

Watershed Connections

Photo by JD Lasica/Socialmedia.biz

TOMALES BAY NEEDS YOU. In the Tomales Bay watershed some 11,000 of us live, and up to 2.5 million people visit annually. We are intimately connected by our dependence on the clean, healthy water the watershed supplies for our drinking and irrigation needs—and also by our wastewater, including agricultural run-off and the septic system that nearly every house and business uses.

Each of us must participate and seek ways to protect and sustain the bay and its watershed for now and the future. To fulfill this need, the Tomales Bay Watershed Council will help provide a good future for our bay and community, and we ask you to join us.

The Tomales Bay watershed is a network of connections. As we look across this landscape, we can appreciate the vital importance of many of its parts. Creeks form pathways for birds and many kinds of wildlife and also act as a circulatory system, transporting water, nutrients and

waste. Healthy grasslands and croplands support livestock and agricultural products for human consumption, and they provide open space through most of the region. A productive and thriving estuary is home to marine mammals and birds; it connects a dwindling population of coho salmon to their spawning grounds in the large sub-watershed of Lagunitas Creek.

Considering this entire system in depth was the goal of our 6th State of the Bay Conference, in October 2010. From oceanography to local ranching needs, the presentations were rich in information (see page 3), and all are accessible online at www.tomalesbaywatershed.org.

Each person reading this is connected to Tomales Bay watershed—as a resident or visitor—and we welcome you and urge you to join in this Council. Read this *Bulletin*, and consider becoming an active member. We need you, just as you and all life here need healthy water. 🌊

—*Neysa King, Tomales Bay Watershed Council Coordinator*

A Dynamic System—and Facing the Effects of Global Change

Tomales Bay: Essentially an Estuary

by Tomales Bay Watershed Council staff

OUR COMPLEX WATERSHED. Protecting the lands and waters of the Tomales Bay watershed is the mission of Tomales Bay Watershed Council. Yet this watershed has many aspects, and Tomales Bay is subject to many influences.

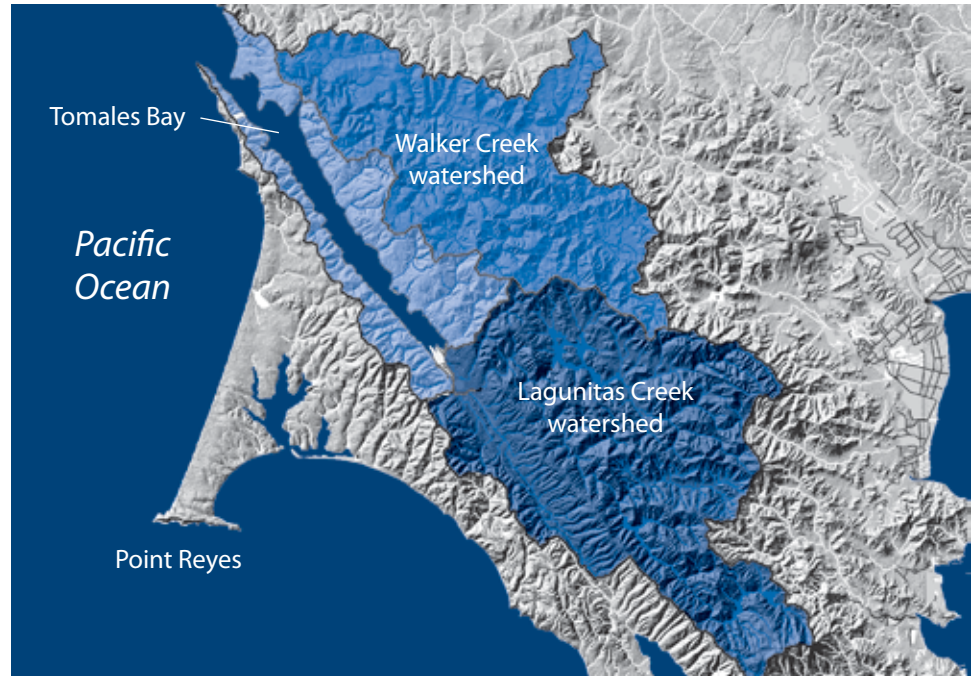
Usually we think of a watershed as all of the lands that drain to a common water body—in this case Tomales Bay. So we understand that improving conditions within the bay depends on how well we manage the lands that drain into the bay, as well as activities in the bay itself.

Lands draining into the bay can be viewed as three watersheds in one: the two large creek drainages, Walker Creek and Lagunitas Creek, and the area encompassing all the smaller tributaries on the east and west shores of Tomales Bay.

