

## **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, 2007 through June 30, 2008.

### **A. Assist with Lagoon Enhancement Plan Investigations**

#### Description and Purpose

The District, Monterey County Water Resources Agency (MCWRA), 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 of the bridge, and to establish a mitigation bank for future transportation projects. Cal-Trans created the Carmel River 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 2007-2008

During this period, CDPR with funding from the Conservancy continued their native riparian plant re-vegetation efforts within the 100-acre portion of the “Odello West” property that is now part of the Carmel River State Beach. The State Legislature appropriated \$4 million in the year 2000 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 2004, an extensive re-vegetation effort with native plants began following completion of the earthworks in 2004. The re-

vegetation work and associated monitoring is ongoing. For a summary of the status of the lagoon restoration project in 2007, see CDPR's *2007 Carmel River Lagoon Enhancement Report* dated January 2008 (CDPR 2008). The last summary of annual trends in water quality and aquatic invertebrate fauna, and an effort at video monitoring for juvenile steelhead during 2006-2007 were reported in the July 2007 report, *Carmel River Lagoon Enhancement Project: Water Quality and Aquatic Wildlife Monitoring, 2006-7*, prepared by California State University Monterey Bay's (CSUMB) Watershed Management Institute (Perry et. al. 2007). CSUMB researchers also began a fall lagoon monitoring effort that they hope to continue annually as part of a graduate seminar. The first year's results for Fall 2007 are the November 2007 report *Carmel Lagoon Water Quality and Steelhead Soundings: Fall 2007* (Anderson et. al 2007).

One of the ongoing goals of the Carmel Area Wastewater District (CAWD) is to cease discharges to Carmel Bay, by finding methods to recycle treated wastewater back to beneficial uses within the community. District staff provided hydrological data to the 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, primarily during the dry season, to increase the amount of water available at the lagoon and increase steelhead habitat was continued for a third year in Fall 2007. CAWD is exploring the potential to release recycled water directly to the lagoon as part of their discharge permit renewal from the Central Coast Regional Water quality Control Board (CC-RWQCB). This concept was considered by the CC-RWQCB in two hearings held on August 23, 2007 and March 20-21, 2008. The CC-RWQCB staff noted that impending modifications proposed to be completed at the CAWD treatment plant would likely change the quality of water produced from the treatment process, and they recommended a delay in their consideration of direct discharge to the lagoon, until tests of the effluent from the modified treatment process could be conducted. The outcome of these hearings was a permit to allow disposal on land, but not direct discharges into the lagoon. Further studies are needed before direct discharges to surface water would be permitted. Those studies include baseline monitoring of treatment plant effluent and lagoon water quality for specific metals, which might be elevated above acceptable limits for receiving waters by releases of CAWD's recycled water. The tertiary-treated CAWD discharges continue to meet water-quality standards for ground disposal and agricultural use, allowing their release onto surrounding habitat to irrigate vegetation, but not directly into the lagoon. The Carmel River Lagoon Technical Advisory Committee (CRL-TAC) hosted discussions of what would be needed to successfully complete the process, and made recommendations to CAWD and the CC-RWQCB on how to undertake baseline monitoring efforts for metals in the receiving waters of the lagoon. CAWD began this baseline monitoring for metals in 2008; CDPR provided funds for lab analyses of the samples CAWD collected. Efforts on this project will continue in 2008-2009. CAWD also hired a consultant to develop a study plan for completing the necessary studies that could lead to direct disposal of discharges to the lagoon. CAWD is currently looking for funding to undertake these studies.

District staff 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.

