

XI. LAGOON HABITAT MITIGATION MEASURES

The Findings for Adoption of the Water Allocation Program Final EIR identified three mitigation measures to reduce impacts to the Carmel River Lagoon, including wildlife that is dependent on it (Finding Nos. 390-A through C, and 392). They include: (a) assist with lagoon enhancement plan investigations, (b) expand long-term monitoring program, and (c) identify feasible alternatives to maintain adequate lagoon volume. This section briefly describes the purpose of these three programs and summarizes the mitigation activities from July 1, 2005 through June 30, 2006.

A. Assist with Lagoon Enhancement Plan Investigations

Description and Purpose

The District, Monterey County Water Resources Agency, California Department of Parks and Recreation (CDPR), and the California Coastal Conservancy (Conservancy) co-funded the Carmel River Lagoon Enhancement Plan, which was prepared by Philip Williams & Associates. A key aspect of the Lagoon Enhancement Plan was to identify alternative means to restore and enhance the lagoon environment. District staff participated on a plan review committee, which met on an as-needed basis, and contributed staff expertise for enhancement plan investigations. District staff reviewed and provided comments on the Draft Lagoon Enhancement Plan document. These comments, as well as comments from other reviewing agencies, were incorporated into the Final Plan dated December 1992.

The Lagoon Enhancement Plan correctly noted that state and local government funding is limited and “implementation needs to be opportunistic”. Budget concerns stymied progress until the floods of January and March 1995. Aspects of the Plan were then recognized as possible emergency means to prevent flooding in the Mission Fields neighborhood north of the river, as well as a way to restore riparian and wetland habitat on the south side. Working in conjunction with CDPR, the California Department of Transportation (Cal-Trans) developed a conceptual plan for mitigation of impacts associated with replacement of the Highway 1 Bridge that washed out in March 1995. Cal-Trans planned to incorporate certain features of the Lagoon Enhancement Plan to mitigate for disturbance to riparian habitat caused by construction crews. Cal-Trans envisioned a mitigation bank in the Odello West field by lowering the south bank levee and creating 37 acres of riparian habitat and five acres of freshwater wetland.

Implementation and Activities During 2005-2006

During this period, CDPR and the Conservancy completed their restoration of the 100-acre portion of the “Odello West” property that is within the Carmel River State Beach. The State Legislature appropriated \$4 million for the Conservancy to restore habitat in the lower Carmel River, and CDPR entered into an agreement with the Conservancy to implement and manage the project. The dredging and filling of the new south arm of the lagoon was completed in 2005, and monitoring of the extensive re-vegetation effort with native plants is ongoing. For a summary of

the status of the lagoon restoration project in 2006, see CDPR's *2006 Carmel River Lagoon Enhancement Report* dated January 2007.

District staff provided hydrological data to the Carmel Area Wastewater District (CAWD) to aid them in evaluating and monitoring their efforts, funded by California American Water (CAW), to augment flow to the lagoon using recycled water. A proposal to use treated water from the CAWD plant to increase the amount of water available for steelhead habitat in the lagoon was continued for a second year in Fall 2005.

District staff tested the quality of the water that was added to the lagoon, monitored receiving water quality, and provided expertise to representatives from numerous state, federal and local agencies, as well as members of the public, regarding the best ways to obtain additional water for the lagoon during the dry summer and fall months of the year. During the summer and fall, there is usually no natural surface flow to the lagoon, and the lagoon has historically experienced poor water quality and low water levels that have, at times, led to fish mortalities.

District staff was also involved in ongoing discussions regarding Monterey County Public Works Department's (MCPWD) breaching of the sandbar that forms each year between the lagoon and the ocean. On December 28, 2005, the river mouth was opened by a breach in a south-southwest direction through the barrier beach, and over the bedrock ledge that extends from the southern bluffs under the beach sand. This alternative was approved by the National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (CDFG), in contrast to the historical straight westerly breach across the beach. The southerly breach was intended to maintain higher water levels in the lagoon and avoid the sudden drop in water levels associated with the normal westerly breach. While the southerly breach was not expected to maintain lagoon levels as well as the northerly breach that was made in 2005, it was expected that the southerly breach would lessen the amount of erosion of the northern beach berm and Scenic Road bluffs that had occurred in 2005. Subsequently, the lagoon elevation dropped almost five feet over the two days following the initial breach. Ocean swells partially restored the beach berm over the next few days, bringing lagoon levels up approximately two feet. Following this rise, lagoon levels gradually declined to a level of three feet (NGVD) by the end of January 2006.

