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4 **BEFORE THE STATE WATER**
5 **RESOURCES CONTROL BOARD**
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7 In the Matter of the State Water Resources) Hearing Date: September 24, 2007
8 Control Board (State Water Board))
9 Hearing to consider Monterey Peninsula) Carmel River in Monterey County
10 Water Management District's (MPWMD))
11 Petitions to Change Permits 7130B and)
12 20808 (Applications 11674B and 27614))
13
14

15 **EXHIBIT KU-4**

16 **MONTEREY PENINSULA WATER MANAGEMENT DISTRICT**

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18 **MPWMD 2006 Chapter IX Steelhead Mitigation Measures**
19 **in the 2005-2006 Mitigation Program Annual Report, June 2006**
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EXCERPT

**CHAPTER IX
STEELHEAD MITIGATION MEASURES**

From

**2005-2006 ANNUAL REPORT
(July 1, 2005 - June 30, 2006)**

**MPWMD MITIGATION PROGRAM
WATER ALLOCATION PROGRAM
ENVIRONMENTAL IMPACT REPORT**

Prepared by

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

IX. STEELHEAD MITIGATION MEASURES

The Findings for Certification of the Water Allocation Program Final EIR (Findings Nos. 388-A through D) identified mitigation measures to reduce impacts to the Carmel River steelhead population, including: (a) expansion of the program to capture and transport smolts during spring, (b) prevent stranding of early fall and winter migrants, (c) rescue juveniles downstream of Robles del Rio during summer, and (d) implement an experimental smolt transport program at Los Padres Dam. Monitoring of adult returns and juvenile populations provides an indication of the overall success of the steelhead mitigation measures. The following sections briefly describe the purpose of each mitigation measure and activities during the reporting period.

A. Capture and Transport Emigrating Smolts in Spring

Description and Purpose

During spring months, when steelhead smolts are actively emigrating from fresh water to the ocean, the diversion of surface and groundwater from the river often interferes, and in some cases, blocks migration into the ocean. This threatens individual fish, reduces the number of smolts that successfully reach the ocean, and indirectly affects the number of adults that eventually return to freshwater. When streamflow is too low for natural emigration, or when smolts are at risk of being stranded, the District monitors streamflow, captures emigrating smolts, and transports them to the lagoon or ocean. The goal of this program is to reduce disruption of the steelhead life cycle due to streamflow diversions.

Implementation and Activities During 2005-2006

During April, May and June 2006, mean daily streamflow in the Carmel River at the Highway 1 Bridge ranged from 3,310 to 24 cubic feet per second (cfs) (**Figure IX-1**). These flows kept the river mouth open the entire normal smolt migration period, except for minimal short term closures for only part of each day on May 17 and 25, 2006, and June 13, 2006, and provided excellent conditions for the emigration of smolts from the lower Carmel River and the Lagoon into the ocean. The river mouth stayed open throughout June 2006 and did not close for the summer season until July 6, 2006. The California Department of Parks and Recreation (CDPR), with help from volunteers and interagency staff, and with the approval of State and Federal regulatory agencies, sandbagged the outlet of the lagoon on June 16, 2006, in an effort to raise lagoon levels for the purpose of creating improved over-summer habitat for steelhead. This effort was successful in restoring lagoon levels from an all-time recorded low of 1.6 feet NGVD back up to 7.8 feet by June 21, 2006. Probably as a result of this effort, lagoon levels remained above 6 feet NGVD almost continuously through July 2006. Without this effort, lagoon levels would likely have never risen above approximately 2 feet, even after natural lagoon closure, as inflow to the lagoon had declined to 24 cfs by the end of June and less than 1 cfs by the end of July 2006. The sandbagged outlet did not prevent or impede emigration of juvenile steelhead, as outflow over the structure was retained until July 6, 2006. Due to excellent environmental conditions described in last year's report for 2004-2005, only one smolt was rescued from the river in the summer of 2005 (**Figure IX-2**).

B. Prevent Stranding of Fall/Winter Juvenile Migrants

Description and Purpose

As in other central California streams, juvenile steelhead in the Carmel River move downstream into lower reaches of the river well ahead of the peak emigration of smolts. Depending on river conditions and diversions during the previous dry season, there is some risk that pre-smolts and other juvenile steelhead will be stranded following early fall and winter storms, which increase flows and stimulate the fish to move downstream into habitats that are subsequently dewatered after the storm peak passes. This risk occurs primarily from October through February, although during severe droughts, the risk period may extend into March. The District mitigates this problem by capturing and transporting juveniles during the high-risk period from October through February. Currently, juveniles trapped during fall/winter months are transported upstream to viable habitats above the Narrows or held at the District's Sleepy Hollow Steelhead Rearing Facility (SHSRF).

Implementation and Activities During 2005-2006

District staff monitored river conditions during the fall and winter months of the 2005-2006 reporting year (RY 05-06). Following a series of storms beginning on December 26, 2005 and continuing through January 2, 2006 (see **Figure II-1**), mean daily streamflow below San Clemente Dam reached 1,170 cfs on January 2, 2006 (see **Figure III-1**). During the period of initial flows, District staff monitored conditions in the lower river. Continuous seasonal streamflow returned to the MPWMD gaging station at Highway 1 on December 24, 2005, following the initial six days of lower aquifer recharge beginning December 18, 2005. During this period the wetted riverfront progressed steadily downstream. As a result, no steelhead were at risk and no rescues of juvenile fish were needed during the fall/winter period in RY 05-06.

- **Status of Holding Facility** — The Water Allocation Program EIR included the construction and operation of a facility to hold steelhead pre-smolts during the period prior to spring months when they become smolts. The conceptual plan called for a facility to be located in lower Carmel Valley, near Garland Park, or the upper end of Aquifer Subunit 3 (AQ3), where an acceptable source of water is available. The need for the facility was based on a finding that water supply Option V would induce dewatering of the lower river during the late fall/early winter period. Currently, the District has placed construction of this facility on hold due to changes in the California American Water (CAW) system that reduce the risk of stranding. Since 1990, approximately 789 acre-feet (AF) of surface storage have been lost to reservoir sedimentation, including 179 AF in San Clemente Reservoir and 610 AF in Los Padres Reservoir. This loss causes the reservoirs to fill and spill earlier and reduces the risk of Fall stranding, as early surface flows are sustained at higher levels following storm events. Based on these changes, the District does not believe a separate facility to hold fish in the lower Carmel Valley is needed; the District operates the SHSRF (described below) in lieu of a holding facility.

C. Rescue Juveniles Downstream of Robles del Rio in Summer

Description and Purpose

About 1.5 miles of habitat between Boronda Road and Robles del Rio and up to nine miles of habitat

below the Narrows may dry up, depending on the magnitude of streamflow releases at San Clemente Dam, seasonal air temperatures and water demand. Beginning as early as April or May of each dry season, the District rescues juvenile steelhead from the habitat in these reaches. The goal of this program is to help maintain a viable steelhead population by transplanting juveniles to permanent river habitats downstream of San Clemente Dam (if it is available), and/or rearing juvenile steelhead at the Sleepy Hollow Steelhead Rearing Facility, located just downstream of San Clemente Dam, if habitat is not available.

