2003 State of the Bay
Conference Proceedings

November 14th and 15th, 2003
Los Osos and Morro Bay

2003 State of the Bay Conference

The 2003 State of the Bay Conference took place on Friday November 14th at the Los Osos Community Center and Saturday November 15th at the Morro Bay Community Center. The conference was organized by the Morro Bay National Estuary Program to provide the community with current information about the health of the Morro Bay estuary, the priority issues facing the Bay, and ongoing efforts to address these issues.

More than 120 people gathered each day to see presentations by local and visiting experts. Field trips in the Bay and watershed were also well attended. The conference was recorded and broadcast on local television; videos of the conference are available from the Morro Bay National Estuary Program (MBNEP) office. Many of the presentations were made using PowerPoint slides, and these slideshows are available on CD by request from the MBNEP. Each speaker prepared a brief summary of their presentation for these proceedings. The MBNEP can be contacted for more information at 805/772-3834 or by email at staff@mbnep.org.

Thank you to the following people for their time and effort that made the State of the Bay event a big success…

SPEAKERS
Dr. Jeffrey Haltiner, Philip Williams and Associates
Dr. Martin Miller, Battelle Marine Sciences Laboratory
Dominic Roques, Regional Water Quality Control Board
Karen Worcester, Regional Water Quality Control Board
Kathryn McNeill, Regional Water Quality Control Board
Meredith Hardy, California Conservation Corps
Dave Highland, California Department of Fish and Game
Rebecca Ellin, Central Coast Wetlands GIS Project
Dr. Ronald Thom, Battelle Marine Sciences Laboratory
John Roser, Kern Co. Environmental Education Program
Greg Smith, California State Parks
Tom Edell, SLO County Bird Records Compiler
Dr. Chris Kitts, Cal Poly Biology Department
Shanta Keeling, Regional Water Quality Control Board
Rick Algert, City of Morro Bay Harbor Department
Dr. Dean Wendt, Cal Poly Biology Department
Ann Kitajima, Morro Bay Volunteer Monitoring Program

INFORMATIONAL BOOTHS
Friends of the Estuary
Morro Estuary Greenbelt Alliance
Environmental Center of SLO County
Small Area Wilderness Preserve
Morro Coast Audubon

FIELD TRIP LEADERS
Linda Chipping, San Luis Coastal RCD
Mike Stiles, Morro Coast Audubon
Jeff Grover, Cuesta Community College
Liz Caldwell, State Park Docent
Kara Hagedorn, Morro Bay Volunteer Monitoring Program
Pete Sarafian, Small Area Wilderness Preserve
Bill Hoffmann, Regional Water Quality Control Board

State of the Bay Conference Welcoming Address

Daniel Berman, Programs Manager
Morro Bay National Estuary Program

Good afternoon, and welcome to the 2003 State of the Bay Conference

I'm excited to see so many people here today who care about the health of the estuary, people who want to hear the latest information about water quality, eelgrass, sedimentation, and the many other issues facing the Morro Bay estuary. I'm excited to see you here, but I'm not surprised. I'm not surprised, because we are lucky enough to live in a community that cares about the estuary, and has been working to protect and preserve Morro Bay for decades. Thank you for being here.

As some of you may remember, this is not the first State of the Bay Conference. The first one was held in 1991, on the eve of Morro Bay's acceptance into the National Estuary Program. In fact two of our speakers here today also presented at the 1991 conference, and I bet they'll be here for the next State of the Bay Conference as well. Morro Bay was accepted into the National Estuary Program because of the concern, the dedication, and the hard work of people like them, and like you here today.

The Morro Bay National Estuary Program is a collaboration of partners working together to protect and enhance the estuary and its resources. I won't try to name them all here, but I encourage you to look over the poster that lists all of the MBNEP partners. All of these groups and agencies together make up the MBNEP. They helped create our Conservation and Management Plan, and they guide us in implementing it. In addition to the input of agencies and other groups, hundreds of people have volunteered their time and energy to help create the MBNEP, and to help shape our CCMP. Today volunteers serve on committees and working groups, and make up the core work force of the volunteer monitoring program.

We have a wonderful lineup of speakers for you both today and tomorrow, and some great field trips tomorrow morning. Thank you for attending, and enjoy the conference.

MORRO BAY
NATIONAL
ESTUARY
PROGRAM

Session I - Sedimentation in Morro Bay. Going, Going, Gone? Our Shrinking Bay

SEDIMENTATION PROCESSES IN MORRO BAY: A WATERSHED TO BAY PERSPECTIVE

Jeffrey Haltiner, Ph.D., P.E.
Philip Williams and Associates, Ltd.

Philip Williams and Associates (PWA) has participated in a series of studies on sedimentation processes in Morro Bay over the past 17 years, working with a variety of local and state and national agencies, including the California Coastal Conservancy, the Coastal San Luis Resource Conservation District, the Morro Bay National Estuary Program and the Central Coast Regional Water Quality Control Board.

Our initial assessment work focused on estimates of historic sedimentation rates in the Bay. This was accomplished by comparing bathymetric conditions in the Bay using an 1884 survey with current conditions, based on a 1998 resurvey of the Bay. Interpretation of these data indicated that 2 to 4-ft of sediment had been deposited in the bay over a period of 114 years, resulting in a net decrease in the bay tidal prism (volume of water exchanged between high and low tides) of about 20- to 25-percent. The decreased bay volume was most evident in the back Bay, due to expansion of the Chorro/Los Osos delta, and in the southern shoreline adjacent to Los Osos.

Based on available data, we developed an approximate sediment budget for the Bay, identifying the various sources of sediment supply and sediment removal from the Bay. The main sediment sources are littoral processes, fluvial supply and Aeolian (wind-driven) transport of sand from the barrier beach. Littoral transport of sand and silts by waves and near shore currents makes up the largest sediment source, but this material is excavated from the harbor mouth and channel on a regular basis to maintain navigability. Fluvial transport from Los Osos and Chorro Creeks deposits fine-grained silts and clays in the back Bay, and has produced an average of 30,000 to 40,000 cubic yards of net sediment accumulation per year over the historic time period, gradually reducing the bay volume. Deposition patterns seem to indicate that the sediment is deposited on the tidal flats, resulting in aggradation, while the slough channel system in the back Bay has actually expanded, resulting in a deeper, more extensive channel network draining the adjacent mudflats. This is a process typical of developing tidal wetlands, whereby the back Bay will eventually convert to intertidal marsh, consisting of vegetated tidal wetlands dissected by an extensive slough channel system. This type of ecosystem already occurs in the (expanding) Chorro-Los Osos delta.

Subsequent studies were conducted to assess how erosion control measures in the upper watershed could be effective in reducing sediment transport to the bay downstream. PWA identified potential floodplain restoration locations that offer sediment storage capacity and also provide improved habitat benefits. The key success of the project was in relating how sediment reductions of 25%, 50%, or 75% from the watershed could result in preserving Morro Bay as an open water estuary for several centuries into the future.

To provide immediate sediment reduction, PWA developed a plan to trap sediment upstream of the Bay on Chorro Creek. A 100-acre parcel of former agricultural land along Chorro Creek was acquired, and a plan developed to restore the site to riparian floodplain, using the dense native vegetation to reduce overland flow velocities and trap excess sediment on the floodplain. In addition, the creek channel was allowed to reestablish its historical alignment within the floodplain.

