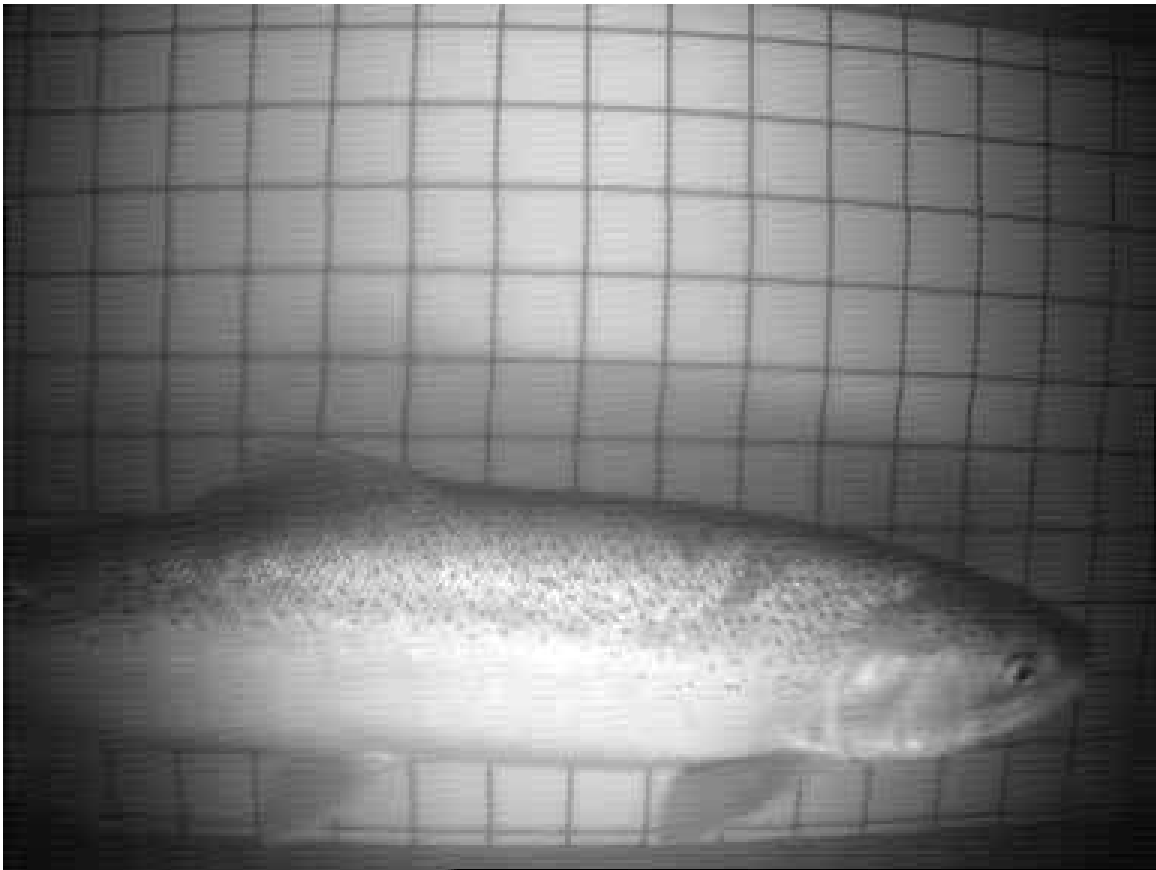


2008 Progress Report for the  
Robles Diversion Fish Passage Facility



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## 1.0 EXECUTIVE SUMMARY

Casitas Municipal Water District (CMWD) is implementing the Robles Fish Passage Facility (Robles Facility) Project described in the Biological Assessment (BA) proposed by Reclamation (USBOR 2003) and analyzed in the Biological Opinion (BO) prepared by the National Marine Fisheries Service (NMFS 2003a). This 2008 Annual Progress Report of the Robles Facility, as required by the BO, is the culmination of monitoring and operational data collected during the reporting period of July 1, 2007 to June 30, 2008.

The monitoring and evaluation studies related to the Robles Facility conducted during the 2007-2008 reporting period are included in two main sections of this progress report. The fisheries monitoring section contains: upstream fish migration impediment evaluation, sandbar monitoring at the mouth of the Ventura River, fish attraction evaluation, fish passage monitoring, and downstream fish passage evaluations. The Robles Facility Operation section contains: information and data on the facility status, flow observations and control, costs associated with operation and monitoring, assessment of the effectiveness to provide fish passage, recommendations of priorities for future activities, and revisions deemed necessary to the operations.

During the 2008 migration season, six adult steelhead were detected passing upstream through the fish ladder and three of those were detected migrating back downstream, one of which was detected passing back upstream a second time.

## 2.0 INTRODUCTION

NOAA Fisheries listed the southern California steelhead, *Oncorhynchus mykiss*, as endangered in 1997 (NMFS 1997) under the Endangered Species Act (ESA) of 1973. Steelhead were organized into stocks (i.e., groups) of evolutionary significant units (ESU) and represented groupings that were considered to be substantially isolated from other steelhead stocks reproductively and were an important part of the evolutionary legacy of the species. The southern California steelhead ESU included, at the time, steelhead populations from the Santa Maria River in San Luis Obispo County south to Malibu Creek in Los Angeles County. The ESU was later extended to the US/Mexican border in San Diego County in 2002 (NMFS 2003b). In a later delineating approach, NOAA Fisheries recognized the anadromous life history form of *O. mykiss* as a distinct population segment (DPS) under the ESA (NMFS 2005). The DPS policy differs from the ESU by delineating a group of organisms by “marked separation” rather than “substantial reproductive isolation”. In the case of *O. mykiss* of the southern California steelhead ESU, this marked separation between the two life history forms was considered valid because of physical, physiological, ecological, and behavioral factors related to its anadromous life history characteristics. Both resident and anadromous *O. mykiss*, where the two forms co-occur and are not reproductively isolated, are still part of the ESU; however, the anadromous *O. mykiss* (steelhead) are now part of a smaller subset identified as the southern California steelhead DPS.

Rainbow trout can be generally organized into four large groupings (Behnke 1992; Scott and Crossman 1973): 1) coastal rainbow trout that extend from northern Baja California to northern Alaska near the Kuskokwim River and also the Kamchatkan Peninsula of northeastern Asia, 2) redband trout of the inland Columbia and Frazer River basins, 3) redband trout of the central valley of California, and 4) trout of the Gulf of California drainages. The taxonomic group of coastal rainbow trout, *O. m. irideus*, exhibit two life history forms; anadromous and resident. The common name for the anadromous life history form is termed steelhead trout and the resident form is generally termed rainbow trout. Throughout the range of coastal rainbow trout, there is a widespread occurrence of the anadromous life history form (Behnke 1992). There are two general life history patterns exhibited by adult anadromous steelhead when they return from the ocean to spawn in fresh water. The patterns are group by either summer or winter spawning runs. There are many exceptions to this pattern, but this general characterization has been use to group steelhead spawning runs by the season in which the peak of spawning run occurs as they return from the ocean (Busby et al. 1996). Summer steelhead are generally found in river systems that drain from far inland like that of the Columbia Basin. Winter steelhead runs are typically found in the coastal areas where river systems is not as large and overall are the most abundant life history pattern within the natural range of the species (Busby et al. 1996).

### 3.0 MONITORING

The monitoring and evaluation studies and activities related to the modifications of the Robles Facility, as outlined in the BO (NMFS 2003a), were intended to achieve three main objectives:

- I. Monitor Fish Passage Facility operations and performance.
- II. Determine if the Fish Passage Facility functions and operates in such a fashion that migrating steelhead:
  - a. Successfully navigate into and through the facility, and
  - b. Move through the facility in good physical condition.
- III. Determine if the operations at the Robles Diversion are enhancing the opportunity for:
  - a. Adult steelhead to migrate upstream to the Robles Facility, and
  - b. Smolts and kelts to migrate downstream through the Robles Reach.

### 3.1 Upstream Fish Migration Impediment Evaluation

#### Methods

The objective of the impediment evaluation is to assess factors that may impede steelhead's ability to migrate to the fish passage facilities (NMFS 2003a).

Selected critical passage features will be surveyed multiple times during the fish migration season to determine water depth, velocity, and channel width so that discharge can be calculated. The mainstem Ventura River was first surveyed from the mouth to the Robles Facility using standard stream survey techniques. The survey methodology used followed Moore et al. (2002) and was equivalent to a level IV survey as described in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 2002). Selected sites will be surveyed over a range of discharges from approximately 10-100 cfs (the upper limit dependent on the ability to safely conduct the surveys). The number of repeated surveys will be dependent on the number of significant rain events, the number of selected sites, access to sites, and time constraints due to other aspects of the monitoring and evaluation program. These impediment surveys will most likely be conducted over a period of 3-4 years depending on water conditions. The selected impediment sites will be resurveyed as many times as needed to develop a statistically rigorous data set that could be used to evaluate fish passage.

#### Results

During 2008, the initial phase was completed by conducting physical stream surveys for the 23 km of the Ventura River from the mouth to the Robles Facility. This provided physical measurements of all habitat units so that a more objective method could be developed to select potential impediments for future monitoring. Of the 378 habitat units surveyed, a subset of 15 sites (14 units plus the sandbar) were chosen for the impediment evaluation that were representative of potential impediment throughout the 23 km reach (Appendix 1). An impediment metric was developed and calculated for all 378 habitat units. A set of initial of sites were chosen based on their impediment metric value and nature of the impediment (Appendix 2).

After discussions with the Biological Committee, NMFS and CDFG believed that this method of site selection could be missing important potential sites for monitoring. Therefore, an alternative method, separately or in conjunction with this metric, of selecting sites will be used in 2009 to determine the final sites for future impediment evaluations.

The impediment metric for each habitat unit was determined by the equation:

$$\text{Impediment Metric} = \log_{10} [(10/((\text{unit length}/\text{unit slope}) * \text{unit depth})) + 1]$$

The impediment metric value indicates units that have the attributes of being short, steep, and shallow. Shallow water habitat units (i.e., critical riffles) have been

commonly used to study potential upstream passage impediments in other California rivers (Dettman and Kelley 1986; Bratovich and Kelley 1988; Hager 1996). By combining all three measurements (unit length, slope, and depth), the shorter, steeper, and shallower a unit is, the smaller the resulting number will be. By dividing this into 10, the smaller numbers become larger and the larger numbers become smaller relative to each other. This creates numbers that range from close to 0 to 10,000, therefore a  $\log_{10}$  was needed to make the larger numbers smaller; however, 1 was first added to make all numbers  $> 1$  because the log of a number between 0 and 1 is negative. The impediment metric values for all 378 habitat units ranged from 0.0 to 3.0, with a mean value of 0.34. Of the 378 sites, 7% ( $n = 26$ ) of the units scored an impediment metric value of greater than 1.0. Of those 26 sites, 20 of the sites were located within the Robles Reach.

### Discussion

The habitat surveys were completed in spring of 2008, which allowed the metric analysis to be conducted. The survey, and subsequent analysis, was done to select a subset of all possible passage impediments for further monitoring. The analysis of the habitat units was done by identifying units that were short, steep, and shallow and calculating an impediment metric. The subset was selected based on their metric score and location within the Ventura River. An effort was made to have an approximate 2 km systematic sampling plan to cover each representative reach of the river. This would allow for longitudinal differences of losing and gaining reaches of the river to be captured. Ease of site access was also taken into consideration due to the fact that the sites would potentially be surveyed multiple times per year during periods when the hydrograph would also be rapidly rising or falling. Of the 15 sites selected, 10 sites are located within the Robles Reach and the remaining 5 sites are located downstream of the Robles Reach. The sandbar at the mouth of the Ventura River was also included because of its unknown potential in limiting entry into the river at lower flows. Ironically, the interim rock weirs downstream of Robles scored as some of the most severe impediments to fish passage. Because of the artificial nature of the rock weirs and proximity to the Robles fish ladder, they were included in the impediment evaluation. The low-flow road crossing was also included in the evaluation for the same reasons. All step units were evaluated for passability using downstream pool depths to step height and steelhead jumping capabilities (Powers and Orsborn 1985). Over the next several years, the selected units will be resurveyed multiple times over a range of flows to determine water depths and velocities. The impediment metric was only developed to as a tool to help objectively select sites rather than subjective site selection, which is the common practice. The metric was not intended to be used for future monitoring of sites, only to aid in site selection.

To reiterate, NMFS and CDFG believed that this method of site selection could be missing important potential sites for monitoring. Therefore, an alternative method, separately or in conjunction with the metric, of selecting sites will be used in 2009 to determine the final sites for the impediment evaluation.

### 3.1.1 Sandbar Monitoring

#### Methods

The primary objective of the sandbar monitoring is to determine if the criteria for initiation of the fish passage augmentation season have been met (NMFS 2003a). During each sandbar inspection, observations and recordings were made for: date, time, status of the sandbar, general location of the mouth, tidal stage, water temperature, discharge at the Robles Facility and the USGS Foster Park gauging station, and index count of piscivorous birds.

#### Results

From July 27, 2007 to June 19, 2008 the mouth of the Ventura River was inspected 23 times to determine if the sandbar had been breached. Thirteen of the observations occurred during the fish passage augmentation season (January 1 to June 30) and 10 were outside of the fish passage augmentation season. The sandbar closed in August 2007 and remained closed for the next several months (Appendix 3). In mid December 2007, the sandbar was breached and the Ventura River was able to flow into the Pacific Ocean allowing fish to volitionally enter or exit the estuary. The sandbar remained open throughout the 2008 fish passage augmentation season. The river discharge during the days the sandbar was inspected at the USGS Foster Park gauge station ranged from about 0.51 to 1,080 cfs and 0.0 to 304 cfs at the Robles Facility. Prior to the sandbar closing in August of 2007, the river was exiting from the westside of the estuary, but once the sandbar was breached in December 2007, the river was exiting from the eastside of the estuary.

A total of 3,381 piscivorous birds were counted during 19 index surveys of the Ventura River estuary (Appendix 4). The bird that was observed the most were gulls at 2,709, followed by pelicans at 345, cormorants at 260, terns at 48, and egrets at 14. Kingfishers, grebes, and herons were counted less than two times during the same period. No mergansers were observed although 5 were observed the previous year (CMWD 2007).

#### Discussion

Since the sandbar was already breached before January 1, 2008, the fish passage augmentation season began on that date and continued through June 2008. The Ventura River, like many other California rivers, typically develops a seasonal sandbar at the mouth during the late spring or summer and is breached by higher river discharge in the late fall and winter. The sandbar closed the estuary in August 2007 and remained closed until December 2007. However, during 2006 and 2005, a sandbar did not develop at the mouth. As more data are collected on this dynamic process, a better understanding of the Ventura River estuary will begin to be developed and how this process compares with other California systems. The lagoon that forms, if a sandbar

develops, can provide important rearing habitat for juvenile steelhead because of the abundant food resources available and facilitate the physiological and behavioral changes associated with steelhead smoltification (Cannata 1998).

