



State of the Bay 2010 – A Conference about Tomales Bay and its Watershed
October 22-23, 2010 at the Inverness Yacht Club
Presented by the Tomales Bay Watershed Council

Abstracts from Conference Agenda

(In order of appearance).

Friday, October 22, 2010

Keynote Address by the Honorable Jared Huffman, California State Assembly, 6th District and Chair, Assembly Water, Parks and Wildlife Committee

See video of this keynote address on our website by clicking [here](#).

Overview of the Last Decade of Ecological Research on Tomales Bay

By Ben Becker, PhD, Pacific Coast Science and Learning Center, Point Reyes National Seashore

An overview of some recent research on Tomales Bay, including efforts to map physical features through LiDAR imaging, and research on the ecology and biodiversity of Tomales Bay's marine ecosystem.

Impacts of Ocean Acidification and Climate Change on Estuarine and Coastal Organisms

By Ann Russell, PhD, Associate Research Scientist, Dept. of Geology, University of California at Davis

Accumulation of fossil fuel carbon in the atmosphere since the Industrial Revolution has decreased ocean pH by 0.1 unit, leading to a 30% decrease in one of the building blocks used by marine organisms to form calcium carbonate shells and skeletons. The combined warming and acidification of ocean water will pose a challenge for these organisms, which have adapted to a relatively stable climate over the last 10,000 years. Our research group at the Bodega Marine Laboratory has several research goals: 1) to understand these climate effects on the larval development and post-settlement survival of native oysters and other near-shore invertebrates; 2) establish the variability of temperature, salinity, pH, and pCO₂ in estuarine and coastal waters in Tomales Bay and off Bodega, over annual to centennial time scales. In Tomales Bay, carbonate system parameters show strong seasonal variability linked primarily to winter fresh-water inflow and to marine carbon input during upwelling. Experiments with native oysters show that larvae raised under elevated pCO₂ (lower pH) conditions are significantly smaller than those raised under ambient conditions, and that this size discrepancy persists even after settlement.

Tomales Bay Watershed Species of Local Interest: update on a conservation planning tool

By Thomas Gardali, PRBO Conservation Science (contributors include: John Kelly, and Jules Evens)

The Tomales Bay Watershed Stewardship Plan, developed by the Tomales Bay Watershed Council (TBWC), outlined a framework for watershed stewardship intended to “guide future programs and projects and to assist funding organizations in ascertaining our [TBWC] needs at the watershed scale.”

Abstracts from State of the Bay 2010 – A Conference about Tomales Bay and its Watershed

The framework contained a series of goals, associated objectives, and an action plan needed for achieving the goals. One of the three goals (Goal B) is to “Restore and preserve the integrity of natural habitats and native communities” within the Tomales Bay Watershed and one of the key activities is to develop a list of “species of local interest.” The Habitat Committee of the TBWC was tasked with developing the Species of Local Interest (SoLI) project and have made substantial progress including drafting a definition of a SoLI, developing and defining scoring criteria, and nominating and scoring approximately 400 taxa. The scores are currently being reviewed by scientists with expertise in the watershed. Once the scores have been finalized, we will apply a ranking scheme to cull the 400 taxa into two prioritized lists: (1) local concern and (2) local pest species. The final lists will be used to prioritize and evaluate projects, provide conservation guidance, and prioritize research and monitoring activities.

Invasive Plants and their Impact on the Watershed

By Andrea Williams, Vegetation Ecologist, Marin Municipal Water District

Exotic or non-native species are essential to our lives, comprising over 98% of our food supply and generally much of our gardens as well. Some of these non-native species can become harmful to human health or the economy, or to the environment; these are termed invasive species. “Invasive” can also refer to native species which spread in an aggressive manner, but “invasive species” is an official term for harmful exotics. Invasive species arrive and spread in a variety of ways, and follow a predictable growth curve which is met by different management responses at different stages—often too late to be effective. The Bay Area Early Detection Network hopes to shift the paradigm to early action, matching the prevention and detection efforts found in human health. Early detection species and weeds of the watershed are discussed in the talk, as are specific effects of weeds; reasons they may be present in an area; and tools for dealing with them.