Implementation and Activities during 2005-2006

- **MPWMD Annual Rescue Totals** – During the July 2005 to June 2006 reporting period, a total of 20,821 steelhead were rescued from the mainstem Carmel River, including 20,289 young-of-the-year (YOY), 489 older juveniles, one smolt, and 42 mortalities in July through September 2005 (**Table IX-1**). In comparison to previous rescue seasons, rescues in the 2005 dry season were above the average number of steelhead rescued from 1989 through 2005 (**Figure IX-3**).
- **CRSA Annual Rescue Totals** – During the July 2005 to June 2006 reporting period, a total of 15,214 steelhead were rescued from the mainstem Carmel River and Carmel River Lagoon, including 13,778 young-of-the-year (YOY), 724 older juveniles, and 712 mortalities.
- **Mainstem Rescues, 2005 Dry Season** – Late spring storms combined with high water levels in the Carmel Valley Aquifer Subunits 3 and 4 resulted in an extended season of runoff, and the lower river did not begin drying up until July 2005. The surface flow of the Carmel River reached 10 cfs at the Highway 1 Bridge by July 14, 2005. In response to the decline in surface flow, District staff began rescues on July 13, 2005 and efforts continued to September 14, 2005. During these months, staff conducted 35 rescue operations, yielding a total of 20,821 fish.
- **2005 Dry Season, MPWMD Transplant Location** – During the 2005 dry season, all the juvenile steelhead rescued by MPWMD, were transported and released into the District's Sleepy Hollow Steelhead Rearing Facility (20,821). The mortality of rescued and transported fish was 0.20% (42 fish), which is lower than the 1991-2005 average mortality of 0.72%. This was probably due to the use of an experienced rescue crew (seasonal fisheries aides' third year of rescues), use of block nets to reduce electrofishing exposure, improved transport techniques, and more favorable environmental conditions during the rescue process.
- **2005 Dry Season, CRSA Transplant Location** – During the 2005 dry season, juvenile steelhead rescued by CRSA, were transported and released in either the Carmel River Lagoon or the District's Sleepy Hollow Steelhead Rearing Facility. CRSA released 10,790 juvenile steelhead into the Carmel River Lagoon and 3,712 to the District's Sleepy Hollow Steelhead Rearing Facility. The mortality of fish rescued and transported by CRSA was 4.68% (712 fish).

- **Sleepy Hollow Steelhead Rearing Facility (SHSRF)** - The District's Water Allocation Mitigation Program includes construction and operation of a facility for rearing juvenile steelhead through the dry season. In early 1997, the District completed construction of the Sleepy Hollow Steelhead Rearing Facility, which includes a diversion and pump station, three large circular tanks, an 800-foot long rearing channel, electrical, water, pressurized air and drainage systems, a office/shop/lab building and miscellaneous equipment.

Late in 2002, the California Department of Water Resources, Division of Safety of Dams (DWR/DSOD) required lowering the water surface elevation in San Clemente Reservoir to an elevation of 515 feet, beginning on January 1, 2003. District staff feared that this change in CAW's operation could result in significant bypass of fine-grained sediment into the river channel below the dam, especially during periods when flows range below the capacity of the outlet structure. As a consequence, District staff expected that the large quantities of fine-grained sediment, including silt and sand, would pass into the Facility's intake structure. This would be problematic because deposition of fine-grained sediment and passage of silt would harm fish in the Facility and could lead to rapid failure of the recently repaired pumps. In 2003, the Board approved funding for the Interim Retrofit Project (IRP), which included upgraded impellers on the existing pumps, purchases of an additional backup pump and a mobile emergency pump, and installation of a centrifugal separator to reduce the buildup of coarse sediment in the cooling tower and rearing channel.

Facility Modifications in Reporting Year 2005-2006 - During the release of fish from the Facility in the winter of 2005, staff discovered that many of the smaller, young-of-the-year fish had moved from the lower bays to the upper bays in the rearing channel despite the weirs installed in 2004. This made the final accounting of survival percentages in each bay difficult. After the channel was decommissioned in the off-season, gaps were discovered under the new wooden weir boards. The sides and bottom of all the weirs were filled with caulking to prevent fish movement in the future. This had the added benefit of waterproofing the weirs, thereby adding an additional backup mechanism to prevent immediate dewatering of the rearing channel. If the river pumps were to fail, the channel would hold more water longer, giving staff more time to correct the problem without fish loss.

Summary of 2005-2006 SHSRF Fish Stocking and Releases - Following a wet spring, steelhead rescues began on July 13, 2005 and the first fish were brought to the Facility. Between July 13 and September 14, 2005, staff received approximately 24,612 rescued fish at the Facility, including fish rescued by the Carmel River Steelhead Association (CRSA). After being treated for parasites in quarantine, 24,457 fish were stocked in tanks and the rearing channel at the Facility, including approximately 21,313 young-of-the-year (YOY), 2,535 "medium" sized fish, and 609 large yearlings.

During the six and one-half month holding period, 25% of the Facility's fish died as a result of disease, stress, or generally poor health (**Table IX-2**). Primarily due to the installation of new weirs that divided the channel into 17 separate sections, thus keeping the large, aggressive fish from preying on the smaller fish, there was only 18% unaccounted for "mortalities" (**Table IX-2**). This compares to the 2004-2005 data when there was only 5% disease mortality, but 52% unaccounted for fish.

From January through March 2006, 13,911 fish were released from the Facility back into the Carmel River at seven locations (**Table IX-3**). Small, non-smolting fish were released above River Mile (RM) 5.5, primarily in the reach around the Facility. Most of the large or smolting fish were released at the San Carlos Well site (RM 3.7). Most fish were in excellent physical condition, and many had grown quite large.

The overall survival rate of fish held at the Facility in 2005 was 57%, the best result for a full-production season in the Facility's 10-year history (**Table IX-2**). This is a very favorable result when compared to the survival of wild fish in the lower Carmel River, and shows that the combination of the cooling tower, quarantine protocol, feeding regime, and naturalistic habitat in the rearing channel is successful in rearing wild-caught juvenile steelhead. The additional separation of size classes this season dramatically reduced the number of fish that could not be unaccounted for at the end of the rearing season.

D. Modify Spillway and Transport Smolts around Los Padres Dam

Description and Purpose

No downstream fish passage facilities were built at Los Padres Dam when it was constructed by CAW in 1948. By 1990, several improvements had been made to improve smolt passage, but no tests had been conducted to determine whether the modifications improved conditions. As part of a cooperative effort between California Department of Fish & Game (CDFG), CAW and the District to improve passage conditions, increase the survival of smolts, and increase the returns of sea-run adults to Los Padres Dam, the District implemented a program to measure the mortality of steelhead smolts as they pass through the spillway. The goal is to assess how well previous spillway modifications are functioning and to recommend whether or not additional modifications or permanent programs to transport smolts around the reservoir are needed.

Implementation and Activities During 2005-2006

Following modifications to the spillway and removal of bedrock below the spillway in 1995, District staff conducted experiments in 1996 and 1999 to determine survival of steelhead past Los Padres Dam. District staff has not completed the analysis of the data from the 1996 and 1999 field experiments due to other more pressing projects. However, staff has provided the data and preliminary results of analyses to CDFG, NOAA Fisheries, and several consultants for their work on the Carmel River and other central California streams. Future analysis of the experimental and survey data will provide an estimate of the number of steelhead smolts produced from habitat upstream of Los Padres Dam, and will help determine whether or not modifications made to the spillway in 1994 and 1995 have helped to increase smolt survival.

E. Monitoring of Steelhead Population

Description and Purpose

The District uses two primary techniques to monitor the health of the steelhead population: (1) counts of adult steelhead passing San Clemente Dam, and (2) surveys of the juvenile steelhead population in freshwater at the end of the dry season in October.

- **Winter Steelhead Adult Run** — The fish counter and related equipment were reinstalled at San Clemente Dam on December 19, 2005 and operated continuously from that date until May 31, 2006. As of May 5, 2006, a total of 368 fish passed by the counter, including seven in December 2005, 67 each in January and February 2006, 180 in March, 46 in April, and 1 in May 2006 (**Figure IX-4**). The 2006 run was slightly better than in 2005, but still below average and only about 44% of the recent peak runs of 804 fish in 2001 and 861 fish in 1998 (**Figure IX-5**). During the period from 1962 through 1975, visual counts of adult steelhead at San Clemente Dam averaged 778 fish and ranged from a low of 94 fish in 1972 to 1,350 fish in 1965. While not directly comparable to actual counts in the 1990-2001 period, the index from the 1962-1975 period was about six times the average count during the 1988-1996 period, but only 23% higher than the seven-year average from 1997-2005. This comparison indicates that adult returns have not reached levels common prior to the 1976-77 drought. Further, while the number of adults may not have recovered to historical levels, the persistence of returning adult numbers exceeding the historical lows indicates that the steelhead population continues to recover from the last drought in 1987-91. Of concern was the trend since 2001 as the run had declined consistently from one year to the next. However, this apparent decline may have leveled off and future years data will be needed to make any further interpretations. The four-year decline raised the question as to whether or not habitat conditions in the river and survival rates in the ocean may now be less favorable for steelhead.