During Fall 2007, CAWD released water from October through November for the sole purpose of percolating it into the soil adjacent to the lagoon in an attempt to improve lagoon water quantity and quality. CAWD did so once again during this reporting period only in May 2008. Specifically, CAWD released a total of 11.0 AF of tertiary treated wastewater from October through November 2007, and 0.3 AF in May 2008. The CDPR also utilized what is known as its “Cal-Trans” well to provide irrigation water for its riparian restoration areas adjacent to the south arm of the lagoon. Any water not consumed in evapotranspiration of the crops or riparian vegetation, also theoretically percolated into the aquifer adjacent to the lagoon. Specifically, CDPR produced a total of 58.31 AF of groundwater between July 2007 and June 2008 to irrigate the riparian restoration area. This was approximately one third the level of their use in the prior reporting year. There has been no quantitative analysis of the effect of these releases on lagoon water quality.

District staff was also involved in ongoing discussions under the auspices of the CRL-TAC regarding Monterey County Public Works Department’s (MCPWD) breaching of the sandbar that forms each year between the lagoon and the ocean. NMFS and CDFG have indicated that an elevation of from four to ten feet, depending on the time of year, would be an optimal management target to benefit steelhead rearing.

The lagoon was last connected to the ocean on a continuous basis during the prior Reporting Year on April 9, 2007. During the week of March 26, 2007, CDPR equipment operators had raised the beach berm and formed a high elevation outlet channel. A large swell event closed the CDPR outlet channel on April 10, 2007, after which continued inflow raised lagoon levels to the annual high point of approximately 9.5 feet on April 27, 2007. Due to ocean wave activity, it was necessary for CDPR to use equipment to re-form the berm and outlet channel again during the week of April 23, 2007. The CDPR made their last adjustments of the year on April 26, 2007, to raise the sand berm and close the outlet channel. Lagoon levels then gradually declined as inflow dropped. Inflow to the lagoon ceased on approximately June 9, 2007, and the lagoon’s water level dropped to a little over 3.5 feet by June 31, 2007.

During the current Reporting Year, the lagoon’s water volume mostly stabilized at low levels throughout the summer and fall of 2007, fluctuating between approximately 2.5 – 3.75 feet through September 2007. Water levels began to slowly increase in October and November reaching an initial peak of just under six feet by December 5, 2007, due to the last three days of high surf and associated wave over-wash, then leveling off to near five feet until the first major winter storm on January 5, 2008. Very small amounts of surface flow were recorded at the MPWMD Highway 1 Gage for two days on December 18 and 20, 2007, due to localized urban run-off. Continuous Carmel River main-stem flow reached the lagoon on January 4, 2008, rising to a daily mean of approximately 500 cubic feet per second (cfs) at the MPWMD Highway 1 stream flow gage on January 5, 2008. This first major storm of 2008 produced 5 – 10 inches of rain in the upper watershed, and was combined with 25 – 30 foot ocean swells at the coast. The combined high surf, high tides, and river inflow raised the lagoon’s elevation to approximately 12.66 feet on January 5, 2008 when it breached naturally without assistance from the County Department of Public Works. The County had staged equipment in the area to do so, but was prevented from using its bulldozers by the rapid rise in the lagoon, which combined with saltwater wave action, softened the beach sands to the point where heavy equipment could not

safely operate on it. This new modern record of lagoon elevations exceeded the prior value of 12.04 feet set on January 11, 2001. The high lagoon elevations on January 4 and 5, 2008, required emergency evacuation of low lying homes adjacent to the lagoon, due to flooding of the lowest homes and adjacent streets. Subsequently, the lagoon elevation dropped to approximately 1.5 feet over the next four days following the initial breach. During most of the lagoon's daily cycles thereafter through March 17, 2008, minimum lagoon levels were above two feet.

Flows increased with the next major winter storm to the mean daily high flow for the water year of 1,940 cfs by January 28, 2008, then following two additional storm flow peaks, steadily declined to 19 cfs on April 28, 2008, when the lagoon closed naturally for the last time. As a result of low river flows and winter ocean wave action that periodically built up the beach, the lagoon was closed for more than 24 hours on four occasions between January and April 2008, totaling approximately 15 days or 13% of the time during those months. During most of the lagoon's open periods between March 17 and April 7, 2008, the lagoon drained almost daily to levels below two feet. From April 8 through 27, 2008, it drained almost daily to levels below 1.5 feet. After the final closure on April 28, 2008, the lagoon surface reached an elevation of approximately 8.2 feet on May 14, 2008. Flow to the lagoon ceased for the year on June 20, 2008, and lagoon elevations were at approximately 4.7 feet at the end of this reporting period on June 30, 2008, which was over a foot higher than at the same time in the prior year.

