD2017a)

 Audubon Canyon Ranch

 United States National Park Service



Updated Recommended Restoration Sites

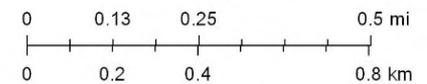


Mooring Zone (February 2018)



Eelgrass (Collected by Merkel Aug. 2017)

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Web AppBuilder for ArcGIS

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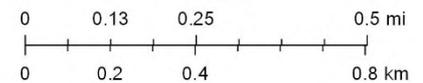
Duck Cove



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-  Updated Recommended Restoration Sites
-  Mooring Zone (February 2018)
-  Aquaculture in U.S. Coastal and Offshore Marine Waters
-  Eelgrass (Collected by Merkel Aug. 2017)
-  Eelgrass Maximum Observed Extent (CDFW-ds2795)
-  PRNS Offshore Mgmt Area

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Web AppBuilder for ArcGIS

USDA FSA | NOAA / NOS / Special Projects Office | Source: USGS, EPA | marinecadastre.gov | Esri, HERE, Garmin, IPC |

N. Shell Beach and N. of Tomasini Point (430-12)



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Protected Areas (CPAD2017a)

- California Department of Parks and Recreation
- United States National Park Service



Updated Recommended Restoration Sites

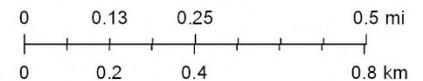


Mooring Zone (February 2018)



Hydrographic Sectors of Tomales Bay (Smith et al. 1989)

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Native Oyster, *Ostrea lurida* Population Enhancement



PE1: Undertake phased restoration activities to augment the self-sustaining population of the Tomales Bay native oyster, *Ostrea lurida*, robust enough to be resilient to projected climate-related threats and episodic recruitment and mortality. Oyster restoration activities with potential to negatively impact sensitive habitats, like eelgrass, should be avoided.

Phase 2: Implement demonstration projects in 2023 in areas where pilot restoration was deemed successful based on the identified success criteria and incorporating lessons learned from the pilot restoration projects. Considerations to include when developing a demonstration project are in the Working Group meeting materials. Evaluate demonstration projects against predetermined success criteria prior to Phase 3.

Native Oyster, *Ostrea lurida* Population Enhancement



PE1: Undertake phased restoration activities to augment the self-sustaining population of the Tomales Bay native oyster, *Ostrea lurida*, robust enough to be resilient to projected climate-related threats and episodic recruitment and mortality. Oyster restoration activities with potential to negatively impact sensitive habitats, like eelgrass, should be avoided.

Phase 3: Strategically implement a large-scale restoration project in 2027 and monitor for evaluation in 2030. The goal of evaluation will be to meet the *Ostrea lurida* population target that ensures the *Ostrea lurida* population is sustainable over time.

Address Existing and Future Threats to *Ostrea lurida* Populations



T1: Develop a plan to manage the invasive oyster drill to mitigate its negative impacts on the sustainable population of *Ostrea lurida*, as well as the overall ecosystem function of Tomales Bay. The plan should include management of the bat ray enclosure fence posts that currently serve as habitat for the drills, as well as focused reduction of drills near pilot restoration project sites.

Monitoring, Evaluation, and Adaptation of *Ostrea lurida* Restoration



ME1: Develop restoration success criteria and metrics to be included in a Tomales Bay *Ostrea lurida* monitoring plan using NOAA Restoration Center Tier I and Tier II protocols as a guide. Success should be defined and assessed across individual projects, multiple scales (e.g. individual oysters, species that benefit from oysters, and bay-wide), benefits (e.g. *Ostrea lurida* population, community, ecosystem, biotic/abiotic), and stressors. When tailoring the success criteria to individual projects, consideration should be given to project location, materials used, project-specific goals, and intended benefits to ensure monitoring protocols are developed to effectively the project's role in changes to benefits provided.

Monitoring, Evaluation, and Adaptation of *Ostrea lurida* Restoration



ME2: Monitor sediment dynamics in Tomales Bay to quantitatively assess sedimentation changes (e.g. shoreline accretion and erosion) that may be created by pilot *Ostrea lurida* restoration projects.

ME3: All restoration activities should include a maintenance or management plan, including a timeline, and responsible party to optimize the positive impact to the *Ostrea lurida* population over time and minimize the potential for negative impacts at abandoned sites where structures were installed or materials added.



Research and Data Needs to inform *Ostrea lurida* Restoration



RD1: Develop a consistent funding stream to support comprehensive, consistent collection of data that will inform the development of a population dynamics model of native oyster adults and larvae (e.g. *Ostrea lurida* numbers, larval movement patterns, settlement and recruitment details, and hydrodynamics of Tomales Bay).

Research and Data Needs to inform *Ostrea lurida* Restoration



RD2: Collect data on recreational use of Tomales Bay, recognizing that currently there is not much known about the recreational use of Tomales Bay and multiple agencies would benefit from having a better understanding of its spatial/temporal use. This will fill important data gaps and ensure the population and Tomales Bay users are more fully understood before launching larger scale restoration.