District Fisheries and Information Technology (IT) staff installed a digital video camera to monitor the fish counter at the SCD fish ladder on January 14, 2006. Between January 14 and 20, this camera provided backup counts during the time the electronic counter failed and was being repaired. By inspecting the digital records for that period, District Fisheries staff were able to record 16 fish that would otherwise have been missed. Staff also used the digital video to conduct quality assurance on the remainder of the electronic fish counter data, by viewing 30 minutes of digital images, 15 minutes before and after the actual time of any electronic count from the automated fish counter. In doing so, staff discovered an additional seven fish that were missed by the automated counter, as well as corrected for when the counter was accidentally triggered by local mammals coming in contact with the fish counting weir. District Fisheries and IT staff have been working with external vendors to apply existing digital recognition software from the security industry towards the automated processing of fish counts from our digital video. Results to date look promising, and we are pursuing a pilot project to test the modified software. This is advanced technology that, when successful, will be applicable at fish counting stations on dams throughout the Western United States.

- **Winter Steelhead Redd Surveys** – Since 1994, the District has periodically conducted winter steelhead redd (nest) surveys between Sleepy Hollow and Los Padres Dam. Originally, these surveys were part of the spawning habitat restoration project to track how many adult fish actually spawned in the injected gravel and to record the downstream movement of the gravel itself. In 2001, the survey area was enlarged to include the Stonepine Resort area and several tributaries. In 2003 and 2004, complete mainstem surveys were conducted, at least once per spawning season, from Via Mallorca Road Bridge (RM 3.2) to Los Padres Dam. In addition to counting the number of redds in each reach, the number of adult steelhead, including spawning pairs, single fish, kelts (spawned-out adults) and carcasses, were also counted. Due to low numbers of adult fish in January and February 2005, high river flows throughout most of the winter that precluded wading most river reaches, and a large storm in late March 2005 that

effectively "erased" existing redds, no redd surveys were conducted in the mainstem of the Carmel River in 2004-05. The winter conditions of 2006 were similar to those of 2005, and no redd surveys were conducted.

- **Juvenile Population Surveys** — Since Fall 1990, the District has surveyed the juvenile steelhead population in the Carmel River below Los Padres Dam. This information is crucial to assess the success of adult reproduction and to determine whether or not freshwater habitats are adequately seeded with juveniles. In October 2005, the population was surveyed at eleven stations in a 16.7-mile reach between the Red Rock area in mid-Carmel Valley and Los Padres Dam, including two sites in the San Clemente Reservoir (SCR) inundation zone. In this 19-mile reach, the population density averaged 1.15 fish-per-foot of stream (fpf) and ranged from 0.21 fpf in the Lower SCR Inundation Zone to 2.10 fpf at the Cachagua Station (RM 24.7) below Los Padres Dam (**Table IX-4**). The Fall 2005 population density was above the long-term (1990- 2005) average density of 0.85 fpf and was well above the 2004 density level of 0.63 fpf (**Figure IX-6**). Several sites had the highest, or near highest, densities of fish ever recorded by the District. The Sleepy Hollow Station had a surprising high density of 1.63 fpf, three times that in year 2004, and much greater than the long term average of 0.61 fpf at this site. The Red Rock, Garland Park, and Stonepine stations all had significantly greater densities of fish than their long-term averages. Based on the 2005 population levels and comparison to previous environmental conditions, it appears that the increase in juvenile numbers was related to higher stream flows that persisted longer into the summer months, and possibly from greater numbers of adults spawning in the lower river compared to previous years.

- **Constraints to CAW Diversions from the Lower Aquifer** - During the 1992 SWRCB hearings on complaints against CAW's diversions from the Carmel River, testimony was presented that outlined the potential benefits of a modified way of managing the sequence of pumping from CAW well fields in the Carmel Valley Alluvial Aquifer. Pursuant to Condition No. 5 of SWRCB Order WR 95-10, CAW is required to operate its Carmel Valley production wells beginning with the most downstream well, and moving upstream to other wells as needed to meet demand. The goal of this order is to maximize the length of viable stream and aquatic habitats in the lower Carmel Valley.

During the 2005 dry season, this mode of operation and flow releases from San Clemente Reservoir resulted in approximately 2.3 miles of additional viable aquatic habitat. Based on estimated population density at the Scarlett and Lower River sites (see **Table IX-4**), this habitat produced about 19,000 additional juveniles, representing 21% of the total juvenile population downstream of San Clemente Dam (**Figure IX-7**).

F. Other Activities Related to the Steelhead Resource

The District also carried out several activities in RY 05-06 that were not required as part of the original Allocation EIR Mitigation Program, but will improve habitat conditions or help restore the steelhead resource. In prior years, these activities have included rescue and transportation of kelts, spawning habitat restoration, and grant funding for habitat improvement.

"Kelts" are adult steelhead that spawn from January through March, and begin to migrate back to the ocean in late spring and early summer. Under existing conditions, these fish are threatened by

receding flows in many years, especially when the upstream migration of adults is delayed due to late-season storms. District staff rescue and transport these fish to more stable waters, when needed.

In 1991, the District received a grant from the California Wildlife Conservation Board (CWCB) to restore spawning habitats in a 7.4-mile long reach between Los Padres Dam and the Sleepy Hollow area below San Clemente Dam. Existing dams have blocked the flow of gravel from the upper watershed for 85 years at San Clemente Dam and 58 years at Los Padres Dam, and severely reduced available habitat throughout the reach. The contract with the CWCB called for placing gravel into selected spawning sites and maintaining the sites over a ten-year period. The District acquired a Section 404 permit from the U. S. Army Corps of Engineers (No. 19958S09, dated May 26, 1993), which extended for a five-year period until 1998 to allow the District to add gravel below each dam for maintenance of spawning habitats. In August 1998, the District applied for a renewal of its permit, which was granted in October 1998. The renewal authorized injection of spawning gravel until Spring 2004. Over the 10-year duration of the project, the District injected a total of 2,444 cubic yards of gravel into the Carmel River.

In June 2000, the District was awarded three grants under the California Coastal Salmon Recovery Program (CCSRP) for projects to improve environmental conditions for steelhead in the Carmel River. These include projects to improve passage conditions for adult steelhead at four sites, to screen outflows from the Rancho San Clemente Trout Pond, and to conduct a pilot gravel dredging and injection project at San Clemente Reservoir.

In November 2000, the District began a bioassessment program using benthic macroinvertebrates (BMI) as an indicator of water and habitat quality at four locations between Los Padres Dam and California American Water's (CAW) Begonia Water Treatment Plant at Mid-Valley. In 2004, the Russell Wells site was dropped, and a new site above Los Padres Reservoir was added. The new "Above Los Padres" location can be used as a reference site to compare "pristine" habitat to habitat below the dams, and that of the lower, developed valley. Spring BMI sampling has been dropped since it was determined that sampling once per year was sufficient for collecting the necessary data. Results from the BMI analysis can be used as an indicator of water quality and food quality for juvenile steelhead, amongst the sites and over time. Low BMI abundance may be attributable to poor substrate quality (little available gravel or filled-in interstitial spaces), high levels of suspended particulates/turbidity, poor oxygen concentrations and high water temperatures. Following CDFG's California Stream Bioassessment Procedure (CSBP), BMI samples are collected from each site in the fall and sent to a laboratory for analysis. A three-year summary report on the District's bioassessment program was completed in June 2005.

Implementation and Activities in 2005-2006

- **Rescue and Transportation of Kelts** - Normally, steelhead kelts migrate downstream in late spring through June. District staff expected to find few if any adult fish in the lower river early in the 2006 rescue season. Not surprisingly, no kelts were found in Spring/Summer 2006 as outflows from the lagoon extended through July 6, 2006, and flow downstream to the District's Highway one gauge remained at least marginally adequate for adult passage through June 21, 2006.

- **Spawning Habitat Restoration Project** - During RY 05-06, no additional spawning gravel was injected into the Carmel River.
- **CRSA's Large Woody Debris Project** - District Engineer, Larry Hampson, provided staff support to a project by CRSA to add large logs to the newly restored South Arm of the Lagoon to improve habitat complexity and cover for steelhead. CRSA successfully applied for grant funds to conduct this project, with the approval and cooperation of the landowner, CDPR. Mr. Hampson received a certificate of recognition from CRSA for his role in helping the project succeed.
- **California Stream Bioassessment Procedure** - During RY 05-06, District staff collected benthic macroinvertebrate (BMI) samples in Fall 2005 from five locations between above Los Padres Dam and CAW's Begonia Water Treatment Plant at mid-Carmel Valley. The four sites below LPR coincide with District steelhead population survey stations. In addition, the Above LPR site is near a CDFG steelhead population survey site.

