

RESOLUTION of the
Greater Farallones National Marine Sanctuary Advisory Council

To support staff recommendations within the Tomales Bay Topic Briefing

At its meeting on May 9, 2024, the Greater Farallones National Marine Sanctuary Advisory Council suggested edits to the staff recommendations within the Tomales Bay Topic Briefing. The council passed a resolution to support the staff recommendations with the suggested edits.

Attachments: Tomales Bay Topic Briefing

This resolution was passed with majority vote by a quorum of primary members (or alternate members serving in place of primary members) at a public meeting on May 9, 2024 held on-site in Stinson Beach, CA. Council discussion regarding this resolution can be found in Meeting Highlights documentation at https://farallones.noaa.gov/manage/sac_meetings.html.

The council is an advisory body to the sanctuary superintendent. The opinions and findings of this letter/publication do not necessarily reflect the position of the sanctuary and the National Oceanic and Atmospheric Administration.



Briefing on Tomales Bay in Greater Farallones National Marine Sanctuary

State of the Resource

Condition Report Data (in preparation)

- Water Quality:
 - Tomales Bay is listed as impaired under Section 303(d) of the Clean Water Act due to sedimentation/siltation, nutrients, mercury, and pathogens. Advisories for swimming and consumption of seafood were present in Tomales Bay without a clear trend. Sea Surface Temperature, aragonite saturation, and salinity increased during the study period. Water quality parameters in Tomales Bay are monitored by a variety of agencies and organizations including: Tomales Bay Watershed Council, Environmental Protection Agency, California State Water Quality Resources Control Board, and California Department of Public Health.
 - Water quality risks to human health included exceedances of shellfish biotoxin saxitoxin (the toxin causing Paralytic Shellfish Poisoning), and from a norovirus outbreak from a shellfish aquaculture operation in Tomales Bay in 2018-2019. To mitigate risks to human health, four types of shellfishery closures (due to rainfall¹, PSP, *Vibrio*, and norovirus) occurred in Tomales Bay; no clear trend was evident.
 - Sea Surface Temperature increased during the study period in Tomales Bay and positive anomalies were observed during the Marine Heatwaves (MHWs) in 2014-2016 and 2019.
 - For aragonite saturation (a measure of carbonate ion concentration used to track ocean acidification), seasonal patterns were observed which included decreases in winter below the threshold considered more difficult for shell forming. However, there was an overall increase in aragonite saturation since 2014, which is more favorable for shell-forming organisms
 - Seasonal patterns were observed in stream flow discharge into Tomales Bay and salinity. During the study period there was a significant decrease in discharge and an increase in salinity.
- Habitat:
 - Restoration of marsh and eelgrass habitats appear to be improving these habitats in certain locations.
 - Marsh restoration has occurred at the southern end of the bay at Giacomini Ranch since 2008, which has resulted in improved hydrology across 51 acres of marsh floodplain and new tidal channels being formed (Parsons & Ryan, 2015). More data are needed to determine the trend for marsh and mudflat habitats
 - Surveys may suggest an increase in eelgrass extent in Tomales Bay, although the difference in methodologies used complicates the

¹ Heavy rainfall can lead to increased runoff and pollutants from land in coastal waters, which accumulate in shellfish. Rainfall closures are preemptive based on forecasts and previous testing data to prevent human health impacts from contaminated shellfish consumption (Rankin, 2022).

assessment of a trend. Anecdotal evidence suggested there were dense eelgrass beds in Tomales Bay that appeared to be healthy and may be expanding; the presence of eelgrass wasting disease was of concern.

- More data are needed to better understand any specific, quantitative changes in mudflat, marsh, and eelgrass habitat over time.
- Living Resources:
 - Overall, more information is needed on the abundance and density of Olympia oysters. Non-indigenous species are present in Tomales Bay. Information on seabirds and shorebirds, fish, and marine mammals are covered in other topic briefings.
 - Anecdotal reports from Tomales Bay suggest Olympia oysters were once abundant enough to benefit the ecosystem by improving water quality through filter feeding and providing structure (i.e., a reef comprised of shells) to help buttress fragile shoreline habitat against waves, storm surge, or future sea level rise. Abundance and density have not been assessed in recent years and it is unknown if Olympia oysters are providing these ecosystem services at their current abundance.
 - 61 non-indigenous species are known to exist in GFNMS estuaries (not specific to Tomales Bay). Green crabs, Japanese oyster drill, Atlantic oyster drill and Japanese mud snail are species of interest for Tomales Bay. Trends for the Japanese mud snail and Atlantic oyster drill varied from 2009-2019 and the Japanese oyster drill decreased after 2015 and has remained low.