Yet there's an altogether different perspective on this region that came to the foreground at the 2010 State of the Bay conference. Namely: consider the bay as an estuary—a place where the fresh water of rivers mixes with the salt water of the ocean to create an area of transition. With that in mind, we need to think of the “other” watershed of Tomales Bay: the Pacific Ocean. What's more, a view to the future indicates the strong likelihood of climate-change effects in the watershed.

See the presentation by John Largier, PhD. at www.tomalesbaywatershed.org/stateofthebay2010.

TOMALES BAY IS AN ESTUARY. An estuary is a place where the variable nature of the habitat is what makes it rare and valuable. We easily recognize that water conditions—and therefore the habitats of the bay—vary seasonally with our dry summers and wet winters. The high creek flows during winter storms bring pulses of fresh water and with them both nutrients and contaminants. This flow of nutrients



from the creeks (originating on the lands of the watershed) and from waters flowing in from the ocean is what drives the growth of phytoplankton—microscopic algae that form the base of the food web—which in turn feeds zooplankton (tiny water-dwelling animals), larger shellfish, crustaceans, fish, birds, and seals. In summer, there is very little inflow; in fact more water evaporates from the surface than flows in. Then the water in much of the bay becomes “hyper-saline” or saltier than the ocean.

THE OCEAN'S INFLUENCE. Seasonal events in the ocean also have a strong influence on Tomales Bay. Upwelling in the ocean occurs when deep, cold water rises to the surface. A localized upwelling zone is what makes the ocean near Central California so productive and home to such a great diversity of marine life. When upwelling is at work in the nearby Pacific, nutrient- and plankton-rich waters fill the outer bay, but only on two or three occasions in summer, when conditions are just right, will these cool rich waters intrude far into Tomales Bay.

THE INNER BAY AND THE OUTER BAY. As a “low-flow” estuary, only the portions of Tomales Bay near the mouths of Lagunitas and Walker creeks are heavily influenced by



Hog Island and northern Tomales Bay. Fog in summer forms when warm moist air from the Pacific Gyre condenses over the cold, upwelled water in the California Current.

freshwater river flow. And these two regions differ from one another. The inner portion of the bay near the mouth of Lagunitas Creek is isolated, and water here has what is called a long “residence time;” that is, it stays in place for months. The outer bay is an extension of the Pacific Ocean: water and nutrients are moving in and out of the outer bay with the tides, and the residence time is only two or three days on average.

Environmental variability in Tomales Bay occurs on multiple time scales. Normal changes in rainfall patterns

produce effects over seasons and years. Climate cycles, over spans of 10 to 20 years, fluctuate between periods of wet winters and periods of drought, periods of strong and weak ocean upwelling. The past decade has been one of strong upwelling, with sea water high in nutrients benefiting organisms such as fish, crabs, and shrimp.

Tomales Bay and Climate Change

SUPERIMPOSED on these shorter-term variations is long-term climate change. While scientists are convinced that long-term climate change is accelerating global warming and sea level rise, exactly how these changes will affect our local environment is still a point of speculation.

MORE CHAOTIC CLIMATE AND ESTUARINE ENVIRONMENTS. The consensus appears to be that our weather will become more variable and more intense. We are likely to see stronger rains in the winter leading to unusually large runoff events, creating larger plumes of fresh water that will persist for longer periods of time in the bay. Periodic drought conditions may become more severe. Summer winds are likely to intensify. Upwelling of colder deep water will last longer, and the usual two to three ocean-water intrusion events in Tomales Bay might become six or seven. Phytoplankton blooms may become more common.

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State of the Bay: A Report to the Watershed

In October 2010, the Tomales Bay Watershed Council convened the **6th State of the Bay Conference**. The goal was to call together scientists, managers, and interested members of the public to share information about Tomales Bay and to identify opportunities for the future protection of the watershed. The two-day event, held at the Inverness Yacht Club, made clear the importance of people being informed and active members of this network of stewardship for Tomales Bay and its watershed.

As this *Bulletin* reports (pages 2–4 and 6–9), the conference included fascinating research reports. Their subjects included **recently identified species in the bay**, other discoveries, and ongoing research (Dr. Ben Becker, Point Reyes National Seashore); the process of **ocean acidification** and ways Tomales Bay is and will be affected (Dr. Ann Russell, U.C. Davis); the **Species of Local Interest** database that a number of experts working in and around the watershed have created (Tom Gardali, PRBO Conservation Science); **trends in marine mammal populations** (Dr. Sarah Allen, Point Reyes National Seashore); and the **oceanography** of Tomales Bay and **the nature of an estuary** like ours (Dr. John Largier).