Status of Salmonids and Efforts for Restoration in the Watershed

By Mr. Eric Ettliger, Aquatic Ecologist, Marin Municipal Water District
& Mr. Michael Reichmuth, Fishery Biologist, National Park Service SF Bay Area Network I&M Program

The Tomales Bay Watershed is home to two species of anadromous salmonids that live in local creeks year-round: coho salmon and steelhead. Coho salmon is a federally Endangered species while steelhead is listed as Threatened. Two additional species, Chinook and chum salmon, periodically spawn in Lagunitas Creek in small numbers. Coho and steelhead are known to occur in the Lagunitas/Olema Creek watershed and in Walker Creek. These salmonids have suffered from logging, mining, water diversions, commercial and recreational fishing, agriculture, residential development and other human-caused and natural stressors. Populations of both species, but particularly coho salmon, have declined precipitously from historic estimates. Numerous agencies, non-profit organizations and individuals are involved in monitoring the populations and trying to restore them. Ongoing monitoring efforts include spawner surveys in fall and winter, smolt outmigration monitoring in spring, and juvenile salmonid surveys in summer. Restoration actions have included creek and estuary habitat enhancement, erosion control, barrier removal and artificial propagation. Despite the cooperative efforts of many people and organizations in the Tomales Bay Watershed, coho salmon remain at the brink of extinction.

Marine Mammals in Tomales Bay

By Sarah Allen, PhD, Senior Scientist, Point Reyes National Seashore

Marine mammals that venture, forage and breed in Tomales Bay are diverse including a total of 10 species. There are four cetacean species, two fissioned and four pinniped. Of the cetacea, gray whales are regular visitors of the bay, occurring year round and often are observed foraging on benthic invertebrates.

The other three species, minke whale, harbor porpoise and bottlenose dolphin are rare sightings. Sea otters also are rare visitors but river otters are abundant and occur year round, breeding in numerous locations in the bay. Pinnipeds straddle the land-sea boundary, both foraging in the bay and ocean, and breeding and resting on the land. Within Tomales Bay, both harbor seals and California sea lions pursue prey, especially on Pacific herring, within the bay, but of the pinnipeds, only harbor seals are year round residents that breed in the bay. The harbor seal population within the bay occurs mostly on the intertidal sandbars north of Tom's Point but they recently have begun reusing Hog Island. The seal population has been relatively stable for the past 15 years, although during El Nino events such as that in 1998, resulted in reduced pups born. Such events provide a window into how changes in climate might affect marine mammals in central California and Tomales Bay.

Tomales Bay Oceanography and how Climate Change may Alter Bay Environments

By Dr. John Largier, Professor, Coastal Ecology University of California at Davis

Tomales Bay is a “low-inflow estuary” typical of west-coast environments characterized by dry summers and wind-driven coastal upwelling. In winter, the oceanography of the bay is driven by land runoff events, whereas in summer the waters in the bay are only flushed infrequently by ocean-driven intrusion events. Following well-timed upwelling events, a cold near-bottom layer of high-nutrient ocean water can be observed intruding at least 2/3 of the length of the bay, delivering nutrients and plankton. The oceanography of Tomales Bay is thus driven by ocean and watershed, in addition to direct atmospheric effects. Being long and narrow the bay has a marked longitudinal structure, with many properties varying strongly with distance from the ocean. Stratification is generally weak. In contrast in the two tributary estuaries that form where Lagunitas and Walker Creeks enter the Bay, highly stratified waters are observed with strong tidal fluctuations, more characteristic of the drowned-river valley estuaries on the outer coast. During the long dry summers, a spatial maximum in phytoplankton is observed in mid-Bay.

Tomales Bay is subject to forcing from three systems, which are all changing in response to global climate change – watershed, ocean and atmosphere. Observations of rising sea level, increasing upwelling, decreasing pH, and more intense winter storms in the region are likely to lead to significant changes in the oceanography and ecology of Tomales Bay. Ongoing monitoring and study of environmental conditions in Tomales Bay are essential for developing credible projections of ecosystem change in the Bay.