Climate Vulnerability Assessment Findings

- Vulnerability is calculated from exposure to climate and non-climate stressors, sensitivity to those same stressors, and the resource's ability to adapt to the impacts. Ratings presented are from the original 2015 report and from 2023 revisions of some indicators.
- Estuaries have a **high vulnerability** score (second most vulnerable habitat in the sanctuaries) based on very high exposure to climate change stressors, namely increased water temperatures, wave action and sea level rise, and reduced dissolved oxygen, and high or moderate sensitivity to sea level rise, sea surface temperature, and precipitation; however, estuaries do exhibit high adaptive capacity due to high species diversity and value to people. Estuaries also have very high exposure to non-climate stressors such as land use impacts; disturbance from structures, vessels, or moorings; and invasive species. The vulnerability of estuaries did not change since the original assessment.

Pressures on Tomales Bay

- Sedimentation/siltation
- Nutrients and pathogens
- Anchoring in eelgrass

Summary of Relevant Regulations

All regulations related to discharge, seabed disturbance, wildlife take and possession, introduced species, and motorized personal watercraft apply to Tomales Bay. Specific regulations that apply within or directly adjacent to Tomales Bay include the following:

- There is a Special Wildlife Protection Area that prohibits disturbing marine mammals and seabirds by flying aircraft below 1,000 feet above ground level at Tomales Point.
- There is a prohibition on anchoring a vessel in a designated seagrass protection zone in Tomales Bay, except as necessary for aquaculture operations conducted pursuant to a valid lease, permit or license.

See full text, definition, and exemptions on the regulations page of the [GFNMS](#) website.

Summary of Relevant Sanctuary Projects

Conservation Science

- Beach Watch survey sites: Tomasini Creek Beach, Brazil Beach, Dillon Beach
- Sediment science in the sanctuary assesses long-term coastal change at erosion 'hotspots' in Tomales Bay to understand the impacts of storm flooding and sea level rise inundation and identify nature-based solutions to address impacts to shoreline ecosystems.

Resource Protection

- Review and comment on project proposals, including proposed actions from other agencies, that could potentially: 1) violate sanctuary regulations and impact Tomales Bay habitat, species, water quality and hydrological functions or 2) protect and restore Tomales Bay. For example, review of Marin County's living shorelines project to allow for transitional habitat in areas that are affected by sea level rise.
- Through permitting actions the sanctuary manages, reduces, or eliminates injury to Tomales Bay.
- Work with NOAA's Office of Law Enforcement to document incidents that violate sanctuary regulations and/or injure Tomales Bay resources.
- In partnership with all agencies with jurisdiction in Tomales Bay, implement the Vessel Management Plan
- In partnership with the California State Lands Commission, implement the Tomales Bay Mooring Program.
- Coordinate with other stakeholders to promote and implement programs that aim to protect Tomales Bay.

Education and Outreach

- School programs
 - Teacher professional development in partnership with Marin County Office of Education including lesson plan modeling, kayaking, eelgrass exploration, and interviews with scientists. Training was part of a year-long intensive professional

development effort with 27 teachers to develop Next Generation Science Standard units focused on climate change and local coast and ocean habitats.

- Community Programs
 - Sanctuary Explorations: Kayak trips (including evening bioluminescence trips) for the public with participants led by local kayak outfitters and sanctuary educators.
 - Sanctuary Naturalist Training Program includes a Bay and Estuaries module with sections highlighting Tomales Bay physical factors, biological communities, protection, and how to plan a visit.
- Exhibits/Signs
 - Miller County Boat Launch Interpretive Sign about Eelgrass/Tomales Bay
- Media and Outreach activities
 - Radio program/Podcast “Ocean Currents” Episodes focused on Tomales Bay
 - Earth Is Blue Photos/Videos
 - Tomales Bay Boater Outreach

Infrastructure and Vessels

Sanctuary infrastructure supports this work through through office space, at sea assets, and administrative, logistical, and operational assistance including:

- Meeting spaces for staff and partners to collaborate on projects and storage for field equipment.
- Spatial analysis products and services
- Crissy Field Visitor Center as an exhibit and teaching space to deliver related programs to educate the public about the importance of Tomales Bay.
- GIS support for habitat mapping and to conduct spatial analysis in order to plan and assess resource protection activities.
- Government vehicles for transportation to and from Tomales Bay.
- Vessel support for field operations.