## 3.2 Fish Attraction Evaluation

### Methods

The objective of the fish attraction evaluation is to determine if any adult or juvenile steelhead were holding in close proximity to the fish ladder entrance during the fish passage augmentation season (NMFS 2003a). The primary area of interest was the reach immediately downstream of the Robles Facility to the low-flow road crossing. The reach also included the area downstream of the low-flow road crossing within the four rock weirs. The distance of this reach was approximately 200 m. Surveys were completed from January through June of 2008. Bank surveys were conducted by 1-2 surveyors moving in an upstream direction while wearing polarized glasses. Snorkel surveys were also conducted by 1-2 snorkelers in an upstream direction. All fish species were identified and enumerated to extent that the conditions and fish densities would allow.

### Results

The reach downstream of the fish facility was surveyed on 26 separate occasions, 17 bank and 9 snorkel surveys. A cumulative total of 5,200 m were surveyed from January through June. An total of 143 fish were observed during all surveys (Appendix 5). The fish most frequently observed was the arroyo chub, *Gila orcutti*, (n = 56), followed by *O. mykiss* at 47. Also observed during the surveys were green sunfish, *Lepomis cyanellus*, (n = 23) and three-spine stickleback, *Gasterosteus aculeatus*, (n = 7). The water temperatures ranged from 9.0 °C in January to 25.0 °C in June.

### Discussion

Previous surveys and studies found fish species throughout the Ventura River similar to the surveys conducted in 2008 (EDAW 1978; Moore 1980; CMWD 1988, 2006, 2007; Capelli 1997). The total count of 143 was the result of fish counted multiple times over the course of survey season. In particular, the count of 47 *O. mykiss* in the reach below the Robles Facility was the result of counting fish multiple times. The surface flow connection to the lower river was lost approximately mid-April and the first *O. mykiss* was not observed until April 18th. Undoubtedly, some *O. mykiss* were counted that ultimately migrated downstream. By June 18th, 4 *O. mykiss* were observed in the two large pools on the Ojai Valley Land Conservancy property approximately 1 km downstream of Robles. However, it seems likely that the vast majority of the 47 total *O. mykiss* counted were the result of multiple observations. The highest count of *O. mykiss* during any one survey was 13 and ranged from about 2 to 13 fish. Over the monitoring period, there was an increase of *O. mykiss* downstream of the facility. This



could have been do to an inability to migrate upstream through the fish ladder because of insufficient water depth in the ladder or a preference for the cooler water in the entrance pool and a rejection of the warmer water coming from the ladder. Based on observations during the April snorkel surveys, it appeared these fish were going through the smoltification process, i.e., vanishing parr marks, silvering of the body, and darkening of the margins of the fins. The lack of flow (3 cfs at the peak count of *O. mykiss*) in the channel most likely stopped further migration downstream (Appendix 6). Based on snorkel observations during June, it appeared these fish were beginning to revert to a resident form, i.e., lightening of the margin of the fins, coloring across lateral line, and yellowish-green coloring on the dorsal side of the body.

The total fish count was substantially lower then the previous season with 2,255 fish in 2007 to 141 in 2008, although 97% (n = 2,192) of the fish in 2007 were non-*O. mykiss* species, most of which were arroyo chub. The lower fish counts were most likely caused by the lack perennial flow, thus a lack of habitat, at and near the Robles Facility. In the summer and fall of 2007 the area around Robles was dry, while during the same time period in 2006, surface flow existed at the Facility, thus providing suitable habitat for a continued existence of the these non-*O. mykiss* fish that were counted in the subsequent year.

### 3.3 Fish Passage Monitoring

#### Methods

Fish passage monitoring within the Robles Facility is accomplished using a Vaki Riverwatcher (Riverwatcher). The Riverwatcher consists of a scanner with light diodes that send infrared light beams through the water to a receiving scanner plate. When a fish swims through the infrared beams of light, it breaks the signal and a silhouette is recorded on a computer. In addition, when a fish swims through the infrared light beams, the scanner triggers an underwater camera to record a short video clip. Only fish swimming upstream can be recorded with the Riverwatcher system because only one camera can be operated and it is located on the upstream side of the scanner. Other data recorded when the scanner is triggered are: date and time, length of the fish (from a length/height ratio), swimming speed (m/sec), and direction of the fish movement (upstream or downstream). The scanner is positioned in the center of an aluminum frame (fish crowder) covered with 1/2 inch aluminum bars, spaced 1 1/2 inches apart on center, with a resulting 1 inch spacing between the bars. The crowder directs fish that swim between the scanner plates. The crowder acts essentially as a bottleneck for the fish to swim through so they can be counted in both an up- and downstream direction. A separate standalone downstream camera was added in 2008 to verify downstream detections. The downstream camera was independent of the Riverwatcher and the video captured was stored on a digital video recorder (DVR). Two DVR's were used with one recording for three weeks, while the other is reviewed. After the three weeks the DVR's were exchanged and the process was repeated. However,

this year the downstream camera was only installed for a limited time and continued evaluations and operational logistics are still being worked out.

Upstream detections were reviewed and classified as an adult steelhead, *O. mykiss* non-adult steelhead, largemouth bass, unknown fish, steelhead probable, fish probable, or not a fish. The classifications were determined by the combination of the silhouette, estimated length, and the video clip. Also, larger *O. mykiss* were measured for a variety of morphometric ratios that were compared to known steelhead and rainbow trout. The adult steelhead classification was used if the fish observed was an *O. mykiss* and displayed characteristics of an adult steelhead, such as black spotting on dorsal, adipose, and caudal fins, black spotting on dorsal side of body, slivery body, and larger size. *O. mykiss* non-adult steelhead classification was used if the fish observed was an *O. mykiss* but did not display the characteristics of an adult *O. mykiss*. Because of the difficulty in distinguishing between resident and anadromous fish of smaller sizes, no further classifications were used for *O. mykiss*. The fish unknown classification was used if the detection was known to be a fish, but the species identity could not be determined. The fish probable classification was used if no fish were observed in the video, but the silhouette was similar to that of a typical fish silhouette based on previous experience. The not fish probable classification was used when no fish was observed in the video and the silhouette was not similar to that of a typical fish silhouette and was most likely debris or water turbulence.

Downstream detections were classified as fish probable, steelhead probable, and not fish probable. The fish probable classification was used if the silhouette image was similar to that of a typical fish silhouette. The steelhead probable classification was used when the silhouette was similar to that of a typical fish silhouette and the estimated length was a minimum of 42 cm. The not fish probable classification was used when the silhouette did not look like a typical fish silhouette.

### Results

During the 2008 fish migration season, the Riverwatcher recorded 5,592 total detections, of which 1,944 were upstream and 3,648 were downstream (Appendix 7). Of the total upstream detections, 11.6 % (n = 225) were fish and included: 6 adult confirmed steelhead, 1 adult steelhead probable, 74 *O. mykiss* non-adult steelhead, 81 largemouth bass, 24 fish unknown, and 39 fish probable. Of the total downstream detections, 5.4% (n = 186) were fish and included 3 adult steelhead probable and 183 fish probable.

The dates for the upstream detections occurred from January 31 through June 30 with a mean date of May 23. The 6 upstream adult steelhead passed through the facility between January 31 and February 22, with a mean date of February 7. The one upstream probable adult steelhead was detected by the Riverwatcher on April 23. The one fish that was considered a probable adult steelhead was not confirmed due to a camera malfunction. However, because of the silhouette and size recorded by the Riverwatcher, it was most likely an adult steelhead. The 74 *O. mykiss* non-adult

steelhead were detected between February 2 and June 28, with a mean date of April 30. The dates for downstream detections were from February 9 through June 30 with a mean date of May 22. The three downstream probable adult steelhead were detected from February 26 to April 4 with a mean date of March 17. The downstream probable fish were detected from February 9 through June 30 with a mean date of May 28. Of the 7 adult steelhead detected migrating upstream, three were detected in daylight hours and 4 at night.

The total lengths of the upstream adult steelhead ranged from 42 cm to 65 cm with a mean of 55 cm. The one upstream probable steelhead total length was 49 cm. The total lengths of upstream migrating *O. mykiss* non-adult steelhead were from 12 cm to 39 cm with a mean of 30 cm. The total length of the downstream probable adult steelhead ranged from 43 cm to 49 cm with a mean of 47 cm. The downstream fish probable total lengths were from 14 cm to 48 cm with a mean of 29 cm. In addition to length and visual confirmation of adult steelhead, morphometric analysis was conducted. A conventional method is to use ratios of body measurements for comparison to remove the effects of body size so actual differences can be determined. (Strauss and Bond 1990). This was done by comparing the standard length (SL) to the ratio of eye diameter to SL in linear regression (Appendix 8). Standard length is the length from the snout to the end of the hypural plate near the end of the fleshy caudal peduncle, which is unaffected by caudal fin deformities (Anderson and Neumann 1996). Of the 6 adult steelhead detected, only 5 could be included in this analysis because the video camera malfunctioned. Data for the rainbow trout included in the analysis were from non-adult steelhead from the Ventura River and the data for the steelhead were collected from adult steelhead in Oregon. The one fish that had a total length of 32 cm was concluded to be a rainbow trout because it was smaller than a typical small adult steelhead (Shapovalov and Taft 1954).

The turbidity levels at the time of passage for the upstream adult steelhead ranged from 2 NTU to 22.5 NTU with a mean of 12 NTU. The turbidity levels for the upstream migrating *O. mykiss* non-adult steelhead were from 0.6 NTU to 21.2 NTU with a mean of 2 NTU. The mean turbidity for the downstream adult steelhead and fish probable was 9 NTU and 2 NTU, respectively.

The discharge at the Robles Facility at the time of upstream passage for adult steelhead ranged from 21 cfs to 129 cfs with a mean of 85 cfs. The discharge for the upstream migrating *O. mykiss* non-adult steelhead was from 1 cfs to 129 cfs with a mean of 22 cfs. The discharge for the downstream probable adult steelhead ranged from 32 cfs to 50 cfs with a mean of 43 cfs. The mean discharge for the downstream fish probable was 12 cfs.

### Discussion

The six adult steelhead that migrated upstream past the Robles Facility relatively soon after the series of storm events in January and February of 2008. From the peak of the

last and largest storm event, the travel times to Robles ranged from 4 to 26 days, with a median of 9 days and a mean of 11.

The one additional steelhead that was detected migrating upstream passed the Robles Facility occurred on April 23. At the time of the Riverwatcher detection, the upstream camera was not functioning and no image was recorded to verify the detection as an adult steelhead. Given that the estimated length was 49 cm, the fish was most likely an adult steelhead. It is unlikely that it was a new adult steelhead however, but rather one of the three that had passed downstream through the facility earlier in the season. A steelhead passed downstream three weeks prior on April 4 that had an estimated length of 49 cm. The surface water connection to the lower river was lost sometime around April 18 approximately 4.5 km downstream of the Robles Facility preventing any downstream migration. The steelhead which passed through the ladder on April 4 migrating downstream most likely made it a few kilometers downstream before having to turn around and migrated upstream again, passing back through the facility on April 23. Three probable adult steelhead passed downstream through the fish passage facility in 2008. The first downstream adult passed through the facility 26 days after the first adult steelhead passed upstream and just 4 days after the last adult passed upstream. Post-spawn adult steelhead are termed kelts; however, the spawning status of the three adult steelhead that migrated downstream through the Robles fish ladder was not known.

During the 2008 fish migration season, three adult steelhead were visually observed: two in the pool at the fish ladder entrance (on March 3 and 21). On March 21, an adult steelhead was observed just upstream of Santa Ana Blvd Bridge. It is unknown which direction this steelhead was traveling, but it was most likely migrating downstream due to the date, river discharge, and timing other detected steelhead.

The hour of detection by the Riverwatcher revealed a diel migration pattern for non-adult *O. mykiss* through the fish passage, in which *O. mykiss* are migrating downstream just before dawn then migrating back upstream just after dusk. The hour of upstream migration for *O. mykiss* peaked at 2000 h. There was also a peak of downstream migration for fish at 0500 h. Although it is unknown which species was migrating downstream, they are likely *O. mykiss*. The distance of the daily travel is unknown, it is probable the fish are remaining within the area around the facility since the number *O. mykiss* visually observed near the Robles Facility remained relatively constant for periods of time. A full listing of fish detection can be found in Appendix 9 and of steelhead adults only in Appendix 10 and 11.

### Equipment Issues

There were several technical problems with the Riverwatcher during the 2008 season. On several occasions in January and February, the communication connection was lost between the Riverwatcher and the computer. The communication was generally lost for less than one day. Attempts were made to fix the problem which included: powering down the computer and restarting the system, inspection of cables and connectors, and

cleaning and re-greasing of connections. Generally one of these actions would remedy the problem. Then, in April, for a period of several weeks, the video communication from the Riverwatcher to the computer was not working. The Riverwatcher continued to function as a counter, but the video communication was lost. The problem was eventually diagnosed as a faulty cable; several wires had broken off from inside a connector. The damaged cable was the likely cause of communication problems between computer and the Riverwatcher earlier in the season.

One of the two Riverwatcher lights seals failed and filled with water during the season and a replacement light was ordered and installed. In discussions with Vaki, Casitas was informed that white lights are now being offered as well as the standard red lights. Vaki stated the white lights are now the preferred light color for Riverwatcher systems. However, Vaki could not provide any scientific data of the effects of the use of red or white lights. Therefore, at this time Casitas intends to continue using the red lights until it can be determined that white lights do not interfere with migration.

The upstream camera was moved mid-season because the speed at which the upstream adult steelhead were swimming, the video system could not start soon enough to maximize the amount of time a steelhead was in the field of view. The camera was moved upstream, within in tunnel, approximately 1 foot. The effect of the new camera position was not analyzed because additional adult steelhead did not pass upstream after the modification.

The downstream camera was installed on March 11, 2008. However, within hours the "waterproof" camera filled with water and stopped operating. A replacement camera was installed on April 21, 2008. The review process was more time consuming than initially anticipated because of several technical issues related to the speed of searching video, time differences between the Riverwatcher and DVD, and field of view of the camera. The effectiveness of the downstream camera to verify detections was much less than expected because of the technical issues.

Non-fish detections remain an issue with the Riverwatcher. During storm events, leafy and woody debris remains an issue causing false detections by the Riverwatcher and blockage the crowder. Later in the season as water temperatures increased, filamentous algae caused blockage of the crowder and also caused false detection by the Riverwatcher. Water turbulence also appears to cause false detections.

The effects of turbidity on the Riverwatcher efficiency continues to be being evaluated. The current findings show the Riverwatcher begins to function below 200 NTUs. In the 150-200 NTU range, the Riverwatcher is operational, but seems to have many false detections. This is most likely caused from a combination from the suspended material in the water deflecting the light from the scanner plate and high debris. In the 30-150 NTU range, the Riverwatcher was operating, but the camera could only be used to verify detections at turbidity levels below approximately 30 NTU. The effects of turbidity on the Riverwatcher will continued to be evaluated.

