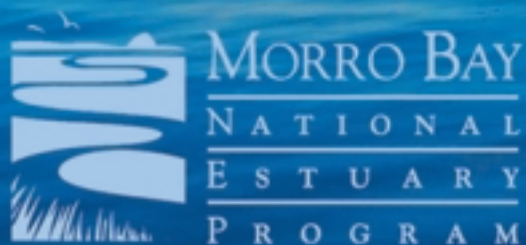




Estuary Tidings:

A Report on the Health of
the Morro Bay Estuary



How healthy is the Morro Bay estuary? In this report, the Morro Bay National Estuary Program (MBNEP) addresses this complex issue by breaking it down to a series of focused questions. Is the water safe for people and wildlife? Is the bay filling in? Are important habitats being protected or restored?

The goal of this report is to provide the community with important information about the health of the estuary today, and to create a framework to guide our efforts and measure our success as we work together to protect and restore this estuary of national significance.

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Why is the Morro Bay Estuary’s Health Important?

Morro Bay is an estuary, a place where freshwater from creeks mixes with the ocean’s salty tides. Healthy estuaries are among the most productive environments on earth. Like other wetland and coastal habitats, many estuaries have been lost or severely degraded by intensive development. Morro Bay is one of the largest and least disturbed estuaries in Central and Southern California. Its sheltered waters, salt marshes and eelgrass beds provide rare and important habitat

for a diverse array of fishes, birds, shellfish, and other life.

The estuary is also a center of activity for people and contributes significantly to our local economy. As a working harbor, the bay supports commercial and sport fishing as well as recreational boating. More than 25,000 people make their homes along the bay’s shore and thousands more visit the bay each year to take in its beauty and participate in fishing, boating, bird watching and hiking.





Question:

Is the bay clean enough to support commercial shellfish farming?

What we measured: Fecal Coliform levels in the shellfish growing areas

Answer:

Yes, but not in all areas. Of the three harvesting parcels in Morro Bay, two are partially closed to shellfish harvesting due to elevated bacteria levels. The California Department of Health Services (DHS) is responsible for ensuring that harvested shellfish are safe. DHS has concluded that bay waters are clean enough to support commercial shellfish operations in portions of the three parcels. Mandatory closures are necessary immediately following rainfall events.

Why This Is Important:

One indicator of whether or not the water is safe for shellfish growing is the presence of disease-causing pathogens such as bacteria, viruses and protozoa. Since shellfish are filter feeders, pollutants in the water (indicated by elevated bacteria levels) can become temporarily concentrated in shellfish which can cause illness in humans who eat them.

Potential sources of pathogens in the environment that can contaminate shellfish include urban area runoff, inadequately treated sewage, failing septic systems, sewage discharge from boats, pet waste, farm animals and wildlife.

Project Highlight:

The MBNEP is working with the California Department of Fish and Game to remove abandoned and illegally moored boats in Fish and Game's Wildlife Management Area. Many of these boats are moored too close to shellfish operations, and waste or spills from these boats could negatively impact shellfish and bay wildlife.

References:
California Department of Health Services, bacteria data from 1989 to 2004.

Bacteria Levels in Shellfish Growing Areas



The percentages on the map show how many samples exceeded the bacteria levels established for safe shellfish harvesting. This figure shows the approximate locations of established shellfish harvesting parcels. Harvesting is not currently allowed in portions of two parcels (shown in red on the map) due to elevated bacteria levels. The California Department of Health Services continues to monitor the areas surrounding the closed harvesting parcels to track the bacteria trends over time. The hope is that these parcels will eventually have clean enough water quality to resume shellfish operations. In the three active parcels (shown in green), growers are allowed to harvest shellfish during times of adequate water quality.



Question:

Are Morro Bay watershed creeks and bay safe to swim in?

What we measured: *E. coli* levels in the creeks and bay

Answer:

Not consistently. While many of the bay sites monitored for bacteria showed levels safe for swimming, except after rain, the majority of creek sites were unsafe in at least 30% of samples collected and some sites in the back bay were unsafe in 10-20% of samples collected.

Why This Is Important:

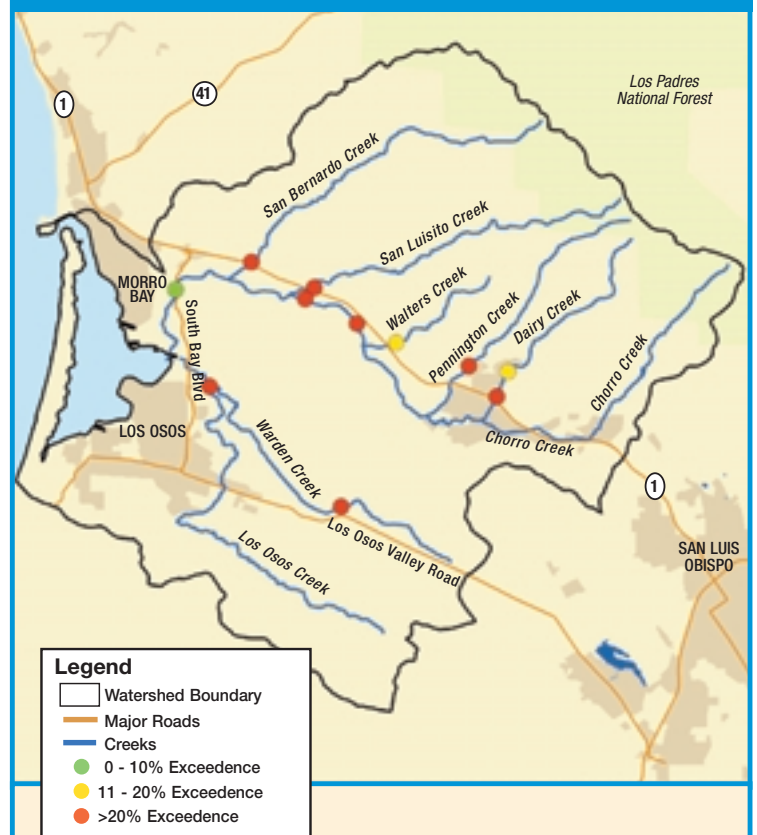
One indicator of whether or not the water is safe is the presence of disease-causing pathogens such as bacteria, viruses and protozoa. These pathogens can cause illness in humans who ingest water while swimming or eat contaminated shellfish. *E. coli* is a bacteria that is found in the intestines and feces of all warm-blooded animals and is widely used as an indicator of fecal contamination.

Potential sources of pathogens in the environment include runoff from urban areas, boat and marina waste, inadequately treated sewage, failing septic systems, pet waste, farm animals and wildlife.