GFNMS Advisory Council Recommendations

These recommendations were provided during a GFNMS Advisory Council meeting on May 9, 2024. To view council discussion on this topic, please visit https://farallones.noaa.gov/manage/sac_meetings.html and view the meeting’s highlights.

Summary

Tomales Bay is an important estuary with international, federal, state and local designations to protect the waters and habitat. In general, information on the condition of Tomales Bay shows that there are water quality risks to human health, and that some habits appear to be improving, but there are living resources that may have impacts from diseases, are impacted from introduced species or are at population levels that may affect the ecosystem function of the Bay. Tomales Bay has a high vulnerability score due to climate change stressors and non-climate stressors. The sanctuary focuses on sediment science in Tomales Bay to assess long-term coastal change at erosion 'hotspots'. The sanctuary, with partners, implements actions that

protect and restore Tomales Bay including vessel and mooring management. Education projects inform students and adults about the importance of Tomales Bay through school programs, community programs, exhibits and signs, and targeted outreach to visitors. Sanctuary infrastructure supports this work through office space, at sea assets, and administrative, logistical, and operational assistance.

Staff Recommendations

Conservation Science:

- Update the science needs assessment and develop a science plan for estuaries in GFNMS to address the highest priority needs.
- Explore partnerships with agencies and organizations conducting research and monitoring on water quality in Tomales Bay to identify synergies and opportunities to address sanctuary priorities.
- Support or conduct monitoring to understand the status and trends of water quality, habitat, and species to inform management of Tomales Bay including sediment management.
- Develop and implement long-term programs to monitor extent and health of eelgrass

Resource Protection:

- Continue to review and comment on project proposals, including proposed actions from other agencies, that could potentially: 1) violate sanctuary regulations and impact Tomales Bay habitat, species, water quality and hydrological functions or 2) protect and restore Tomales Bay in order to maintain Tomales Bay as a UN Wetland of International Significance.
- Continue to work with all agencies with jurisdiction in Tomales Bay to implement the Vessel Management Plan.
- Continue to partner with the California State Lands Commission to implement the Tomales Bay Mooring Program.
- Encourage good boating practices and stewardship of sanctuary resources through outreach to the local boating community.
- Consider a role in coordinating with agencies and organizations monitoring water quality impacts in Tomales Bay in order to promote a holistic approach to ameliorate impacts.
- Review eelgrass bed survey data to determine the extent of the beds and determine if changes to the designated seagrass protection zones and regulations are needed.
- Conduct research on potential impacts of climate and other human activities on eelgrass. Explore programs to actively restore and protect eelgrass beds as necessary.
- Add low over flight regulations (including drones) – from the recommendation from GFNMS Advisory Council
- Explore the use of new technology data from overflights in Tomales Bay
- Monitor and mitigate the impacts of the increase of human use in and around Tomales Bay.

Education and Outreach:

- Highlight Tomales Bay as a local focus for school curriculum and public programming in Marin and increase awareness of Tomales Bay as a regionally significant location ecologically, recreationally, culturally, and for public benefit.
- Expand programming and teacher training with Shoreline Unified School District schools to build stewardship and local awareness of the value of Tomales Bay.
- Increase awareness of the benefits of the Giacomini Wetland Restoration Project including accessibility, especially for people with disabilities, to GFNMS through communications and media.
- Conduct outreach with Tomales Bay boaters, commercial outfitters and guides, for example, including exploring partnerships with other educational institutions for docent programs to incentivize positive behavior, or create a fish friendly pilot program.
- Increase signage on visitor engagement and resource protection around Tomales Bay
- Talk about the connection between Tomales Bay, estuaries and ocean to GFNMS

Infrastructure:

- Maintain meeting space and offices in San Francisco and Point Reyes Station to facilitate collaboration among science, resource protection, education, and operations staff and partners.
- Provide spatial analysis products and services.
- Expand Crissy Field visitor center to develop an estuary exhibit, provide teaching space to train teachers, and to deliver estuary habitat education programs to promote stewardship of Tomales Bay.
- Ensure staff have vehicle and vessel access to conduct field work. Partner with other agencies to share resources to protect Tomales Bay. Ensure GFNMS vessel has covered storage and dock access on Tomales Bay to facilitate field work.