### 3.4 Downstream Fish Passage Evaluations

#### Methods

There are two main objectives for the downstream fish passage evaluation. The first objective is to determine if steelhead are successfully passing through the Robles Facility. The second objective is to capture and examine steelhead smolts and kelts and determine if there are any injuries that may have been caused by downstream passage through the Robles Facility (NMFS 2003a).

A weir trap was placed and operated approximately 100 m downstream of the Robles Facility. The weir trap consisted of a live-box with an internal fyke situated near the bank. A fence was extended upstream at a 45° angle, approximately 3/4 of the way into the river channel from the live-box allowing any adult steelhead to pass upstream by the trap location (Appendix 12). The trap was planned to be operated from mid-March through June or until water temperatures exceeded a daily mean of 22°C, which could negatively impact capture fish (SYRTAC 2000). However, the trap was not installed until April after a CDFG permit was obtained.

#### Results

The trap was operated from April 9, 2008 to June 16, 2008. The trap generally operated from Sunday afternoon through Saturday morning. No *O. mykiss* were trapped during this time period. Although green sunfish, *Lepomis cyanellus*, (n = 1), bullfrog, *Rana catesbeiana*, (n = 3), western pond turtle, *Clemmys marmorata*, (n = 4) and red swamp crayfish, *Procambarus clarkii*, (n = 4), were trapped. Since no *O. mykiss* were trap, no radio tags were used to determine downstream smolt migrations. The average daily water temperature was 22°C on three of the four days prior to the trap being removed, which was the criterion for trap removal. The stream discharge ranged from 3 cfs to 27 cfs (see appendix 6, 13, and 14 for discharge data and trends during trapping period).

#### Discussion

The trap was installed and operational later than was expected. This delay in trapping was most likely the cause for not capturing *O. mykiss* in the trap. In May, one *O. mykiss* was observed immediately downstream of the trap in the weir pools. It is unknown when and how long the fish was there, but there is a possibility the fish may have avoided the trap and successfully migrate downstream around the trap or may have moved downstream while the trap was removed for the weekend. Even though there were up to 10 *O. mykiss* observed in the entrance pool and numerous *O. mykiss* were passing back and forth through the fish ladder, it appeared there was a general lack of urgency to migrate downstream. This could be partly explained by the elevated water temperatures that can cause the smoltification process to stop and allow the fish to revert back to a resident form (Allan T. Scholz, Eastern Washington University, personal communication). The trap was effectively operated in flows up to 27 cfs during the 2008

migration season. However, these levels are thought to be well under the maximum operational limit of the trap. After next years trapping season, the upper limit of river flow operation will be determined, if conditions exist.

## 4.0 ROBLES FACILITY OPERATIONS

### 4.1 Facility Status

The Robles Fish Passage Facility started the 2007-2008 season in a fully functional mode. The 2007-2008 season was characterized by an average rainfall year as measured at Casitas Dam with more snow pack than normal in the watershed. Two water diversion periods occurred during the year. The first occurred between January 4 and January 11, 2008. The second diversion period began on January 24 and continued until March 31, 2008. It appeared that the snow pack remained in the mountains for a longer period of time resulting in an extended recession of the surface flows. Some surface flow continued over the measurement weir until August 2008.

The 2007 Report identified several projects to be completed during the summer and fall. The principal projects were:

- Cut rebar in spillway
- Fill in scour hole at the diffuser (entrance) box w/rock
- Remove Arundo/non native plant
- Implement MWH recommended Improvements to the brush system.
- Repair trash grate in the entrance box
- Install raw water pump for screen cleaning
- Repair or replace auxiliary pipeline flowmeter

A brief description of each project and the project's status is listed below:

**Cut Rebar in Spillway**-Scour of the concrete deck in the spillway has occurred, exposing steel rebar. Rather than resurface this area with concrete at this time, the rebar was removed. At some point in the future, this area will require a concrete repair.

**Fill in Scour Hole at the Diffuser (entrance) Box with Rock**-A scour hole developed in the entrance pool and threatened to undermine the diffuser structure. The scour hole was filled with rock.

**Removal of *Arundo donax* from the forebay and channel**-This year, removal of the non native plants was accomplished by the same crews removing arundo for the County as part of the Matilija Dam removal project.

**Implement some of MWH Recommended Improvements to the Brush System** – MWH, a consulting firm formerly known as Montgomery Watson Harza, was hired by Casitas to make recommendations on the brush system. MWH produced a report with

suggested modifications. Casitas implemented several of these improvements, including shorter, stiffer brushes, articulated (windshield wiper) brush arms and hydrofoil wings on the brush arms. The modified brush assemblies removed significantly more debris than the original design. However, the existing brush motors were unable to drive the brushes at full stage condition. Casitas intends to upgrade the brush motor drive system this summer and fall. Brush motors will be increased from 1.5 hp to 5 hp and the gear drive will be upsized to meet the requirements of the new motor. New variable frequency drives will be installed for the upsized motors. The variable frequency drives will be relocated to an enclosure near the brush motors. This should reduce the electrical interference the variable frequency drives have had on some of the instrumentation at Robles Fish Passage.

**Repair the trash grate and diffuser panel in the entrance box-**The winter storms of 2004-2005 damaged one of the vertical grates at the entrance/diffuser box. In the summer of 2005, Casitas staff was unable to close the entrance box gates and pump the box dry to facilitate the removal and repair of the grate. During the fall of 2006, the gates were closed sufficiently to allow the entrance box to be pumped dry. This allowed for the inspection and repair of the trash grate. Temporary repairs were made to the diffuser panels. Permanent repairs were completed in the summer of 2007 after surface flow in the river stopped. Further modifications for the diffuser panels are anticipated to allow for removal without draining the box.

**Install raw water pump for screen cleaning-**A raw water pump was purchase for use at the Robles Fish Passage. Unfortunately, the pump was damaged in shipping and was returned. The replacement has arrived and will be installed this summer and fall.

**Repair of the auxiliary flow meter-**The auxiliary flow meter was not operational by the end of the 2005-2006 season. In the fall of 2006, when the entrance box could be drained, the transducers for the auxiliary flow meter were inspected. The mounting band holding the transducers was torn loose from the pipe. The band was damaged. To protect the instrument from further damage it was removed. During the fall of 2007 while there was no surface flow in the river, a new mounting band was installed. The repaired flow meter appears to be working, however Casitas has not yet been able to verify the accuracy of the instrument.

#### 4.2 Flow Observations and Control

The District collected flow information and verified flows where and when reasonably safe conditions existed in the Ventura River. Flow and level measurement devices are also located at various locations within the Robles Fish Passage Facility. The primary points of measuring and recording stream flows entering, flowing through and leaving the Robles Fish Passage Facility are:

- Matilija Creek at Matilija Hot Springs – located approximately 2,100 feet downstream of Matilija Dam – good rating for low to moderate flows – operated by Casitas Municipal Water District, formerly a USGS station;



- North Fork Matilija Creek – located approximately 3,000 feet upstream of its confluence with Matilija Creek – good rating for low to moderate flows – operated by the Ventura County Watershed District;
- Robles-Casitas Diversion Canal – located on the diversion canal approximately 1,300 feet downstream of the Robles Diversion Dam – trapezoidal channel with a good rating for flows up to 600 cfs;
- Ventura River near Meiners Oaks (VRNMO) – located approximately 540 feet downstream of the Robles Fish Passage spillway – concrete weir section – good rating to 70 cfs, use of equations above 70 cfs with poor ratings above 1000 cfs (no verifications at higher flows).
- Fish Ladder-A 4 path flow meter by Accusonics located near the Riverwatcher. Provides reasonable flow data in the 15 to 60 cfs range.
- Auxiliary Water Supply-An American Sigma flow meter.

All of the instruments can suffer from inaccuracies from time to time. The inaccuracies can be caused by clogging of bubbler lines, electronic creep, debris accumulating on sensors, changes to the measured cross sections, and equipment problems. As an example, the bubbler at the low flow crossing stopped providing accurate measurements early in the flow season. A new bubbler hose was required to correct the problem. For this reason, the data is verified against field measurements and observations. The information gathered from each of these locations has been reduced to the daily reporting of flows in the form of average cubic-feet per second. The spreadsheets are in Appendix 13, entitled “Ventura River Flow Assessment for the Robles Fish Passage Facility – FY 07-08” and general trends from Appendix 14).

The first surface flows came to Robles with the January rain storms. The screens remained in place for the entire year.

Five storm peaks, several of them overlapping, triggered BA/BO required supplemental flow releases.

### Facility Testing

Casitas had entered into an agreement with Wood Rodgers to complete performance testing on the Robles Fish Passage Facility. Wood Rodgers primary human resource on the project left the firm. Wood Rodgers did not have anyone else on staff capable of replacing this person, so Wood Rodgers requested to be released from the contract. Casitas was unable to contract with another firm before the end of the flow season. Testing will be completed next year if there are sufficient flows for testing.

### 4.3 Costs Associated with Operation and Monitoring

The BA/BO specified that the District provide the costs that are associated with the activity. The following is a summary of the direct costs incurred by the District during the 2007-08 fiscal years:

- **Fisheries Monitoring:**

Salaries	\$233,404
Equipment	\$ 16,091
Materials	\$ 22,855
Permits	<u>\$ 295</u>
	\$272,645

- **Facility Operations:**

Salaries	\$ 63,823
Materials	\$ 15,044
Permit	\$ 471
Equipment	<u>\$ 11,898</u>
	\$ 91,236

- **Capital Improvements:**

No capital improvement costs were incurred this year.

#### 4.4 Assessment of the Effectiveness to Provide Fish Passage

A total of 10 adult steelhead were documented passing through the Robles Fish Passage. Six passed upstream, three downstream, and one passed back upstream a second time. This provides evidence that the fish passage facility is effective in providing fish passage for steelhead.

#### 4.5 Recommendations Regarding the Prioritization of Future Activities

The District has completed its third season with the fish passage fully operational. Several projects have been identified to improve the functionality and reliability of the system. Other items require repairs. The summer and fall work list includes:

- Upgrading the brush drive system
- Modify the brush on the west side to match the brush on the east and make all modifications permanent.
- Adjust the notch on interim weir two.
- Install the raw water pump.
- Purchase and install small crane to facilitate brush removal.
- Removal of reeds from fish passage facility.

#### 4.6 Recommendations on any Revisions Deemed Necessary to the Operations

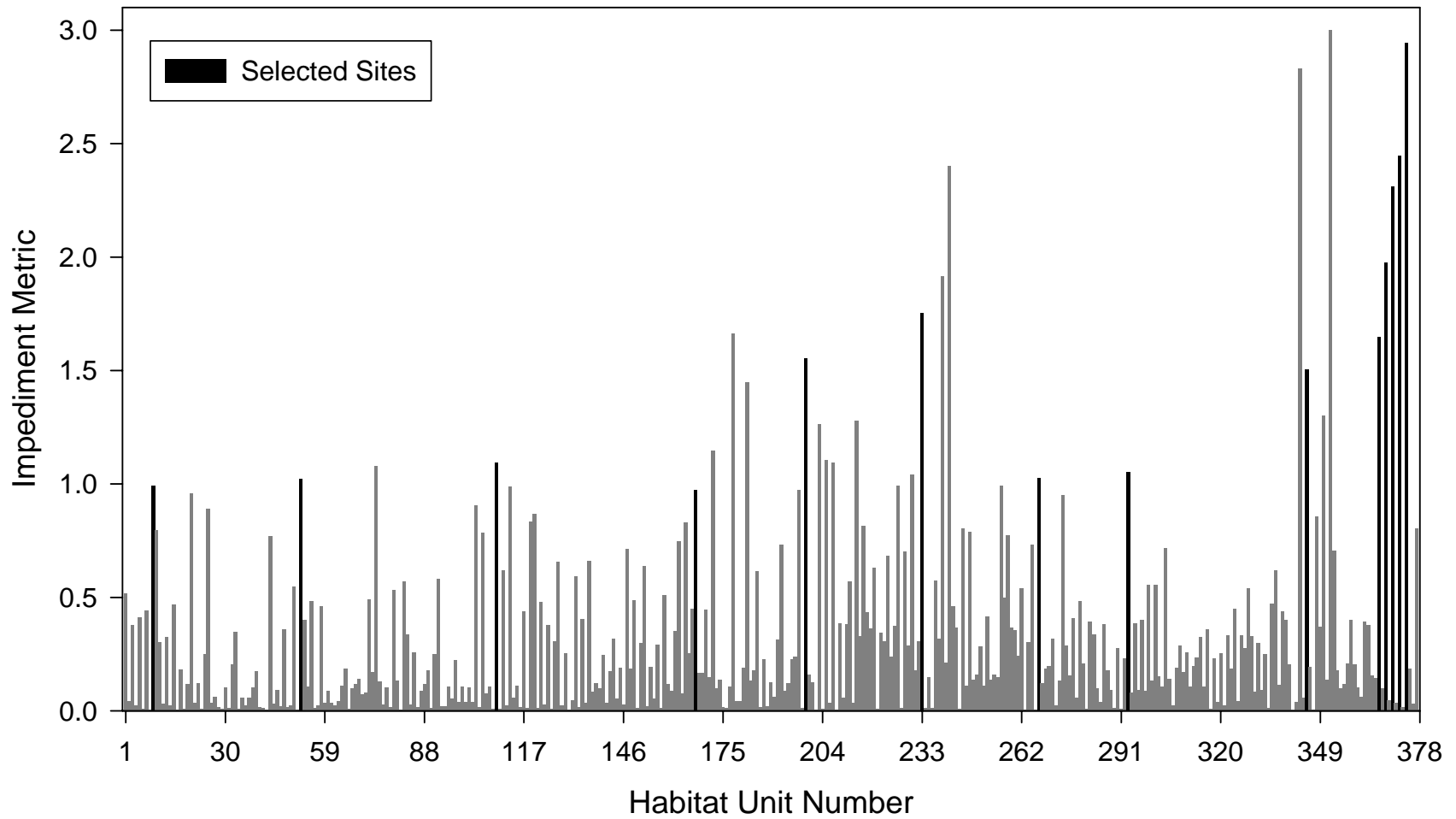
Casitas recommends that the construction of the 15-weir portion of the project be put on hold at least until the Matilija Dam Removal Project is completed. Physical and numerical model studies show that the Robles Reach of the river will significantly accrete with the removal of the dam. The level of accretion would be sufficient to bury the weirs. The accretion of sediment in this reach would make the weirs unnecessary for grade control.

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## 6.0 APPENDIXES



Appendix 1. Impediment metric values for all surveyed habitat units from the mouth of the Ventura to the Robles Fish Facility.

Appendix 2. Impediments sites initially selected for upstream fish migration impediment evaluations.