Oil Spill Response in California

By Dr. Kathleen Jennings, California Department of Fish and Game - OSPR

California is a resource-rich state, with more than one thousand miles of outer coastline, four national marine sanctuaries, and more than three hundred threatened and endangered species. Tomales Bay and its watershed provide a home to many of these sensitive resources. One threat to coastal resources is oil spills. In recent years, several California oil spills have made national headlines, including the M/V Cosco Busan spill in 2007. Similar spills in the late 1980's and early 1990's led to both state and national pollution laws to prevent impacts of spilled oil to sensitive resources. The California law led to the creation of the Office of Spill Prevention and Response (OSPR) in the California Department of Fish and Game. OSPR is tasked with providing “...the best achievable protection of California's natural resources by preventing, preparing for, and responding to spills of oil and other deleterious materials and through restoring and enhancing affected resources.” This presentation covers all aspects of OSPR's spill response involvement throughout California.

Invasive Marine Species in Tomales Bay

By Dr. Ted Grosholtz, Professor and Swanz Chair in Cooperative Extension, University of California at Davis

Tomales Bay has many introduced species in the marine environment. The source of many new invasions is dispersal along the coast from major ports. Screening and quarantine procedures minimize aquaculture introductions, but commercial and recreational boaters may be introducing some species. Many of the introduced invertebrates and fish have been catalogued in the All Taxa Biological Inventory (ATBI) by PRNS and in the Species of Local Interest (SOLI) by local scientists. Removal and control programs for *Spartina* and the Asian mud snail have shown varying levels of success. Population trends for the European green crab and introduced whelks (oyster drills) show concentration of these invasive species in the inner bay, relative to the middle and outer bay. Many potential invaders that are prevalent in SF Bay have not made it to Tomales Bay. Climate change may have a significant impact on the rate and success of invasions by exotic species.

The Tomales Bay Vessel Management Plan

By Dr. Dominique Richard, Chair, Tomales Bay Working Group, Gulf of the Farallones National Marine Sanctuary.

This review of the Tomales Bay working-groups' efforts to provide input to the development of a vessel management plan for Tomales Bay by the Gulf of the Farallones National Marine Sanctuary. This includes an overview of jurisdiction, issues under consideration, recommendations by the working group, and future steps.

Saturday, October 23, 2010

County Efforts to Protect Water Quality and Improve Habitat

By The Honorable Steve Kinsey, Marin County Board of Supervisors

See video of this address on our website by clicking [here](#).

Dealing with Failing Septic Systems in the Watershed

By Ms. Liza Crosse, Aide to Steve Kinsey, & Mr. George Clyde, East Shore Planning Group

See video of this address on our website by clicking [here](#).

Water Quality in the Bay and Watershed

By Rob Carson, Water Quality Program Manager, Tomales Bay Watershed Council

Water Quality has always been a priority for The Tomales Bay Watershed Council. Monitoring water quality provides important information about public health issues, ecosystem health, and the effectiveness of restoration and management practices. Many groups, researchers, public agencies have conducted, or are currently conducting monitoring in the watershed. Data from most of these efforts are being compiled in the Council's database to enable a watershed-level analysis of water quality. The Council's Water Quality Monitoring Program has been conducting intensive monitoring at eleven tributary sites, and four bay sites since late 2007. These efforts are coordinated with the National Park Service's ongoing

monitoring in and around the Giacomini Wetland Restoration project area. This long-term dataset will enable a strong analysis of water quality trends in the watershed, and the effectiveness of restoration efforts. Results from our program have shown a strong correlation between storm-driven runoff and elevated levels of pollution in tributaries and in the Bay. Nutrient results show elevated levels even during base-flow conditions, although most results from the Bay itself show low levels through most of the year. Bacteria results show elevated levels during winter run-off periods in particular. Most monitoring sites exceed the State's contact or shellfish-harvesting water quality standards for some period of the year, and some sites exceeded the standard for most of the year. The Council's monitoring will continue, as will our efforts to gather data sets from outside groups and agencies to strengthen an analysis of water quality trends in the watershed.