Results from the Fall 2005 sampling show generally low abundance of BMI at all river sites. The Above Los Padres site had the greatest taxonomic richness, and a high percentage of intolerant organisms (those that are highly intolerant to water and/or habitat quality impairment), but very low abundance. Red Rock had the second highest abundance and the greatest biovolume. The Sleepy Hollow site had very low diversity (52% black fly larvae) and a low percentage of EPT taxa (mayfly, caddisfly and stonefly).

Of the five composite site samples, 2,491 BMIs were processed comprising 59 taxa. Three species of mayflies comprised 36% of the taxa above Los Padres. *Baetis* mayflies were the most dominant species at both the Cachagua and Stonepine sites. *Simulium* (black fly larvae) dominated Sleepy Hollow, and Red Rock had a high percentage of caddisfly larvae.

- **Carmel Lagoon Water Quality Monitoring** – The District continued to monitor lagoon water quality by taking depth profiles of the lagoon at five sites on a monthly basis in 2005-2006. This work was conducted from July 9, 2005 through January 4, 2006 under the direction of the District's Senior Fisheries Biologist as a "Capstone" project by part-time Water Resources Technician, Eric Lumas, who was an undergraduate student at CSUMB. The District has continued the work at five of the original eleven sites for March through June of this reporting year, and intends to do so in 2006-2007. Data were not collected in February due to workload at the SHSRF. Data from the first six months of the work have been summarized in Mr. Lumas' Capstone Report (Lumas, 2006), available in District files, but Fisheries staff have not had time to analyze the remainder of the 2005-2006 data. The raw data and associated graphs have been shared with the Carmel River Lagoon Technical Advisory Committee.
- **Development of a Rescue and Rearing Management Plan for the SHSRF** – The District has had a Section 10 Permit application on file with NOAA Fisheries for a number of years. This year, NOAA Fisheries staff had the time to begin working with the District to develop a "Hatchery Genetics Management Plan" (HGMP) required for any fish rearing facility to receive a Section 10 Permit. Since the District's Sleepy Hollow Steelhead Rearing Facility is not a hatchery in the traditional sense, we have titled our plan the "Rescue & Rearing Management Plan" to more accurately characterize its purpose. District staff have been meeting with representatives of NOAA Fisheries, the California State Department of Fish & Game,

aquaculturist Dave Streig of the Monterey Bay Salmon & Trout Project's Big Creek Hatchery, and Mr. Bob Zampatti of the CRSA to develop initial drafts of the plan. The process was initiated with a tour of the SHSRF in August 2005 and the first meetings began in November 2005. District Fisheries staff met again with this technical advisory group in March, May and June 2006 when they presented draft sections of the RRMP, and received comments. The final draft of the RRMP is scheduled for completion by June 2008.

OBSERVED TRENDS, CONCLUSIONS, AND RECOMMENDATIONS:

Monitoring conducted by the District shows that the Carmel River steelhead population recovered somewhat from remnant levels that prevailed as a result of the last drought and past water supply practices. Since 1992, the spawning population has recovered from a handful of fish to levels approaching 900 adults per year as counted at San Clemente Dam. In the past five years, the spawning population has trended downward from 804 fish in 2001 to 328 fish in 2005, but recovered slightly to 368 fish in 2006. Monitoring of the juvenile population at several sites along the main stem Carmel River below Los Padres Dam shows that the population is recovering from low densities during the 1989-91 drought period (ranging below 0.50 fish per foot [fpf] of stream) to levels frequently ranging above 1.00 fpf, values that are typical of well-stocked steelhead streams. In the 2005-2006 reporting period, average population density was above the long-term average for the Carmel River. District staff believes the recovery and fluctuation of steelhead in the Carmel River Basin is directly related to the following factors:

- Improvements in streamflow patterns, due to favorable natural fluctuations, exemplified by relatively high base flow conditions since 1995;
- The District's and the SWRCB rules to actively manage the rate and distribution of groundwater extractions and direct surface diversions within the basin;
- Changes to CAW's operations at San Clemente and Los Padres Dams, providing increased streamflow below San Clemente Dam;
- Improved conditions for fish passage at Los Padres and San Clemente Dams due to physical improvements;
- Recovery of riparian habitats, tree cover along the stream, and increases in woody debris, especially in the reach upstream of Robinson Canyon;
- Extensive rescues (and rearing) by MPWMD of juvenile steelhead over the last 17 years, now totaling 233,922 fish through December 31, 2005; and by the transplantation of the younger juveniles to viable habitat below Los Padres Dam, and of older smolts to the lagoon or ocean; and
- Implementation of a captive broodstock program by Carmel River Steelhead Association and CDFG, and planting of 186,882 juvenile fish, including 73,786 fry, 84,679 fingerlings, and 28,417 smolts during the period from 1991 to 1994.

Though overall populations are improved since the inception of the Mitigation Program in 1990, District staff has noticed a period of decline in the adult run from 2001 to 2005, even though the

juvenile population density have increased or fluctuated within a "normal" range. At present, the reasons for period of decline in adult returns are not obvious, but may be related to a combination of controlling and limiting factors including:

- Better spawning conditions in the lower Carmel River (i.e., fish spawn before they reach the counter at the dam);
- Chronic poor water quality in the lagoon that causes annual fish die-offs or high predation, especially in low-flow years, thus resulting in fewer returning adults;
- Low numbers of juvenile fish in 1999, 2001, and 2004 affecting subsequent adult populations;
- Migration barriers such as the Old Carmel River Dam;
- Chronic, and occasionally acute, fall temperature and hydrogen sulfide levels below LPD;
- Potential for enhanced predation on smolts migrating through the sediment fields of LPD and SCD;
- Poor ocean conditions; and
- Ongoing but limited impacts of fishing (i.e., ~1.5% incidental mortality associated with catch-and-release fishing for adults in the winter season, and catch-and-release fishing for juvenile steelhead from in the upper watershed during the Spring/Summer trout season may slightly reduce the number of fish that reach the ocean).

A recent challenge that may remain for some years is the potential effects of substantive physical and operational changes to San Clemente Dam required by DWR/DSOD, including possible removal of the dam. The most significant issue is the effect of released sediment from the reservoir on downstream river habitat, proper functioning of MPWMD's Sleepy Hollow Steelhead Rearing Facility, and downstream property owners (flood elevations). Major changes include:

- Lowering of the reservoir water level to address seismic safety concerns;
- Significant changes in the sediment regime in the Carmel River downstream of San Clemente as the dam fills with sediment; and
- Loss of reservoir storage, which, in the past, has helped maintain adequate river flows and cooler water in the lower Carmel River.

However, improvements in State and Federal permit conditions this last year have extended by two weeks, until at least May 1 of each year, the time that the reservoir will remain full and that the fish ladder can operate to pass adult steelhead upstream. This improvement over past standards may result in allowing up to a dozen or more adult steelhead each year to pass San Clemente dam under the new draw down regimen.

District staff continues to provide technical expertise and scientific data to CAW engineers and environmental consultants, DWR/DSOD, CDFG, NOAA Fisheries, U.S. Fish and Wildlife Service, and others involved in addressing the resource management issues associated with seismic retrofit of San Clemente Dam. District staff also continues to provide technical expertise and scientific data to CDPR, Monterey County Water Resources Agency, Monterey County Public Works Department, California Coastal Commission, U. S. Army Corps of Engineers, and Carmel Area Wastewater District, other regulatory agencies and stakeholders involved in the management of the Carmel River Lagoon and barrier beach.