Marlin Harris

Creek Bacteria Levels



The map shows the sites monitored for bacteria in the watershed. Each dot shows the site location and represents the % of samples collected at the site that exceeded recommended federal criteria for safe recreational contact. Of the watershed sites sampled, San Luisito Creek had the highest number of exceedences – 96% of the total samples collected exceeded the standard for safe recreational contact.*

* Data was compared to a value of 235 MPN/100 mL for a single sample, which is from EPA's Ambient Water Quality Criteria for Bacteria published in 1986. While this criteria value is not yet a regulatory standard in our region, it is the recommended level for safe recreational contact when *E. coli* is used as the indicator species. Thus, any measured values that exceed this level are of concern. The State and Central Coast Regional Water Quality Control Board are in the process of adding this standard to our region's regulations.

Bay Bacteria Levels



Each dot on the map represents the % of samples collected at the site that exceeded federal criteria for safe recreational contact. Baywood Pier had the highest number of exceedances (20%). In general there were more exceedances at the back bay sites (Cuesta Inlet, Pasadena Point and Baywood Pier) than at the front bay sites (State Park Marina, Tidelands Park, Windy Cove and Coleman Beach). At all bay sites monitored, the bacteria levels are typically not safe for swimming immediately after rainfall. Monitoring has been conducted since the summer of 2002. *

*Bay data was compared to a screening value adapted from the freshwater criteria. This value is not a regulatory standard but rather a level of concern recommended by EPA. Since *E. coli* is known to be sensitive to salt water, data from the bay are likely an underestimation of bacteria levels. *Enterococcus* sp. is the recommended indicator in marine waters, and MBNEP volunteers began monitoring it earlier in 2005.

What is a Watershed?

A watershed is an area of land that drains rainwater to a common waterway, such as a stream, lake, estuary, or even the ocean.

The Morro Bay estuary watershed includes the town of Los Osos, portions of Morro Bay, farms and ranches, parks, national forest, highways and more. The size and shape of the 48,000-acre Morro Bay Watershed is not determined by people or politics. The shape of the watershed is determined by the topography of the land...mountains, hills and valleys determine the direction rainwater flows.

As rainwater drains from yards, hillsides, farm land and streets it carries pollution with it. Think twice before you dump cleaners, paint, oil and other chemicals on your yard, in the storm drain or in the street. How we use the land in the watershed impacts the quality of the water that flows into our creeks and estuary.



Project Highlight:

Local groups such as Morro Bay Beautiful and Small Wilderness Area Preservation (SWAP), with funding from the MBNEP and other sources, installed and maintain 'mutt mitt' dispensers around the bay that provide bags for dog owners to pick up after their pets. These efforts help reduce the amount of bacteria reaching the bay.



References:

MBNEP and CCRWQCB, bacteria data from bay and creeks, 2002 to 2004.
EPA, Ambient Water Quality Criteria for Bacteria, 1986.



Question:

Does creek and bay water quality support fish and other aquatic life?

What we measured: Dissolved oxygen and nutrient levels in the creeks and bay

Answer:

The bay and creeks are home to fish and other aquatic life, but high nutrient levels are present in the creeks, and dissolved oxygen levels regularly fall below minimum levels of concern in the back bay and some creeks.

Why This Is Important:

Our creeks and estuary provide important habitat to a wide variety of fish, shellfish, and other aquatic life. These animals breathe oxygen, just as we do, and the available oxygen in the water is called dissolved oxygen. Low levels of dissolved oxygen in the water are stressful and even deadly to fish and other aquatic organisms.

One cause of low dissolved oxygen levels is a chain reaction that begins with artificially high levels of nutrients. Nutrients such as nitrogen and phosphorus are crucial for life, but excess nutrients in an aquatic system can lead to sudden increases in algal growth. When these algal blooms die



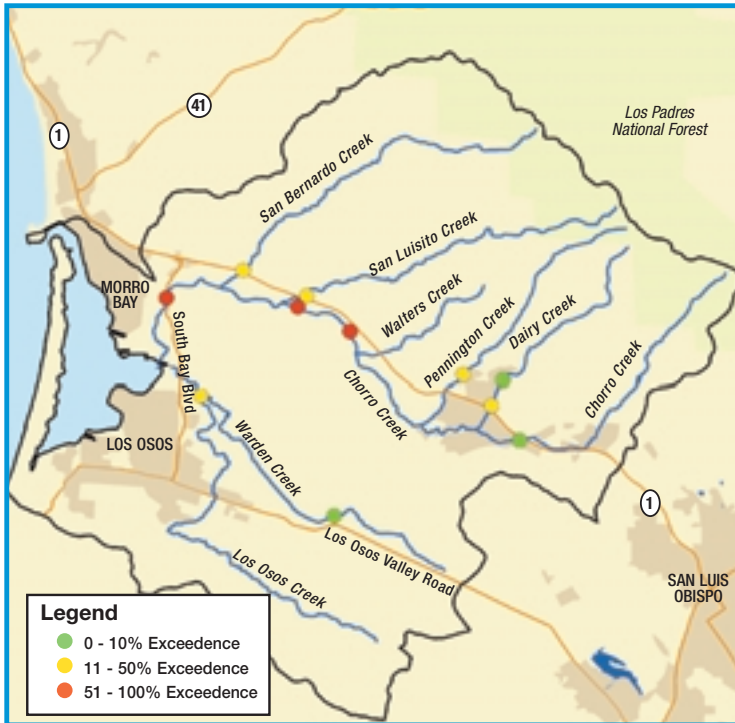
Martin Harris

off and decompose, much of the oxygen can be depleted from the water. Dissolved oxygen and nutrient levels are therefore linked, and both are key measures of water quality.

Oxygen Levels in the Bay



MBNEP volunteers kayak to seven bay sites in the pre-dawn hours and collect dissolved oxygen (DO) data. This captures the lowest DO levels of the day. State water quality agencies have determined that DO levels must be above 7 mg/L to be protective of aquatic life. DO levels below that protective standard are regularly detected in the back bay. Whether this is due to nutrient enrichment, limited tidal flushing, or some combination of the two is not known. The dots on the map show the percent of the readings at each site where the DO levels were below 7 mg/L.



Nutrient Levels in the Creeks

This map shows the Morro Bay watershed and the sites monitored on a monthly basis by MBNEP volunteers. The dots on the map indicate the percent of samples that exceed the orthophosphate level of concern for protection of aquatic life*.

The sites with the highest levels (poorest water quality) are on the lower reach of Chorro Creek. The wastewater treatment plant for the California Men's Colony, Cuesta College, and the National Guard camp discharges its treated effluent into the creek above these sites. The effluent has high nutrient levels, but a new plant is under construction which should significantly improve effluent quality when it goes on line in 2006.