Many other presenters spoke about **invasive species, agriculture** and ongoing programs to support local ranching needs, ways we are addressing **septic systems**, monitoring our effects on **water quality**, and of course, the **Giacomini Marsh Restoration** project.

Thanks to Peggy Day of West Marin TV, **video recordings of all the presentations** at the conference are available for viewing at our website www.tomalesbaywatershed.org. You can now “virtually attend” this extraordinary gathering of experts and concerned citizens of the Tomales Bay watershed. Welcome to the State of the Bay! Read selected summaries of the conference in this *Bulletin*.



Shoreline at Shell Beach, Tomales Bay.

SEA LEVEL RISE. The historic rate of sea level rise, measured at the Fort Point tide gage, has been .08 inches per year since 1900, or 8 inches in 100 years. Scientists agree that the rate of sea level rise is accelerating, but they differ in estimates of how much. The State of California is using a planning range of 12–17 inches by 2050 and 20–55 inches by 2100. With this increased rate of sea level rise, we can expect unprecedented losses in estuarine, intertidal, and transition upland habitats.

We are fortunate that the Giacomini Wetlands restoration project (detailed in our 2008 *Bulletin*, online) has increased the resilience of the Tomales Bay estuary to the changes expected with sea level rise. In contrast, elsewhere in the bay and throughout coastal California, most wetland areas will decrease in size over the coming years due to sea level rise.

IMPACTS ON HUMAN ENVIRONMENTS. Our human environments will feel the effects of greater storm surges and wind and wave energy, leading to increased coastal flooding and erosion and intrusion of salt water into local coastal drinking water wells. Now is the time for us to begin considering how these changes will affect not only this watershed's human residents and visitors—but also all the other living things that depend upon the Tomales Bay environment.

OCEAN ACIDIFICATION. Accumulation of fossil-fuel carbon in the atmosphere is making ocean waters more acidic. The increasing acidity of ocean water entering Tomales Bay makes it harder for shell-building organisms such as oysters, mussels, and limpets to form calcium carbonate shells.

Researchers, including Ann Russell and colleagues at the U.C. Davis Bodega Marine Laboratory, have experimented with the effects of different levels of atmospheric carbon on our native oyster. Under conditions simulating future ocean acidity, they measured a slight decrease in size of settled larval oysters and a significant decrease in the growth rate of juveniles.

Stewardship

TOMALES BAY is a vibrant system that encompasses all the lands, flowing fresh waters, estuarine variability, and oceanic influences that create its biodiversity. This rich and sensitive watershed will merit our study and protection—and everyone's participation in its stewardship—now and for the future. 🌊

You are a watershed inhabitant.

Everyone living and visiting here contributes to the well-being of the Tomales Bay watershed ecosystem.

Tomales Bay Watershed Council represents you in the collaborative stewardship efforts this place needs and deserves.

Support your Council's work. The health of Tomales Bay watershed depends upon your participation and help.

Please donate now at www.tomalesbaywatershed.org.

We genuinely need your support. For more information, email Coordinator neysaking@tomalesbaywatershed.org or Water Quality Pgm Mgr robcarson@tomalesbaywatershed.org.

Call 415-868-9081 ♦ Visit www.tomalesbaywatershed.org

The Health of Our Waters

by Rob Carson, Water Quality Program Manager



Here's to our health! About three-quarters of the drinking water consumed in central and southern Marin County comes from the Tomales Bay watershed.

WATER QUALITY IS A CRUCIAL MEASURE of the health of aquatic ecosystems: it reflects our stewardship of the land through which water drains. The Tomales Bay watershed provides drinking water for almost 200,000 residents through public utilities: it provides not only local drinking water but about 75% of the water consumed in central and southern Marin County. A great many of us have a stake in the health of this watershed.

Making water quality integral to every cooperative effort toward a healthier watershed is part of Tomales Bay Watershed Council's (TBWC's) core work. We have consistently monitored 15 sites, four on the bay and 11 at tributaries, since the winter of 2007, in order to evaluate long-term trends in water quality watershed-wide. From TBWC's Water Quality Monitoring Program, we presented results from the first three years at the October 2010 State of the Bay Conference.

See video and slides of the presentation by Rob Carson at www.tomalesbaywatershed.org/stateofthebay2010.

COORDINATING AND COOPERATING. The local, state, and federal government agencies that monitor various aspects of water quality in the Tomales Bay region are not necessarily able to coordinate efforts, analyze, and communicate findings or to address the issues at the watershed level.