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Authors: Beverly Chaney, Cory Hamilton, & Kevan Urquhart

Figure IX-1
Water Surface Elevation in the Carmel River Lagoon and Streamflow at the Highway One Bridge: April through June 2006

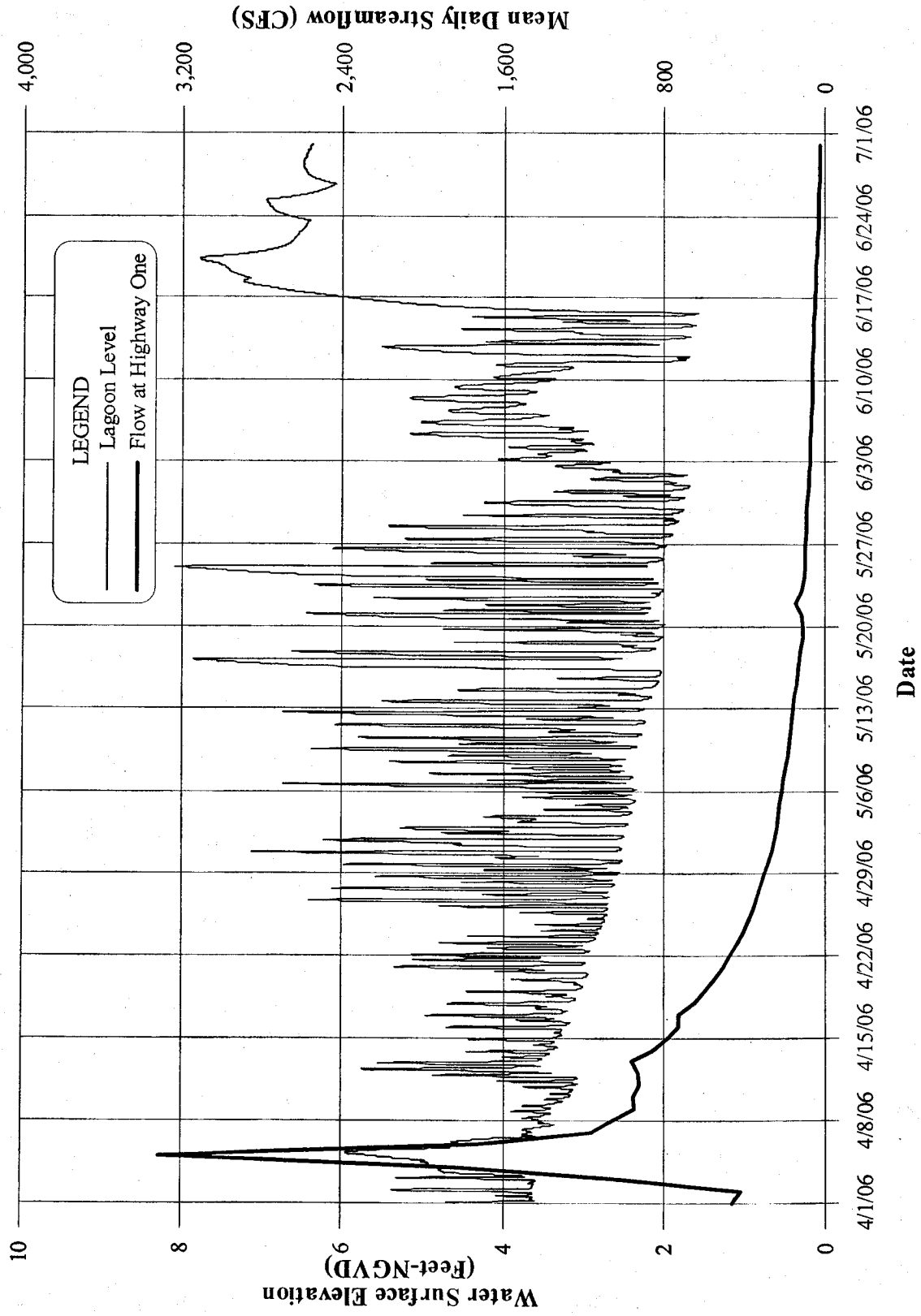


Figure IX-2
 Number of Steelhead Smolts Rescued by Location in the Carmel River Basin from 1989 to 2005

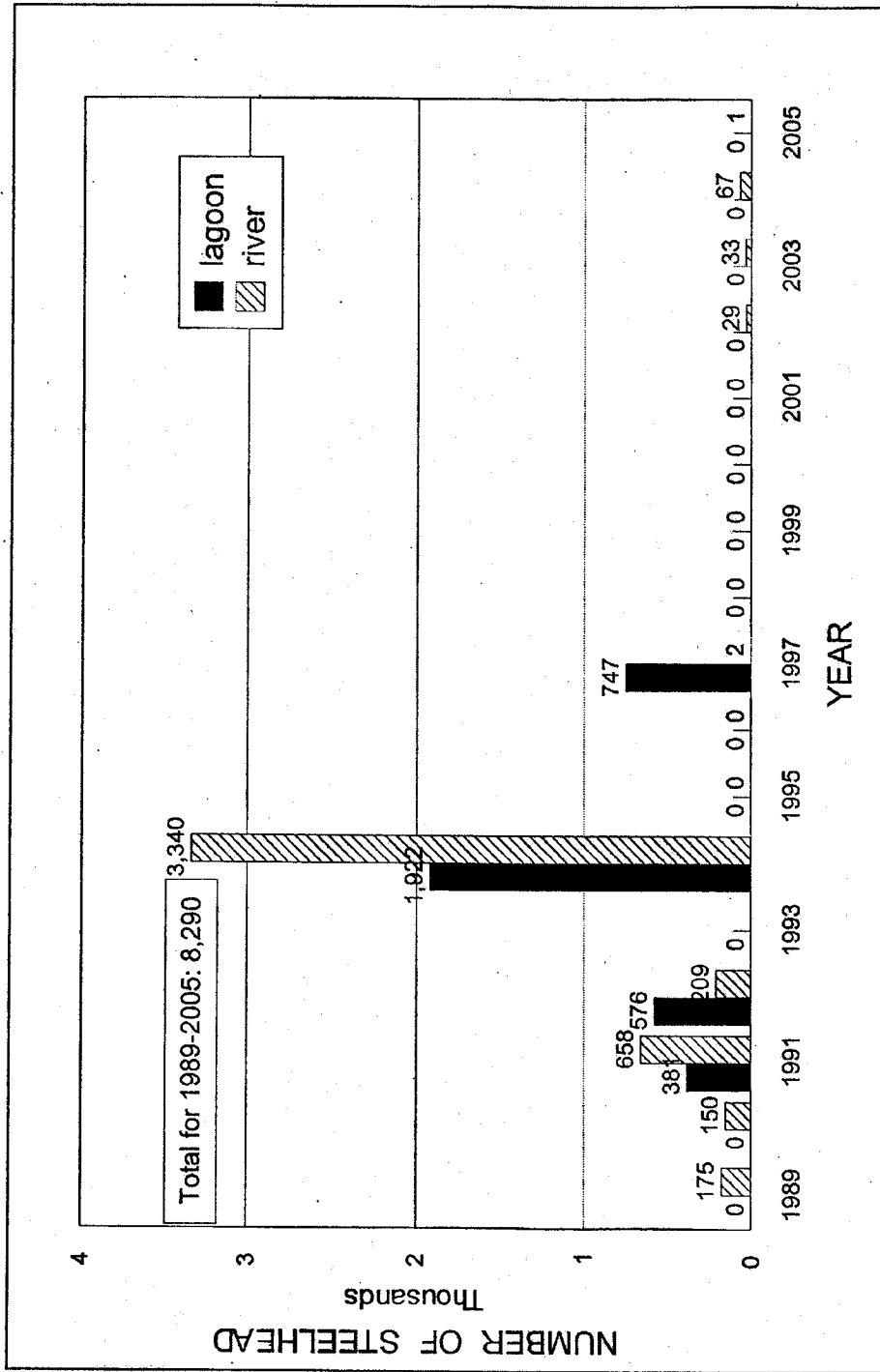


Figure IX-3
Number of Juvenile Steelhead Rescued by the MPWMD in the Mainstem Carmel River from 1989 to 2005