NMFS and CDFG indicated that an elevation of seven or more feet would be an optimal management target to benefit steelhead rearing. During most of February 2006, below-normal rainfall occurred and flows declined to 43 cubic feet per second (cfs) at the USGS Near Carmel streamflow gage by February 25, 2006, when additional rainfall occurred and flows began to rise at the end of the month. As a result of low flows and winter ocean wave action that built up the beach, the lagoon closed over five different periods in February 2006, totaling approximately 12 days or 42% of the time. Sufficient rainfall returned in March and flows kept the lagoon open almost continuously, except for two partial day closures during the latter half of March and one in mid-June 2006. The river mouth stayed open throughout June 2006 and did not close for the summer season until July 6, 2006.

On June 16, 2006, CDPR, with assistance from volunteers and interagency staff and with approval of State and Federal regulatory agencies, sandbagged the outlet of the lagoon in an effort to raise the lagoon level to improve over-summer habitat for steelhead. This effort was successful in restoring lagoon levels from a record low of 1.6 feet to 7.8 feet by June 21, 2006. As a result of this effort, lagoon levels remained above 6 feet almost continuously through July 2006. It is likely that, without these efforts, lagoon levels would not have risen above 2 feet, as inflow to the lagoon declined to 24 cfs by the end of June and less than 1 cfs by the end of July 2006.

During Fall 2005, both CDPR and CAWD released water to percolate into the soil adjacent to the lagoon in an attempt to improve lagoon water quantity and quality. Specifically, CDPR released a total of 107 AF of groundwater through September 2005. Similarly, CAWD released a total of 61 AF of tertiary treated wastewater from September through October 2005. There has been no quantitative analysis of the effect of these releases on lagoon water quality

On June 14, 2005, District staff participated in the first stakeholder meeting concerning the issue of management of the Carmel River lagoon and beach. A Technical Advisory Committee (TAC) was formed that included District staff. In November 2005, the TAC released a draft *Proposed Short-Term Management Plan for the Carmel River Lagoon*. The TAC met five times between August 2005 and June 2006, with the meetings facilitated by CDPR. These meetings included two sessions with community stakeholders. At CDPR's request, District staff began facilitating the TAC meetings in June 2006, with the District General Manager as chair and the District Water Resources Engineer as staff support. In addition to facilitating the TAC meetings, District staff also assumed responsibility for compiling and editing the draft *Study Plan for the Long-Term Adaptive Management of the Carmel River Beach and Lagoon*.

B. Expand Long-Term Monitoring Program

Description and Purpose

Long-term monitoring of the lagoon and its associated plant communities provides data that can be used to evaluate the wetlands' response to groundwater pumping. The purpose of the monitoring is to: (1) determine if changes in hydrology or plant species distribution and coverage are occurring due to the removal of groundwater upstream, and (2) implement additional mitigations if pumping-induced changes to hydrologic characteristics or vegetation are identified. The Mitigation Program calls for extensive studies such as vegetation mapping and soil surveys to occur every five years. In practice, lagoon vegetation has been monitored annually from 1995 through 2005. Saturation paste conductivity of soils in the vicinity of the vegetation monitoring stations was measured annually from 1995 through 2004. Wildlife surveys and bathymetric surveys continue to be conducted each year.

Implementation and Activities During 2005-2006

The District conducted three types of monitoring during this period:

- Vegetation Surveys
 - Topographic Surveys and hydrology
 - Wildlife Surveys
- **Vegetation Monitoring** – In 2006, the District did not conduct vegetation surveys in the wetlands for the first time since the monitoring stations were established in July 1995. A combination of factors went into the decision not to monitor the vegetation in 2006. First, the efforts to maintain adequate water volume in the lagoon for steelhead and other aquatic species that began with the placement of sand bags at the river mouth on June 16, 2006, maintained the water elevation at a level that was unprecedented through the summer in the previous years of the Mitigation Program. Surface water communication between the lagoon and Carmel Bay was effectively closed on July 6, 2006, and the elevation of the lagoon remained high enough to prohibit effective monitoring of transects and quadrats in the lowest portions of the wetlands. Second, the timing of sampling affects the outcome of vegetation monitoring, as different species are more abundant or scarce depending on temperature, light and hydrologic regime. It has always been a goal to complete the vegetation monitoring in the month of July, but twice it was necessary to postpone monitoring until August due to the hydrologic conditions. In 2006, however, the water elevation was still too high to effectively access some of the quadrats well into the last week of August. And third, the Mitigation Program only requires that this monitoring be conducted every two years.