Fulfilling this vital role falls to TBWC's Water Quality Monitoring Program, which brings together everyone concerned. By sharing all the data available—from government agencies, academic researchers, non-profit groups, and others who monitor water quality in the region—the Council maintains a watershed-wide clearinghouse of information. This resource makes it possible

for anyone concerned to comprehensively analyze long-term water quality trends and also to assess restoration, management, and stewardship practices.


DEFINING PROBLEMS. Equally or more important, the Council monitors water quality in the entire Tomales Bay watershed for all the parameters identified as impairments here by the U.S. Environmental Protection Agency. This effort is already paying off: we are documenting persistent water quality impairments in the watershed, and we can analyze the magnitude, location, and duration of these problems.

SUPPORTING COUNCIL PARTNERS. A number of regional agencies and groups are members of TBWC (see the list on page 11), and they use our water quality data in their work to improve watershed conditions. We help the National Park Service monitor water quality in the Giacomini Wetlands, where results show that restoration has led to significant reductions of pollutant loading. We provide assessments of water quality by sub-watershed, enabling our partners to target projects in areas where the needs are greatest.

In building this program, the Tomales Bay Watershed Council has cultivated a unique capacity to collect, analyze, and communicate results from water quality studies

throughout the watershed. We are now better able to support the hard work of our members and partners by providing sound scientific water quality data that can be used to assess conditions, target improvements, and determine the effectiveness of restoration or implementation projects.

We hope to continue this monitoring program for many years to come, and to foster relationships and partnerships with land managers to improve the health of our watershed.

Your support of this program is critical to the success of our efforts. 

CARLOS PORRATA



Beach Water Quality Conditions

Tomales Bay Watershed Council is hosting a new web page with current advisory conditions for local water recreation spots.

www.tomalesbaywatershed.org/BeachWQ.shtml

Visit weekly for current conditions!

Status Report: Important Wildlife Populations

by Tomales Bay Watershed Council staff

NATIVE SPECIES: salmon, harbor seals, eelgrass, native oysters. **INVASIVE SPECIES:** thistles, pampas grass, encrusting algae, fouling organisms. A great many plant and animal species—native and invasive ones—inhabit the lands and waters of Tomales Bay watershed. How do we nurture the species that are of greatest importance to our ecosystem and control or eradicate those that pose the greatest threats? Scientific efforts to document and monitor important populations are yielding information upon which to base our stewardship action.

BIODIVERSITY INDEX. One of the first such efforts was to categorize just what species of plants and animals live here. Between the years 2002 and 2006, the National Park Service sponsored many studies to identify the forms of life that exist in Tomales Bay and its vicinity—everything from microscopic marine algae to sea lions. To date, an amazing 2,006 species have been identified as part of the Biodiversity Index. Remarkably, a species completely new to science was discovered in our eelgrass beds, a crustacean called *Nebalia kensleyi* that exists nowhere else in the world!

SPECIES OF LOCAL INTEREST. Now Tomales Bay Watershed Council and its partners are engaged in an effort to determine which of the myriad species that inhabit this place are of greatest concern—either because they are threatened or because they themselves threaten to become pests, causing both ecological and economic harm. The Species of Local Interest (SoLI) index will help us focus restoration and protection efforts and, in the case of pest species, eradication and control efforts. When completed, the index will provide conservation guidance and indicate priorities for research and monitoring. Resource managers are not waiting: even while the SoLI work is still in progress, they are starting to enact restoration programs already known to be necessary. Scientists working on the SoLI index have evaluated nearly 400 species to date; they suggest that 198 of these be considered “species of local concern” and another 168 as “local pest species.”

See the presentation by Tom Gardali at www.tomalesbaywatershed.org/stateofthebay2010.

Giacomini Wetland Restoration: Good news after two years! When the National Park Service undertook the restoration of 613 acres of tidal wetlands at the head of Tomales Bay in 2007–08, people were eager to witness the process of reclamation by nature. Many of us closely monitored the area’s changes in hydrologic connections, wildlife use, pollution concentrations, and vegetation communities. To everyone’s delight, the observed changes have occurred more quickly than anticipated.

See presentations about the wetland restoration by Jules Evens, John Kelly, Lorraine Parsons, and Amelia Ryan at the State of the Bay Conference (www.tomalesbaywatershed.org/stateofthebay2010).

There have been many significant increases in wildlife use, including in zooplankton populations (the base of the food web upon which the bay ecosystem depends), and in use of new habitat by both songbirds and shorebirds. Biologists have also found the tidewater goby (a federally endangered species) using the restored wetland and California red-legged frogs (federally threatened) breeding in new habitat created for them. Water pollution concentrations decreased for both bacteria and nitrates—significant because almost two-thirds of the freshwater input to Tomales Bay flows through this wetland system. The vegetation community is flourishing and evolving into a salt marsh. There is also significant increase both in total vegetation cover and in species diversity (though both are still lower than in reference marshes). Two rare plants have colonized the restored wetland for the first time (Humboldt Bay owl’s clover and Point Reyes bird’s beak). The most dramatic visual change to the area has been the natural development of tidal channels—the growth of hydrologic connections.