Unit Number	Unit <sup>1</sup> Type	Unit Length (m)	River Kilometer	Unit Width (m)	Unit Slope (%)	Unit Depth or Step Height (m)	Discharge at time of Survey (cfs) <sup>2</sup>	Metric Score	Selection Criteria
0	sandbar		0.0						First potential impediment and unknown status.
9	RB	11.7	0.4	11	3.1	0.3	13	0.99	Highest IM score in 2 km reach.
52	RB	18.6	3.8	2	6.2	0.35	9.8	1.02	Highest IM score in 2 km reach.
109	RI	16.4	7.5	15	2.8	0.15	10	1.09	Highest IM score in 4 km reach and near other monitoring sites.
167	RB	22	11.0	27	3.7	0.2	9.6	0.97	2nd highest IM score and near ENTRIX (1999) site.
199	RI	10.1	13.1	10	3.5	0.1	124	1.55	Highest IM score in 2 km reach.
233	RI	8.4	14.5	36	7	0.15	42	1.75	3rd highest IM score in 2 km reach with good access.
267	CB	26.1	16.3	22	5	0.2	30	1.02	Highest IM score in 2 km reach.
293	RB	24.4	18.4	8	5	0.2	21	1.05	Highest IM score in 2 km reach.
345	CB	9.2	21.6	24	10	0.35	14	1.51	3rd highest IM score in 2 km reach and selected due to more difficult fish passage. <sup>3</sup>
366	SS	5.1	22.7	17	10	0.5	14	1.65	Artificial rock weir.
368	SS	4.7	22.7	15	11	0.5	14	1.98	Artificial rock weir.
370	SS	4.9	22.7	22.5	20	1.1	14	2.31	Artificial rock weir.
372	SS	3.6	22.7	21	20	0.6	14	2.45	Artificial rock weir.
374	SS	0.5	22.7	7	44	0.4	14	2.94	Road Crossing.

<sup>1</sup> The habitat types are: RB = rapid with protruding boulders, RI = riffle, CB = cascade over boulders, and SS = step crated by artificial structure (Moore et al. 2002).

<sup>2</sup> Discharge for USGS station at Foster Park or Casitas station at Robles was recoded depending on which station was most representative.

<sup>3</sup> The first and second highest scoring units were step-type habitats that were considered passable based on downstream pool depth, step height, step length, and steelhead jumping capabilities (Powers and Orsborn 1985).

Appendix 3. Ventura River sandbar monitoring from July 2007 to June 2008.

Date	Sandbar Breeched (Y/N)	Time (24h)	Tide Height (ft)	Tidal State	High Tide		Low Tide		Temp (°C) <sup>1</sup>	Discharge at Foster <sup>2</sup>	Discharge at Robles	Notes
					Time (24h)	Height (ft)	Time (24h)	Height (ft)		(cfs)	(cfs)	
07/27/07	Y	10:00	3.58	slack	9:56	3.59	3:19	2.71	23.2	4.3	0	Open west bank
08/14/07	N	11:00	4.58	ebb	11:28	4.65	5:14	-0.30	23.1	2.6	0	If breach, open WB
09/11/07	N	11:00	4.90	ebb	11:13	5.07	16:09	1.13	20.9	2.5	0	If breach, open WB
10/16/07	N	9:00	4.16	flood	11:48	5.02	4:42	2.88	15.6	1.2	0	If breach, open WB
11/07/07	N	7:30	5.63	slack	7:24	5.64	14:14	0.26	13.9	0.72	0	If breach, open WB
11/14/07	N	10:50	5.22	ebb	10:30	5.24	18:49	0.32	14.7	0.73	0	If breach, open WB
12/11/2007	N	10:30	5.61	ebb	9:14	5.91	16:57	0.32	9.0	0.51	0	If breach, open EB
12/18/2007	N	9:00	2.09	ebb	4:12	5.00	11:12	1.30	11.6	1.2	0	If breach, open EB
12/19/2007	Y	9:00	2.43	ebb	4:54	5.55	12:12	0.38	12.8	1.4	0	Open east bank
12/26/2007	Y	9:20	6.12	flood	10:12	6.35	4:07	2.29	8.6	0.62	0	Open east bank
01/02/2008	Y	9:30	2.25	ebb	4:58	4.95	12:42	0.72	9.6	0.61	0	Open east bank
01/15/2008	Y	9:15	1.47	flood	2:13	4.80	20:05	1.71	10.5	4.9	8	Open east bank
01/29/2008	Y	11:45	1.98	flood	14:54	2.43	9:30	1.68	10.9	1080	304	Open east bank
02/20/2008	Y	9:15	5.90	ebb	8:29	6.10	15:24	-1.05	14.2	56	47	Open east bank
02/29/2008	Y	11:45	0.44	ebb	6:13	5.01	13:37	-0.39	15.8	79	59	Open east bank
03/11/2008	Y	12:20	3.26	flood	13:04	3.37	7:02	-0.03	18.0	57	49	Open east bank
03/25/2008	Y	14:47	2.51	ebb	12:30	3.11	17:24	1.84	20.5	53	43	Open east bank
04/08/2008	Y	10:25	2.81	flood	12:15	3.64	5:59	-1.03	15.8	40	28	Open east bank
04/24/2008	Y	14:30	2.67	ebb	13:47	2.70	17:02	2.52	21.0	29	20	Open east bank
05/06/2008	Y	11:10	3.72	flood	11:26	3.74	5:03	-1.66	17.9	20	13	Open east bank
05/21/2008	Y	11:24	3.08	flood	11:58	3.14	5:24	-0.56	21.1	13	4	Open east bank
06/05/2008	Y	10:00	2.24	flood	12:27	3.72	5:50	-1.82	19.4	19	3	Open east bank
06/19/2008	Y	9:55	2.70	flood	11:52	3.37	5:14	-0.66	21.1	17	0	Open east bank

<sup>1</sup>Main St. Bridge temperature probe at time of observation.

<sup>2</sup>USGS gauging station 11118500, downstream of Foster Park. Data is provisional and subject to revision.



Appendix 4. Ventura River estuary piscivorous bird survey from July 2007 through June 2008.

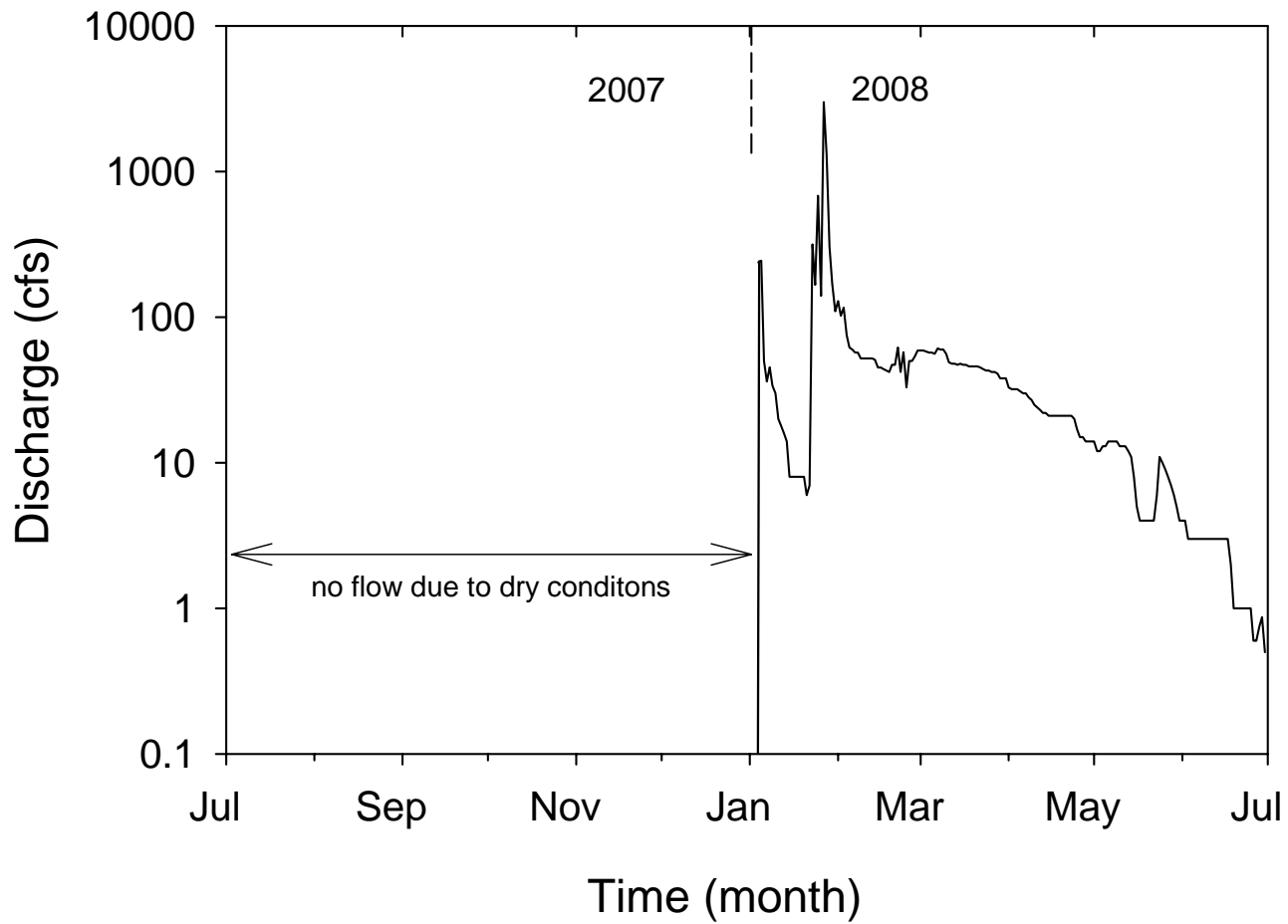
Common Name and Quantity of Observed Birds											
Date	Time	Gulls	Pelicans	Cormorants	Terns	Egrets	Greebs	Heron	Kingfishers	Mergansers	Total
07/27/2007	10:00	44	0	4	33	0	0	0	0	0	81
08/14/2007	11:00	109	3	7	15	0	0	0	0	0	134
09/11/2007	11:00	130	0	7	0	1	0	0	0	0	138
10/16/2007	9:00	73	0	0	0	2	0	1	1	0	77
11/14/2007	10:40	147	21	18	0	0	0	0	0	0	186
12/11/2007	10:20	272	9	0	0	8	0	1	0	0	290
01/02/2008	9:30	112	2	10	0	0	0	0	0	0	124
01/15/2008	9:15	147	0	15	0	2	2	0	0	0	166
01/29/2008	11:45	267	4	9	0	1	0	0	0	0	281
02/20/2008	9:15	147	12	25	0	0	0	0	0	0	184
02/29/2008	11:45	102	0	16	0	0	0	0	0	0	118
03/11/2008	12:30	54	20	0	0	0	0	0	0	0	74
03/25/2008	14:50	327	11	6	0	0	0	0	0	0	344
04/08/2008	10:25	64	50	37	0	0	0	0	0	0	151
04/24/2008	14:30	236	0	33	0	0	0	0	0	0	269
05/06/2008	11:07	99	3	27	0	0	0	0	0	0	129
05/21/2008	11:24	137	19	28	0	0	0	0	0	0	184
06/05/2008	10:00	112	170	11	0	0	0	0	0	0	293
06/19/2008	9:45	130	21	7	0	0	0	0	0	0	158
Total		2709	345	260	48	14	2	2	1	0	3381

Appendix 5. Fish attraction evaluation downstream of Robles Fish Passage Facility

Date	Method	Location	Length (M)	Temp (°C)	Turbidity (NTU)	Discharge from Robles (cfs)	Species	Quantity
01/08/2008	Bank	Robles entrance pool to d/s most rock weir	200	9.0	48.7	45	NFO	
01/16/2008	Bank	Robles entrance pool to d/s most rock weir	200		9.12	8	NFO	
01/23/2008	Bank	Robles entrance pool to d/s most rock weir	200			316	NFO	
01/30/2008	Bank	Robles entrance pool to d/s most rock weir	200		31.1	170	NFO	
02/06/2008	Bank	Robles entrance pool to d/s most rock weir	200	9.1	7.1	60	NFO	
02/14/2008	Bank	Robles entrance pool to d/s most rock weir	200	11.3	2.06	51	NFO	
02/21/2008	Bank	Robles entrance pool to d/s most rock weir	200	12.7	1.34	47	NFO	
02/27/2008	Bank	Robles entrance pool to d/s most rock weir	200	11.0	4.13	50	NFO	
03/04/2008	Bank	Robles entrance pool to d/s most rock weir	200	11.5	2.51	57	NFO	
03/12/2008	Bank	Robles entrance pool to d/s most rock weir	200	13.3	1.91	48	NFO	
03/14/2008	Snorkel	Robles entrance pool to d/s most rock weir	200			47	NFO	
03/19/2008	Bank	Robles entrance pool to d/s most rock weir	200	12.6	4.98	46	NFO	
03/27/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	15.0		42	LMB	1
04/02/2008	Bank	Robles entrance pool to d/s most rock weir	200	14.5	0.56	32	NFO	
04/08/2008	Bank	Robles entrance pool to d/s most rock weir	200	17.0	2.32	28	NFO	
04/10/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	13.0		25	NFO	
04/18/2008	Bank	Robles entrance pool to d/s most rock weir	200	21.5	2.15	21	OMY	3
04/23/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	16.0		21	NFO	
05/08/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	16.0		14	NFO	
05/13/2008	Bank	Robles entrance pool to d/s most rock weir	200	16.0		12	OMY	2
							ARC	22
05/20/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	21.0		4	OMY	8
							UKN	2
							LMB	2
05/27/2008	Bank	Robles entrance pool to d/s most rock weir	200	15.0	0.5	8	OMY	3
06/04/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	20.5		3	OMY	13
							GSF	4
							LMB	1
							TSS	4
							ARC	10
06/12/2008	Bank	Robles entrance pool to d/s most rock weir	200	18.4	0.5	3	OMY	3
06/18/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	25.0		2	OMY	8
							LMB	2
							TSS	1
							ARC	19
							GSF	6
							UKN	1
06/24/2008	Snorkel	Robles entrance pool to d/s most rock weir	200	23.6	0.72	1	OMY	7
							LMB	1
							ARC	5
							TSS	2
							GSF	13

Fish species codes: O. mykiss = OMY, threespine stickleback = TSS, arroyo chub = ARC  
green sunfish = GSF, unknown fish species: UKN, no fish observed = NFO.