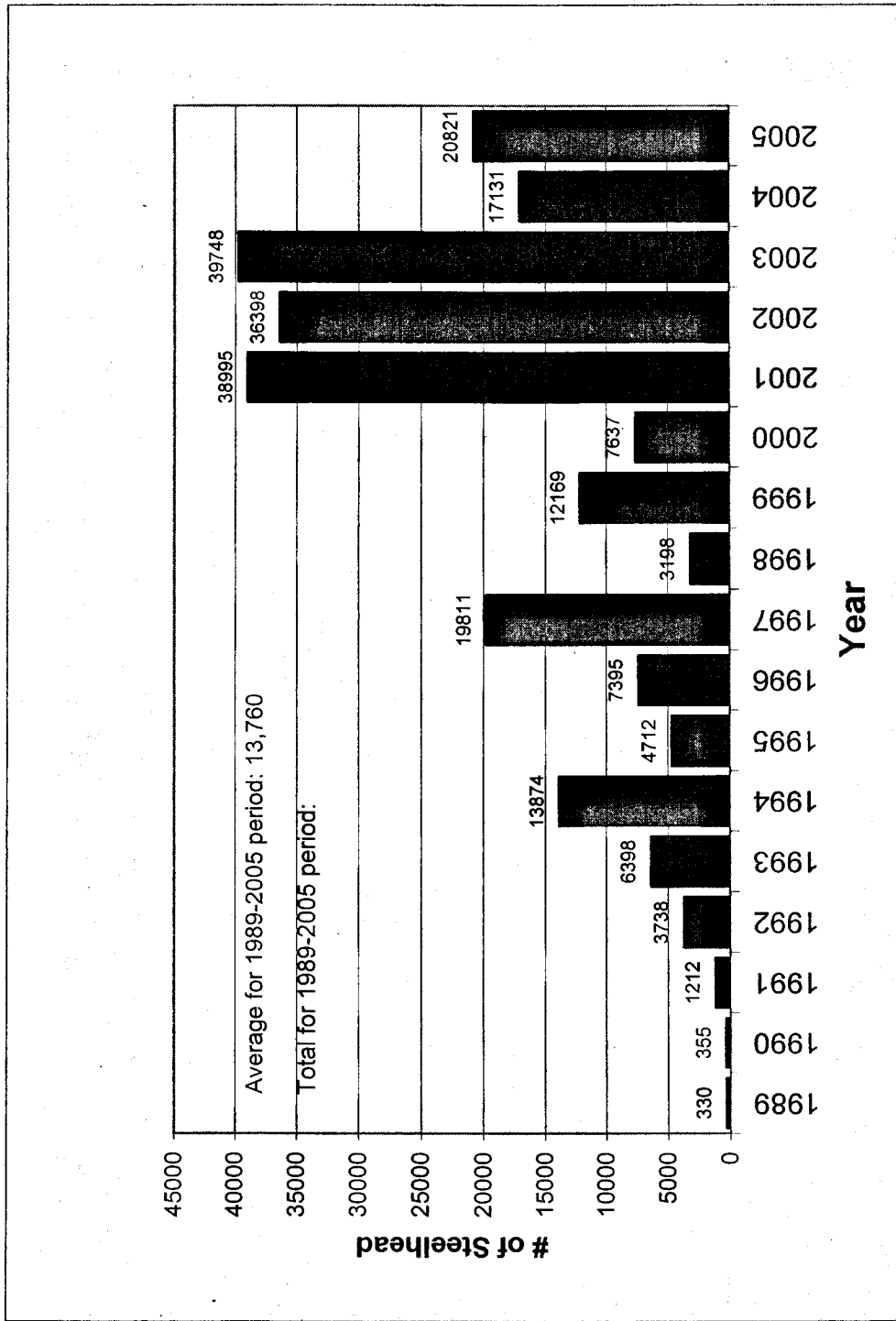
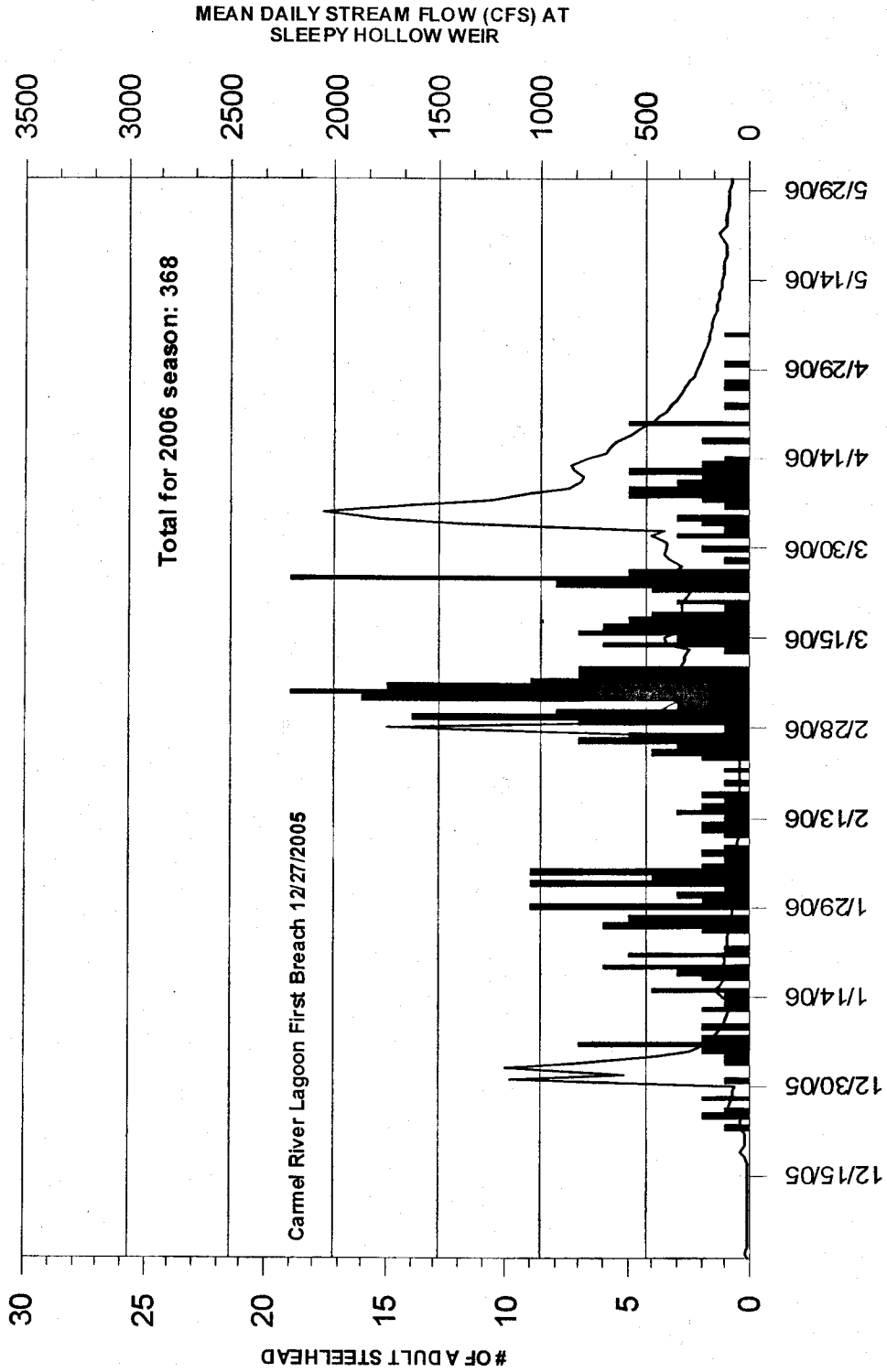
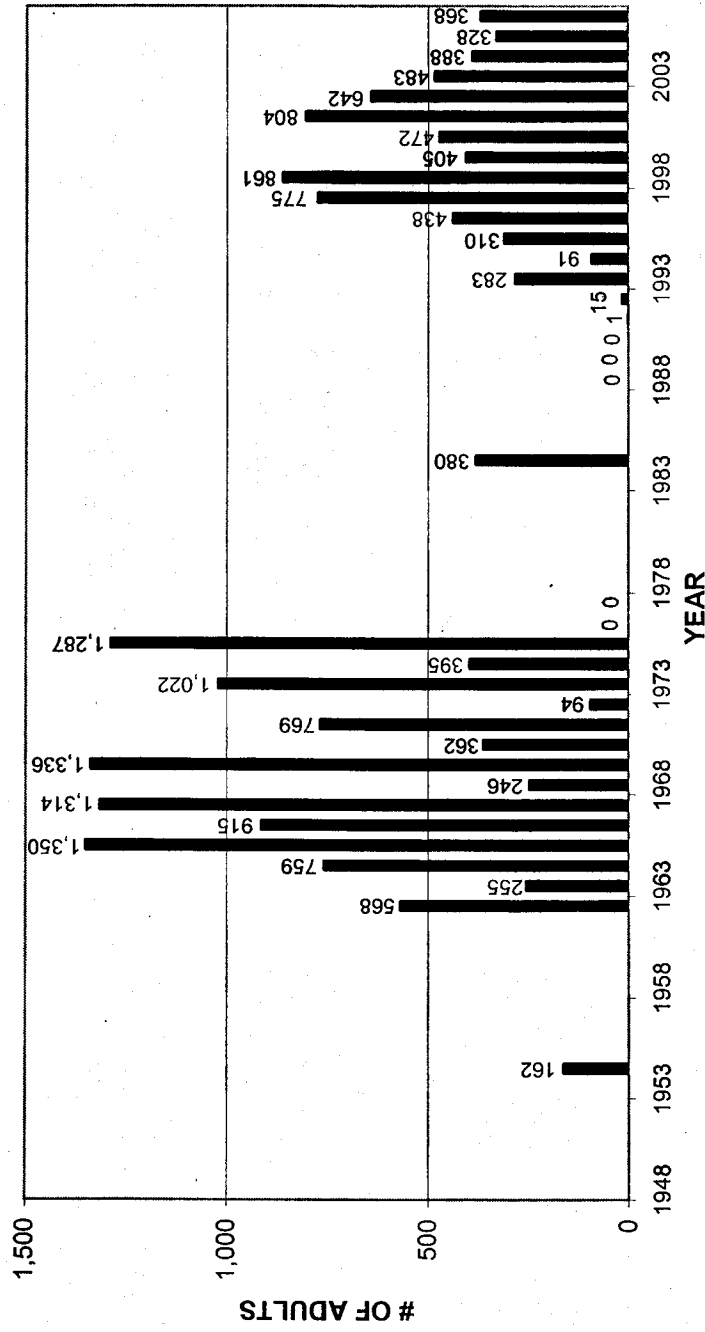