The wetland will continue to evolve naturally, in response to runoff and the tides, and to bring us new wonders in the years to come! To learn more about the restoration, visit: www.nps.gov/pore/parkmgmt/planning_giacomini_wrp.htm.



Native mud shrimp like the one at left are scarce in Tomales Bay due to an invasive parasite. An invasive whelk preys upon our native oyster (see box below).

The Invaders

MARINE INVADERS. What is an invasive species? More often than not, it is an animal or plant that has been introduced to our ecosystem, either deliberately as a food source or inadvertently in ship ballast or on a boat hull or other pathway. Some “invasives” are actually native plants or animals that have become problems because a change in the environment favored their spread, to the detriment of other species. Non-native species enter the waters of Tomales Bay from a variety of sources. Modern-day screening and quarantine procedures have largely eliminated aquaculture as a source, but bait is still fairly unregulated. Many new invasions are thought to be the result of small boats—recreational and commercial fishing boats—traveling along the coast. Keeping boat hulls and moorings clean can go a long way in reducing unwanted introductions.

ESTUARIES ARE ESPECIALLY SENSITIVE. Invasive species cause problems in many environments around the world, but estuaries appear to be particularly susceptible to invasions, due in part to these ecosystems’ variable

Ecological consequences of invasions are often complex. An example concerns whelks (also called oyster drills), crabs, and oysters—some native species, some introduced. Whelks prey on oysters. Crabs prey on whelks. So a healthy population of crabs helps keep the whelks in check and allows the oysters to thrive. In the outer, more saline areas of Tomales Bay, native crabs are effective in this role. In the inner, more brackish areas, European green crabs have largely replaced the native crabs, and Atlantic and Japanese whelks have replaced native whelks. The introduced crabs are not as good at preying on whelks, and the whelks seriously impact oyster populations. This situation may affect human efforts to restore native oyster populations.

nature. Successful invaders are often species that tolerate a wide range of environmental conditions (such as water temperature and salinity) and that can therefore out-compete native species. This is true in Tomales Bay, where the inner bay is more impacted by introductions than the outer bay.

PROBLEM SPECIES. Numerous invasive or problem species have adverse effects in the estuarine environment of Tomales Bay:

- Asian mud snails, introduced in the 1940s, reach very high populations in some areas and probably cannot now be eradicated.
- *Gracilariopsis* is native red macroalgae that forms an encrusting mat on eelgrass. Recently, increases in the extent and density of this algae have been noted, thought to be associated with high nutrient inputs. High densities of *Gracilariopsis* slow the growth of eelgrass roots and stems. Thus, a detrimental change in the environment of the eelgrass beds may be one consequence of unnaturally high inputs of nutrients to the bay.
- Griffon’s isopod is a tiny introduced crustacean that is parasitic on mud shrimp. The native mud shrimp is thought to be an important source of food for juvenile salmon and many other species of fish. The isopod, which enters the shrimp’s gill chambers and feeds on its blood, has decimated the mud shrimp population here. Dr. John Chapman (University of Oregon), who studies mud shrimp, has been unable to find them recently in Tomales Bay.
- Fouling organisms, like the tunicate *Didemnum* and the bryozoan *Watersipora*, are still spreading. They are found extensively in subtidal habitats, including eelgrass beds. While they appear to have little impact on oyster survival, oysters do grow better when the fouling organisms are removed.

See the presentation by Ted Grosholtz at www.tomalesbaywatershed.org/stateofthebay2010.

NOT ALL OF THE NEWS IS BAD. Tomales Bay currently has only a moderate level of invasives. Many invaders that have had devastating impacts in San Francisco Bay, such as mitten crabs and Asian clams, have not yet made it

[please turn to page 8]

to Tomales Bay. Clumps of *Spartina densiflora*, a non-native marsh grass from South America, occasionally show up, but monitoring and removal efforts appear to be effective at keeping this invader from establishing a population.

What will the future hold? We really don't know how climate change will affect the rate at which species new to the bay take hold, or how successful the new organisms will be in relation to natives. Because successful invaders are often species that are adapted to stressful conditions, they may do better as rainfall and upwelling become more variable. Warming temperatures may already be responsible for the northward expansion of fish like California grunion, only recently reported from Tomales Bay.