Update from Point Reyes National Seashore

By Cicely Muldoon, Superintendent of Point Reyes National Seashore

Our success in restoration of Tomales Bay hinges entirely on continued collaboration and partnerships. There is a strong track record of this in Tomales Bay that we must continue to nurture. There are continued threats that critical coastal ecosystems face - pollution, invasives, climate change and the challenges are steep. It is critical that we continue to commit to this strong alliance of entities that care about the long term future of Tomales Bay.

Point Reyes National Seashore is committed to supporting partnerships that improve our understanding and management of our natural resources. Three examples of this commitment are housing, ranch restoration and science education. At the Tomales Bay Research Station at Sacramento Landing, housing is available to researchers and science interns year round, a critical piece of being able to attract high quality research projects. With park ranchers in the watershed, we actively collaborate on securing grants and completing small restoration projects that restore the land and reduce erosion, contributing to a healthier watershed. Finally, we look to the future, and are committed to developing the next generation of scientists and conservation leaders. The NPS Pacific Coast Science and Learning Center hosts science interns to work alongside park scientists, as well as immersion programs in marine and aquatic science for high school students from around the Bay Area.

Improving Watershed Health Through Large-Scale Wetland Restoration

By Lorraine Parsons, Vegetation Ecologist & Amelia Ryan, Wetland Ecologist, Point Reyes National Seashore.

Wetlands are believed to play many important functions for both wildlife and humans. However, these functions are lost when wetlands are developed or altered. Tomales Bay, located 30 miles north of San Francisco Bay, lost 50% of its wetlands in the 1940s when a large marsh was leveed for a dairy ranch operation. In 2000, the National Park Service bought this dairy ranch and began planning for a 613-acre wetland restoration project. In 2007-2008, the National Park Service restored hydrologic connectivity to the Giacomini Ranch by removing levees, tidegates, and culverts; realigning leveed creeks; filling drainage ditches; and constructing new tidal channels.

The Park Service believed that restoration could not only improve the quality of the remaining degraded wetlands within the ranch, but improve overall watershed health by increasing habitat for both resident and migratory wildlife, as well as improve downstream water quality. While Tomales Bay is often viewed as pristine and is a Ramsar Wetland of International Importance, its waters have been impacted by leaking septic tanks, agriculture, and mercury and are designated by the state as impaired under Section 303(d). Two-thirds of

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the Bay's freshwater input -- the principal contaminant source -- comes from tributaries upstream of the Giacomini Ranch, which will now be able to be filtered by the reconnected floodplains.

To determine success of restoration in improving wetland functionality, the Park Service developed an innovative long-term monitoring program is being conducted prior to and after restoration in both the Project Area and reference wetlands. Monitoring in the first year after restoration indicates that many of the improvements anticipated over the long-term after the former pasturelands evolved into salt marsh wetlands are already beginning to occur, including increases in wildlife use; changes in the type of wildlife using the Project Area; substantial reduction in pollutant concentrations; and active conversion of the old pastures by establishment of common and uncommon salt marsh plants.

Every plant species found in reference wetlands are already present in the Project Area. While overall plant species diversity is still much lower than in reference wetlands, it has increased significantly since year one, as has total plant cover. In addition, the site appears to be undergoing succession: fat hen (*Atriplex triangularis*), a non-native brackish marsh species which dominated many areas the first year, was much less common the second year, but was replaced in many areas by another non-native brackish marsh species, brass buttons (*Cotula coronopifolia*). In 2010, populations of two rare annual salt marsh plants colonized the restoration project area for the first time. Overall, initial indicators of plant community development are positive.