The report, *Biologic Assessment of the Carmel River Lagoon Wetlands*, prepared for the District by the Habitat Restoration Group in 1995, provides a detailed description of the methodology employed. Quadrats were intentionally located along transects at lower elevations of the wetlands because it is anticipated that changes in the vegetative community would first become apparent in these areas. The north side was emphasized because of disturbances on the south side associated with the creation of the Cal-Trans Carmel River Mitigation Bank and subsequent restoration of the Odello artichoke field.

Dramatic changes in vegetation were not observed between the summers of 1995 and 2005. Subtle differences in vegetative cover between years may be explained by slightly different sampling dates each year, made necessary by variations in the hydrologic regime from one year to the next, rendering some low-lying quadrats inaccessible until later in the season. The timing, magnitude and direction of wave action, runoff, and breaching of the sand bar at the mouth of the lagoon affect the duration of standing water in some of the lower-lying monitoring sites.

A more detailed discussion of the results of vegetation monitoring to date is presented in the 2005 Mitigation Report. Data gathered thus far suggest that factors favoring freshwater species

over salt tolerant species may be occurring. Determining whether any changes are attributable to water management practices upstream as opposed to the timing of beach breaching, changes in hydrologic regime or even global weather dynamics is a more complex question. Review of the available data has not identified significant changes from one year to the next. Nor have strong relationships between species composition or distribution and water management practices been identified. Nonetheless, staff anticipates continued monitoring of the wetlands in the future to determine long-term trends.

- **Topographic Surveys and Hydrologic Monitoring** -- During the period covered in this report, District staff surveyed four cross-sections to track the movement of sediment in the lagoon (Section XI-C), continued to maintain a water level recorder and ALERT station at the south arm (Section II-G), and measured groundwater elevations in three wetland piezometers that were installed in May 1996. There is a good correlation between surface water elevation and water elevation in the piezometers. Staff also continues to track runoff at various locations including Highway 1 (Section II-B), and water production upstream of the lagoon (Section III).

- **Wildlife Monitoring** – District staff contracted with the Ventana Wilderness Society and Big Sur Ornithology Lab (BSOL) to conduct avian studies in the riparian corridor of the Carmel River at sites from Carmel Valley Village to a point just upstream of the lagoon (Section X-C). One of the concluding recommendations of the HRG report was for the District to conduct more wildlife monitoring around the lagoon. The BSOL will continue the avian monitoring around the lagoon initiated in 1997 by Dr. David Mullen under contract to the District.

In 1997, Dr. Mullen calculated the “Species Diversity Index” of the avifauna in the wetlands north of the lagoon, along transects established in 1996. The project was envisioned to track possible changes in the utilization of this area by birds. Birds are often used as indicators of the suitability of an area for wildlife because they tend to be easier to identify and count than other creatures. By tracking the species diversity index at a specific location over time, scientists are able to infer if changes have occurred that may affect the area’s dependent wildlife. The specific methods and results of the BSOL surveys are presented in an annual report to the District, *Analysis of Avian Guild Species Diversity in the Los Padres Reservoir and Carmel River Riparian Corridor*.

C. Identify Feasible Alternatives to Maintain Adequate Lagoon Volume

Description and Purpose

The purpose of this mitigation measure is to determine the volume required to keep the lagoon in a stable condition that can adequately support plants and wildlife. It is envisioned that alternative means to achieve and maintain the desired volume will be compared, and the most cost-effective means selected. Barring the development of a water supply project that can reliably provide more water to the Carmel River or offset water production from Carmel Valley, few feasible alternatives have been identified. In the summer of 2004, the addition of treated water from the Carmel Area Wastewater District was implemented on a seasonal basis, and some water from an old agricultural well was also added, although there were concerns about the

effects of water quality and quantity on both juvenile steelhead and red-legged frogs. Determination of desirable lagoon volume is conducted in conjunction with the monitoring studies noted above and the findings of the Lagoon Enhancement Plan. Development of alternative means to provide adequate volume will consider the implementation of the selected alternative in the final Lagoon Enhancement Plan.