PWA participated with a team of biologists, engineers and planners to prepare conceptual designs, acquire the necessary permits and public support, prepare final design documents and assist the client in project implementation. The project was constructed in two phases, including an emergency phase (1994) following a major watershed fire and final construction in 1997. During the large floods of 1995 and 1997-98, the project trapped several hundred thousand tons of sediment that would previously have impacted Morro Bay. This project has received a number of awards in recognition of its multiple benefits to riparian habitat and contribution to the long-term health of Morro Bay.

Session I - Sedimentation in Morro Bay. Going, Going, Gone? Our Shrinking Bay

MONITORING SEDIMENT ACCUMULATION IN MORRO BAY

Dr. Martin C. Miller, Manager
Battelle, Marine Sciences Laboratory

In coastal wetlands, the elevation of the marsh plain and intertidal wetland varies with the tidal regime as well as with the availability of sediments. In most cases, the tidal prism of the wetland and/or estuary is reduced by land-use practices that enhance sediment input. The resulting accumulation of sediment reduces the wetland and intertidal areas and, eventually, changes the character of the ecosystem. Though this is a natural process in estuaries, the rate at which sediment accumulates is usually increased, sometimes dramatically, by land use practices and land cover changes associated with development.

Storm inputs of sediment can be a significant component of the overall sediment balance of some coastal wetlands: this is especially true in southern California where watersheds are small and steep-sloped, have been modified, include highly erodible soils, and have high-velocity flows immediately following rainfall events. Rainfall is highly seasonal with high interannual variability.

Only a few tested methods are available for determining the sediment accumulation rate in estuaries. Several, which have been used and documented in the peer-reviewed literature, include radiotracers, marker horizons, rare earth horizons, sedimentation pins and precision surveying (Cahoon, et al., 1999). More recent studies of sediment accumulation in wetlands (both saltmarsh and intertidal) have used Sediment-Erosion Tables (SET) to measure the small rates of accumulation typical of estuarine systems (Boumans and Day, 1993). This method has been used in 43 wetland areas to document vertical accretion, elevation, and shallow subsidence. Combined with marker horizon techniques, the SET can provide net accumulation rates that include subsidence due to compaction and desiccation as well as sediment input (Cahoon and Turner, 1989). The SET will be used in the Morro Bay estuary to determine the long-term sedimentation rate. Six locations will be selected for semi-annual monitoring over a five-year period.

Cahoon, D.R. and R.E. Turner. 1989. Accretion and canal impacts in a rapidly subsiding wetland II. Feldspar marker horizon technique. Estuaries, Vol.12, No.4, pp. 260-268.

Cahoon, D.r., J.W. Day, Jr., and D.J. Reed. 1999. The influence of surface and shallow subsurface soil processes on wetland elevation: A synthesis. Current Topics in Wetland Biogeochemistry, Vol.3 pp.72-88

Boumans, R.M.J., and J.W. Day, Jr. 1993. High precision measurements of sediment elevation in shallow coastal areas using a Sedimentation-Erosion Table. Estuaries, Vol.16, No.2, pp375-380.

Session I - Sedimentation in Morro Bay. Going, Going, Gone? Our Shrinking Bay

IMPACTS OF ACCELERATED SEDIMENTATION ON MORRO BAY'S HABITATS

Mike Multari, Program Director
Morro Bay National Estuary Program

Several studies have shown that Morro Bay is filling with sediment at a rate that has been accelerated due to human activities in the watershed such as ranching, mining, agriculture and development. In recognition of Morro Bay's ecological value, and the potential harm that could occur due to sedimentation, Congress authorized the Army Corps of Engineers to undertake an Ecosystem Restoration Feasibility Study, in partnership with the MBNEP, County of San Luis Obispo and the California Department of Parks and Recreation.

The ACOE developed a model to predict the amount of sediment that would most likely be deposited in the bay over the next 50 years. While there is considerable variability in the projected outcomes depending on assumptions about rainfall events over the next half-century, the average case indicates that approximately one foot of sediment would settle in the bay.

At the same time, a team of biologists inventoried the existing habitats in and around the estuary. They then modeled how a shallower bay 50 years hence would alter the location, amount and quality of those habitats. Their modeling indicates that the area most suitable for eelgrass beds will shrink by about 50 percent. The salt marsh will expand significantly, but the upper areas of the marsh will be increasingly above tidal influences. The resulting habitat will be degraded and less valuable. The area of mudflats will be largely unchanged. The loss of eelgrass habitat and the degradation of the salt marsh are considered significant impacts to the estuary's habitat value.

The details of both the hydrodynamic and biological models are not so important as the general trends that were identified. Substantial impacts on rare and valuable habitats are likely unless ameliorative actions are taken.

The ACOE identified several projects that might help the situation including selective sand removal and dredging to expand eelgrass beds, modifications to channels in the delta to improve the transport of suspended sediment by tidal action, stabilizing sand drifting into the bay from the spit, installing upstream BMPs and sediment traps, and restoring parts of the salt marsh that are already degraded. The next step will be a more detailed feasibility analysis of these possibilities. Decisions on whether to actually do any of them are probably at least two years away.

Session I - Sedimentation in Morro Bay. Going, Going, Gone? Our Shrinking Bay

SOLUTIONS TO SEDIMENT: SETTING GOALS AND STICKING TO THEM

Dominic Roques, Environmental Scientist
Central Coast Regional Water Quality Control Board

The Regional Board's water quality attainment strategy for sediment in Morro Bay identifies creek-borne sediment as the most controllable source of sediment to the estuary. The Board is pursuing a largely non-regulatory approach to achieving reductions in sedimentation from erosion sites throughout the watershed. This is an adaptive management approach in that it acknowledges that ecosystems are complex and inherently unpredictable, it embraces uncertainties of how the system will respond to management, and it attempts to structure management actions as experiments from which learning is a critical product.

The historical transformation of Morro Bay watershed made more sediment available while eliminating places for sediment storage on the valley floor. While much of the initial disturbance is behind us, many intensive land uses continue, and more importantly, the functioning of the watershed has been altered. Therefore, the Board's approach to reducing the amount of sediment entering critical creek and Bay habitats must acknowledge these facts and the direct effects on the biota. Effects include the loss of deep pools and spawning areas, important for fish, including steelhead.

The main elements of the Board's Water Quality Attainment Strategy for sediment, include:

- Problem description and source identification
- Selection and implementation of erosion control actions with stakeholders
- Monitor Water Quality and In-stream Parameters for threshold values
- Annual progress review
- 3-year review of actions,
- 50-Year Compliance Schedule

Implementation Actions include a broad range of activities that parties are committed to taking. It is the potential of these practices to reduce sedimentation that provides the Board with the assurance that we can attain our goal of 50% reduction.

Session II -Testing the Waters: Water Quality in the Morro Bay Watershed

PUTTING MORRO BAY IN PERSPECTIVE: A REGIONAL LOOK AT WATER QUALITY ON THE CENTRAL CALIFORNIA COAST

Karen Worcester, Staff Environmental Scientist
Central Coast Regional Water Quality Control Board

Five years of data from the Central Coast Ambient Monitoring Program helps to put the water quality issues we see in the Morro Bay watershed into a regional perspective. This talk summarized the status of data and information on several different water quality problems, specifically, nutrients, pesticides, metals, petroleum hydrocarbons, pathogens and pathogen indicators.