The CDPR was initially prepared to stage their bulldozers to close the lagoon on April 28, but MPWMD recommended they delay their efforts until flows were lower. Receding flows combined with large ocean swell then closed the mouth of the lagoon and built up the beach faster than lagoon levels could rise. On May 5, 2008, the CDPR pushed additional sand from the northern beach across the narrowest part of the sandbar at the mouth of the lagoon, to prevent evacuation of the lagoon from a breach at this low point, and to maintain lagoon elevations that had reached approximately 8.3 feet. These actions were supported by the CRL-TAC and were successful in maintaining lagoon elevations above the minimum target of four feet through July 15, 2008.

At CDPR's request, District staff began facilitating the CRL-TAC meetings in June 2006, with the District General Manager as chair and the District Water Resources Engineer and Senior Fisheries Biologist as staff support. The CRL-TAC meets as needed concerning the issue of management of the Carmel River lagoon and beach. The CRL-TAC met six times between July 2007 and June 2008 [7/19/07, 10/25/07, 11/29/07, 1/09/08, 3/12/08, and 4/16/08].

The District General Manager continued to work with other local agency managers and community representatives to pursue State funding to implement *Final Study Plan for the Long-Term Adaptive Management of the Carmel River State Beach and Lagoon* (April 17, 2007), but despite a number of joint efforts, no applicable source of funding was found during this reporting period.

In April 2008, the Monterey County Water Resources Agency (MCWRA) confirmed that it had suspended its work with CDPR to develop a draft *Interim Adaptive Management Plan* for the annual flood-prevention management of the beach's sandbar at the Carmel River Lagoon, pending the outcome of potential litigation by the Carmel River Steelhead Association and the Sierra Club under the Federal Endangered Species Act. It was intended that the Interim

Adaptive Management Plan would serve as the basis for a joint CDFG Stream Bed Alteration Agreement Application by CDPR and MCWRA for the annual breaching and re-closure of the lagoon, and eventually lead to a U.S. Army Corps of Engineers permit which would include ESA Section 7 consultations with the NMFS and USFWS. The MCWRA continues to seek the funding necessary to develop the information needed to pursue permit application and review. CDPR continued work on its own towards acquiring permits for the closure of the lagoon in the spring to maximize habitat volume, by producing a second draft of an *Initial Study – Mitigated Negative Declaration for the Carmel River Lagoon Water Elevation Adaptive Management Project* in April 2008 for interagency review by the CRL-TAC. CDPR circulated a final draft for public review and comment on July 16, 2008. CDPR intends to finalize the document and apply for permits in the next reporting year.

## **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 2007-2008

The District conducted three types of long-term monitoring during this period:

- Vegetation Surveys
  - Topographic Surveys and hydrology
  - Wildlife Surveys
- **Vegetation Monitoring** – In July 2007, the District re-occupied monitoring stations that had been sampled annually between 1995 and 2005 after the District's decision to not conduct vegetation surveys in the wetlands in 2006. A combination of factors went into the decision not to monitor the vegetation in 2006, and is discussed in the 2006-07 report.