INVASIVE PLANTS ON WATERSHED LANDS. Most exotic plant species inhabiting our watershed lands are not a problem; in fact, people *rely* on non-native species for 98% of our food supply. But a few species wreak a tremendous amount of environmental and economic damage, and these are referred to as "invasive." Caught early, some can be controlled, but as anyone knows who has ever tried to rid a garden of weeds, eradicating such plants once established is nearly impossible. Invasive species are second only to habitat destruction as a threat to biodiversity worldwide. Along with reducing wildlife populations, they can alter the way nutrients and water cycle through ecosystems, increase fire hazards, degrade scenery, and also cause a loss of forage for domestic animals.

WATERSHED WEEDS. Some of the more important weeds of the Tomales Bay watershed include:

- thistles (including distaff, plumeless, Italian, milk, and bull thistles; teasel; and native thistles)
- grasses such as Jubata grass, panic grass, veldtgrass, and beachgrass
- brooms (French, Scotch, Spanish)
- gorse
- annuals including geraniums and filarees, mustards and radishes, and annual grasses
- vines and groundcovers including periwinkle, English and cape ivy, and iceplants



Invasive Italian thistle (left) and Cape ivy.

GOOGLE IMAGES

EARLY DETECTION. Agencies and organizations are working together in hopes that problem species can be discovered and targeted for control before they get out of hand. Some of the species that the Bay Area Early Detection Network has targeted for monitoring and eradication

efforts include purple loosestrife, Chilean gunnera, giant plumeless thistle, and butterfly bush. If you discover these, or any plant that you believe is becoming a nuisance species, you are encouraged to take a sample (preferably the entire intact plant including roots) to the County Agricultural Extension office, where resource specialists will be happy identify it.

See the presentation on by Andrea Williams (MMWD) at www.tomalesbaywatershed.org/stateofthebay2010.

Coho: On the brink of extinction

POPULATIONS OF STEELHEAD, CHINOOK, AND COHO salmon have declined precipitously from historic estimates. Steelhead and chinook are listed as threatened; coho are endangered and now hover on the brink of extinction. That is the bad news. The good news is that a whole array of state, federal, local, and volunteer organizations and individuals have mobilized to monitor all life stages of the fish and are engaged in extensive habitat restoration efforts to try and bring the coho back from that brink.

See the presentation on by Eric Ettlenger (MMWD) & Mike Reichmuth (NPS) at www.tomalesbaywatershed.org/stateofthebay2010.

ATTEMPTING TO REVERSE IMPACTS. Efforts now under way to reverse adverse impacts on threatened fish species include: the cessation of commercial and recreational fishing; fish passage and habitat improvements; and maintenance of minimum summer flows in Lagunitas Creek. By far the most dramatic effort is the Giacomini Wetlands restoration, which is providing critical salmon habitat.

LAGUNITAS CREEK 2010-11 SPAWNER SEASON.

Biologists from the Marin Municipal Water District (MMWD), the National Park Service (NPS), and the Salmon Protection and Watershed Network (SPAWN) conduct surveys of coho spawning in the Lagunitas Creek watershed. In the



PARALLONES NATL MARINE SANCTUARY

Coho salmon.

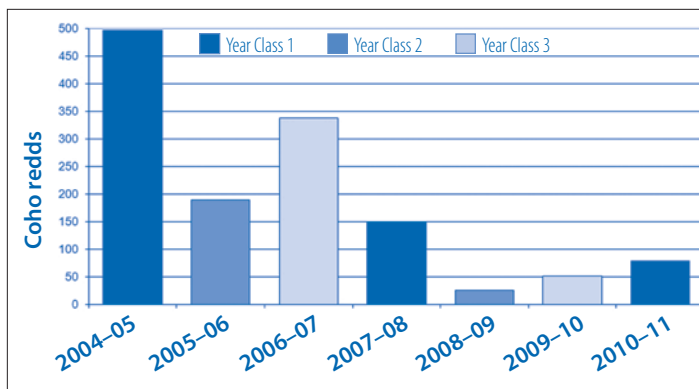
2010–11 season, they recorded 101 coho redds (gravel nests). MMWD biologists observed 32 redds in the main stem of Lagunitas Creek, 40 in San Geronimo Creek, and six in Devil’s Gulch. NPS biologists observed 21 coho redds in Olema Creek, and surveyors with SPAWN observed two redds in the tributaries to San Geronimo Creek. While this past coho run was larger than the disastrous two previous years’, it was just over half the size of the last run made by its generation, which spawned three years ago. Over the last ten years, about 270 coho redds per season have been observed on average, and this year’s run will go down as the third smallest recorded in the watershed. On a positive note,

high stream flows precluded additional spawner surveys in most of Lagunitas Creek. Surveys in the tributaries to Lagunitas Creek, though, found very few spawning steelhead or redds.