Average nitrate concentrations at the mouths of our streams and rivers (or "coastal confluences") range in value from near non-detectable in more pristine areas, to multiple-fold the drinking water standard in watersheds where intense agricultural activity and/or sewage treatment discharges increase nutrient loading. Compared to some of these latter watersheds, the concentrations in Los Osos and Chorro Creeks appear low. However, loading calculations estimate that approximately 200,000 pounds of nitrate enter the Bay each year. These loads may contribute to the large amounts of algae observed in the back bay, the low pre-dawn dissolved oxygen levels documented by volunteer observers, and other possible impacts. Nitrates have been linked to toxicity of *Pseudonitzchia* blooms in laboratory studies, and several excellent research projects are currently underway in our Region to examine the relationships between runoff, nutrients, and phytoplankton blooms.

Pesticides can be considered in two basic groups: legacy chemicals which have been banned for twenty five years or more, and currently applied chemicals. Legacy chemicals such as DDT are still causing problems in some areas. For example, a nesting failure of the Caspian tern in Elkhorn Slough in 1995 has been attributed to high levels of DDT brought in by flooding of the Pajaro River. Sand crab monitoring along beaches has detected elevated levels of DDT and other legacy chemicals in both Elkhorn Slough and the Santa Maria River areas. Morro Bay does not appear to have elevated levels of any of these chemicals. Currently applied pesticides are best monitored with multiple indicators, including toxicity and benthic invertebrate assessment. Toxic plumes of chlorpyrifos and other pesticides have been detected at locations in the Salinas River, the Santa Maria River, and elsewhere, but so far not in the Morro Bay watershed.

Elevated levels of chromium, nickel and other metals associated with serpentine soils have been documented in the Morro Bay watershed. Conventional wisdom has suggested this is a result of chromite mines in the upper Chorro Creek watershed. Coastal confluence monitoring of sediment in river mouths shows that the entire San Luis Obispo county area tends to have elevated levels of these metals, relative to the rest of the Region. Sediment core studies conducted by U.C. Berkeley graduate students found that metals increased dramatically in Morro Bay sediments in the late 1700's, then leveled off, and have even declined somewhat since about 1920. These studies imply that high concentrations are more associated with disturbance and erosion in the upper watershed, than with impacts from mines.

Pathogen indicators are used to test water for exposure to fecal material, and may not in themselves be pathenogenic. The County Health Department samples our beaches for pathogen indicators in order to assess beach safety, as mandated by Assembly Bill 411. This past year our

County scored in general very highly, with 82% of beaches scoring an "A", according to the "Heal the Bay" website (www.healthebay.org). The beach at Pismo Pier scored an "F", for as yet unknown reasons.

Pathogens themselves are proving to be a serious water quality concern for the threatened California sea otter. More than 25% of all mortalities can be attributed to this disease, as the primary or contributing cause of death. Morro Bay is a "hot spot" for *Toxoplasma*, with 78% of all animals tested in the vicinity showing exposure to the disease, and 67% of all dead animals showing evidence of infection from the disease. Followup studies are currently underway, and should help improve our understanding of the prevalence of *Toxoplasma* and other pathogens in the sea otter population, sources of pollutants, mechanisms of exposure, and the role of bioaccumulation of chemicals in sea otter mortality.

Session II - Testing the Waters: Water Quality in the Morro Bay Watershed

RANGELAND BMP'S – DO THEY REALLY WORK?

Kathryn McNeill, Environmental Scientist
Central Coast Regional Water Quality Control Board

For ten years, the Regional Water Quality Control Board (RWQCB) and California Polytechnic State University (CPSU) monitored the effects of rangeland Best Management Practices (BMPs) in the Morro Bay watershed as a part of the National Monitoring Program (NMP). Chumash Creek and Walters Creek were the focus of the study. Several BMP implementation sites, including two cattle exclusion projects, a privately owned rotational grazing project, and a floodplain restoration project, were evaluated to gain a watershed-wide characterization of water and habitat quality conditions.

Results of statistical analyses indicate significant positive changes in water quality, including decreased suspended sediment, decreased turbidity, decreased water temperature, stabilized levels of dissolved oxygen, and decreases in fecal coliform as a result of the BMPs implemented at different project sites. Additional information suggests that rangeland characteristics such as forage species composition and production improved and supplemental feed costs decreased following BMP implementation. These data have provided a basis for Total Maximum Daily Load (TMDL) development and self-determined nonpoint source implementation in the watershed. The project provided baseline values to establish the framework for a local Volunteer Monitoring Program and a regionally-scaled ambient monitoring program. The Morro Bay NMP is part of a continued effort to evaluate long-term effects of BMP implementation on California rangelands and water quality.

Session III - Towards Recovery of the Endangered Southern Steelhead

STEELHEAD HABITAT RESTORATION ACTIVITIES IN THE MORRO BAY WATERSHED

Meredith Hardy, Fish Habitat Assistant
California Conservation Corps

Steelhead habitat restoration activities have been taking place in the Morro Bay Watershed long before there was an organized effort. Recently, with the support and collaboration of funding agencies, sponsors, willing landowners and the California Conservation Corps, much has been done to move forward at a greater pace to improve habitat for the endangered steelhead.

Studies and assessments are done to create baseline data to drive the restoration activities in the most logical direction. Examples are the Comprehensive Conservation Management Plan (CCMP), Morro Bay Barrier Assessment and Habitat Typing. On the ground habitat improvement projects that have been formulated from these studies and assessments include projects on Walters, Pennington, Chorro and Los Osos Creeks. The project objectives have been to reduce land loss and sedimentation, increase riparian vegetation, and create instream habitat diversity by increasing pool depths and frequency.

Possible future projects include habitat restoration on Walters, Dairy and Los Osos Creeks, Sacramento Pikeminnow management on Chorro Creek, barrier removal or modification and road re-grading or decommissioning.

Restoring a viable steelhead fishery may become a reality through the partnerships and collaborations that have been developed in the Morro Bay Watershed to implement these habitat improvement projects. Through continued support and interest from the community, steelhead habitat restoration will make a difference to our future generations.

Session III - Towards Recovery of the Endangered Southern Steelhead

STEELHEAD IN THE MORRO BAY WATERSHED
CURRENT STATUS AND REGIONAL CONTEXT

Dave Highland, Fish Habitat Specialist
California Department of Fish and Game

The Morro Bay watershed with its two main sub-watersheds, Chorro Creek and Los Osos Creek, historically supported healthy populations of anadromous steelhead trout (Oncorhynchus mykiss) according to California Department of Fish and Game stream surveys and anecdotal data. A limited study of the distribution and abundance of steelhead in the Morro Bay watershed was sponsored by the Coastal San Luis Resource Conservation District (CSLRCD) in 2001 and conducted by Thomas R. Payne and Associates.

The study characterized steelhead populations in the Chorro and Los Osos Creek drainages. Although remnant populations remain in both sub-watersheds, numerous anthropogenic factors have contributed to declines in these populations from historic numbers. These factors include migration barriers, reduced water quantity, introduced fish species, lack of escape cover, reduced riparian canopy cover, and sedimentation. Stream inventory surveys, also conducted by the CSLRCD in 2001, inventoried fish habitat in some reaches of Chorro Creek and its tributaries Pennington Creek and Dairy Creek. Access was limited by consent of private property owners. Recommendations to address steelhead population limiting factors were formulated from the results of these surveys. These recommendations include maintaining migration passage, increasing pool habitat, increasing woody cover in pools and flatwater, increasing canopy cover to lower water temperatures, and identifying and treating sediment sources.