Figure IX-4
Daily Count of Adult Steelhead Passing the San Clemente Dam Fish Ladder
Compared to Daily Flow Downstream of the Ladder During the 2005 - 2006 Migration Season



** Streamflow measured at MPWMD gaging station at Sleepy Hollow Weir or San Clemente Spillway

Figure IX-5
Annual Total Number of Steelhead Passing San Clemente Dam in Selected Years from 1962 through 2006



Based on Snider (1983), Dettman (1986), and CDFG and MPWMD files. The 1962-73 and 1991-93 counts at San Clemente Dam are the sum of daily numbers of fish observed by shutting off the flow in the fish ladder. The 1974, 1975, 1984, and 1994-06 data are complete counts registered on an automatic counter.

Figure IX-6
Fall Juvenile Steelhead Population Density in the Carmel River from 1973 through 2005

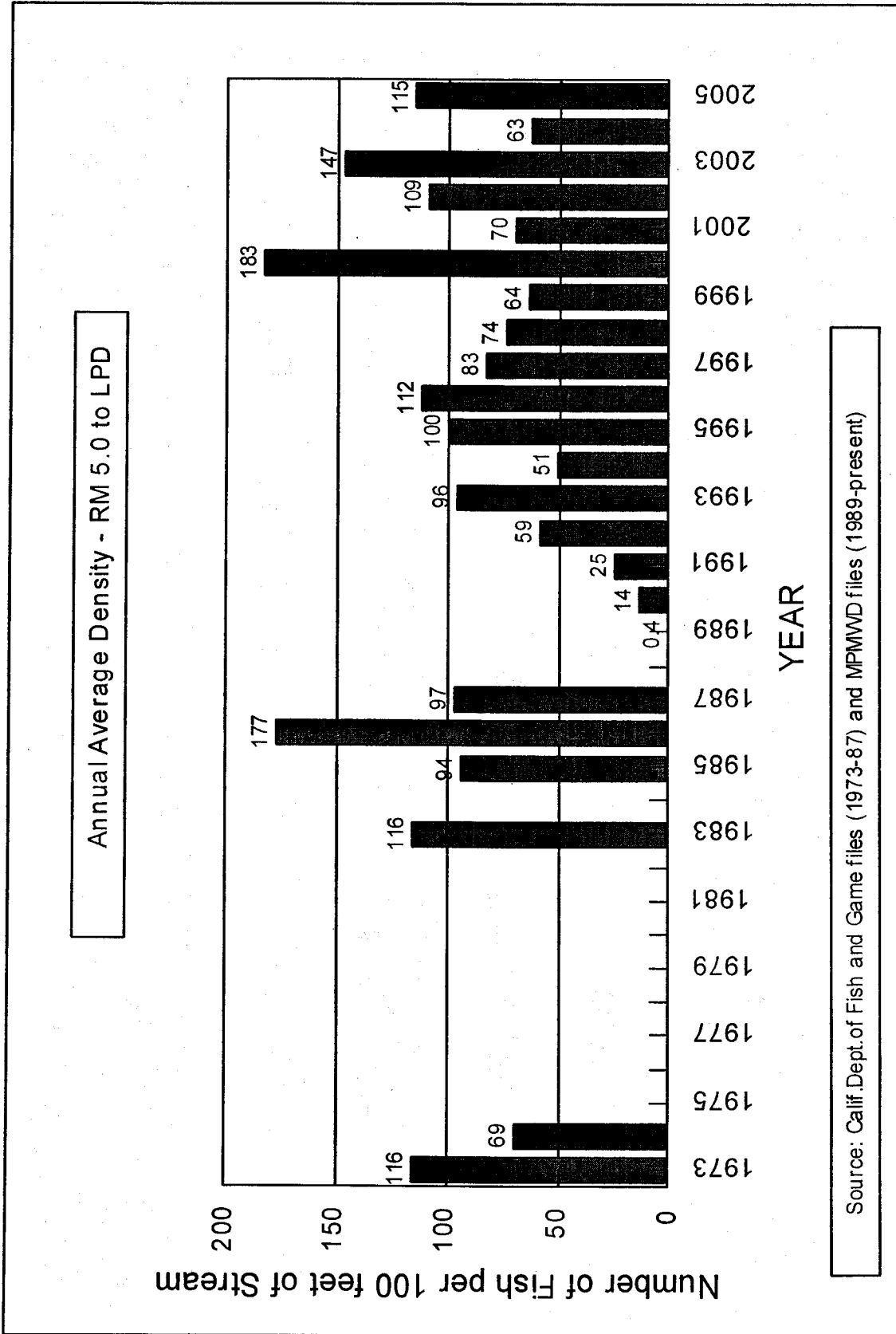
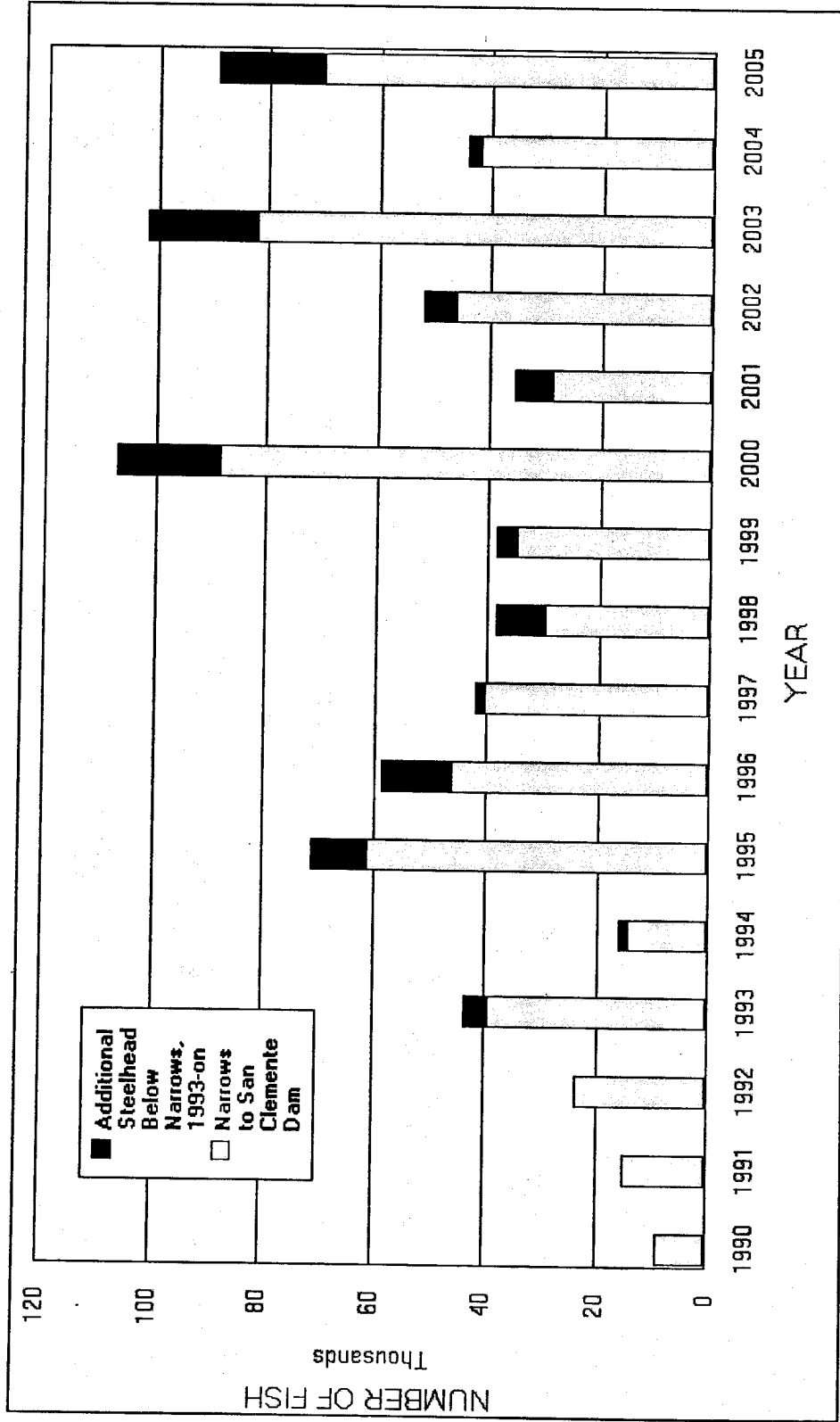