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 2007. 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 are more complex questions. 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 (see Section XI-C of this report), continued to maintain a water level recorder and ALERT station at the south arm (see 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 (see Section II-B), and water production upstream of the lagoon (see 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 November 1995 Habitat Restoration Group 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 annual reports to the District. The last one which covered sampling sites near the lagoon at the mouth of the Carmel River was for summer 2004. Sampling in the vicinity of the lagoon from there on was carried out by the California State Department of Parks and Recreation. Their results for summer 2007 are included in a separate report: Scullen, J. and N. Thorngate, December, 2007, *Carmel River Lagoon Avian Monitoring Program Report*, available from the District. In 2008 California State

Department of Parks and Recreation ceased monitoring avian species in the lagoon area because of budget constraints. However, the District has Species Diversity Index numbers for an area in the Carmel River main-stem just west of Highway One from 1993 to present. These numbers are derived from a point count census that started with Dr. Mullen and is currently carried out by the BSOL.

### Special Studies During 2007-2008

- **Steelhead Population Monitoring**

In response to a request from the interagency Carmel River Lagoon TAC, the District helped design and support a mark-recapture study in 2006-2007 to estimate the steelhead population in the lagoon at the end of the fall rearing season and before the lagoon might be breached for the year. This study was led by biologists from the District and the NMFS, and staffed with employees of the District, NMFS, CDFG, and CDPR, as well as volunteers from CRSA and adjacent homeowners, and students from California State University at Monterey Bay's Watershed Management Institute. The intent was to continue this cooperative study each year to try to assess the abundance of steelhead in the lagoon as soon as possible after closure in the spring/summer, and again just before breaching in the winter. These two numbers could be used to calculate net survival over the summer and fall to assess how well the lagoon habitat was being sustained to enhance steelhead production. However, since the CDPR's ESA Section 10 consultation for steelhead monitoring of the lagoon restoration project had expired, no government agency had the proper authority under the ESA to conduct the studies and they were not pursued. MPWMD will be applying for ESA Section 10 coverage for the future, as part of its semi-annual renewal of staff Scientific Collecting Permits from CDFG.

### **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 Monterey Peninsula and resulting reduced diversions from the Carmel River, few feasible alternatives have been identified. It should be noted that MPWMD staff estimate that approximately eight cfs, or about 16 acre feet per day, can percolate through the barrier beach when the outlet is closed and lagoon water levels are stable at relatively high elevations (8 – 9 feet). This volume of water passing through the beach is significant, and is equivalent to about 1/3 of the daily municipal demand of the Monterey Peninsula during the summer. Beginning 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 existing 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 (see Section XI-A of this chapter). 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 2007-2008

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 sand 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 August 2008, staff completed the annual surveys of cross sections (XS) 1-4. Close inspection of the August 2008 XS surveys indicated very little change in lagoon substrate elevation at the four XS from the previous year's surveys (August 2007) (**Figure XI-3**). The unchanged substrate conditions from 2007 to 2008 may be related to the fact that peak streamflow into the lagoon only reached about 2,500 cfs or an average recurrence interval of two years (i.e., a two-year event), which is clearly not out of the ordinary. In other words, river energy was insufficient to mobilize sands within the lagoon. **Figure XI-2** shows that the lagoon substrate elevations in August 2008 are well within the range of previous surveys indicating no clear trend of either sand depletion or accumulation at the cross sections.

### **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 existing agricultural well and treated water from the Carmel Area Wastewater District to augment the lagoon during periods of low water.