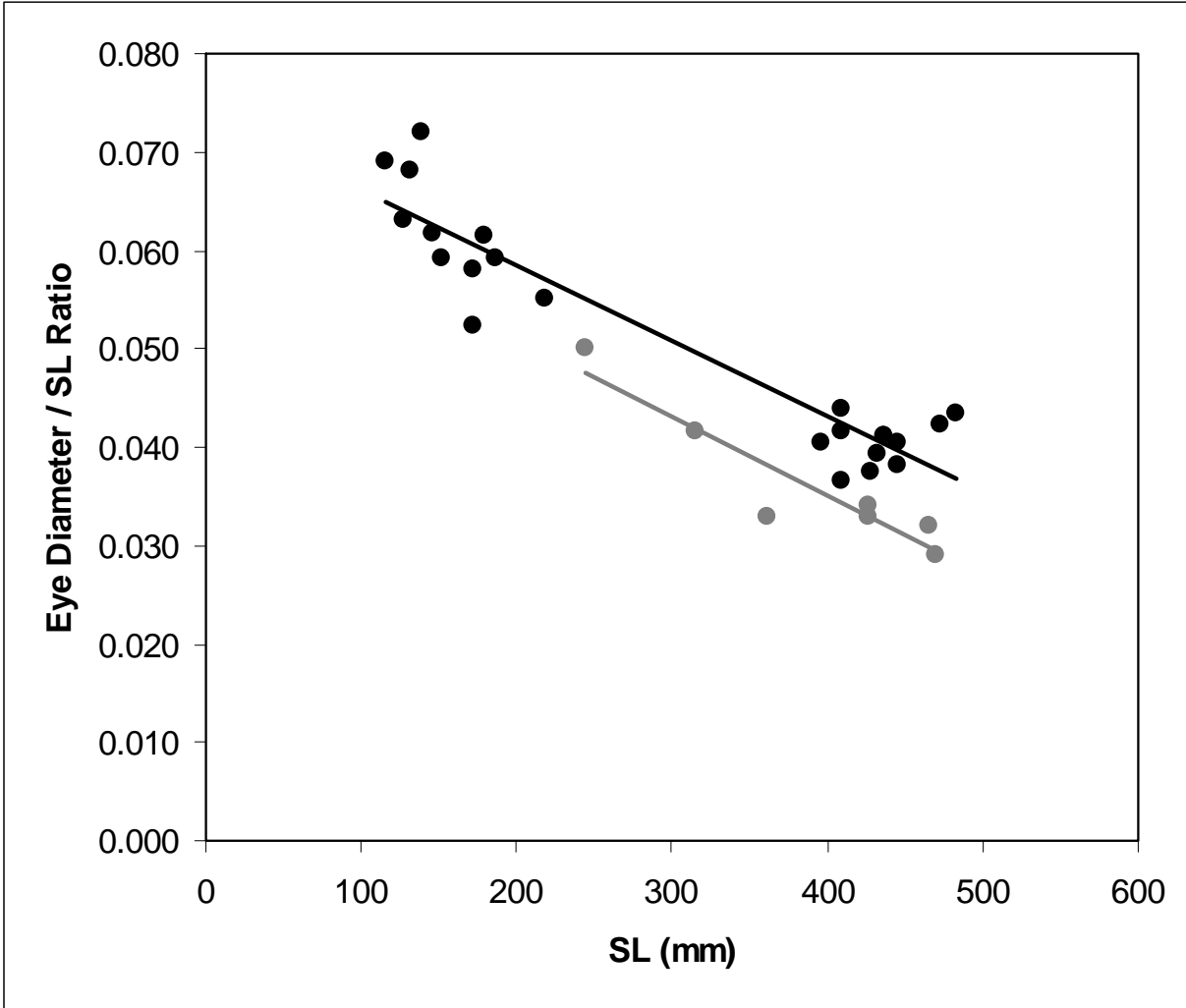
Species	Total
arroyo chub	56
O. mykiss	47
green sunfish	23
threespine stickleback	7
largemouth bass	7
unknown fish	3
<b>Total</b>	<b>143</b>



Appendix 6. Discharge (cfs) below the Robles Fish Passage Facility for the reporting period from July 1, 2007 through June 31, 2008.

Appendix 7. Summary of Vaki Riverwatcher counts at the Robles Fish Passage Facility for 2008.

	Upstream	Downstream
Adult Steelhead	6	0
Adult Steelhead, probable	1	3
O.mykiss, non-adult steelhead	74	0
Largemouth Bass	81	0
Fish, unknown	24	0
Fish, probable	39	183
Not Fish, probable	1719	3462
Total	1944	3648
Mean Date - Adult Steelhead	2/7/2008	N/A
Mean Date - Adult Steelhead, probable	4/23/2008	3/17/2008
Mean Date - O.mykiss, non-adult steelhead	4/30/2008	N/A
Mean Date - Fish, unknown	6/11/2008	N/A
Mean Date - Fish, probable	5/23/2008	5/28/2008
Mean Date - Largemouth Bass	6/15/2008	N/A
Mean Time - Adult Steelhead (24h)	14:51	N/A
Mean Time - Adult Steelhead, probable (24h)	10:42	8:58
Mean Time - O.mykiss, non-adult steelhead (24h)	15:18	N/A
Mean Time - Fish, unknown (24h)	18:06	N/A
Mean Time - Fish, probable (24h)	10:13	16:35
Mean Time - Largemouth Bass (24h)	15:21	N/A
Mean of Mean Daily Turbidity - Adult Steelhead (NTU)	12	N/A
Mean of Mean Daily Turbidity - Adult Steelhead, probable (NTU)	2	9
Mean of Mean Daily Turbidity - O.mykiss, non-adult steelhead (NTU)	2	N/A
Mean of Mean Daily Turbidity - Fish, unknown (NTU)	1	N/A
Mean of Mean Daily Turbidity - Fish, probable (NTU)	1	2
Mean of Mean Daily Turbidity - Largemouth Bass (NTU)	1	N/A
Mean of Mean Daily Temperature - Adult Steelhead (°C)	11.3	N/A
Mean of Mean Daily Temperature - Adult Steelhead, probable (°C)	16.9	14.2
Mean of Mean Daily Temperature - O.mykiss, non-adult steelhead (°C)	18.0	N/A
Mean of Mean Daily Temperature - Fish, unknown (°C)	22.3	N/A
Mean of Mean Daily Temperature - Fish, probable (°C)	20.1	20.5
Mean of Mean Daily Temperature - Largemouth Bass (°C)	22.9	N/A
Mean of Mean Daily Discharge - Adult Steelhead (cfs)	85	N/A
Mean of Mean Daily Discharge - Adult Steelhead, probable (cfs)	21	43
Mean of Mean Daily Discharge - O.mykiss, non-adult steelhead (cfs)	22	N/A
Mean of Mean Daily Discharge - Fish, unknown (cfs)	4	N/A
Mean of Mean Daily Discharge - Fish, probable (cfs)	9	12
Mean of Mean Daily Discharge - Largemouth Bass (cfs)	3	N/A
Mean Length - Adult Steelhead (cm)	55	N/A
Mean Length - Adult Steelhead, probable (cm)	49	47
Mean Length - O.mykiss, non-adult Steelhead (cm)	30	N/A
Mean Length - Largemouth Bass (cm)	40	N/A
Mean Length - Fish, unknown (cm)	28	N/A
Mean Length - Fish, probable (cm)	27	29



Appendix 8. Morphometric analysis of steelhead (n = 5) and rainbow trout (n = 2) observed passing through the Robles fish ladder (gray symbols) compared with known steelhead and rainbow trout (black symbols).

Appendix 9. Summary of Vaki Riverwatcher fish counts at the Robles Fish Passage Facility for 2008.

Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Dishcharge (cfs)	Fish Species	Length (cm)	Direction
01/31/2008	13:27	10.4	22.5	110	Steelhead	54	Up
02/01/2008	2:40	10.8	21.2	129	Steelhead	64	Up
02/01/2008	4:06	10.8	21.2	129	O. mykiss	32	Up
02/02/2008	23:19	10.5	13.4	102	Steelhead	64	Up
02/07/2008	10:03	11.0	5.1	57	Steelhead	42	Up
02/09/2008	10:18	12.2	4.4	52	Fish, probable	36	Down
02/12/2008	21:24	12.8	5.7	52	Steelhead	49	Up
02/13/2008	6:51	13.0	3.9	52	Fish, probable	21	Down
02/14/2008	6:54	11.8	2	51	Fish, probable	17	Down
02/15/2008	6:42	11.3	2.7	45	Fish, probable	22	Down
02/17/2008	17:48	11.9	1.6	44	O. mykiss	22	Up
02/18/2008	6:44	12.3	1.5	43	Fish, probable	18	Down
02/18/2008	12:54	12.3	1.5	43	Fish, probable	28	Down
02/18/2008	12:55	12.3	1.5	43	O. mykiss	32	Up
02/18/2008	17:39	12.3	1.5	43	O. mykiss	17	Up
02/19/2008	6:34	12.2	1.6	42	Fish, probable	14	Down
02/19/2008	6:37	12.2	1.6	42	Fish, probable	26	Down
02/19/2008	7:58	12.2	1.6	42	Fish, unknown	34	Up
02/19/2008	9:34	12.2	1.6	42	O. mykiss	32	Up
02/19/2008	17:27	12.2	1.6	42	O. mykiss	22	Up
02/20/2008	17:43	12.6	1.6	47	O. mykiss	25	Up
02/21/2008	6:21	12.1	2.1	47	Fish, probable	17	Down
02/21/2008	17:04	12.1	2.1	47	Fish, probable	24	Down
02/22/2008	1:16	12.0	4.5	62	Fish, probable	17	Down
02/22/2008	18:16	12.0	4.5	62	Steelhead	58	Up
02/23/2008	6:23	11.2	14.1	42	Fish, probable	25	Down
02/23/2008	16:12	11.2	14.1	42	O. mykiss	22	Up
02/23/2008	16:26	11.2	14.1	42	Fish, probable	25	Down
02/26/2008	0:31	12.4	4.2	50	Steelhead, probable	48	Down
03/01/2008	11:27	13.3	2.9	59	O. mykiss	28	Up
03/02/2008	7:17	12.6	2.9	59	O. mykiss	28	Up
03/03/2008	7:13	12.4	2.9	58	O. mykiss	21	Up
03/03/2008	9:26	12.4	2.9	58	O. mykiss	25	Up
03/04/2008	8:02	12.6	2.6	57	O. mykiss	26	Up
03/05/2008	14:43	12.8	2.4	57	Fish, probable	18	Down
03/06/2008	16:22	12.7	2.2	56	Fish, probable	21	Up
03/07/2008	6:58	13.3	5.5	61	Fish, probable	21	Down
03/07/2008	7:08	13.3	5.5	61	O. mykiss	24	Up
03/07/2008	9:42	13.3	5.5	61	Fish, probable	26	Down
03/07/2008	9:49	13.3	5.5	61	O. mykiss	26	Up
03/07/2008	12:38	13.3	5.5	61	Fish, probable	18	Down
03/08/2008	8:51	13.8	4.8	60	Fish, probable	17	Down
03/08/2008	22:57	13.8	4.8	60	Fish, probable	39	Down
03/10/2008	7:43	13.9	2.7	56	Fish, probable	18	Down
03/13/2008	11:01	15.0	2.2	48	Fish, probable	18	Down
03/13/2008	11:38	15.0	2.2	48	Fish, probable	22	Down

Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Dishcharge (cfs)	Fish Species	Length (cm)	Direction
03/13/2008	11:40	15.0	2.2	48	O. mykiss	24	Up
03/13/2008	15:07	15.0	2.2	48	Fish, probable	25	Down
03/13/2008	15:41	15.0	2.2	48	O. mykiss	26	Up
03/14/2008	14:17	14.7	3.7	47	O. mykiss	26	Up
03/16/2008	9:00	12.7	2.7	47	Fish, probable	26	Down
03/16/2008	9:04	12.7	2.7	47	O. mykiss	29	Up
03/19/2008	8:27	13.9	1.9	46	Fish, probable	21	Down
03/19/2008	8:31	13.9	1.9	46	O. mykiss	29	Up
03/19/2008	10:42	13.9	1.9	46	Fish, probable	15	Down
03/19/2008	12:29	13.9	1.9	46	O. mykiss	26	Up
03/19/2008	12:37	13.9	1.9	46	Fish, probable	22	Down
03/19/2008	15:51	13.9	1.9	46	O. mykiss	29	Up
03/20/2008	10:04	14.3	1.8	46	Fish, probable	29	Down
03/20/2008	10:24	14.3	1.8	46	O. mykiss	29	Up
03/20/2008	10:27	14.3	1.8	46	Fish, probable	29	Down
03/20/2008	10:34	14.3	1.8	46	O. mykiss	18	Up
03/20/2008	11:03	14.3	1.8	46	O. mykiss	25	Up
03/20/2008	11:10	14.3	1.8	46	Fish, probable	14	Up
03/20/2008	11:30	14.3	1.8	46	Fish, probable	20	Up
03/20/2008	11:46	14.3	1.8	46	Fish, probable	22	Down
03/20/2008	12:27	14.3	1.8	46	O. mykiss	32	Up
03/20/2008	12:42	14.3	1.8	46	Fish, probable	22	Down
03/21/2008	12:38	14.2	1.7	46	Steelhead, probable	43	Down
03/21/2008	15:57	14.2	1.7	46	Fish, probable	28	Down
03/22/2008	18:53	14.5	1.6	45	Fish, probable	25	Up
03/29/2008	10:11	15.2	6.4	38	O. mykiss	34	Up
03/30/2008	20:36	15.6	6.4	38	Fish, probable	18	Down
04/01/2008	7:14	14.8	6.2	33	Fish, probable	18	Down
04/01/2008	8:00	14.8	6.2	33	Fish, probable	29	Down
04/01/2008	8:34	14.8	6.2	33	O. mykiss	31	Up
04/02/2008	6:43	14.6	0.9	32	O. mykiss	12	Up
04/04/2008	13:46	16.0	0.8	32	Steelhead, probable	49	Down
04/07/2008	7:11	15.8	0.7	30	Fish, probable	25	Down
04/07/2008	7:22	15.8	0.7	30	O. mykiss	26	Up
04/19/2008	11:02	16.0	2.4	21	Fish, probable	28	Up
04/23/2008	10:42	16.9	2.3	21	Steelhead, probable	49	Up
05/03/2008	2:15	18.2	1.4	12	Fish, probable	22	Down
05/07/2008	20:14	16.6	1.1	14	Fish, probable	24	Up
05/15/2008	11:39	20.4	0.6	8	O. mykiss	22	Up
05/16/2008	2:13	21.2	0.8	5	O. mykiss	28	Up
05/16/2008	4:09	21.2	0.8	5	Fish, probable	22	Down
05/16/2008	23:08	21.2	0.8	5	O. mykiss	26	Up
05/17/2008	2:47	21.9	1.0	4	O. mykiss	26	Up
05/17/2008	12:35	21.9	1.0	4	Largemouth Bass	38	Up
05/18/2008	16:08	22.7	0.8	4	Fish, probable	36	Down
05/20/2008	5:50	21.6	0.9	4	Fish, probable	25	Down
05/20/2008	5:54	21.6	0.9	4	Fish, probable	24	Down

Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Dishcharge (cfs)	Fish Species	Length (cm)	Direction
05/20/2008	6:05	21.6	0.9	4	Fish, probable	22	Down
05/20/2008	6:47	21.6	0.9	4	Fish, probable	26	Up
05/20/2008	6:55	21.6	0.9	4	Fish, probable	25	Down
05/20/2008	23:39	21.6	0.9	4	O. mykiss	36	Up
05/21/2008	4:16	20.2	1.6	4	Fish, probable	18	Down
05/21/2008	5:16	20.2	1.6	4	Fish, probable	28	Down
05/21/2008	5:42	20.2	1.6	4	Fish, probable	15	Down
05/21/2008	5:42	20.2	1.6	4	Fish, probable	24	Down
05/21/2008	6:35	20.2	1.6	4	O. mykiss	25	Up
05/21/2008	7:15	20.2	1.6	4	Fish, probable	18	Down
05/21/2008	8:17	20.2	1.6	4	Fish, probable	25	Down
05/21/2008	8:18	20.2	1.6	4	Fish, probable	25	Up
05/21/2008	8:32	20.2	1.6	4	Fish, probable	24	Down
05/21/2008	8:54	20.2	1.6	4	Fish, probable	25	Down
05/22/2008	20:12	19.3	1.2	4	Fish, unknown	25	Up
05/22/2008	20:57	19.3	1.2	4	O. mykiss	39	Up
05/23/2008	4:35	16.9	1.2	6	O. mykiss	28	Up
05/23/2008	4:43	16.9	1.2	6	Fish, probable	20	Down
05/23/2008	5:25	16.9	1.2	6	Fish, probable	26	Down
05/23/2008	20:34	16.9	1.2	6	O. mykiss	24	Up
05/23/2008	20:38	16.9	1.2	6	O. mykiss	36	Up
05/25/2008	4:35	16.4	0.9	10	Fish, probable	35	Down
05/25/2008	5:31	16.4	0.9	10	Fish, probable	26	Down
05/25/2008	6:05	16.4	0.9	10	Fish, probable	24	Up
05/25/2008	6:05	16.4	0.9	10	Fish, probable	22	Down
05/25/2008	20:48	16.4	0.9	10	Fish, probable	28	Up
05/26/2008	5:03	16.9	0.9	9	Fish, probable	26	Down
05/26/2008	12:54	16.9	0.9	9	Fish, probable	20	Up
05/26/2008	20:40	16.9	0.9	9	O. mykiss	36	Up
05/26/2008	20:51	16.9	0.9	9	O. mykiss	18	Up
05/26/2008	20:57	16.9	0.9	9	Fish, unknown	25	Up
05/27/2008	4:52	18.2	0.9	8	Fish, probable	20	Down
05/27/2008	5:19	18.2	0.9	8	Fish, probable	31	Down
05/27/2008	20:04	18.2	0.9	8	O. mykiss	38	Up
05/28/2008	4:11	18.7	0.7	7	Fish, probable	18	Down
05/28/2008	4:31	18.7	0.7	7	Fish, probable	21	Up
05/28/2008	5:10	18.7	0.7	7	Fish, probable	24	Down
05/28/2008	5:10	18.7	0.7	7	Fish, probable	36	Down
05/28/2008	20:27	18.7	0.7	7	Fish, probable	38	Up
05/29/2008	5:14	19.2	0.7	6	Fish, probable	32	Down
05/29/2008	20:05	19.2	0.7	6	O. mykiss	35	Up
05/29/2008	20:32	19.2	0.7	6	Fish, probable	25	Up
05/30/2008	5:09	19.6	1.1	5	Fish, probable	32	Down
05/30/2008	20:28	19.6	1.1	5	Fish, probable	34	Up
05/31/2008	4:21	19.8	0.5	4	Fish, probable	24	Up
05/31/2008	4:27	19.8	0.5	4	Fish, probable	24	Down
05/31/2008	4:39	19.8	0.5	4	Fish, probable	24	Up



Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Dishcharge (cfs)	Fish Species	Length (cm)	Direction
05/31/2008	4:55	19.8	0.5	4	Fish, probable	25	Up
05/31/2008	5:04	19.8	0.5	4	Fish, probable	20	Down
05/31/2008	5:17	19.8	0.5	4	Fish, probable	17	Down
05/31/2008	19:58	19.8	0.5	4	Fish, probable	34	Up
05/31/2008	20:19	19.8	0.5	4	Fish, probable	26	Up
06/01/2008	5:09	20.2	0.6	4	Fish, probable	25	Down
06/01/2008	5:12	20.2	0.6	4	Fish, probable	31	Down
06/01/2008	19:45	20.2	0.6	4	O. mykiss	34	Up
06/01/2008	20:36	20.2	0.6	4	Fish, probable	26	Up
06/02/2008	4:26	20.4	0.6	4	Fish, probable	21	Down
06/02/2008	4:37	20.4	0.6	4	O. mykiss	25	Up
06/02/2008	4:45	20.4	0.6	4	O. mykiss	25	Up
06/02/2008	5:06	20.4	0.6	4	Fish, probable	25	Down
06/02/2008	5:12	20.4	0.6	4	Fish, probable	31	Down
06/02/2008	20:13	20.4	0.6	4	O. mykiss	36	Up
06/02/2008	20:32	20.4	0.6	4	Fish, probable	28	Up
06/03/2008	5:20	20.4	1.1	3	Fish, probable	28	Down
06/03/2008	19:41	20.4	1.1	3	O. mykiss	35	Up
06/03/2008	20:35	20.4	1.1	3	Fish, probable	25	Up
06/04/2008	5:08	20.4	1.3	3	Fish, probable	31	Down
06/04/2008	19:52	20.4	1.3	3	O. mykiss	36	Up
06/04/2008	20:40	20.4	1.3	3	Fish, probable	26	Up
06/05/2008	5:25	20.6	0.6	3	Fish, probable	20	Down
06/05/2008	20:22	20.6	0.6	3	O. mykiss	35	Up
06/05/2008	20:34	20.6	0.6	3	Fish, unknown	25	Up
06/06/2008	2:53	21.2	0.9	3	Fish, probable	18	Down
06/06/2008	3:16	21.2	0.9	3	Fish, unknown	28	Up
06/06/2008	5:03	21.2	0.9	3	Fish, probable	34	Down
06/06/2008	14:36	21.2	0.9	3	Largemouth Bass	26	Up
06/06/2008	16:17	21.2	0.9	3	Largemouth Bass	32	Up
06/06/2008	20:26	21.2	0.9	3	O. mykiss	32	Up
06/06/2008	20:26	21.2	0.9	3	O. mykiss	26	Up
06/07/2008	2:32	21.3	1.4	3	Fish, probable	24	Down
06/07/2008	4:55	21.3	1.4	3	Fish, probable	31	Down
06/07/2008	20:11	21.3	1.4	3	Fish, unknown	36	Up
06/07/2008	20:33	21.3	1.4	3	Fish, unknown	21	Up
06/08/2008	5:05	21.4	1.8	3	Fish, probable	32	Down
06/08/2008	5:24	21.4	1.8	3	Fish, probable	20	Down
06/08/2008	20:21	21.4	1.8	3	O. mykiss	35	Up
06/08/2008	20:46	21.4	1.8	3	Fish, unknown	28	Up
06/08/2008	22:46	21.4	1.8	3	Fish, probable	25	Up
06/09/2008	4:41	22.4	1.0	3	Fish, probable	20	Down
06/09/2008	5:06	22.4	1.0	3	Fish, probable	28	Down
06/09/2008	5:13	22.4	1.0	3	Fish, probable	24	Down
06/09/2008	20:25	22.4	1.0	3	O. mykiss	34	Up
06/09/2008	20:42	22.4	1.0	3	Fish, probable	29	Up
06/10/2008	5:14	22.1	1.4	3	Fish, probable	29	Down

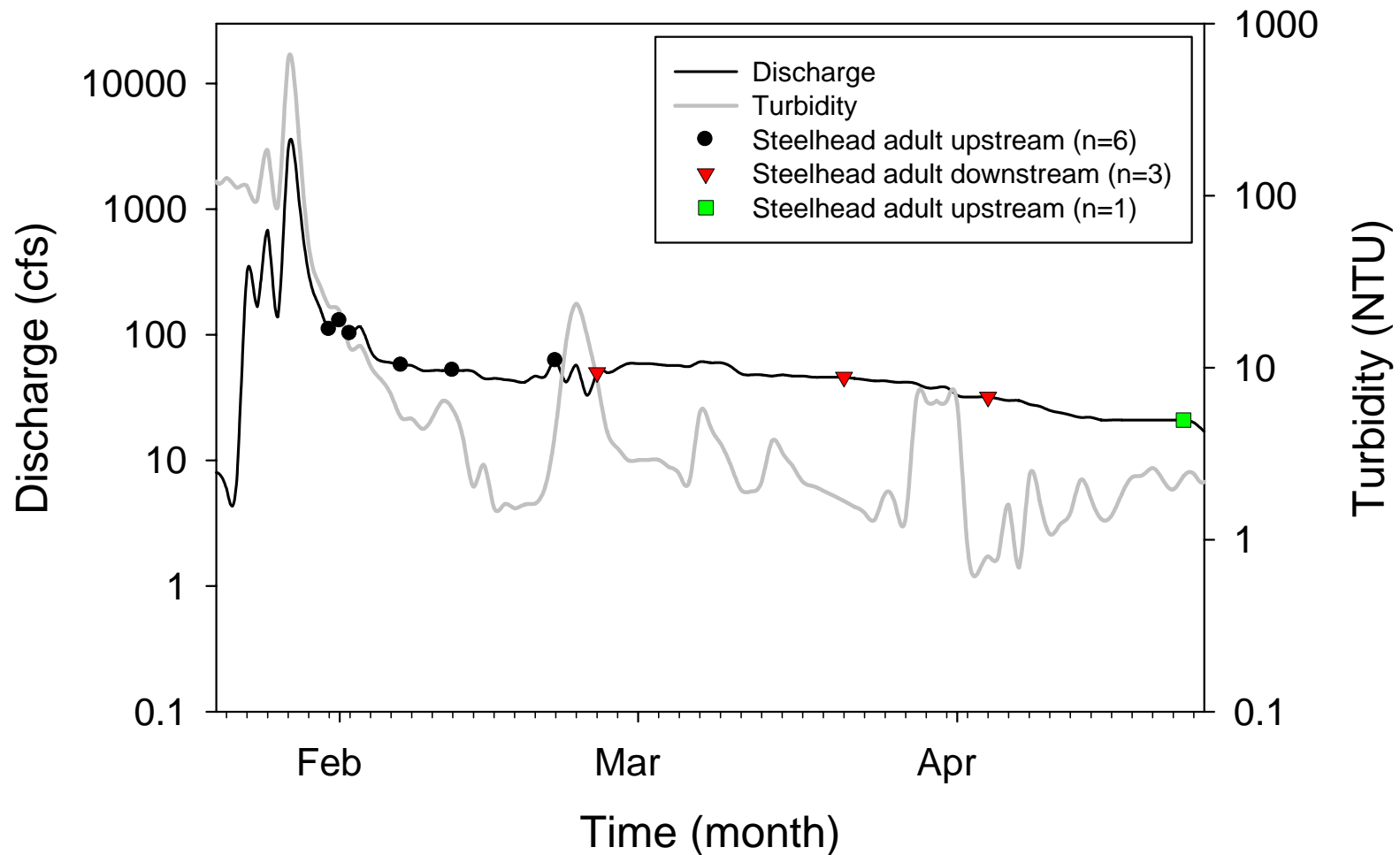
Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Discharge (cfs)	Fish Species	Length (cm)	Direction
06/10/2008	5:20	22.1	1.4	3	Fish, probable	21	Down
06/10/2008	20:02	22.1	1.4	3	O. mykiss	36	Up
06/10/2008	20:28	22.1	1.4	3	Fish, unknown	28	Up
06/11/2008	4:57	22.2	0.8	3	Fish, probable	31	Down
06/12/2008	20:06	21.7	0.6	3	O. mykiss	31	Up
06/12/2008	20:34	21.7	0.6	3	O. mykiss	20	Up
06/13/2008	2:29	22.3	0.6	3	Fish, probable	15	Down
06/13/2008	4:40	22.3	0.6	3	Fish, probable	24	Down
06/13/2008	15:38	22.3	0.6	3	Fish, probable	20	Down
06/13/2008	17:30	22.3	0.6	3	Fish, probable	34	Down
06/13/2008	20:52	22.3	0.6	3	O. mykiss	31	Up
06/13/2008	23:00	22.3	0.6	3	Fish, unknown	25	Up
06/14/2008	0:34	22.5	0.9	3	Fish, unknown	21	Up
06/14/2008	1:42	22.5	0.9	3	Fish, probable	21	Down
06/14/2008	4:53	22.5	0.9	3	Fish, probable	25	Down
06/14/2008	5:11	22.5	0.9	3	Fish, probable	15	Down
06/14/2008	12:31	22.5	0.9	3	Largemouth Bass	38	Up
06/14/2008	12:41	22.5	0.9	3	Largemouth Bass	38	Up
06/14/2008	12:48	22.5	0.9	3	Largemouth Bass	35	Up
06/14/2008	12:56	22.5	0.9	3	Fish, probable	40	Down
06/14/2008	12:56	22.5	0.9	3	Largemouth Bass	38	Up
06/14/2008	13:09	22.5	0.9	3	Largemouth Bass	39	Up
06/14/2008	13:18	22.5	0.9	3	Fish, probable	31	Down
06/14/2008	14:30	22.5	0.9	3	Largemouth Bass	39	Up
06/14/2008	14:43	22.5	0.9	3	Fish, unknown	43	Up
06/14/2008	14:43	22.5	0.9	3	Fish, probable	20	Down
06/14/2008	17:37	22.5	0.9	3	Largemouth Bass	34	Up
06/14/2008	17:43	22.5	0.9	3	Fish, probable	36	Down
06/14/2008	17:43	22.5	0.9	3	Largemouth Bass	42	Up
06/14/2008	17:47	22.5	0.9	3	Fish, probable	38	Down
06/14/2008	17:48	22.5	0.9	3	Largemouth Bass	39	Up
06/14/2008	18:00	22.5	0.9	3	Largemouth Bass	40	Up
06/14/2008	18:06	22.5	0.9	3	Largemouth Bass	40	Up
06/14/2008	18:12	22.5	0.9	3	Largemouth Bass	38	Up
06/14/2008	18:17	22.5	0.9	3	Fish, probable	38	Down
06/14/2008	18:22	22.5	0.9	3	Largemouth Bass	26	Up
06/14/2008	18:26	22.5	0.9	3	Fish, probable	39	Down
06/14/2008	18:30	22.5	0.9	3	Largemouth Bass	38	Up
06/14/2008	18:57	22.5	0.9	3	Largemouth Bass	38	Up
06/14/2008	19:03	22.5	0.9	3	Largemouth Bass	39	Up
06/14/2008	19:08	22.5	0.9	3	Largemouth Bass	34	Up
06/14/2008	19:25	22.5	0.9	3	Fish, probable	36	Down
06/14/2008	19:26	22.5	0.9	3	Largemouth Bass	35	Up
06/14/2008	19:27	22.5	0.9	3	Largemouth Bass	26	Up
06/14/2008	19:28	22.5	0.9	3	Fish, probable	31	Down
06/14/2008	20:39	22.5	0.9	3	O. mykiss	36	Up
06/14/2008	20:44	22.5	0.9	3	O. mykiss	28	Up

Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Discharge (cfs)	Fish Species	Length (cm)	Direction
06/15/2008	2:16	22.6	1.2	3	Fish, probable	14	Down
06/15/2008	11:21	22.6	1.2	3	Largemouth Bass	38	Up
06/15/2008	13:19	22.6	1.2	3	Fish, probable	32	Down
06/15/2008	13:19	22.6	1.2	3	Largemouth Bass	36	Up
06/15/2008	13:26	22.6	1.2	3	Fish, probable	35	Down
06/15/2008	13:26	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	13:31	22.6	1.2	3	Largemouth Bass	40	Up
06/15/2008	13:37	22.6	1.2	3	Fish, probable	31	Down
06/15/2008	13:37	22.6	1.2	3	Largemouth Bass	38	Up
06/15/2008	13:44	22.6	1.2	3	Largemouth Bass	38	Up
06/15/2008	13:54	22.6	1.2	3	Largemouth Bass	26	Up
06/15/2008	13:54	22.6	1.2	3	Fish, probable	42	Up
06/15/2008	13:57	22.6	1.2	3	Largemouth Bass	36	Up
06/15/2008	14:02	22.6	1.2	3	Fish, probable	22	Down
06/15/2008	14:02	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	14:07	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	14:07	22.6	1.2	3	Fish, probable	26	Down
06/15/2008	14:15	22.6	1.2	3	Largemouth Bass	38	Up
06/15/2008	14:19	22.6	1.2	3	Fish, probable	38	Down
06/15/2008	14:20	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	14:21	22.6	1.2	3	Largemouth Bass	40	Up
06/15/2008	14:30	22.6	1.2	3	Largemouth Bass	42	Up
06/15/2008	14:33	22.6	1.2	3	Largemouth Bass	35	Up
06/15/2008	14:41	22.6	1.2	3	Fish, probable	35	Down
06/15/2008	14:42	22.6	1.2	3	Largemouth Bass	40	Up
06/15/2008	14:48	22.6	1.2	3	Fish, probable	36	Down
06/15/2008	14:48	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	14:53	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	14:58	22.6	1.2	3	Largemouth Bass	40	Up
06/15/2008	15:01	22.6	1.2	3	Fish, probable	42	Down
06/15/2008	15:03	22.6	1.2	3	Largemouth Bass	36	Up
06/15/2008	15:10	22.6	1.2	3	Fish, probable	36	Down
06/15/2008	15:11	22.6	1.2	3	Largemouth Bass	38	Up
06/15/2008	15:14	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	15:22	22.6	1.2	3	Fish, probable	26	Up
06/15/2008	15:23	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	15:32	22.6	1.2	3	Largemouth Bass	38	Up
06/15/2008	15:37	22.6	1.2	3	Largemouth Bass	25	Up
06/15/2008	15:42	22.6	1.2	3	Largemouth Bass	38	Up
06/15/2008	15:46	22.6	1.2	3	Largemouth Bass	40	Up
06/15/2008	15:48	22.6	1.2	3	Fish, probable	28	Down
06/15/2008	15:53	22.6	1.2	3	Largemouth Bass	34	Up
06/15/2008	15:56	22.6	1.2	3	Fish, probable	36	Down
06/15/2008	15:56	22.6	1.2	3	Largemouth Bass	40	Up
06/15/2008	16:02	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	16:07	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	16:09	22.6	1.2	3	Largemouth Bass	34	Up

Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Discharge (cfs)	Fish Species	Length (cm)	Direction
06/15/2008	16:19	22.6	1.2	3	Fish, probable	40	Down
06/15/2008	16:19	22.6	1.2	3	Largemouth Bass	39	Up
06/15/2008	17:56	22.6	1.2	3	Fish, probable	39	Down
06/15/2008	18:04	22.6	1.2	3	Fish, probable	42	Down
06/15/2008	20:39	22.6	1.2	3	O. mykiss	25	Up
06/15/2008	20:52	22.6	1.2	3	O. mykiss	25	Up
06/15/2008	20:52	22.6	1.2	3	Fish, probable	24	Down
06/15/2008	20:55	22.6	1.2	3	O. mykiss	20	Up
06/15/2008	21:37	22.6	1.2	3	O. mykiss	36	Up
06/16/2008	4:46	23.0	1.5	3	Fish, probable	22	Down
06/16/2008	4:52	23.0	1.5	3	Fish, probable	29	Down
06/16/2008	7:35	23.0	1.5	3	Fish, probable	20	Up
06/16/2008	20:17	23.0	1.5	3	O. mykiss	25	Up
06/16/2008	20:17	23.0	1.5	3	O. mykiss	35	Up
06/16/2008	22:47	23.0	1.5	3	Fish, probable	32	Down
06/16/2008	22:55	23.0	1.5	3	Fish, probable	22	Down
06/17/2008	4:39	23.5	1.9	3	Fish, probable	18	Down
06/17/2008	4:56	23.5	1.9	3	Fish, probable	20	Down
06/17/2008	5:13	23.5	1.9	3	Fish, probable	31	Down
06/17/2008	12:07	23.5	1.9	3	O. mykiss	25	Up
06/17/2008	20:35	23.5	1.9	3	O. mykiss	25	Up
06/17/2008	20:51	23.5	1.9	3	Fish, unknown	36	Up
06/18/2008	4:50	23.7	2.3	2	Fish, probable	20	Down
06/18/2008	5:08	23.7	2.3	2	Fish, probable	29	Down
06/18/2008	12:11	23.7	2.3	2	Largemouth Bass	34	Up
06/18/2008	12:26	23.7	2.3	2	Fish, probable	36	Down
06/18/2008	12:27	23.7	2.3	2	Largemouth Bass	34	Up
06/18/2008	12:46	23.7	2.3	2	Fish, probable	36	Down
06/18/2008	12:46	23.7	2.3	2	Largemouth Bass	38	Up
06/18/2008	13:00	23.7	2.3	2	Largemouth Bass	39	Up
06/18/2008	13:17	23.7	2.3	2	Largemouth Bass	38	Up
06/18/2008	13:34	23.7	2.3	2	Fish, probable	39	Down
06/18/2008	13:36	23.7	2.3	2	Largemouth Bass	42	Up
06/18/2008	13:39	23.7	2.3	2	Fish, probable	34	Down
06/18/2008	13:41	23.7	2.3	2	Largemouth Bass	43	Up
06/18/2008	13:49	23.7	2.3	2	Largemouth Bass	38	Up
06/18/2008	13:51	23.7	2.3	2	Fish, probable	36	Down
06/18/2008	13:53	23.7	2.3	2	Largemouth Bass	40	Up
06/18/2008	13:57	23.7	2.3	2	Largemouth Bass	42	Up
06/18/2008	14:01	23.7	2.3	2	Fish, probable	34	Down
06/18/2008	14:03	23.7	2.3	2	Largemouth Bass	38	Up
06/18/2008	14:23	23.7	2.3	2	Fish, probable	28	Down
06/18/2008	14:28	23.7	2.3	2	Largemouth Bass	32	Up
06/18/2008	14:36	23.7	2.3	2	Fish, probable	29	Down
06/18/2008	14:36	23.7	2.3	2	Largemouth Bass	39	Up
06/18/2008	14:46	23.7	2.3	2	Largemouth Bass	43	Up
06/18/2008	14:51	23.7	2.3	2	Fish, probable	29	Down

Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Discharge (cfs)	Fish Species	Length (cm)	Direction
06/18/2008	14:53	23.7	2.3	2	Largemouth Bass	43	Up
06/18/2008	15:19	23.7	2.3	2	Fish, probable	32	Down
06/18/2008	16:49	23.7	2.3	2	Largemouth Bass	43	Up
06/18/2008	16:52	23.7	2.3	2	Fish, probable	31	Down
06/18/2008	16:55	23.7	2.3	2	Largemouth Bass	40	Up
06/18/2008	17:01	23.7	2.3	2	Largemouth Bass	42	Up
06/18/2008	17:02	23.7	2.3	2	Fish, probable	35	Down
06/18/2008	17:06	23.7	2.3	2	Largemouth Bass	42	Up
06/18/2008	17:08	23.7	2.3	2	Fish, probable	39	Down
06/18/2008	17:11	23.7	2.3	2	Largemouth Bass	40	Up
06/18/2008	17:13	23.7	2.3	2	Fish, probable	40	Down
06/18/2008	17:16	23.7	2.3	2	Largemouth Bass	36	Up
06/18/2008	17:19	23.7	2.3	2	Fish, probable	38	Down
06/18/2008	17:20	23.7	2.3	2	Largemouth Bass	36	Up
06/18/2008	17:26	23.7	2.3	2	Largemouth Bass	38	Up
06/18/2008	17:30	23.7	2.3	2	Largemouth Bass	39	Up
06/18/2008	17:36	23.7	2.3	2	Largemouth Bass	42	Up
06/18/2008	17:36	23.7	2.3	2	Fish, probable	36	Down
06/18/2008	17:40	23.7	2.3	2	Largemouth Bass	38	Up
06/18/2008	20:43	23.7	2.3	2	O. mykiss	25	Up
06/18/2008	21:53	23.7	2.3	2	Fish, unknown	34	Up
06/19/2008	5:03	23.9	2.7	1	Fish, probable	15	Down
06/19/2008	5:04	23.9	2.7	1	Fish, probable	22	Down
06/19/2008	17:23	23.9	2.7	1	Fish, probable	20	Down
06/19/2008	23:04	23.9	2.7	1	Fish, probable	24	Down
06/19/2008	23:25	23.9	2.7	1	Fish, probable	21	Up
06/20/2008	4:49	25.0	3.1	1	Fish, probable	20	Down
06/20/2008	16:44	25.0	3.1	1	Fish, probable	15	Down
06/20/2008	22:48	25.0	3.1	1	Fish, probable	25	Up
06/21/2008	3:47	25.8	2.5	1	Fish, probable	25	Down
06/21/2008	15:12	25.8	2.5	1	Fish, probable	35	Down
06/21/2008	16:09	25.8	2.5	1	Fish, probable	39	Down
06/21/2008	16:19	25.8	2.5	1	Fish, probable	20	Down
06/21/2008	17:20	25.8	2.5	1	Fish, probable	26	Down
06/21/2008	18:21	25.8	2.5	1	Fish, probable	22	Down
06/21/2008	22:17	25.8	2.5	1	Fish, unknown	21	Up
06/21/2008	23:47	25.8	2.5	1	Fish, probable	22	Down
06/22/2008	17:17	25.5	1.9	1	Fish, probable	38	Down
06/23/2008	17:27	25.0	1.3	1	Fish, probable	20	Down
06/23/2008	20:52	25.0	1.3	1	Fish, unknown	21	Up
06/23/2008	21:41	25.0	1.3	1	Fish, unknown	25	Up
06/23/2008	22:12	25.0	1.3	1	Fish, unknown	11	Up
06/24/2008	4:35	24.2	1.1	1	Fish, probable	28	Down
06/24/2008	16:35	24.2	1.1	1	Fish, probable	14	Down
06/24/2008	20:57	24.2	1.1	1	Fish, unknown	24	Up
06/24/2008	22:28	24.2	1.1	1	Fish, probable	21	Down
06/24/2008	23:50	24.2	1.1	1	Fish, probable	35	Up

Date	Time (24h)	Mean Daily Temperature (°C)	Mean Daily Turbidity (NTU)	Mean Daily Discharge (cfs)	Fish Species	Length (cm)	Direction
06/25/2008	4:55	23.3	1.3	1	Fish, probable	21	Down
06/25/2008	5:00	23.3	1.3	1	Fish, probable	29	Down
06/25/2008	20:42	23.3	1.3	1	Fish, probable	20	Up
06/25/2008	21:44	23.3	1.3	1	Fish, probable	18	Up
06/25/2008	23:12	23.3	1.3	1	Fish, probable	28	Up
06/26/2008	5:04	23.2	0.8	1	Fish, probable	22	Down
06/26/2008	5:16	23.2	0.8	1	Fish, probable	25	Down
06/26/2008	5:29	23.2	0.8	1	Fish, probable	31	Down
06/26/2008	16:00	23.2	0.8	1	Fish, probable	31	Down
06/26/2008	19:15	23.2	0.8	1	Fish, probable	34	Down
06/26/2008	20:35	23.2	0.8	1	O. mykiss	32	Up
06/26/2008	20:46	23.2	0.8	1	O. mykiss	25	Up
06/26/2008	21:21	23.2	0.8	1	Fish, probable	20	Up
06/27/2008	0:26	23.6	2.5	1	Fish, unknown	22	Up
06/27/2008	5:16	23.6	2.5	1	Fish, probable	28	Down
06/27/2008	16:38	23.6	2.5	1	Fish, probable	39	Down
06/27/2008	20:46	23.6	2.5	1	Fish, probable	28	Up
06/27/2008	21:35	23.6	2.5	1	O. mykiss	31	Up
06/28/2008	5:09	23.8	2.0	1	Fish, probable	25	Down
06/28/2008	5:17	23.8	2.0	1	Fish, probable	21	Down
06/28/2008	5:20	23.8	2.0	1	Fish, probable	34	Down
06/28/2008	13:40	23.8	2.0	1	Fish, probable	17	Down
06/28/2008	20:57	23.8	2.0	1	O. mykiss	36	Up
06/28/2008	21:05	23.8	2.0	1	Fish, probable	48	Down
06/29/2008	5:17	23.5	1.6	1	Fish, probable	34	Down
06/29/2008	5:18	23.5	1.6	1	Fish, probable	24	Down
06/29/2008	20:43	23.5	1.6	1	Fish, probable	25	Up
06/29/2008	21:23	23.5	1.6	1	Fish, probable	32	Up
06/30/2008	5:09	23.8	1.1	1	Fish, probable	32	Down
06/30/2008	5:18	23.8	1.1	1	Fish, probable	26	Down
06/30/2008	5:19	23.8	1.1	1	Fish, probable	24	Down
06/30/2008	15:46	23.8	1.1	1	Fish, probable	38	Down
06/30/2008	20:55	23.8	1.1	1	Fish, unknown	14	Up
06/30/2008	21:49	23.8	1.1	1	Fish, unknown	29	Up
06/30/2008	23:35	23.8	1.1	1	Fish, unknown	22	Up
06/30/2008	23:55	23.8	1.1	1	Fish, unknown	22	Up