Figure IX-7
 Estimated Number of Steelhead Reared Below San Clemente Dam from 1990-2005



**Table IX-1
 Number of Juvenile Steelhead Rescued from the Carmel River
 By Age Group and General Location in Rescue Year 2005-2006**

Age Group	General Location	MPWMD July- Sept. 2005	CRSA July- Sept.2005
Young-of-the-year	Lower River ^{1/}	20,289	13,778 ^{2/}
Age 1+	Lower River	489	724 ^{2/}
Smolts	Lagoon	1	0
Adults	Lower River	0	0
Mortalities	Lower River	42	712
Totals		20,821	15,214
Percentage Mortality		0.20%	4.68%
1 - Below Schulte Road Bridge; 2 - 58 YOY and 7 AGE 1+ fish rescued from Carmel River Lagoon			

**Table IX-2
Sleepy Hollow Steelhead Rearing Facility Fish Rearing Summary: July 13, 2005 - March 3, 2006**

Tank #	# Fish Added	Morts. (Disease)	#Morts. (Unaccounted for) ⁽¹⁾	Total Released	% Survival	Notes
RC	24,373	6,176	4,366	13,831	56.8	All age classes (4-14" FL at release). Segregated by bays.
T3	84	4	0	80	95.0	Extra Large 1+ fish. Rescued in September.
Totals	24,457	6,180	4,366	13,911	57.0	
		25%	18%		57%	

Notes:

Unaccounted-for-fish were most likely caused by predation of smaller fish. Fish were segregated in the rearing channel by size/age at the start of the holding season, but many of the small, yoy fish were able to move up towards the head of the channel through small gaps in the screens, making it impossible to calculate the exact survival percentages in each bay. The overall rearing channel survival is correct.

**Table IX-3
 Sleepy Hollow Steelhead Rearing Facility (SHSRF) Fish Release Location Summary: January - March 2006**

Release Location	River Mile	Number Released	Percent of Total
SHSRF Area	17.5	7,469	54%
DeDampierre Park	13.9	922	7%
Garland Park Area	10.8	738	5%
Red Rock	8.1	937	7%
R.V. Park	5.5	533	4%
San Carlos Well	3.7	3,243	23%
Highway 1	1.1	69	1%
Total Released		13,911	100%

**Table IX-4
Carmel River Juvenile Steelhead Annual Fall Population Survey¹**

Lineal Population Density at Survey Stations (numbers per foot of stream) ^{2,3}															
YEAR	Lower River Sites	Scarlett Narrows	Garland Park	Boronda	DeDamp. Park	Stonepine Resort	Sleepy Hollow	SCR Lower Station	SCR Upper Station	Los Compadres	Cachagua	Overall Annual Average	Average ⁴ 1993-on Comparison	(nos./ft)	(nos./mi)
1990	0	0	0	0	0	0.50	0.27			0.26	0.22	0.14	--	--	--
1991	0	ND	0.12	0	0.74	0.39	0.30			0.09	0.62	0.25	--	--	--
1992	ND	0.67	0.36	ND	0.96	0.30	0.30			0.40	0.83	0.59	--	--	--
1993	ND	0.62	0.91	0.92	0.82	0.84	0.52			1.22	1.84	0.96	--	--	--
1994	ND	0.44	0.23	0.43	0	0.50	0.29			1.51	0.71	0.51	0.96	5,075	5,075
1995	0.49	0.65	1.01	1.61	ND	1.42	0.69			0.50	1.63	1.00	0.51	2,713	2,713
1996	0.24	1.52	0.82	1.05	2.03	1.22	0.29			0.95	1.92	1.12	1.07	5,666	5,666
1997	0.02	0.22	1.02	1.74	1.15	0.5	0.22			1.15	1.41	0.83	1.23	6,468	6,468
1998	0.19	0.30	0.67	0.34	1.50	0.27	0.60			0.54	2.24	0.74	0.93	4,891	4,891
1999	0.17	0.26	0.50	0.32	0.62	1.67	0.45			0.46	1.35	0.64	0.81	4,264	4,264
2000	0.91	1.03	0.64	1.38	5.66	1.71	1.46			1.41	2.3	1.83	0.70	3,716	3,716
2001	ND	0.48	0.35	0.63	0.68	1.08	0.32			0.47	1.62	0.70	1.95	10,289	10,289
2002	ND	0.68	0.85	1.67	0.83	1.07	0.5	0.33	0.68	1.52	2.73	1.09	0.70	3,716	3,716
2003	1.53	0.82	2.16	1.86	1.45	1.55	1.23	0.58	1.09	1.69	2.16	1.09	1.09	5,734	5,734
2004	0.25	0.46	0.78	1.21	0.43	1.24	0.55	0.21	0.41	0.45	0.89	0.63	1.46	7,704	7,704
2005	1.23	0.6	1.34	1.16	0.91	1.62	1.63	0.21	0.85	0.98	2.1	1.15	0.66	3,501	3,501
Station Ave (no./ft)	0.46	0.54	0.80	0.93	1.15	1.06	0.61	0.33	0.76	0.85	1.54	0.85	1.02	1.02	5,311
Station Ave (no./mile)	2,414	2,845	4,206	4,884	6,064	5,574	3,204	1,756	4,000	4,488	8,108	0.82	4,322	4,322	4,322
Overall Station Averages:															

¹ Surveys completed in October and results based on repetitive 3-pass removal method using an electrofisher.

² RM; indicates miles from rivermouth

³ Data listed as single digit 0; indicates stream was dry at sampling station

⁴ Average 1993-on comparison does not include data for lowest river sites at Meadows Road (1995); Schulte Area (1996), and Red Rock Area (1997 - present).

⁵ Result for Lower River Site, 2004, (upper Red Rock) is estimated from one pass of rescues and data from Red Rock and Scarlett pop. surveys the past seven years.