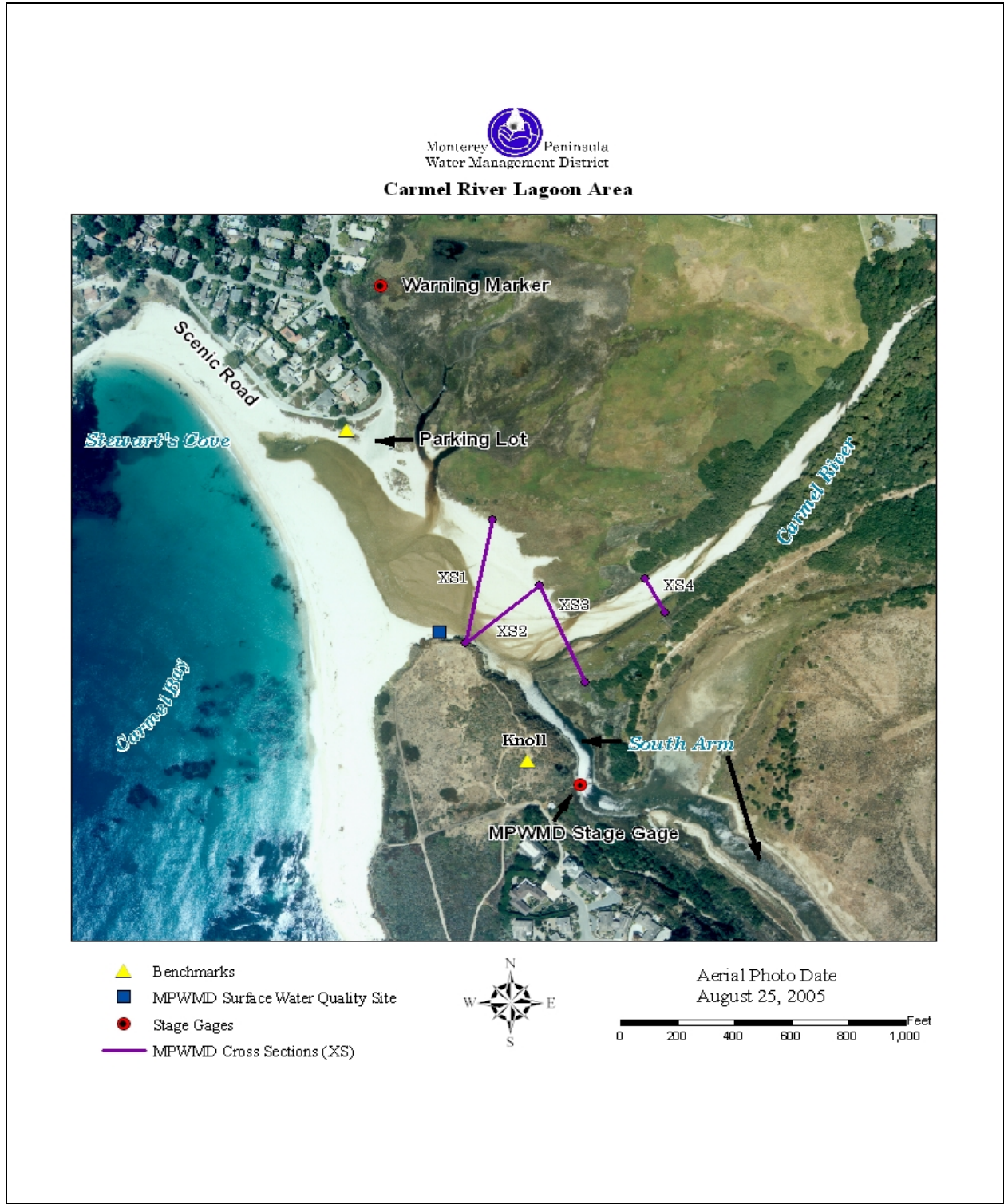
The District expanded its long-term monitoring around the lagoon in 1995 in an attempt to determine if the reduction in freshwater flows due to ground water pumping upstream might be changing the size or ecological character of the wetlands. Demonstrable changes have not been identified. Because of the 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.