THE FUTURE OF COHO. We are not sure what the future holds for this key species, so important to the identity of

Tomales Bay and its watershed. Restoration and recovery work will continue as long as there is hope for bringing back this amazing fish. Monitoring techniques have improved so we can continue to keep track of vital life stages in coming years. Everyone can help by contacting any of the following organizations to volunteer to improve the coho’s chances for survival.

- Point Reyes National Seashore www.nps.gov/pore (415) 464-5131
- Marin Municipal Water District www.marinwater.org (415) 945-1128
- Salmon Protection and Watershed Network (SPAWN) www.spawnusa.org (415) 663-9534



Coho redds by year class 2004–2010 in Lagunitas Creek and tributaries (not including Olema).

nearly 70 percent of this season’s redds were located out of the main stem of Lagunitas Creek; eggs laid there are less likely to be washed away by floods.

Steelhead runs during the previous two years were also exceptionally small. This season, surveys indicated another small steelhead run, although weather patterns prevented thorough surveys for most of the spawning season. Due to dry weather early in winter, observers found no steelhead spawning until mid-February. Then frequent rains and

Coho are vulnerable through a range of habitats because of their complex life cycle: hatching and early growth of fry for a year in fresh water; growth to adulthood in the ocean; and returning to their native streams to spawn and die. The coho from Lagunitas/Olema and Walker creeks are part of a larger Central California Coast population—suffering throughout its range (from Punta Gorda to the north through the Aptos River near Santa Cruz). Stresses on the fish throughout the region stem from logging, mining, water diversions, commercial and recreational fishing, agriculture, residential development, and other human-caused and natural factors. Problems in Tomales Bay are not unique, but the Lagunitas Creek spawners once represented the largest spawning population of coho in the Central California Area and now are present only in precipitously low numbers.

Marine Mammal in Tomales Bay

SEALS, OTTERS, EVEN WHALES are part of the Tomales Bay wildlife community. See the box on page 11. 🐬

Chicken Ranch Beach Project Update

by Neysa King, Project Manager

GOOD NEWS! The Chicken Ranch Beach Restoration Project is much closer to realization, and we will select a preferred alternative this summer. Stay tuned for upcoming public meeting announcements!

Since the release of the “Draft Restoration Feasibility and Conceptual Design Report” in June 2010, our technical team has worked with our partners at the County of Marin, State Lands Commission, private landowners, and community members to integrate physical, biological, and political aspects of the project area into a series of project alternatives for the improvement of Chicken Ranch Beach and adjacent private and public lands. Our draft planning report, which is available at www.tomalesbaywatershed.org, includes a discussion of the flora and fauna found in the project area, as well as limiting factors that must be addressed as part of any final project that is developed.

The primary project goals include:

- Reduced sedimentation and bacteria delivery to Tomales Bay
- Improved wetland habitats along Tomales Bay, and the capacity of those ecotones to naturally respond and adapt to changes associated with sea level rise
- Restoration of a functional and self-sustaining riparian floodplain in the lower reaches of Third Valley Creek
- Improved wetland, aquatic and riparian habitats

Implementation of the final favored project concept will require the participation of both public and the



NEYSA KING

Third Valley Creek enters Tomales Bay at Chicken Ranch Beach. See www.tomalesbaywatershed.org for a complete view of the restoration plan for this sub-watershed, which encompasses riparian (freshwater stream), marsh, and estuarine habitats.

private landowners. The project alternative will include provisions to sustain access by beach users, and it observes the rights of the private property owners in all phases of implementation. The preferred project concept will re-establish a natural topographic gradient and contiguous riparian-to-bayland corridor. These site conditions will permit natural processes to drive adaptation to sea level rise in Tomales Bay, sustaining Chicken Ranch Beach for generations to come.

Specific project elements include:

- Creation of a self-sustaining wetland to replace Channel B
- Modification of runoff from Camino Del Mar to Third Valley Creek
- Rerouting Third Valley Creek to its historic outlet at the southern end of Chicken Ranch Beach
- Expansion and enhancement of ecologically valuable habitats in portions of the private and public parcels

The Council has also restarted water quality monitoring of nearshore bay water, Channel B, and Third Valley Creek this year. Unfortunately, bay water and Channel B continue to exceed state standards for contact recreation during the rainy season, and sometimes beyond. We will sustain sampling of bay water and Channel B during the recreational season, and we are now posting this information along with other sites in Marin County on our website (see page 5).