Shorebird Status in Tomales Bay: Response to Wetlands Restoration

By Dr. John P. Kelly, Audubon Canyon Ranch

Audubon Canyon Ranch has been working with numerous local birders to track changes in shorebird use in Tomales Bay since 1989. In anticipation of future restoration, we began monitoring shorebird use of the Giacomini Ranch in 1992. During the first year after tidal action was reintroduced into the Giacomini Wetlands, in October 2008, relatively little shorebird use was observed. In the second year after the restoration began, the number of shorebirds in the restoration area increased considerably, during winter and during spring and fall migration periods. In particular, increased use of the wetlands by Western Sandpipers, Least Sandpipers, dowitchers, and Greater Yellowlegs has been substantial. Using ongoing baywide monitoring results and long-term measurements of differences in shorebird use between northern and southern Tomales Bay, we are comparing resident shorebird numbers in Tomales Bay with numbers expected if the restoration had not occurred. Increased use of southern Tomales Bay by some wintering shorebird species suggests possible growth of local wintering populations. However, it is still too early to determine the extent to which increasing shorebird use in the developing tidal marsh reflects shifting habitat use by locally resident shorebirds or, alternatively, increases in the size of local wintering populations in Tomales Bay. Shorebird use in the Giacomini Wetlands and in southern Tomales Bay is sensitive to dynamic seasonal changes in habitat suitability, especially in relation to hydrographic changes associated with freshwater runoff and flooding in winter. Future use of the Giacomini Wetlands by shorebirds might reveal considerable seasonal importance of the restored habitat for feeding, but the potential value of the wetlands to shorebirds could be limited if the availability of food or suitable feeding areas is periodically reduced by heavy storms or runoff.

Overall Bird-use in Response to Wetland Restoration: Years 1 & 2

By Mr. Jules Evens, Principal, Avocet Research Associates and Research Associate, PRBO Conservation Science

Avocet Research Associates (ARA) began monitoring the avian communities within the 219 hectare restoration site shortly after the levee breach that returned the site to tidal influence in October 2008. We partitioned the year into three seasons: fall, winter, and spring (nesting). In fall and winter we conducted

absolute counts of all waterbirds using the site at approximately one-month intervals. Coverage was standardized for tidal influence and weather conditions. Species were grouped into three generic classes—waterfowl, shorebirds, and larids. From these data we derived summary statistics to describe the waterbird community using the site in each season and to compare results with those from surveys conducted prior to restoration. In April, May, June 2009 and 2010, we conducted fixed-radius (± 50 -m) point counts to document nesting species. From these data we derived species richness, diversity indices, and density values for each species and for each survey point to evaluate changes in the nesting bird community over time. During the fall and winter periods surface feeding waterfowl dominated the site, comprising 95.5 percent in Year-1 and 69.6 percent in Year-2. Shorebird use of the increased significantly in Year-2, especially during the spring (April) migratory pulse. Nesting season surveys of songbirds found an increase in abundance, density, and species diversity of wetland and riparian associates when compared to pre-restoration results. Increases in most passerines species were also evident from Year-1 to Year-2. Song Sparrow was the most abundant nesting passerine. Greatest increases in densities were noted in Common Yellowthroat, Savannah Sparrow, and Red-winged Blackbird.

Thirty Years of Preserving Agricultural Land in West Marin

By Mr. Robert Berner, Executive Director, Marin Agricultural Land Trust

The Marin Agricultural Land Trust (MALT) has been committed to the preservation of agricultural land in West Marin for more than thirty years. More than 62% of all agricultural land in Marin County is located within the Tomales Bay watershed. MALT has protected 36,400 acres of land within the watershed (or 47% of all of the agricultural land in the watershed). A major tool by which MALT achieves preservation is the use of Agricultural Conservation Easements which 1) prohibit subdivision & non-agricultural development, 2) permit “additional improvements and facilities reasonable and necessary to the ag uses of the property, and 3) Prohibit any uses that “result in significant soil degradation or significant pollution or degradation of any surface or subsurface waters.” Other tools include Creek Conservation Areas, which are integrated into Management Plans and aim “to protect the water quality, soil and bank stability, and the vegetative cover adjacent to water courses.” MALT also has an active Monitoring and Stewardship program to verify compliance with easement agreements, and a Stewardship Assistance Program which provides assistance to land-owners to implement conservation measures on their land.