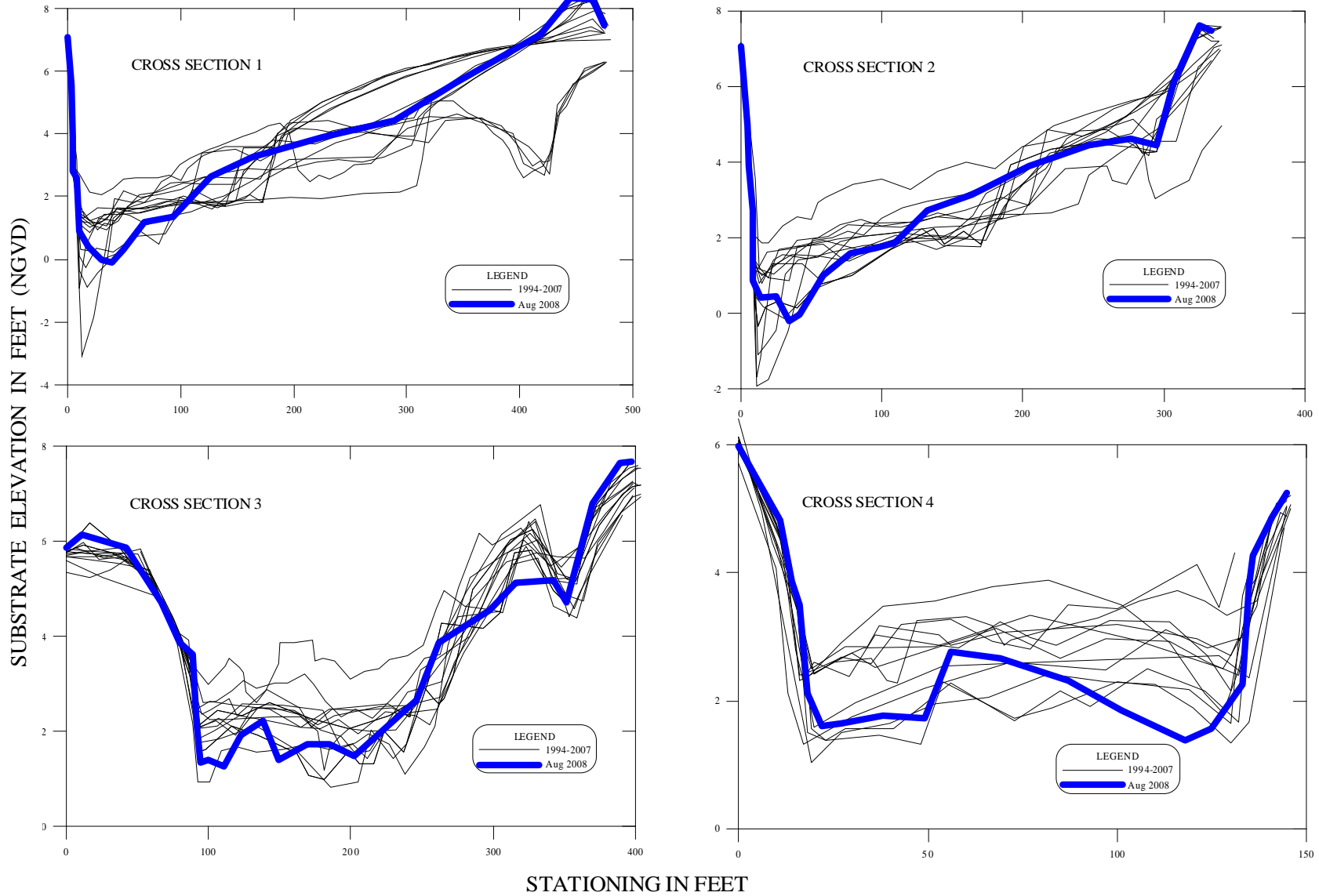
Lagoon bathymetric cross sectional surveys, initially conducted in 1988, have been completed annually during the dry season since 1994. These data are useful in assessing changes in the sand supply within the main body of the lagoon and are necessary to answer to questions concerning whether or not the lagoon is filling up with sand, thus losing valuable habitat. As indicated in the survey plots, the sandy bed of the lagoon can vary significantly from year to year. In general, no major trends indicating sand accumulation or depletion at the lagoon cross sections have been identified based on available data.

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



**Figure XI-2**

**Carmel River Lagoon Cross Sections 1 through 4, based on Annual Surveys over the 1994-2008 Period.**



**Figure XI-3:**  
**Carmel River Lagoon Cross Sections 1 through 4, Comparison of 2007 and 2008 Surveys**