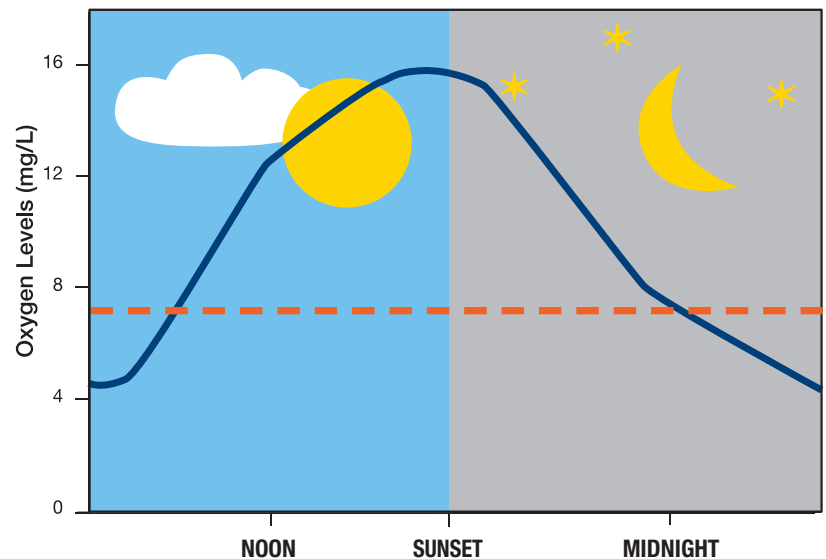
*While this level is not set in the state regulations, it has been determined by the RWQCB to be a level which, if exceeded, could have negative impacts on the fish, insects and other creatures living in the system. The data were collected by the MBNEP volunteers and the RWQCB's Central Coast Ambient Monitoring Program.

Project Highlight:

The MBNEP recently launched a public education campaign focused on how individual residents can reduce their contribution to water pollution. The edgy newspaper ads featured slogans such as 'When your dog goes on the lawn, it doesn't just go on the lawn' and addressed sources of pollution in stormwater run-off.



Where Does the Oxygen Go?



Oxygen levels in creeks and the bay change significantly from day to night. The lowest levels of oxygen occur at night. Why is that? Plants in the water undergo photosynthesis during the day and release oxygen into the water. But when the sun goes down, photosynthesis stops and the plants actually take in oxygen through respiration.

The trouble starts when waters are polluted with excess nutrients, like nitrogen and phosphorus. Excess nutrients fuel large algal blooms, and the resulting night time respiration (uptake of oxygen) can lead to extremely low levels of oxygen, which is stressful and sometimes deadly for aquatic life such as fish and insects.

The chart above shows oxygen levels over a 24-hour period in a creek with a severe algal bloom. As you can see the oxygen levels drop below that needed by fish and other aquatic life to thrive.

References:

Central Coast Regional Water Quality Control Board, dissolved oxygen data from Chorro Creek, 2003.

MBNEP and CCRWQCB, dissolved oxygen and nutrient data, 2002 through present.

Header Photo by Marlin Harms



Question:

Does the bay support healthy eelgrass beds?

What we measured: Acres of eelgrass beds

Answer:

Eelgrass acreage fell sharply in the mid-1990s and has shown a partial recovery since then.

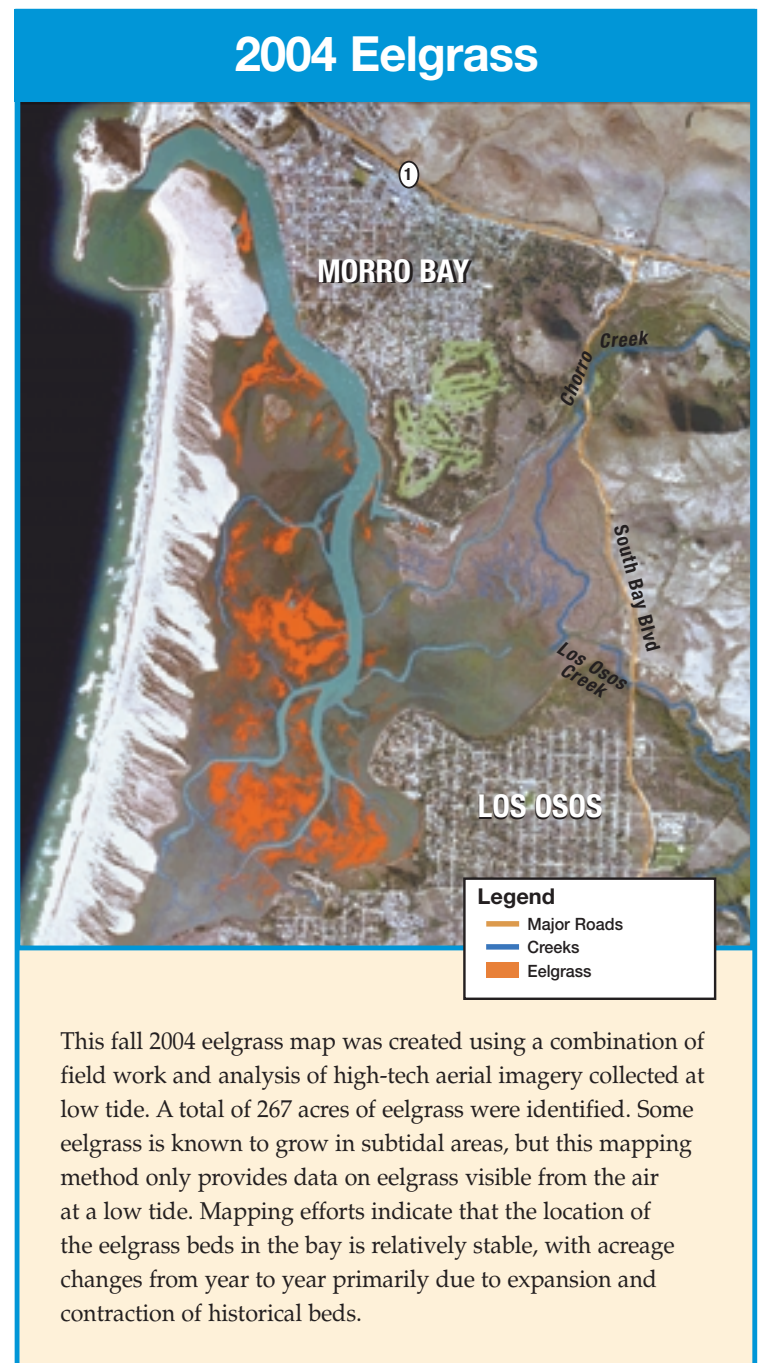
Why This Is Important:

Eelgrass is a seagrass that forms meadows in sheltered bays. Eelgrass beds are a rare and important habitat that provide food and shelter for a rich array of fish and invertebrates. Wintering brant geese rely on eelgrass as their primary food source. Eelgrass beds also play a role in keeping bay waters clear by stabilizing bottom sediments and filtering nutrients and sediment out of the water. Eelgrass is recognized as a good indicator of bay health because it is sensitive to sediment and poor water quality.