RD3: Prioritize the need for research to assess the interaction of eelgrass and *Ostrea lurida*, to be used to inform all phases of future restoration projects.

Research and Data Needs to inform *Ostrea lurida* Restoration



RD4: Study to quantify the role of *Ostrea lurida* in providing protein to the surrounding community/fishery and the number and type of species that native oysters help support in Tomales Bay. For example, determining what species rely on the oysters? Would their numbers improve if the *Ostrea lurida* population was enhanced?

RD5: Study to understand the existing state of *Ostrea lurida* aquaculture co-benefits in Tomales Bay, as well as incorporating lessons learned into future management actions. Puget Sound Restoration Fund should be used as an example for the type of studies to conduct.

Research and Data Needs to inform *Ostrea lurida* Restoration



RD6: Study the type of substrate most effective for *Ostrea lurida* to prosper in different areas of the bay, as well as the most efficient way to introduce and/or enhance the substrate at the project site. From this information, create criteria to guide the implementation of future restoration projects. Criteria should consider bathymetry, site specific objective, and the natural and/or man-made existing substrate.

Research and Data Needs to inform *Ostrea lurida* Restoration



RD7: Study to quantify the role of *Ostrea lurida* in providing living shoreline benefits such as reducing coastal erosion, increasing sediment accretion, and protecting other coastal habitats and human assets. The study should include monitoring sediment levels, erosion rates and sedimentation accretion rates at restoration sites and control sites without oyster reefs. How would a robust and resilient native *Ostrea lurida* population affect and protect the bay?

Education and Outreach for *Ostrea lurida* in Tomales Bay



EO1: The Working Group recommends that a Tomales Bay restoration education and outreach strategy and program be developed. Program Messages should include:

1. The benefits a functional Tomales Bay ecosystem can provide to the surrounding human community, e.g. habitat for nearshore species, food source for predators, including fishermen, mediate salt marsh accretion, mitigate wave and wind energy, and contribute to nearshore coastal shoreline protection.
2. The state of the *Ostrea lurida* population.
3. Threats to the *Ostrea lurida* population and Tomales Bay habitats.
4. What community members can do to help the *Ostrea lurida* population. Such as: (a) establish recruitment collection sites using oyster shell necklaces. (b) Outline the specific actions the community can do to reduce threats to *Ostrea lurida*.

Education and Outreach for *Ostrea lurida* in Tomales Bay



EO2: Outreach could include:

1. Engaging school groups in community science activities and developing educational materials for K-12 teachers.
2. Development of pamphlets for interested public, e.g. kayakers, property owners, aquaculture, etc.
3. Targeting boaters for assistance in monitoring restoration sites.
4. Creation of educational wayside signage for sites in all phases of restoration.
5. Engage diverse communities in recognizing the current and past cultural and economic value of *Ostrea lurida* in Tomales Bay and along the West Coast.

Education and Outreach for *Ostrea lurida* in Tomales Bay



EO3: The Working Group recommends the development of a Tomales Bay Community Science Program with the goal of increasing local community understanding of Tomales Bay ecosystem dynamics, local buy-in of the ecological and economic value of *Ostrea lurida* and increased potential for data collection that will better inform adaptive restoration of *Ostrea lurida* populations and habitat. Community Science could include assisting with:

1. Monitoring (e.g. water quality (salinity, sediment, temperature); *Ostrea lurida* population and related threats; man-made structures for oysters & oyster drills)
2. Removal of non-native oyster drills aligned with CDFW collection permit requirements
3. Fabrication of alternate oyster habitat, e.g. shell mounds, reefballs, habitat suspended from floats or piers, subtidal habitat attached to mooring anchors.
4. Installing appropriate hard substrate that acts as artificial oyster habitat and encourages oysters to recruit.

Education and Outreach for *Ostrea lurida* in Tomales Bay



EO4: Build and engage multi-organizational collaborations to share information about Tomales Bay *Ostrea lurida* oysters and to facilitate effective management of the oyster population's Tomales Bay ecosystem and surrounding human communities.

Questions?



Discussion & Voting



Action, motion to:

1. Adopt the Tomales Bay Native Oyster Restoration Working Group recommendations
2. Send the Working Group meeting notes to the GFNMS Superintendent for further consideration.



Native Oyster, *Ostrea lurida* Population Enhancement



PE1: Undertake phased restoration activities to augment the self-sustaining population of the Tomales Bay native oyster, *Ostrea lurida*, robust enough to be resilient to projected climate-related threats and episodic recruitment and mortality. Oyster restoration activities with potential to negatively impact sensitive habitats, like eelgrass, should be avoided.

Phase 1: Implement and monitor pilot restoration projects in 2020 at six locations (see Restoration Sites for *Ostrea lurida* in Tomales Bay) to better understand if these locations are appropriate for demonstration projects. Pilot projects should include experimenting with a range of restoration and monitoring methods to help managers better understand what are the most effective methods to use in Tomales Bay. Examples of methods to test are in the Working Group meeting materials. Evaluate pilot restorations against project-specific success criteria prior to Phase 2.