Implementation and Activities During 2005-2006

District staff continued the annual survey of four key lagoon cross sections (**Figure XI-1**) to track changes in the volume of sand in the active portion of the lagoon over time. An initial survey of the four cross sections was conducted in January 1988. Subsequent annual surveys have been conducted beginning in September 1994 through the present. Sedimentation in the lagoon is a concern because the Carmel River as a whole has taken on an increased load of sediment from Tularcitos Creek and other drainages following the El Niño winter of 1998. Much of the sediment eventually washes into the main body of the lagoon, and subsequently some reaches the ocean. These four key cross sections provide a quantitative means to evaluate whether or not lagoon volume is changing significantly over time. The dynamic nature of the lagoon substrate is evident in **Figure XI-2**, which shows the results of the annual surveys conducted since 1994.

In September 2006, staff completed the annual surveys of cross sections (XS) 1-4. The September 2006 XS surveys indicated significant scour of sand at the cross sections, resulting in a greater lagoon volume at the XS than in most years. This is of particular interest since the June 2005 surveys showed unprecedented sand accumulation (and associated loss in lagoon volume) at the XS. It should be noted that the scour at the XS surveyed in September 2006 is consistent with unprecedented scour or channel incision along much of the Lower Carmel River amounting to 1.5 feet at the District's Carmel River at Highway 1 Bridge (HWY 1) gaging station. The stage discharge relationship or rating curve for the HWY 1 site supported by discharge measurements indicates that two-thirds of this scour resulted from the heavy, late season stormflow on April 5, 2006. It is possible that the lagoon scour was also associated with the April 5 event, but with only one annual XS survey at the lagoon the timing of the scour is an unknown. Another possible explanation of the lagoon scour and lower river incision is that the sediments deposited in the riverbed during El Nino 1998, are finally working through the river system, into the lagoon, and out to the Carmel Bay. Future, annual surveys should show if this sediment loss is the beginning of a trend or simply an anomaly in the data set.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

The District continues to support and encourage the ongoing habitat restoration efforts in the wetlands and riparian areas surrounding the Carmel River Lagoon. These efforts are consistent with goals that were identified in the Carmel River Lagoon Enhancement Plan, which was partially funded by the District. The District continues to work with various agencies and landowners to implement restoration of the Odello West property and Odello East property across the highway. Because of the restoration activities on the south side of the lagoon, the

District has concentrated its monitoring efforts on the relatively undisturbed north side. Staff have also attended meetings and had discussions with other agencies regarding the use of an old agricultural well and treated water from the CAWD to augment the lagoon during periods of low water.

The District expanded its long-term monitoring around the lagoon in 1995 in an attempt to determine if the reduction in freshwater flows due to groundwater pumping upstream might be changing the size or ecological character of the wetlands. Demonstrable changes have not been identified. Because of the complexity of the estuarine system, a variety of parameters are monitored, including vegetative cover in transects and quadrats, water conductivity, and hydrology. It is notable that due to the number of factors affecting this system, it would be premature to attribute any observed changes solely to groundwater pumping. During this period, for example, there have been two extremely wet years (1995 and 1998), and two above normal years (1996 and 1997), in terms of runoff. Other natural factors that affect the wetlands include introduction of salt water into the system as waves overtop the sandbar in autumn and winter, tidal fluctuations, and long-term global climatic change. When the District initiated the long-term lagoon monitoring component of the Mitigation Program, it was with the understanding that it would be necessary to gather data for an extended period in order to draw conclusions about well draw-down effects on wetland dynamics. It is recommended that the annual vegetation, conductivity, topographical and wildlife monitoring be continued in order to provide a robust data set for continued analysis of potential changes around the lagoon.

Lagoon bathymetric cross sectional surveys, initially conducted in 1988, have been completed annually during the dry season since 1994. These data are useful in assessing changes in the sand supply within the main body of the lagoon. Although, significant sediment accumulation was observed during the June 2005 surveys, the September 2006 surveys indicated just the opposite as significant sediment loss or scour was measured at the cross sections. It is also interesting how the 2005 and 2006 data appear to bracket the variability found in the multi-year data set. It is too early to tell if the scour detected in 2006 at the lagoon cross sections is the beginning of a trend, or merely a short term change. In general, no major trends indicating sand accumulation or depletion at the lagoon cross sections have been identified based on available data. These data are necessary to answer the questions concerning whether or not the lagoon is filling up with sediment, thus losing valuable habitat.