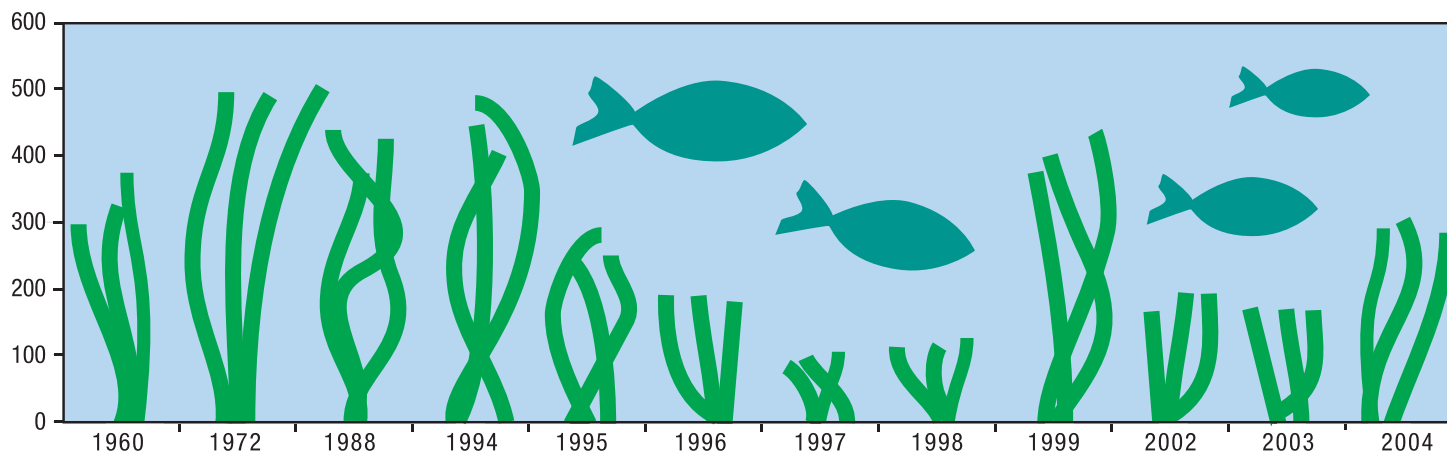
Morro Bay's eelgrass beds are recognized as the largest and least impacted of any in Central and Southern California.



Ruth Ann Angus



How has Morro Bay Eelgrass changed over time?



From 1960 to 1994, eelgrass acreage was relatively stable. In the 1994-5 season, the Highway 41 fire burned 35% of the Chorro Creek watershed. That winter the bare hillsides were drenched by El Niño rainstorms resulting in a major erosion event. Swollen creeks carried large amounts of sediment down to the estuary,

literally burying the bay's eelgrass beds. This smothering led to a severe decline in eelgrass acreage.

Eelgrass beds have shown a partial recovery: recent acreage estimates have been relatively stable, but lower than pre-1994 estimates.



Marsha Mello

Eelgrass Meadows Are Full of Life

- 1 – Surf Scoter
- 2 – Pacific Herring
- 3 – Bay Ray
- 4 – Leopard Shark
- 5 – Belly Jelly
- 6 – Grass Shrimp
- 7 – Bay Pipefish
- 8 – Lingcod
- 9 – Dungeness Crab
- 11 – Copper Rockfish
- 11 – English Sole
- 12 – Staghorn Sculpin
- 13 – Shiner Surfperch

References:

MBNEP, eelgrass map for 2004 and acreage data for 2002 through 2004.

Chesnut, John, eelgrass acreages for 1988 through 1999.

California Department of Fish and Game, eelgrass acreages for 1960 and 1972.

Header Photo by Ruth Ann Angus

5 Best Places to Enjoy the Estuary

1 Sweet Springs Preserve

This small preserve includes a mixture of freshwater wetlands and salt marsh habitat that ensures great birding and a look at rare coastal wetlands. Sweet Springs is a great spot for a quiet walk and has benches that offer super sunset views. Please note, this is a small preserve filled with sensitive habitat so dogs are best left at home (although allowed on leash), and a quiet voice is appreciated by both wildlife and other visitors.

2 Audubon Overlook

This sheltered overlook provides a nice location to enjoy the birds of the back bay, especially during the winter months. Morro Coast Audubon maintains this property and offers occasional birding sessions with local experts. To learn more, visit their website at www.morrocoastaudubon.org. To reach the overlook, take 3rd Street north off of Santa Ysabel in Los Osos and turn right at the end of 3rd onto the dirt road.

3 Windy Cove in Morro Bay State Park

If you need a spot to cool off, Windy Cove is the place for you. Park in the lot at the Museum of Natural History and take a stroll down to the waterfront. This is a great spot to watch shorebirds forage for worms and other invertebrates in the mudflats. If you have time, head into the Museum to learn more about the estuary (see #7 for more information).

4 Elfin Forest

This open space park preserves extremely rare coastal Dune Scrub habitat and a forest of hundred-plus-year-old oak trees. A boardwalk has been constructed to protect the fragile vegetation, which also makes for an easy walking surface that is wheelchair accessible. Take an hour out of your day to walk this beautiful loop trail or attend an informative 3rd Saturday of the month walk presented by Small Wilderness Area Preservation (call 528-0392 for a recorded informational message). Dogs on leash are allowed and everyone (including your dog) must remain on the boardwalk.

5 Tidelands Park

A great place for the entire family, Tidelands Park offers beautiful views of the bay and sand spit along with a play area for children and convenient public restrooms. A series of interpretive signs offers visitors a chance to test their estuary knowledge.



5 Fun and Easy Ways to Learn More about the Estuary



HIGHWAY ONE



MORRO BAY STATE PARK



6 Estuary Nature Center

At the Estuary Nature Center you can take a look at eelgrass, get a bird's eye view of the watershed and enjoy an 18-foot long mural depicting estuary habitats. The Center is open everyday from 10am to 5pm and is free. Stop by to pick up estuary literature and enjoy a great view of the bay. Located on the Embarcadero at Marina Street, upstairs in the Marina Square Building.

7 Morro Bay Museum of Natural History

The entrance to the Museum is free for children, just \$2 for adults, and the experience is priceless. The Museum is full of interactive exhibits and offers one of the best views of the bay, rain or shine. Visit their website at www.morrobaymuseum.org or call 772-2694 for more information.