From a regional standpoint, San Luis Obispo County likely has the healthiest populations in the southern half of California. The Morro Bay Watershed steelhead populations are an important link in maintaining population continuity between the northern and southern reaches of both San Luis Obispo County and California and should be preserved and enhanced for their use and enjoyment of the people of the state.

Session IV - Mapping Wetlands in the Morro Bay Watershed

PUTTING MORRO BAY ON THE MAP: USING GPS AND GIS TECHNOLOGY TO MAP LOCAL WETLANDS

Rebecca Ellin, Project Manager
Central Coast Wetlands GIS Database Project

To protect the wetland and riparian habitats within the Morro Bay watershed, it is essential to know where these habitats are and what condition they are in. A detailed and comprehensive wetland and riparian dataset does not currently exist for the Morro Bay watershed. In an effort to meet its goals of ensuring habitat diversity and protecting the benefits provided by such habitats, the Morro Bay National Estuary Program partnered with the California Coastal Commission and the California Conservation Corps to develop the Central Coast Comprehensive Wetlands GIS Database Project (CCWGIS).

The CCWGIS is a synthesis of descriptive and digital spatial wetland information with a watershed perspective disseminated online via an interactive geographic information system (GIS). Phase I is currently underway and includes the development of the CCWGIS framework for the Marin Headlands south to Point Conception. The Morro Bay watershed will be the first area described in the CCWGIS. The project draws from four different information sources to create an effective and up-to-date planning tool for the Morro Bay watershed, including 1. wetland and riparian mapping using global positioning systems and aerial photograph interpretation to create a comprehensive wetland and riparian dataset for the watershed, 2. existing GIS datasets, 3. large-scale GIS datasets developed to fill data gaps, and 4. detailed information regarding wetland location, size, type, condition, and management culled from published studies.

In addition to providing information to local and state agencies, non-government organizations, and the public, these data will also be used for trend analyses, goal achievement assessments, and prioritization of wetlands for conservation projects. Phase II will incorporate 4 – 5 more central coast watersheds into the CCWGIS framework and will link the tool to related programs within the project area.

Session I - Morro Bay Eelgrass – Threatened or Thriving

WHAT CAN EELGRASS TELL US ABOUT THE HEALTH OF THE BAY?

Ron Thom, Staff Scientist
Battelle Marine Sciences

The Morro Bay estuary supports a wealth of plant and animal species, many of which are threatened or endangered. The health of the estuary and the resources it supports are threatened by a variety of factors, including habitat loss and contamination. This presentation examines how eelgrass, which is the major component of the Morro Bay aquatic ecosystem, can be used to assess the overall environmental health of the Bay. Eelgrass, *Zostera marina,* is the most prevalent of about 60 species of seagrasses that grows in dense meadows in shallow water in protected marine and estuarine areas. It serves as important habitat for reproduction, prey production, and refuge. Other important functions include primary productivity, detritus export, a food source, and shoreline stabilization. A conceptual model is a useful tool to elucidate the roles and functions of eelgrass within the ecosystem and the various factors that support eelgrass growth.

A variety of stressors can contribute to loss of this important plant, and understanding the complexities of human influences, natural fluctuations, and other confounding variables can be difficult. Case studies are presented on programs conducted in the Pacific Northwest, such as Sequim Bay, Willapa Bay, and Grays Harbor, WA, and Tillamook Bay and Coos Bay, OR, which have examined the role of primary productivity and factors that contribute to eelgrass growth and distribution. These factors include light, turbidity, nutrients, salinity, temperature, water depth, substrate, and tidal currents.

An assessment of the health and growth of eelgrass can provide an important indication of the overall health of an aquatic ecosystem. Health indicators include plant vigor (size, density, below-ground biomass, absence of disease), plant resilience and ability to recover from various stresses, and general biodiversity of fish and invertebrate species within the ecosystem.

Within the Morro Bay ecosystem, threats to eelgrass include filling, diking, and dredging; shoreline armoring; overwater structures; nutrient overloads; climate variability; sea-level rise; disease; fisheries harvest and aquaculture; vessel disturbances; sedimentation; suspended sediment; and invasive species. Identified mechanisms for recovery include natural recovery processes, removal or reduction of the sources of disturbances, and restoration through plantings. In Morro Bay, eelgrass health can be enhanced through limiting water-quality impacts, including impacts from the surrounding watershed, and reducing or reversing physical threats as much as possible. Acquisition of additional data through monitoring of controlling factors, biodiversity, and other health metrics is critical to better understanding those factors that affect eelgrass health, and thereby the health of this important ecosystem.

Session I - Morro Bay Eelgrass – Threatened or Thriving

EELGRASS TRENDS IN MORRO BAY

Dan Berman, Programs Manager
Morro Bay National Estuary Program

Eelgrass, *Zostera marina,* is a valuable resource in Morro Bay. Eelgrass is the primary food for the migratory black brant geese that over-winter in Morro Bay. Eelgrass supports a rich array of invertebrate species and provides food and shelter for many species of juvenile fish, including the endangered steelhead trout. The extent of eelgrass in Morro Bay has varied over time, and it is predicted that future shallowing of the bay due to sedimentation may significantly reduce the area of eelgrass in Morro Bay.

Maps of eelgrass bed locations and estimates of eelgrass acreage in the estuary are available for almost every year from 1994 to the present. Earlier maps of eelgrass in the estuary are available from 1960 and 1988. This time series of data is an invaluable source of information for understanding the factors affecting eelgrass abundance and distribution in Morro Bay.

The available maps and aerial photography indicate that while the location of the large eelgrass beds in the bay has been remarkably stable over the last 50 years, there have been extreme changes in the abundance of eelgrass over the last decade. Eelgrass acreage underwent a steady decline in the mid 1990's, dropping from approximately 430 acres in 1994 to a low of about 100 acres in 1997. There was a small upturn in 1998 to 125 acres, and then a dramatic return in 1999 to around 430 acres. This recovery has lasted through 2002, when the total acreage was estimated at around 800 acres. The steep decline of the mid 90's has been associated with an intense storm event in the winter of 94-95 that followed an extensive watershed fire. This combination led to a massive sedimentation event. The 94-95 winter and the 97-98 winter were also El Nino seasons, with increased sea water temperatures, high rainfall, and increased sedimentation.

Eelgrass maps and acreage estimates are generated by interpreting aerial photography with the help of field efforts to 'ground truth' the photos. The quality and scale of the aerial photographs has varied over time, and the work of interpreting the photos to create a map and an acreage estimate is inherently subjective. The MBNEP created the 2000 and 2002 maps, while local botanist John Chesnut created the 1994 through 1999 maps. The increase from 430 acres in 1999 to 800 acres in 2002 is partially a function of different techniques and the level of detail used in creating the maps. The MBNEP is working to standardize the protocol for photo interpretation so that future acreage estimates will be comparable and repeatable.

The MBNEP plans to continue to monitor eelgrass and to create eelgrass maps and acreage estimates annually into the foreseeable future. Future trends in acreage and bed locations will be compared with other data including rainfall, water temperatures, bathymetry, turbidity, and nutrients to better understand the driving forces behind changes in eelgrass location and extent.