Figure XI-1
Map of Monitoring Transects and Stations at Carmel River Lagoon

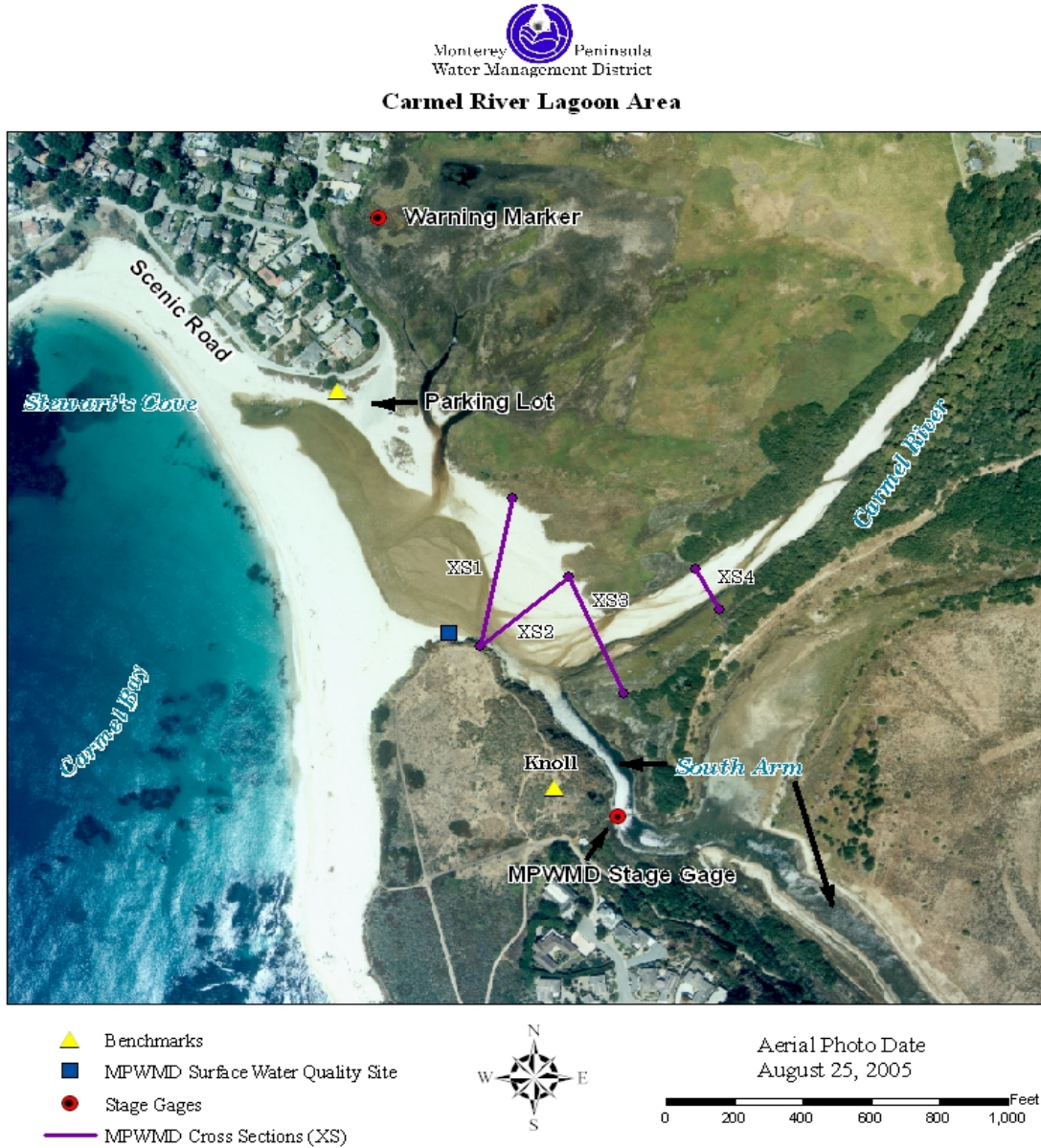


Figure XI-2

Carmel River Lagoon Cross Sections 1 through 4, based on Annual Surveys over the 1994-2006 Period