8 Adventures with Nature Walks

What could be better than a free guided tour of the estuary? Join volunteer docents for a walk around the bay and that is just what you get. Adventures with Nature walks are offered each month and you can check the schedule at www.morrobaymuseum.org or

pick up a copy at the Museum of Natural History. The walks begin at varied times and locations in State Parks throughout the county.

9 SWAP Walks

Every 3rd Saturday of the month Small Wilderness Area Preservation (SWAP) volunteers offer educational walks in the Elfin Forest. The walks begin at 9:30 a.m. at the north end of 15th Street off of Santa Ysabel. Wear comfortable shoes, park carefully to avoid driveways and mailboxes, and leave your pets at home. These easy paced walks last 1 to 2 hours. For more information about upcoming topics, call 528-0392 for a prerecorded message.

10 Los Osos Library Estuary Learning Center

Los Osos Library has recently put together an estuary learning collection including books, videos and interactive CDs. If you would like to learn about the hidden treasures found in estuaries around the world, this is the place to go. Call 528-1862 for hours and other information. The Los Osos library is on Palisades Avenue off of Los Osos Valley Road.

Photo Credits:
1, 5, Dave Hoover / 4, Ruth Ann Angus / 8, Mike Baird / Bird Photos, Ruth Ann Angus



Want to Learn More About Birding?

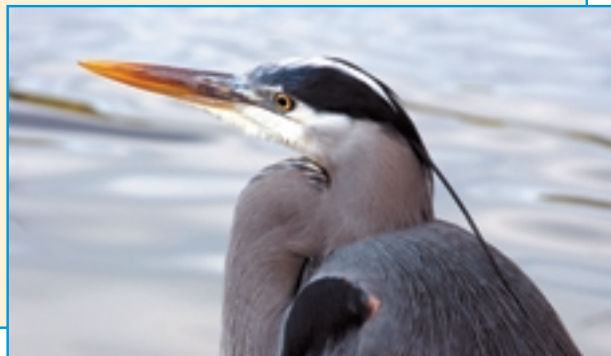
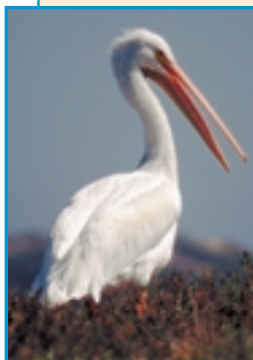
Anyone that enjoys the outdoors will make a great birder. Here is how to get started...

1) Obtain a local bird checklist or field guide to help you get acquainted with the birds you are most likely to see. A full color brochure is available at the Estuary Nature Center.

2) Take a walk or sit quietly at the water's edge. If you spend just five quiet minutes in an open habitat you will likely see a handful of birds. Morro Bay is great place to start birding... because there are so many birds to see!

3) Use a pair of binoculars. One of the most important skills is the ability to observe a bird without disturbing it. Binoculars will help you see details on a bird at a respectful distance that will not cause it to take flight.

4) Head out with an experienced birder. Birding with others is a fun way to quickly increase your knowledge. Find out about walks and seminars offered by Morro Coast Audubon (www.morrocoastaudubon.org) or join an Adventures with Nature walk focused on birds (www.morrobaymuseum.org).





Question:

Is the bay filling in at an unnatural rate?

What we measured: Rate of sediment deposited in bay

Answer:

Yes. Estuaries gradually fill as part of a natural geologic process, but in Morro Bay human changes to the watershed have increased soil erosion and altered natural stream channels. The resulting sedimentation of the bay has been dramatic, as much as ten times the natural rate. Sedimentation has been identified as one of the primary threats to Morro Bay.

Why This Is Important:

Recent studies have determined that Morro Bay has lost more than one quarter of its tidal volume in the last 100 years. Studies estimate that the bay may fill in within the next 300 years unless we can slow erosion rates. Under 'normal' circumstances unaffected by humans, the timeframe would be several thousand years. As the bay becomes more shallow, intertidal habitat is lost and area for valuable habitat such as eelgrass is reduced.



Salt Marsh Expansion in Last 100 Years



During heavy rain events, eroded soil from brushland, rangeland, cropland and urban areas are carried through Chorro and Los Osos Creeks and deposited into Morro Bay. This sedimentation has caused the creek bottom at Twin Bridges to rise over 13 feet in the last 50 years, and the salt marsh to double in size over the last century.

The MBNEP will continue to monitor changes in the estuary using bathymetry surveys and recently established stations to track sediment deposition.

Sedimentation Solutions



Stopping It at the Source

One way to slow the filling of the estuary with sediment is to stop or slow the erosion of land in the watershed. Erosion rates are being reduced through repairs to eroding stream banks and improved management practices on watershed farms and ranches like riparian fencing to reduce cattle access to creeks and riparian buffers between farm fields and creeks. A recent example is the restoration effort underway on Walters Creek, a tributary to Chorro Creek, where a century of cattle grazing has led to eroding stream banks and denuded riparian corridors. The MBNEP and landowner Cal Poly, with funding from the California Department of Fish and Game, are shoring up banks, replanting native vegetation, and installing cattle fencing and water troughs to reduce erosion at this site. The Coastal San Luis Resource Conservation District has spearheaded the implementation of improved management on private farms and ranches in the watershed. Projects like these have prevented an estimated 190,000 tons of eroded sediment from reaching the bay over the past 15 years.

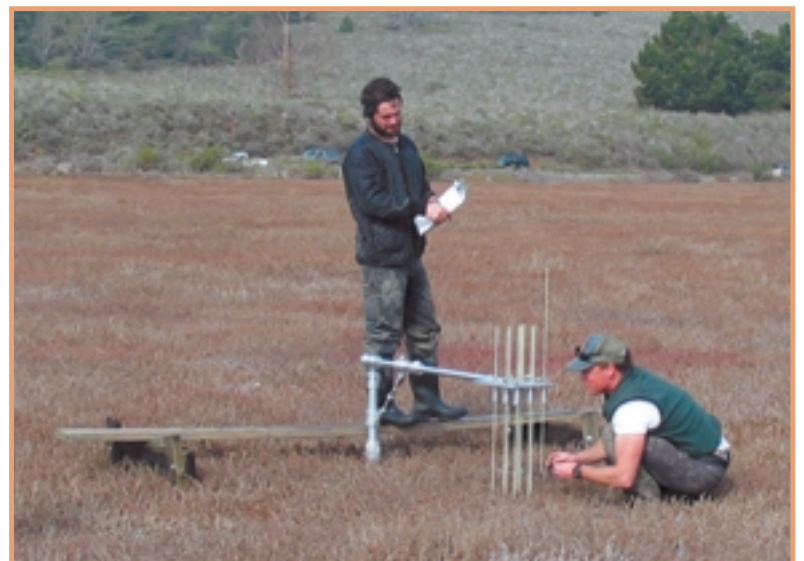


Catching It Downstream

A second approach includes capturing sediment in a creek floodplain. The Los Osos Creek Wetland Reserve and the Chorro Flats Enhancement Project are restored floodplains. By removing levees and allowing creeks to flood, water velocity slows in these vegetated areas, which allows sediment to settle out and be deposited there instead of in Morro Bay. It is estimated that the Chorro Flats project has prevented over 225,000 tons of sediment from reaching the bay and will continue to function well into the future. A similar project is planned for the recently protected Chorro Creek Ecological Reserve at the foot of Hollister Peak.