Session II - A Place to Call Home: Birds on the Bay

THE BRANT OF MORRO BAY: PAST, PRESENT, AND FUTURE

John Roser, Lead Naturalist
Kern County Environmental Education Program

From November 1997 through April 2003 the author conducted baseline surveys of Morro Bay's wintering brant population. Frequent population counts were made. A tarsal band reading effort was also undertaken resulting in a total of 3,575 resightings representing approximately 750 individuals. The tarsal band resighting data set has been turned over to several flyway biologists engaged in a variety of population studies.

Seasonal brant use days were calculated for all six seasons. Brant use days steadily increased from the '97/'98 season (167,000) to the '01/'02 season (466,000). This increase is proportional to the baywide increase in eelgrass coverage following the mid 90's eelgrass decline. The author plans to continue brant census work in the future.

Two historic data sets are useful to review when examining recent population census data. From 1931 to 1942 Moffitt did annual brant counts along the California coast. Eight mid February counts for Morro Bay during this period averaged 6,783. The high count for this period was 11,140. The California Department of Fish and Game conducted midwinter surveys for brant on Morro Bay from 1950 to 1966. These averaged 6,000 with a high of 11,800. In comparison, the author's 6 year mid February average was only 2,755. The six year high was 4,651. These data sets suggest that Morro Bay may be supporting fewer than 50% of the brant it did several decades ago. The cause of this decline is speculative, but it does mirror a statewide decline measured by Pacific Flyway Midwinter Waterfowl Surveys.

Hunter surveys taken by DFG personnel during the '57/'58 hunting season estimated 1,875 hunter days on Morro Bay with 1,860 brant taken. During the '98 and '99 brant seasons the author estimated 200 hunter days/year with approximately 200 brant taken/year. Brant hunting activity frequently flushes the population to the open ocean where they remain until just after dark. The pursuit technique of sculling appears to be more closely associated with this behavior than stationary decoy hunting. During six seasons of regular observations, the only time outside of brant hunting season that the population was observed seeking refuge on the ocean was during a weekend of high recreational activity that coincided with the 2003 Morro Bay Winter Bird Festival.

Most observers agree that recreational use of the bay has increased significantly in the last two decades, although there is no recreational use survey data to back up this assertion. Brant are susceptible to disturbance from recreationalists while the birds rest on the open water at high tide, eat grit at very specific preferred shoreline locations at mid tide (gritting provides particles necessary for eelgrass digestion), and feed in the eelgrass beds at low tide.

In order for Morro Bay to continue to support large numbers of brant, managers need to: 1) ensure that Morro Bay's eelgrass biomass is conserved and defended against sedimentation, exotic organisms and other threats; 2) ensure that the combination of hunting and recreational pressures on the population remain tolerable.

Session II - A Place to Call Home: Birds on the Bay

RECREATION AND THE WESTERN SNOWY PLOVER

Greg Smith, State Park Sector Superintendent
California State Parks

The Western Snowy Plover is listed by the U. S. Fish & Wildlife Service as a threatened species. Heavy recreational uses of area beaches have had negative impacts on plovers and nesting success. Because the plover is a resident species of numerous beaches along the San Luis Obispo coast, State Parks has developed approaches to protecting the plover and its habitat while continuing to accommodate the outstanding recreational opportunities of the area.

Current population trends for the State of California imply that pressures to nesting and roosting habitat for the plover are going to continue to expand. State Parks is taking the following steps to address protection of the plover: assess habitat needs for plover; assess extant recreational needs in regards to plover habitat; determine areas of appropriate use by developing access plans with various constituency groups; provide appropriate recreational access to areas that do not impact plover habitat; and formalize access through education and enforcement.

Initial nesting success (including expansion of nesting sites and number of successful nest hatches) after removal of dogs from area beaches has improved dramatically. State Parks goal is to protect plover habitat while continuing to provide beach-dependent recreational activities, a process consistent with the Department's mission statement.

Session II - A Place to Call Home: Birds on the Bay

SPECIAL STATUS BIRDS OF MORRO BAY

Tom Edell, Biologist and SLO County Bird Record Compiler

Special status is derived from federal, state, or private organization listings. Listings include species considered endangered or threatened throughout their range and species of local concern. State and federal Endangered Species Acts (ESA) provide the mechanism for listing and afford protections to listed species. Species of concern lists prepared by government and private organizations do not provide the protection afforded under the ESAs, but impacts to these species must be considered in the preparation of California Environmental Quality Act (CEQA) documents. The presentation briefly discusses species found on the Morro Bay Estuary that are federal or state threatened or endangered, fully protected state species (SFP), and those identified as federal and state species of concern (SC), present on the US Fish and Wildlife Service Birds of Conservation Concern 2002 list (BOCC), and/or appear on the Audubon Watch List (AWL).

The strongest regulatory protection is provided to special status species federally or state listed as endangered or threatened and designated fully protected by the California Department of Fish and Game. These designations have been extended to the following species on the Morro Bay Estuary: brown pelican, white-tailed kite, bald eagle, American peregrine falcon, California clapper rail, California black rail, western snowy plover, and California least tern. Additional special status species present on Morro Bay and found on either federal and state species of concern, BOCC, and AWL lists include: double-crested cormorant, American bittern, brant, northern harrier, black oystercatcher, whimbrel, long-billed curlew, marbled godwit, black turnstone, red knot, short-billed dowitcher, heermann's gull, elegant tern, and black skimmer.

Specimen and egg set data and/or field notes found in the Berkeley Museum of Vertebrate Zoology, Western Foundation of Vertebrate Zoology, Santa Barbara Natural History Museum, and the Morro Bay Natural History Museum offer a historic perspective of two species extirpated as breeders on Morro Bay. Brown pelican (*Pelecanus occidentalis californicus*), a Federal and State endangered species, was last documented as a breeder on Morro Rock in 1932 when two egg sets were taken on April 12, 1932. A male and female California clapper rail (*Rallus longirostris*) a Federal and State endangered species, collected on Morro Bay on 16 Feb 1939 provide the only specimen evidence for the San Luis Obispo County. It was last recorded on the Morro Bay Estuary in 1973; there are no documented breeding records for the estuary. The California least tern (*Sterna antillarum browni*) is a Federal and State endangered species. There is one nesting record from the Morro Bay sandspit that involves a sight record of a nest on July 6, 1983. Whether this tern was ever a regular breeder on the sandspit is unknown.

A small resident population of the State threatened and SFP California black rail (*Laterallus jamaicensis coturniculus*) breeds along the bay fringe of the Morro Bay Estuary. There is no data available to indicate historic numbers for this species. A recent protocol level survey of the entire Morro Bay Estuary in March and May 2001 recorded four territorial birds, indicating the local breeding population of California black rails is perilously low and that its needs must be considered during management decisions affecting the bay fringe. The non-native red fox and increased numbers of breeding herons and egrets may contribute to the current low population number. It is speculated that winter migrants augment the breeding population.

The western snowy plover (*Charadrius alexandrinus nivosus*) is a Federal threatened and SFP species that nests along the sandy beaches of Estero Bay. The US Fish and Wildlife Service

designated the Morro Bay sandspit as critical habitat necessary for this species recovery. The sandspit accounts for the largest nesting population in Estero Bay.