Recently, the property that lies adjacent to the State Lands Commission and county beach parcels transferred

ownership, and the Council is now working with the new owners to identify opportunities to proceed. The Council currently has funding to continue its project planning and facilitation role, and is seeking funds to complete all of the permitting necessary to implement this wonderful project with its partners at the Marin County Department of Parks and Open Space and the State Lands Commission. A final Conceptual Design Report will be released in summer 2011, with a public meeting to present the findings and to gather input on the next steps. 🦋

TBWC members & affiliations

Jerry Abbott • *Inverness Yacht Club*

Todd Barto • *California State Parks*

Gordon Bennett • *Save Our Seashore*

Maria Brown • *Gulf of the Farallones National Marine Sanctuary*

George Clyde • *East Shore Planning Group*

Liza Crosse • *Aide to Supervisor Kinsey*

Terri Fashing • *Marin County Stormwater and Pollution Prevention Program*

Ken Fox • *Tomales Bay Association*

Tom Gardali • *PRBO Conservation Science*

Stan Gillmar • *Inverness Association*

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Dale Hopkins • *Regional Water Quality Control Board*

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Michael Mery • *Watershed stakeholder*

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Carrie Sendak • *Salmon Protection and Watershed Network*

Gail Seymour • *California Department of Fish and Game*

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Amy Trainer • *Environmental Action Committee of West Marin*

Harbor seal. ▶



Marine Mammals. In Tomales Bay, harbor seals and river otters are resident, but eight other marine mammals species can occur here.

See the presentation on Marine Mammals by Sarah Allen, National Park Service, at the State of the Bay Conference.

Gray whales are regular visitors throughout the year and often feed in the bay on benthic invertebrates. Rarely sighted are minke whale, harbor porpoise, bottlenose dolphin, and sea otter. California sea lions frequently pursue prey in the bay. The Steller sea lion, whose population is decreasing in California, is only rarely seen in the bay. Elephant seals feed offshore and very seldom venture into the bay.

Harbor seals live in the bay, and their breeding numbers have been stable over the past 15 years. Nonetheless, seal numbers at haul-out sites within the bay vary in response to food abundance, weather patterns, predation, and disturbance by humans. For food, this seal population depends largely on Pacific herring and anchovies. Harbor seals frequent the intertidal sandbars north of Tom's Point and recently have begun reusing Hog Island. Undisturbed haul-out sites

are of particular importance, so kayakers (in particular) can avoid disturbing the seals by keeping their distance.

A "paddler's etiquette"—developed by resource management agencies together with conservation groups—has helped educate and decrease disturbances. Predation on harbor seals includes, most recently, coyotes seen stalking seals onshore; the local coyote population has increased. In years following El Niño years (when ocean water is warmer than normal), harbor seals produce fewer pups. If climate change brings more frequent and more intense El Niño events, harbor seal populations could decline.

River otters have recently grown in abundance and are increasingly common in the inner bay. It is not yet known just how they are making use of the bay's resources or why their numbers are growing. Otters eat salmon and steelhead but also non-native green crabs.



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AN ESTUARY IS A MIXING ZONE THAT COLLECTS WATER WITHIN ITS RIM OF SURROUNDING HILLS—FROM STREAMS, SURFACE FLOW, GROUNDWATER. IT IS ALSO PART OF A MUCH LARGER SYSTEM—THE MARINE ENVIRONMENT. WATERS MOVE BETWEEN THE ENTIRE TOMALES BAY WATERSHED AND THE GREAT CURRENTS OF THE PACIFIC OCEAN. HERE, EVEN THE SMALLEST ACT OF LOCAL STEWARDSHIP IS AN ACT OF GLOBAL CONSEQUENCE.

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BULLETIN PRODUCED BY CLAIRE PEASLEE EDITING AND GRAPHIC DESIGN

Inside the newest discoveries and insights about Tomales Bay watershed—reports from the comprehensive State of the Bay Conference in October 2010 **News Flash**—a resource for residents and visitors—current water quality conditions at local beaches (page 5) www.tomalesbaywatershed.org

Support the Council ♦ Get Involved

Please donate now at www.tomalesbaywatershed.org

♦ **Financial donations** to the Tomales Bay Watershed Council Foundation are tax-deductible and support the implementation of the Council's programs and projects, helping to realize the goals of the Watershed Stewardship Plan. To learn how your contribution can make a difference, contact Watershed Coordinator, Neysa King at 415-868-9081.

♦ **General meetings** of the Tomales Bay Watershed Council are held on the third Tuesday of each month and are open to the public.

♦ **Find out more** about the Council's mission, current activities and programs online at www.tomalesbaywatershed.org

Tomales Bay Watershed Council

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