Project Highlight:

In 2004, the MBNEP began a project to track sedimentation rates in the bay. Sedimentation-erosion tables known as SETs have been established at six locations in the salt marsh. A permanent pipe was installed at each measurement location. Scientists return to these benchmarks each fall and use a precision instrument to measure the marsh surface elevation. This indicates the amount of either erosion or deposition that occurred since the previous measurement.



References:
MBNEP, salt marsh map developed from bathymetry provided by Phillip Williams Associates.
Coastal San Luis Resource Conservation District, Final Chorro Flats Report, 2000.
Coastal San Luis Resource Conservation District, Morro Bay Watershed Enhancement Project Final Report, 2001.



Question:

Are important habitats for fish and wildlife being protected and restored in the Morro Bay watershed?

What we measured: Acres of habitat protected and restored

Answer:

Yes, over 3,000 acres of valuable wildlife habitat have been permanently protected in the Morro Bay watershed since 2001, and over 4.5 miles of stream habitat have been restored.

Why This Is Important:

The Morro Bay Estuary and watershed is made up of many diverse habitat types that are critical to the survival of our native plants and animals, some of which are found nowhere else in the world. Healthy, intact habitats provide a home for these species, protect water quality in our creeks and estuary, and preserve the scenic beauty and outdoor recreational opportunities that draw residents and visitors alike to the Central Coast.

Habitat loss and degradation can occur through poorly planned development, poor land management, invasive exotic species, and pollution. Habitats which may appear protected, such as salt marshes and eelgrass beds in the estuary, can be degraded or even destroyed by excess sedimentation and other pollutants traveling downstream.



Ruth Ann Angus

References:
MBNEP compiled map, 2005.
Header photo by Marlin Harms. Otter photo by Rich Hansen. Snowy Plover photo by Greg Smith.

Habitat Protection and Restoration



This map of the Morro Bay Estuary and watershed highlights some of the most significant recent efforts to protect and restore important habitats, including acquisitions, conservation agreements, and restoration projects.

Conservation Agreements

Conservation agreements are a voluntary and cost effective approach to protect land from being developed while still keeping land in private hands and preserving traditional uses, such as family farming and ranching. The MBNEP and the Maino family formed a conservation agreement to protect the 1,860-acre Maino Ranch by limiting future development while ensuring that ranching and farming will continue. The ranch's key location between the city of Morro Bay and the rural

Chorro Valley makes this agreement especially important for protecting the watershed from future urban sprawl.

Land Acquisitions

The purchase of land from a willing seller is considered when an area contains rare habitats, hosts endangered species, or plays a critical role in protecting water quality. A total of more than 1,100 acres have been permanently protected in our watershed since 1995. Much of this recent effort has been led by the Partners for the Conservation of the Los Osos Coastal Dunes, who have made great progress towards their vision of a Los Osos Greenbelt, a protected arc of rare dunes habitat around



The Maino Ranch conservation agreement protects this healthy working landscape and contributes to good water quality and slower sedimentation rates in the estuary.



Thom Ream

Hollister Peak stands guard over the Chorro Creek Ecological Reserve, a newly protected property owned by Dept. of Fish and Game and acquired through the work of many MBNEP partners.

the community of Los Osos. The greenbelt provides wildlife corridors, protects habitat for rare plants and animals, provides walking and hiking trails for the community, and ensures that future generations will enjoy these lands.

The MBNEP helped arrange the purchase of the 580-acre Hollister Peak Ranch in 2003, now under the ownership of the California Department of Fish and Game as the Chorro Creek Ecological Reserve. Once slated for development into a golf course and resort, a collaborative effort between the MBNEP and Fish and Game is underway to improve water quality and restore habitat and floodplains along Chorro Creek as it flows through the property.

Restoration Projects

Restoration of degraded or altered habitats, especially creek corridors, is an essential part of ensuring the health of our watershed and estuary. Typical projects include repairing erosion sources like gullies, failing dirt roads, and collapsing stream banks, renewing native plant populations to help stabilize the area and improve habitat, removing non-native invasive species, and trapping sediment before it reaches the estuary.

The MBNEP recently completed restoration work on a half mile stretch of upper Los Osos Creek that included the repair of eroding creek banks, enhancement of steelhead trout habitat and the planting of 600 native riparian and upland plant species. Similar efforts are currently underway on Walters Creek in Chorro Valley.



This section of upper Los Osos Creek suffered from steep and severely eroding banks. Today, this area is terraced and held in place by hundreds of native plants and the creek bed offers clean gravel in which steelhead can spawn.

Local Habitats are Home for these Rare Species



Southern Sea Otter

- Brown Pelican – endangered
- California Clapper Rail – threatened
- California Red-Legged Frog – threatened
- ♦ California Sea-Blite – endangered
- ♦ Chorro Creek Bog Thistle – endangered
- ♦ Indian Knob Mountainbalm – endangered
- Least Bell's Vireo – endangered
- ♦ Morro Bay Kangaroo Rat – endangered
- ♦ Morro Manzanita – threatened

- ♦ Morro Shoulderband Snail – endangered
- Salt Marsh Bird's-Beak – endangered
- Southern Sea Otter – threatened
- Southern Steelhead Trout – threatened
- Southwestern Willow Flycatcher – endangered
- Tidewater Goby – endangered
- Western Snowy Plover – threatened

♦ indicates species found only in this area.



Western Snowy Plover



Question:

Are the bird populations that depend on bay habitat stable?

What we measured: Shorebird and Brant Geese Populations

Answer:

Local surveys and research suggest that estuary bird populations have been stable in the short-term, but the number of brant geese using the estuary is much lower than it was in the mid-1900s. National and global studies suggest that many bird populations have been greatly reduced in the last 100 years, with habitat loss a key factor. Most of the bird species that depend on the bay are migratory. These birds face challenges throughout their ranges, making the Morro Bay Estuary that much more important to their survival.