Monitoring of special status birds species is essential to determine their current status on the Morro Bay Estuary. Data is necessary to evaluate the affects of restoration proposals and the possible impacts caused by increasing recreation on special status species. Limited trend data available from Morro Bay shorebird counts and the Morro Coast Audubon Christmas Bird Count for many species, and specimen and egg set data from California museums is limited at best. Improved data will lead to a more informed decision making process to better protect these threatened species.

Session III - Pathogens in the Bay, Sources and Solutions

IDENTIFYING SOURCES OF ESCHERICHIA COLI CONTAMINATION TO THE SHELLFISH GROWING AREAS OF THE MORRO BAY ESTUARY

Dr. Chris Kitts, Assistant Professor
Cal Poly Biological Sciences Dept.

Fecal coliform bacteria, common in the intestines of warm-blooded animals, are used as an indicator of fecal contamination in the environment. The overall goal of this project was to determine the sources of fecal coliform to the Bay, specifically to the oyster growing area, and to determine each source's relative contribution.

This project involved routine water quality monitoring as well as microbial source tracking to identify the origins of bacterial contamination to the estuary. The study consisted of sampling efforts that lasted over a two-year period. The first sampling effort covered a wide area in the Morro Bay watershed, Bay samples, and groundwater seep samples, with analyses for total and fecal coliform only. The second effort included the collection of more than 1600 E. coli strains isolated from water, oyster, and sediment samples. Genetic fingerprints known as ribotypes were used to compare the isolated bacteria to library strains isolated from the feces of different animals. The study also included a detailed set of quality assurance experiments, which verified the reproducibility of the ribotyping methodology for strain source tracking.

Results from the first sampling effort revealed that wet season fecal coliform counts were two orders of magnitude higher on average than dry season counts. Combining fecal counts with flow rates from creeks within the watershed provided an estimate of the fecal coliform load to the bay. While Chorro Creek had consistently higher flows, the larger coliform counts in Los Osos Creek resulted in higher loading values, except during times of highest flow.

The ribotyping effort revealed that the four most important sources of E. coli in Morro Bay were, in order of contribution, birds (24%), humans (17%), cattle (15%), and dogs (9%). Across the entire study, 45% of the E. coli were from sources under human influence. The results also indicated the three Bay sites sampled were affected by similar sources of E. coli. Intriguingly, the study concluded there was no significant difference between the distribution of sources in wet weather versus dry weather. In addition, groundwater seeps and sediment areas had distributions of sources that were significantly different from most other sites. Conversely, the distribution of the sources in the oysters could not be distinguished from the distribution in the bay waters.

Analysis of the source tracking data resulted in a model whereby the bay receives most of its E. coli from the creeks and the oysters collect their E. coli from the bay. Pathways for E. coli entering the bay are through the creeks and seeps or by more direct means, rain water run-off or direct entry for example. The model separates input into the bay by sources. A large fraction of E. coli from birds enters the bay through direct pathways. Conversely, most E. coli from livestock enters the bay through the creeks. E. coli from the other sources, human, and wild and domestic animals, enters the bay through all pathways somewhat equally.

The CCRWQCB used this study, along with other data collected, to develop a Total Maximum Daily Load Implementation Plan to reduce the amount of controllable levels of bacteria entering the bay in order to protect shellfish harvesting and water-contact recreation.

Session III - Pathogens in the Bay, Sources and Solutions

REDUCING BACTERIA CONCENTRATIONS IN MORRO BAY

Shanta Keeling, Water Resouces Control Engineer
Regional Water Quality Control Board

The Central Coast Regional Water Quality Control Board (Regional Board) plays a key role trying to reduce the input of bacteria from fecal sources into Morro Bay. The Regional Board has come up with a water quality attainment strategy to reduce the input of bacteria from fecal sources into Morro Bay. The Regional Board is focusing on controlling sources from human influenced activities; i.e., input from humans, livestock and pets.

For direct human input, the focus is on reducing waste from improperly functioning septic systems through regulatory oversight. Existing efforts by the City of Morro Bay Harbor Department and public outreach efforts by the Morro Bay National Estuary Program are addressing waste from boaters. For livestock, contributions should decrease via implementation of grazing management measures. Encouraging pet owners to pick up after their pets through public outreach and installation of "mutt-mitt" stations will reduce contribution of pet waste.

The above recommended management measures are scheduled to take place within ten years. Monitoring in the Bay and the watershed is performed by the California Department of Health Services, shellfish growers, Regional Board and the National Estuary Program's Volunteer Monitoring Program.

Session IV - Fisheries Resources and Research

A HISTORY OF LOCAL FISHERIES AND A LOOK TO THE FUTURE

Rick Algert, Harbor Director
City of Morro Bay

First thank you very much for inviting me to speak. The harbor department and fishing community have always felt that we are a part of the Morro Bay Estuary, and I think this kind of presentation validates that feeling. Today, I am going to talk more about the current fisheries than the history here, but I should say that native American's have fished in the Morro Bay area from time immemorial There were major encampment areas all around the bay that took advantage of the easily accessible and plentiful fishery and wildlife resources. European settlement in the late 1800's was centered on boating and fishing. From 1930's through 1960's Morro Bay was the biggest abalone port in the world, and Commercial and recreational fishing remains the heart and soul of the community today.

Seafood landed in California now is harvested in the most environmentally sound and highly regulated manner in the world. Since 1996 all our commercial and recreational fishermen have been fishing under the sustainable fisheries act which requires the use of the best available science and the precautionary principle which says that if the best available science can't prove that a resource is being harvested at or below a sustainable level, the fishery is curtailed or eliminated.

Much of this presentation focused on the different kinds of boats operating out of our harbor to provide fresh seafood for the consumers in a sustainable, environmentally sound manner. A copy of the slideshow (available at the MBNEP) will be a helpful accompaniment to the following text.

The first vessel pictured is a Nova Scotia style lobster boat owned by Tom Hafer. Tom has a tier 2 spot prawn trap permit and a near shore rock cod fishing permit which is scheduled to be closed for the remainder of the year starting Nov. 21. The second vessel is Morro Colini's who has been fishing since the 1930's. Additional vessels pictured include Aguero's, built in Fort Bragg and outfitted with a drift sword fish net; the Barbara Marie was built in Moss Landing and is outfitted with Dungeness crab traps; the Capriccio, a scokum motor sailor built in Port Townsend and used for fishing salmon and albacore; the St Joseph, a trawler with no permits now that spot prawn trawl has been closed, the Skagerrak a deep water complex trawler built in the Gulf of Mexico; Molle, a deep water and open access trawler also built in the Gulf, and Billy Boy, a local bait boat.

Commercial fishing continues to be a very difficult industry with dwindling infrastructure and employment, and an increasing average age of participants. We are in a very data-poor area and this has worked to our disadvantage, as we have no science to prove what most fishermen feel: that the ocean resources in our area are extremely healthy. The regulatory framework does not get a chance to work because of poor data and politics. However there are some bright spots as data is improving and is showing increasingly that resources are better than thought, and that often times environmental conditions are the biggest effects on specific fishery declines/increases. You can help the resources and the local community by asking for locally caught fish. Don't buy fish at the supermarket which 99% of the time is coming from under-regulated or third world fisheries with no sound environmental practice. Ask in restaurants for wild caught California salmon and search out the local fish market with sustainable caught local fish products.