Marin Farmers and Ranchers Conserving the Tomales Bay Watershed

By Mr. David Lewis, Director, Univ. of California Cooperative Extension Marin &
Ms. Nancy Scolari, Executive Director, Marin Resource Conservation District

Agricultural producers in the Tomales Bay watershed have a long history of implementing conservation practices for the protection of natural resources. This presentation provides a glance at the efforts by farmers and ranchers in protecting the resources they rely upon to maintain viable agricultural operations for future generations. Since the 1970s and the passage of the Clean Water Act producer participation in conservation projects has dramatically increased. Over 3,000 projects have been completed including streambank and gully repairs, filter strips, riparian fencing, native plantings and road repairs. These projects were preceded by extensive watershed studies and planning efforts conducted in the 80s and 90s. Most recently, water quality monitoring and studies conducted by the University of California Cooperative Extension Service have enabled producers and agricultural resource agencies to focus on the implementation of specific management practices and have demonstrated water quality improvements. Over 574 cubic yards of sediment at 284 sites have been prevented from entering waterways and 133,554

feet of stream have been revegetated. Agricultural producers will work toward future watershed improvements based upon planning documents, monitoring efforts and adaptive management.

Chicken Ranch Beach Restoration Planning by the Tomales Bay Watershed Council

By Neysa King, TBWC and Greg Kamman, Kamman Hydrology and Engineering

There is growing momentum and willingness to restore Chicken Ranch Beach and lower Third Valley Creek that has been demonstrated by willing adjacent private landowners, supportive agencies and broad-based community support. The Tomales Bay Watershed Council (TBWC) is undertaking a planning project to restore the degraded wetland and riparian corridor of lower Third Valley Creek and parts of Chicken Ranch Beach in Inverness, California. The potential project area includes the County owned Chicken Ranch Beach, and adjacent lands, which potentially include a State Lands Commission parcel to the west, and small portions of private lands adjacent to the beach and Third Valley Creek. The overall goal of the project will be to create a self-sustaining riparian and wetland system, requiring minimal operation and maintenance. Specific project objectives include:

- Address historic and current bacteria issues impacting the beach and improve water quality;
- Improve floodplain functionality and reduce flooding potential;
- Improve wetland, riparian and aquatic habitat values;
- Maintain beach recreation;
- Improve transitional zone between aquatic and marine habitats;
- Improve refuge habitats and connectivity between tidal marshlands along Tomales Bay;
- Reduce sediment delivery to Tomales Bay; and
- Restore native vegetation and remove non-native species.

TBWC is just completing the first phase of work to characterize existing site conditions and develop a preferred conceptual design that informs land acquisition, stakeholder participation and permitting. To guide this process, four (4) conceptual restoration alternatives spanning the spectrum of “no project” to maximum valley restoration have been identified and evaluated. The alternative designs propose varying degrees and blends of habitats, including (from upstream to downstream): riparian stream corridor, seasonal/perennial freshwater marsh, and tidal/saltwater marsh. This exciting restoration opportunity will result in lasting benefits to this popular and historic site, and to the rich mosaic of habitats along the shores of Tomales Bay.

Updates and Actions for Salmon in the Tomales Bay Watershed

By Chris Van Schaack, SPAWN and the Turtle Island Restoration Network

SPAWN volunteers and support staff continue to raise public awareness and to implement on the ground activities to enhance and restore habitat for wildlife, in particular salmon, in the Lagunitas Watershed. Educational opportunities include the Summer Salmon Institute, Creek Naturalist Training, and an array of classroom and field activities for students. Many community members learned more about wildlife and what is involved with improving salmon habitat through SPAWN’s nursery and restoration weekly volunteer days. Habitat enhancement activities include; the construction of rainwater harvesting facilities, production of native plants and projects focused on reforestation, sediment reduction and salmon habitat enhancement such as large wood placements. SPAWN continues its long term commitment to research and monitoring completing spawning and smolt outmigration surveys, water quality sampling and juvenile fish rescue.