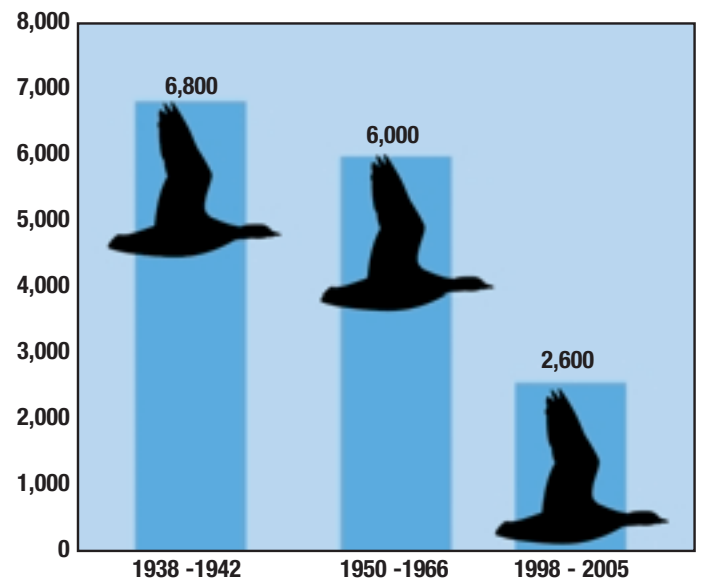
Why This Is Important:

Morro Bay provides a home for more than 150 species of birds, and almost 70 species use it as a stop on the Pacific Flyway during their long migratory journeys. The National Audubon Society recognizes Morro Bay as an Important Bird Area that provides essential habitat for birds. Tracking bird populations provides information about how individual species of birds are faring, and serves as an indicator of bay habitat quality.



This Brant was photographed in Morro Bay, but the band on its leg tells researchers that it spends its summers in Alaska. Banding is a common and important method used to study birds and their migration patterns.

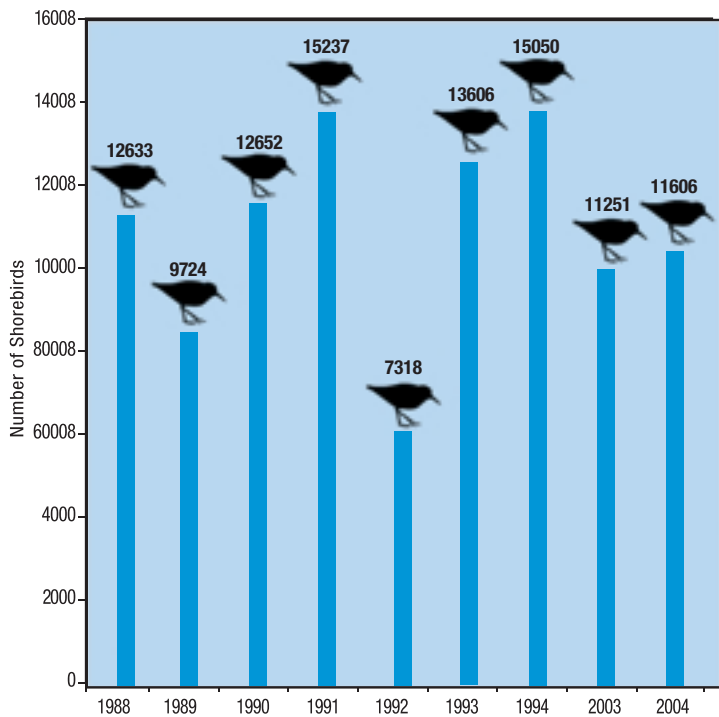
Morro Bay Winter Brant Populations



Brant are small dark geese that migrate up to 11,000 miles each year. During the summer nesting season, Brant are found in Arctic wetlands. Winters are spent in southern habitats including Morro Bay and other areas as far south as Baja California. During winter, their primary food source is eelgrass, a ribbon-like plant that grows only in sheltered bays and coves. Morro Bay offers migrating Brant the last remaining significant eelgrass beds in Southern California.

The graph compares the average number of Brant counted on Morro Bay during three separate survey periods. Counts were taken during mid-winter when Brant numbers typically peak in the area. The data show a downward trend that may reflect a loss of eelgrass habitat here as well as impacts all along their migratory path.

Morro Bay Shorebird Numbers



Each spring and fall, local birders come together to conduct counts of shorebirds on the bay, sand spit and Morro Strand. The work follows a protocol developed by the Point Reyes Bird Observatory and has been conducted since the late 1980s. The graph shows the total counts for each of the surveys conducted in the fall. Birders identify an average of 27 species during the fall counts, and this value has remained relatively stable over the years. The data shows a trend of relatively stable shorebird populations on Morro Bay.

Project Highlight:



As kayaking has increased in popularity so has the need to educate boaters about proper wildlife viewing. To help out, the MBNEP teamed up with Morro Coast Audubon to create a bird-friendly boating brochure. The waterproof piece teaches visitors about local

birds and informs boaters how to view these magnificent birds without impacting their critical resting and feeding needs. The brochures are available at boat rental shops and the Estuary Nature Center.

A Stop on the Pacific Flyway

Migration is the seasonal movement of animals from one habitat to another. Half of the world's bird species migrate, some flying over 10,000 miles each way. Migration takes place for many reasons, but the most obvious is to be in areas with abundant food.



American Avocet



Long-Billed Curlew

Bird migration in North America is essentially north-south along major routes known as "flyways." Some birds fly non-stop migrations over several days while other birds use stop-over locations to rest and find food. The Pacific Flyway, the most significant bird migration route on the west coast, includes Morro Bay. Each winter, Morro Bay hosts a mixture of winter residents and stop-over birds, and bird surveyors find over 150 species.

The life of a migratory bird is undeniably difficult. These birds not only endure grueling flights, but they also rely on the health of two separate summer and winter homes. If any of their summer, winter, or stop-over habitats are lost or degraded, the food and rest



Least Sandpipers

they need to survive are not available. Morro Bay plays an important role in the network of habitats that support millions of migratory birds, making preservation of the estuary that much more important.



Greater Yellowlegs

References:

California Department of Fish and Game, Brant data, 1950-1966.
MBNEP, Shorebird survey, 2003 to 2005.
Moffitt, J. Brant data, 1931-1942.
Local volunteers in conjunction with Point Reyes Bird Observatory, shorebird survey data, pre-2003.
Roser, John, Brant count data, 1998 - 2005.
National Audubon Society, State of the Birds, 2004
Bird photos by Ruth Ann Angus. Kayaker photo by Garry Johnson.



Question:

Do the estuary and watershed support a healthy population of steelhead trout?

What we measured: Number of steelhead in local creeks

Answer:

No. While an inventory in 2002 identified several thousand steelhead, the population is much lower than historic levels. The Morro Bay watershed contains much viable habitat for steelhead. However, invasive species, fish migration barriers, and low summer flows continue to limit the number of steelhead trout in local creeks.