Session IV - Fisheries Resources and Research

PRELIMINARY RESULTS FROM A COLLABORATIVE STUDY OF THE NEAR-SHORE FISH AND FISHERIES OF THE CENTRAL CALIFORNIA COAST

Dean Wendt, Assistant Professor
Biological Sciences Department and Center for Coastal Marine Science, Cal Poly,
The Marine Interest Group of San Luis Obispo County

The Marine Interest Group (MIG) of San Luis Obispo (SLO) County has been exploring through workshops, invited speakers, and panel discussions, the fisheries resources of the south central coast of California. We have determined that there is a lack of credible data on local near-shore fish assemblages in our area. The best available rockfish data is an unpublished study on recreational vessels conducted by local sport fisherman and the California Department of Fish and Game (CDF&G) from 1988-1998. As such, to afford effective comparison, the CDF&G recreational vessel study served as the foundation of our sampling protocols and as the historic data set to which we compared our current findings. We are reporting data from a total of approximately 50 trips on recreational fishing vessels for the 2003 season to date and data collection is ongoing. Data have been collected on over 7000 individuals from 23 different species. This summary focuses on the species that comprise the highest percentage catch off San Luis Obispo County.

Five species of rockfish and the Lingcod comprise over 85% of the catch on the recreational fishing vessels in San Luis Obispo County. A rank correlation shows that the species assemblage supporting the fishery has not changed from 1991 to 2003; these data indicate that the same species are being harvested at the same relative proportions for more than a decade. The most common fish caught in San Luis Obispo waters for 2003 are (in descending order): *Sebastes mystinus* (Blue Rockfish, 32%); *S. carnatus* (Gopher Rockfish, 22%); *S. auriculatus* (Brown Rockfish, 14%); *Ophiodon elongatus* (Lingcod, 9%); *S. miniatus* (Vermillion, 8%); *S. serranoides* (Olive Rockfish; 3%). Of the most common species caught the mean size of fish harvested is not significantly different (in 2003) from 1998 for 3 species: 1) *Sebastes mystinus* (Blue Rockfish); *S. auriculatus* (Brown Rockfish); and *S. miniatus* (Vermillion). The mean size has increased significantly from 1998 for 1 species *S. carnatus* (Gopher Rockfish). The average size of the most common species caught has decreased significantly from 1998 for 2 species: 1) *Ophiodon elongatus* (Lingcod); and *S. serranoides* (Olive Rockfish). Regulatory size restriction changes with *O. elongatus* make direct comparison of size between 1998 and 2003 problematic.

The mean size of fish caught in 2003 was compared to the median size at first reproduction reported in the literature for each species. Harvesting fish at this size means that 50% of the time the fish harvested will have had the opportunity to reproduce, and 50% of the time they will not have had the opportunity to reproduce. If the mean size of fish being harvested is well *below* the median size of reproduction, the majority of fish harvested *will not* have had the opportunity to reproduce. If the mean size of fish being harvested is well *above* the median size of reproduction, then the majority of fish harvested *will* have had the opportunity to reproduce. For the most common species caught in 2003 the following species were caught at average sizes above the median size of reproduction: 1) *Sebastes mystinus* (Blue Rockfish); *S. auriculatus* (Brown Rockfish); and *S. carnatus* (Gopher Rockfish). The Lingcod (O. *elongatus*) was the only species being caught at the median size of reproduction. Two species, *S. miniatus* (Vermillion) and *S. serranoides* (Olive) were caught at sizes below the median size of reproduction. Comparisons of fishing pressure, measured as catch per unit effort (CPUE), are difficult to make between years given the confounding factors of changes in bag limits and number of hooks. We have

normalized the CPUE data from previous years when 5 hooks were used to reflect the decreased effort of 2 hooks used in 2003. The overall data for the fishery indicates that the catch per unit effort has decreased slightly from 4.2 in 1998 to 4.0 in 2003. Given the range of data for CPUE since 1988, and the uncertainty of effort measurements with changes in number of hooks and bag limits, the CPUE is similar in 2003 compared with previous years of the study. Interestingly, the CPUE has increased monthly throughout the 2003 season.

Session V - The Morro Bay Volunteer Monitoring Program

TAKING THE PULSE OF THE ESTUARY

Ann Kitajima, Program Manager
Morro Bay Volunteer Monitoring Program

The Morro Bay Friends of the Estuary Volunteer Monitoring Program (VMP) is a citizen-based monitoring effort that has been in existence for ten years. The program has operated for the past three years under a Clean Water Act Section 319(h) grant. The volunteers conducted several types of monitoring including water quality, bacteria, flow, macroinvertebrates, stream profiling, bay dissolved oxygen, algae, phytoplankton and shorebirds. These data are critical for assessing the health of the bay and the effectiveness of efforts to protect the bay, including the implementation of the Regional Water Board's TMDLs for nutrients, pathogens, and sediment.

The VMP collected water quality data on a monthly basis at a dozen sites, using test kits and meters to measure pH, dissolved oxygen, conductivity, turbidity, temperature, nitrates as nitrogen and orthophosphates as PO_4. The only parameters with regular exceedances of levels of concern were nitrates and orthophosphates. These exceedances were typically seen at two sites on Chorro Creek directly downstream of a wastewater treatment plant discharge, and on Warden Creek downstream of agricultural operations. The Basin Plan's drinking water standard of 10 mg/L for nitrates was rarely exceeded. Exceedances of the informal attention level for phosphates of 0.36 mg/L were also seen at Coon Creek, a control site in Montana de Oro State Park. The volume of water flowing in the creeks is recorded with a flow meter, a key step in estimating the total volume of pollutants moving through the system.

Also on a monthly basis, the VMP monitored 11 creek sites and 6 bay sites for pathogen indicators using IDEXX Colilert-18 test kits. Volunteers collected the samples and processed them at the Morro Bay-Cayucos Wastewater Treatment Plant lab. For the bay sites, exceedances of the 400 MPN/100 mL fecal coliform standard for a single one-time grab sample were common at Pasadena Point, Baywood Pier and Cuesta Inlet. On the creek sites, exceedances of that same standard were common at Pennington, Dairy and San Luisito Creeks. This data is shared each month with various agencies and non-profits responsible for the safety of local waters and will eventually be used for TMDL monitoring.

Water quality monitoring gives an instantaneous picture of water quality at a site. The types of aquatic insects found at a site give a more long-term indication of water quality: if only tolerant types are present, water quality is likely not good, while if intolerant and tolerant types are present, water quality is likely good. Each spring, VMP monitors collected macroinvertebrate samples from local creeks for analysis by the state Fish & Game lab. The data are most easily understood using the index of biological integrity (IBI), a single value from 1-10 that reflects the rank of a site relative to all the sites monitored on the Central Coast. Los Osos Creek in Clark Valley had an average IBI of 6 and at sites lower in the watershed such as Twin Bridges and Upper Chorro Flats the value was an average of 4. The lab is currently processing this year's samples.

Each summer, volunteers conducted basic surveying at 19 sites to create cross-sectional profiles that track erosion and deposition in the watershed's creeks. The majority of the sites were stable with little change from year to year. Two exceptions were at upper Chorro Creek, which showed erosion during the'94-95 season due to the Highway 41 fire, and heavy rains that followed, and Pennington Profile #4, which showed erosion each season, regardless of storm events.