Why This Is Important:

Steelhead numbers have drastically decreased along the Central Coast, leading to their designation as a federally threatened species. Degraded habitat, lack of freshwater flow, barriers to migration, and predation by invasive Sacramento pikeminnow continue to challenge the population.

Steelhead are the anadromous form of rainbow trout, which means that they hatch and grow in freshwater streams, then migrate to the ocean where they typically grow much larger than their freshwater kin. The adult steelhead then return to freshwater creeks and streams to spawn and lay eggs, starting the cycle again. This life cycle makes steelhead a good indicator of ecosystem health because they need healthy conditions in the creeks, the estuary, and the ocean to thrive. Cool clean water and abundant riparian (streamside) vegetation are especially important for steelhead in our watershed creeks.



Barriers such as bridge crossings, culverts, dams and insufficient freshwater flows can block steelhead migration.

Barriers to Steelhead Migration



Legend	
●	Removed Fish Barrier
●	Pending Barrier Removal
✕	Current Fish Barrier
Chorro Creek: 221 steelhead	
Los Osos Creek: 2,612 steelhead	

Narrow crossings under bridges, poorly designed culverts, dams and insufficient freshwater flows all constitute barriers to steelhead migration. A study conducted in 2002 identified six high and medium priority barriers in the Morro Bay watershed, indicated on the map above. Removal of these barriers would provide additional valuable steelhead habitat. Steelhead populations were surveyed in 2001 in areas where access was allowed. The estimated abundance based on those surveys is indicated in the legend. The Chorro Creek estimate does not include any tributaries to Chorro Creek.

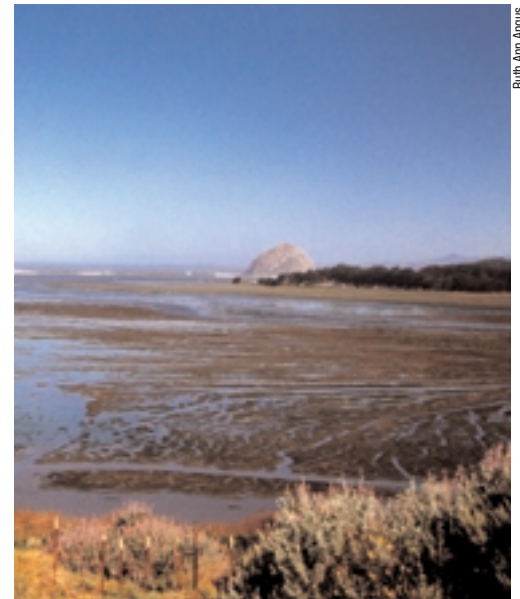
References:

Final Report: Morro Bay Watershed Stream Crossing Inventory and Fish Passage Evaluation, 2003, Coastal San Luis Resource Conservation District survey
Header photo by Dan Dugan

Conclusion

Measuring the health of the Morro Bay Estuary is a difficult task. The estuary is a dynamic system with many influences from both the land and the ocean, and this natural resource hosts a complex ecosystem. Yet, with the estuary functioning as a center of activity for wildlife and people alike, tracking the environmental health of the bay is an important part of protecting and preserving it.

The questions posed in this report represent the vision and goals of the Morro Bay National Estuary Program for the future of the estuary: thriving populations of birds and steelhead trout, rich eelgrass beds, a slowed sedimentation rate, key habitats protected from development, and at the center of it all, clean water in our bay and creeks. Are we there yet? No. But just as there is work to be done, there is much to be hopeful about.



Ruth Ann Angus

Healthy

- ◆ **Shorebird** surveys indicate the abundance and diversity of these species is stable.
- ◆ **Watershed erosion and creek water quality** have benefited from the farming and ranching community's land management projects.
- ◆ **Eelgrass beds** have made a significant recovery from their collapse in the mid-1990s, although they continue to be threatened by sedimentation.
- ◆ **Areas of protected lands and restored habitats** have increased dramatically due to projects implemented by various MBNEP partners.

Impaired

- ◆ **Steelhead trout populations** in watershed creeks are low and access to much of their habitat is blocked.
- ◆ **Sedimentation of the estuary** remains a top concern even as efforts to reduce erosion are put in place. Newly initiated monitoring efforts will provide more data on whether the rate of filling has slowed.
- ◆ **Nutrient over-enrichment and low dissolved oxygen levels** that stress aquatic life are seen in the creeks and estuary.
- ◆ **Bacterial contamination** in the creeks as well as portions of the estuary is a concern for public health, shellfish operations, and other aquatic life as well.



Ruth Ann Angus

Looking Forward

The Morro Bay National Estuary Program is a partnership of community members, non-profits, agencies, local government, and businesses working to protect, preserve and restore Morro Bay Estuary and its watershed. As we work towards our vision for a healthy estuary, we will continue to monitor these key indicators of environmental health and will build on the findings of this report with future results. With your help, the next Report will show further improvements to the health of the Morro Bay Estuary.



Ways You Can Help Protect *The Estuary*

1. Keep a respectful distance from birds and wildlife when you are walking on the shore or kayaking. Use binoculars for observation.
2. Join a local environmental group such as Audubon, Small Wilderness Area Preservation, Friends of the Estuary, Central Coast Natural History Association and many others. Most groups offer an informative newsletter to their members that lists events and volunteer opportunities.
3. Clean up after your dog, and don't allow your dog to chase birds and other wildlife.
4. Learn more about the resources and ecosystem. The Natural History Museum, the MBNEP Estuary Nature Center, and libraries are good places to start.
5. When landscaping, use native plants and plants that don't need a lot of irrigation and fertilizer.
6. Volunteer your time. There are many ways people can contribute and many organizations are looking for help. Check out our website for more information.
7. Don't dump household pollutants like automobile oil, paint or household cleaners down storm drains. Remember, all storm drains eventually empty into the estuary or the ocean.

The Morro Bay National Estuary Program (MBNEP) is a collaborative effort of many local partners working to restore, protect and preserve the health of the Morro Bay Estuary. Morro Bay Estuary was named an "Estuary of National Significance" in 1995, becoming one of 28 National Estuary Programs around the country. Financial and technical assistance from the US EPA supports a small staff that works to implement the MBNEP's Management Plan for the estuary.



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The data used in "Report on the Health of the Morro Bay Estuary" is the cumulative work of many organizations and agencies. You can find the data sources in each section. The MBNEP would like to thank the many people that provided assistance in the development of this report.

Cover photo credits: Morro Rock front cover photo by Scott Loy; boat photo by Sue Lichtenbaum; all other photos by Ruth Ann Angus

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