In the bay, volunteers collected dissolved oxygen data in the pre-dawn hours to capture the lowest levels during the diurnal cycle. Seven sites were monitored monthly. The lowest values were seen in the summer in the farthest back bay sites, Cuesta Inlet and Sharks Inlet, where levels regularly fell below 5 mg/L, at which point many aquatic organisms become stressed. Part of understanding the balance between nutrients and dissolved oxygen includes tracking the macroalgae blooms that are an important part of this cycle. Volunteers took photos from 10 vantage points around the bay to document macroalgae growth. The data showed some algae present year-round with unexpected wintertime blooms following warm weather.

To assist the California Department of Health Services in ensuring the safety of human consumers of shellfish, program volunteers assisted in the tracking of phytoplankton blooms. Some types of phytoplankton are toxic and can bioaccumulate in shellfish and fish, causing illness or even death in humans and marine mammals that consume them. Volunteers regularly conducted phytoplankton pulls and identification of the samples down to the genus level. In April 2003, the volunteers assisted the DHS in tracking a toxic *Pseudonitzschia* bloom. Their efforts assisted in DHS issuing a press release warning people to avoid shellfish and the viscera of certain fish during the bloom.

In an effort to track the shorebird population in Morro Bay, volunteers this year began conducting spring and fall counts. The monitoring was conducted using the same method as counts done in the late ‘80s and ‘90s, so the data could be directly compared. On average, the spring and fall totals for this year were slightly lower than average counts of past surveys.

An extraordinary volunteer effort made this data set possible. Over 200 volunteers donated over 2,500 hours during the three years of the grant, which equals nearly $50,000 of labor contribution. Countless businesses, nonprofits, and agencies also contributed greatly to the program’s success.

Closing Session

MBNEP STATUS, ACCOMPLISHMENTS, AND VISION FOR THE FUTURE

Michael Multari, Program Directory
Morro Bay National Estuary Program

The Morro Bay National Estuary Program is a collaborative effort by government agencies, non-profits, businesses, and individuals working to improve the water quality and habitat value of Morro Bay and its watershed. The MBNEP is one of 28 national estuaries that have been so designated by Congress pursuant to the federal Clean Water Act. The US EPA oversees the national estuary program and provides important funding.

An Executive Committee approves MBNEP policies, work plans and grants. The Executive Committee (EC) is advised by a larger Implementation Committee (IC). There are also three "working groups" that provide advice to the IC and EC on finance, science, and educational issues.

Since the 1960s, scientists, community members, and government agencies have recognized both the importance and vulnerability of Morro Bay. Planning and related efforts to protect this resource have been ongoing since then. By the 1980s the Bay Foundation and Friends of the Estuary, two non-profit corporations, had been formed to support efforts on behalf of the bay. The State Coastal Conservancy, Coastal San Luis RCD (CSLRCD) and Natural Resource Conservation Service collaborated in the late 1980s and early 1990s on a Morro Bay Watershed Enhancement Plan. In 1991 the first State of the Bay Conference was held. In 1994 Morro Bay was declared a state estuary, and Morro Bay entered the national program the following year. The Comprehensive Conservation and Management Plan for Morro Bay was approved in 2000-01, and since then, the program has been actively implementing the plan.

Fifty-five of the 61 "action plans" in the Comprehensive Conservation and Management Plan (CCMP) have been initiated; 15 are in-place and ongoing. Priority issues facing the estuary include loss of habitat, sedimentation, pollution, reduced freshwater flows, and the need for environmental education and outreach.

Habitat protection around the bay and in the watershed is being accomplished through the acquisition of sensitive parcels and by easements. Some highlights include the protection of rare dunes habitat in a greenbelt around Los Osos, spearheaded by the Morro Estuary Greenbelt Alliance and the Partners for the Conservation of Los Osos Dunes; the acquisition of the 580-acre Hollister Peak Ranch by Trust for Public Land and then transferred to the Department of Fish and Game to become the Chorro Creek Ecological Reserve; and an option to purchase a large easement on the eastern end of the city of Morro Bay. All told, over 1000 acres have been preserved over the last few years, and projects that would protect another 2000 acres are pending.

Besides habitat protection, existing degraded habitats are being restored and enhanced. Key efforts include re-vegetation at the Elfin Forest by Small Wilderness Area Preservation and the California Conservation Corps (CCCs), exotics removal projects by the CCCs, County of San Luis Obispo, Cal Poly and the State Department of Parks and Recreation; and steelhead habitat work in several locations. In the bay, the MBNEP is partnering with the US Army Corps of Engineers, State Parks and the County on an extensive habitat restoration feasibility study. Some significant progress has been made but approval of specific projects is still at least a couple of years off.

Sedimentation and pollution are being addressed through a number of projects including the CCCs Watershed Crew, the CSLRCD's Project Clearwater, and the Regional Water Quality Control Board's (RWQCB) Total Maximum Daily Limits (TMDLs). Specific projects include erosion control and re-vegetation on Pennington, Los Osos and Walters Creeks. In addition the MBNEP and City of Morro Bay have cooperated on boater education signs and the removal of derelict boats. Mutt Mitt dispensers have been installed around the bay by Small Wilderness Area Preserve (SWAP), State Parks and Morro Bay Beautiful. Freshwater flow has been improved in Chorro Creek through the acquisition of the Chorro Creek Ecological Reserve and the retirement of over 200 acres of irrigated cropland and orchards.

Other stressors affecting the estuary include cooling water withdrawal from the Morro Bay Power Plant. The MBNEP has participated in the deliberations by the California Energy Commission and RWQCB, but a decision on the application for certification for the proposed modernization of the plant is still pending.

Education and outreach projects include the quarterly newsletter, website, informational map, educational booklets, visitor center, children's programs, several mini-grants to non-profits and other groups.

We anticipate over the next few years continued work on habitat protection and enhancement, completion of the next phase of the Army Corps of Engineer study, implementation work on the TMDLs, and new educational materials.

Thanks go out to everyone who participates in the MBNEP and for the many people who worked so hard for so long to first get the program in place.

The Morro Bay National Estuary Program is a collaboration of partners working together to protect and enhance the estuary and its resources.

Bay Foundation of Morro Bay
California Polytechnic State University
California Coastal Commission
California Coastal Conservancy
California Conservation Corps
California Department of Boating and Waterways
California Department of Corrections (Men's Colony)
California Department of Fish and Game
California Department of Forestry
California Department of Health Services
California Department of Parks and Recreation
California Department of Transportation
California Department of Water Resources
California National Guard (Camp San Luis)
California Native Plant Society
Central Coast Natural History Association
Central Coast Regional Water Quality Control Board
Central Coast Salmon Enhancement
City of Morro Bay
Coastal Alliance on Plant Expansion
Coastal Resources Institute
Coastal San Luis Resource Conservation District
County of San Luis Obispo
Cuesta Community College
Farm Bureau
Friends of the Estuary
Land Conservancy of San Luis Obispo County
Los Osos/Baywood Chamber of Commerce
Los Osos Community Services District
Morro Bay Beautiful
Morro Bay Chamber of Commerce
Morro Bay Commercial Fisherman's Association
Morro Coast Audubon Society
Morro Estuary Greenbelt Alliance
National Marine Fisheries Service
Natural Resources Conservation Service
Partners for the Conservation of the Los Osos Coastal Dunes
San Luis County Air Pollution Control District
Sierra Club
Small Wilderness Area Preservation
Trust for Public Land
UC Cooperative Extension
US Army Corps of Engineers
US Bureau of Land Management
US Coast Guard
US Environmental Protection Agency
US Fish and Wildlife Service
US Forest Service
Wildlife Conservation Board