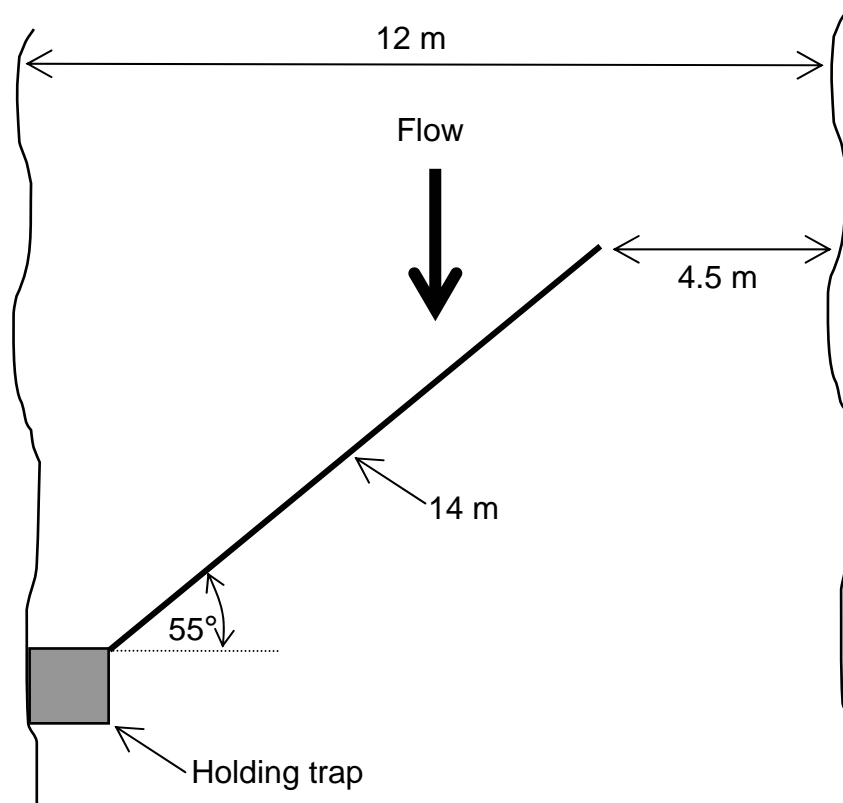


Appendix 10. Upstream and downstream adult steelhead detected by the Riverwatcher at Robles Fish Passage relative to discharge (cfs) and turbidity (NTU) from January 20, 2008 through April 25, 2008. The green box indicates an adult detected on 23-Apr that was migrating back upstream for the second time.

Appendix 11. Summary table of adult steelhead that passed up- or downstream through the Robles fish ladder during 2008. The last upstream detection on 23-Apr was assumed to be a downstream migrating fish that changed directions and went back upstream through the ladder for a second time.

Species/Life Stage	Date	Time (24h)	Direction	Ladder (cfs)	Discharge (cfs)	Days from Peak <sup>1</sup>	Turbidity (NTU)	Total Length (cm)
Steelhead/adult	31-Jan	13:37	Upstream	50	110	4	23	54
Steelhead/adult	01-Feb	14:40	Upstream	42	129	5	21	64
Steelhead/adult	02-Feb	23:19	Upstream	42	102	6	21	64
Steelhead/adult	07-Feb	10:03	Upstream	38	57	11	5	42
Steelhead/adult	12-Feb	21:24	Upstream	36	52	16	6	49
Steelhead/adult	22-Feb	18:16	Upstream	34	62	26	5	58
Steelhead/adult	26-Feb	0:31	Downstream	42	50	2	4	48
Steelhead/adult	21-Mar	12:38	Downstream	35	46	26	2	43
Steelhead/adult	04-Apr	13:46	Downstream	32	32	40	1	49
Steelhead/adult	23-Apr	10:42	Upstream	21	21	59	2	49

1. Peak of storm event as defined in the Robles Biological Opinion.



Appendix 12. Top view of downstream migrant smolt trap layout in the Ventura River below the Robles Fish Facility.



Appendix 13. Ventura River Flow Assessment for the Robles Fish Passage - FY 07-08.

<b>Annual Flow Summary - FY 07-08</b>							
	-1	-2	(1)+(2)	-3	-4	-5	(4)+(5)
	<b>Source Stream Daily Flows</b>			<b>Robles Facility Daily Flows</b>			
	Matilija Ck D/S Dam* (avg cfs/d)	North Fork Matilija Ck.* (avg cfs/d)	Sum of Creek Flows (avg cfs/d)	Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	Total Inflow (avg cfs/d)
Jul-07	5	0	5	0	0	0	0
Aug-07	4	0	4	0	0	0	0
Sep-07	3	0	3	0	0	0	0
Oct-07	1	1	1	0	0	0	0
Nov-07	1	1	2	0	0	0	0
Dec-07	1	1	2	0	0	0	0
Jan-08	271	69	340	28	226	71	297
Feb-08	131	32	163	38	60	84	144
Mar-08	67	13	80	36	49	17	66
Apr-08	27	2	29	23	23	0	23
May-08	15	2	17	9	9	0	9
Jun-08	9	2	11	2	2	0	2
Jul-08	6	2	8	0	0	0	0
Total	540	126	666	136	369	172	541

\* Preliminary flow information provided by the Ventura County Watershed Protection District.

Date	Source Stream Daily Flows		Average Daily Flow FY 07-08		Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	5	1	6	0.01	0	0	0	0
2	5	0	5	0.01	0	0	0	0
3	5	0	5	0.01	0	0	0	0
4	5	0	5	0.01	0	0	0	0
5	5	0	5	0.01	0	0	0	0
6	5	0	5	0.01	0	0	0	0
7	5	0	5	0.01	0	0	0	0
8	5	0	5	0.01	0	0	0	0
9	5	0	5	0.01	0	0	0	0
10	5	1	6	0.01	0	0	0	0
11	5	1	6	0.01	0	0	0	0
12	5	1	6	0.01	0	0	0	0
13	5	1	6	0.01	0	0	0	0
14	5	1	6	0.01	0	0	0	0
15	5	1	6	0.01	0	0	0	0
16	5	1	6	0.00	0	0	0	0
17	5	1	6	0.01	0	0	0	0
18	5	1	6	0.01	0	0	0	0
19	5	1	6	0.01	0	0	0	0
20	5	0	5	0.01	0	0	0	0
21	5	0	5	0.01	0	0	0	0
22	5	0	5	0.01	0	0	0	0
23	5	0	5	0.01	0	0	0	0
24	5	0	5	0.01	0	0	0	0
25	5	0	5	0.01	0	0	0	0
26	5	0	5	0.01	0	0	0	0
27	5	0	5	0.01	0	0	0	0
28	5	0	5	0.01	0	0	0	0
29	5	0	5	0.01	0	0	0	0
30	5	0	5	0.01	0	0	0	0
31	5	0	5	0.01	0	0	0	0
Monthly Avg	5	0	5	0	0	0	0	0

Date	Source Stream Daily Flows			Average Daily Flow FY 07-08		Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)		Forebay Avg. Depth (ft)	Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	5	0	5		0.01	0	0	0	0
2	5	0	5		0.01	0	0	0	0
3	5	0	5		0.07	0	0	0	0
4	5	0	5		0.18	0	0	0	0
5	5	0	5		0.16	0	0	0	0
6	5	0	5		0.14	0	0	0	0
7	5	0	5		0.11	0	0	0	0
8	5	0	5		0.09	0	0	0	0
9	5	0	5		0.07	0	0	0	0
10	5	0	5		0.04	0	0	0	0
11	5	0	5		0.00	0	0	0	0
12	5	0	5		0.00	0	0	0	0
13	5	0	5		0.00	0	0	0	0
14	5	0	5		0.00	0	0	0	0
15	5	0	5		0.00	0	0	0	0
16	4	0	4		0.00	0	0	0	0
17	4	0	4		0.01	0	0	0	0
18	3	0	3		0.00	0	0	0	0
19	3	0	3		0.00	0	0	0	0
20	3	0	3		0.00	0	0	0	0
21	3	0	3		0.00	0	0	0	0
22	3	0	3		0.00	0	0	0	0
23	3	0	3		0.00	0	0	0	0
24	3	0	3		0.00	0	0	0	0
25	3	0	3		0.00	0	0	0	0
26	3	0	3		0.00	0	0	0	0
27	3	0	3		0.00	0	0	0	0
28	3	0	3		0.00	0	0	0	0
29	3	0	3		0.01	0	0	0	0
30	3	0	3		0.01	0	0	0	0
31	3	0	3		0.01	0	0	0	0
Monthly Avg	4	0	4		0	0	0	0	0

September-07 Date	Source Stream Daily Flows		Average Daily Flow FY 07-08		Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
	1	3	0	3	0.01	0	0	
2	3	0	3	0.02	0	0	0	0
3	3	0	3	0.01	0	0	0	0
4	3	0	3	0.00	0	0	0	0
5	3	0	3	0.01	0	0	0	0
6	3	0	3	0.01	0	0	0	0
7	3	0	3	0.01	0	0	0	0
8	3	0	3	0.00	0	0	0	0
9	3	0	3	0.01	0	0	0	0
10	3	0	3	0.01	0	0	0	0
11	3	0	3	0.01	0	0	0	0
12	3	0	3	0.01	0	0	0	0
13	3	0	3	0.00	0	0	0	0
14	3	0	3	0.00	0	0	0	0
15	3	0	3	0.00	0	0	0	0
16	3	0	3	0.00	0	0	0	0
17	3	0	3	0.00	0	0	0	0
18	3	1	4	0.01	0	0	0	0
19	3	1	4	0.02	0	0	0	0
20	3	1	4	0.01	0	0	0	0
21	3	1	4	0.02	0	0	0	0
22	3	1	4	0.02	0	0	0	0
23	3	1	4	0.01	0	0	0	0
24	3	1	4	0.01	0	0	0	0
25	3	1	4	0.02	0	0	0	0
26	3	1	4	0.01	0	0	0	0
27	3	1	4	0.01	0	0	0	0
28	3	1	4	0.02	0	0	0	0
29	3	1	4	0.01	0	0	0	0
30	3	1	4	0.02	0	0	0	0
Monthly Avg	3	0	3	0	0	0	0	0

October-07 Date	Source Stream Daily Flows		Average Daily Flow FY 07-08		Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	1	1	2	0.01	0	0	0	0
2	1	1	2	0.02	0	0	0	0
3	1	1	1	0.01	0	0	0	0
4	1	1	1	0.01	0	0	0	0
5	1	1	1	0.02	0	0	0	0
6	1	1	1	0.02	0	0	0	0
7	1	1	1	0.01	0	0	0	0
8	1	1	1	0.01	0	0	0	0
9	1	1	1	0.01	0	0	0	0
10	1	1	1	0.01	0	0	0	0
11	1	1	1	0.02	0	0	0	0
12	1	1	1	0.02	0	0	0	0
13	1	1	2	0.02	0	0	0	0
14	1	1	2	0.02	0	0	0	0
15	1	1	1	0.01	0	0	0	0
16	1	1	1	0.01	0	0	0	0
17	1	1	1	0.02	0	0	0	0
18	1	1	1	0.01	0	0	0	0
19	1	1	1	0.01	0	0	0	0
20	1	1	1	0.02	0	0	0	0
21	1	1	1	0.02	0	0	0	0
22	1	1	1	0.02	0	0	0	0
23	1	1	1	0.02	0	0	0	0
24	1	1	1	0.02	0	0	0	0
25	1	1	1	0.01	0	0	0	0
26	1	1	1	0.01	0	0	0	0
27	0	1	1	0.03	0	0	0	0
28	0	1	1	0.02	0	0	0	0
29	0	1	1	0.02	0	0	0	0
30	0	1	1	0.01	0	0	0	0
31	0	1	1	0.02	0	0	0	0
Monthly Avg	1	1	1	0	0	0	0	0

November-07 Date	Source Stream Daily Flows		Average Daily Flow FY 07-08			Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)		
	1	0	1	1	0.01	0	0	0	
2	0	1	1	0.02	0	0	0	0	
3	1	1	1	0.02	0	0	0	0	
4	0	1	1	0.01	0	0	0	0	
5	1	1	1	0.01	0	0	0	0	
6	0	1	1	0.02	0	0	0	0	
7	1	1	1	0.01	0	0	0	0	
8	0	1	1	0.02	0	0	0	0	
9	0	1	1	0.02	0	0	0	0	
10	0	1	1	0.02	0	0	0	0	
11	0	1	1	0.03	0	0	0	0	
12	1	1	1	0.02	0	0	0	0	
13	1	1	1	0.02	0	0	0	0	
14	1	1	1	0.02	0	0	0	0	
15	1	1	1	0.02	0	0	0	0	
16	0	1	1	0.01	0	0	0	0	
17	0	1	1	0.02	0	0	0	0	
18	0	1	1	0.02	0	0	0	0	
19	0	1	1	0.02	0	0	0	0	
20	1	1	1	0.02	0	0	0	0	
21	0	1	1	0.01	0	0	0	0	
22	0	1	1	0.02	0	0	0	0	
23	0	1	1	0.02	0	0	0	0	
24	0	1	1	0.02	0	0	0	0	
25	0	1	1	0.02	0	0	0	0	
26	0	1	1	0.01	0	0	0	0	
27	1	1	1	0.02	0	0	0	0	
28	1	1	1	0.03	0	0	0	0	
29	1	1	1	0.01	0	0	0	0	
30	1	1	1	0.02	0	0	0	0	
Monthly Avg	1	1	1	0	0	0	0	0	

Date	Source Stream Daily Flows		Average Daily Flow FY 07-08				Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)			
	1	1	1	1	0.02	0	0	0	0	
2	1	1	1	0.02	0	0	0	0		
3	1	1	1	0.01	0	0	0	0		
4	1	1	1	0.01	0	0	0	0		
5	1	1	1	0.01	0	0	0	0		
6	1	1	1	0.02	0	0	0	0		
7	1	1	2	0.09	0	0	0	0		
8	1	1	2	0.09	0	0	0	0		
9	1	1	2	0.07	0	0	0	0		
10	1	1	2	0.06	0	0	0	0		
11	1	1	2	0.04	0	0	0	0		
12	1	1	2	0.01	0	0	0	0		
13	1	1	2	0.01	0	0	0	0		
14	1	1	2	0.01	0	0	0	0		
15	1	1	2	0.01	0	0	0	0		
16	1	1	2	0.01	0	0	0	0		
17	1	1	2	0.01	0	0	0	0		
18	2	4	5	0.18	0	0	0	0		
19	1	5	6	0.48	0	0	0	0		
20	1	2	3	0.70	0	0	0	0		
21	1	2	3	0.39	0	0	0	0		
22	1	2	2	0.32	0	0	0	0		
23	1	1	2	0.25	0	0	0	0		
24	1	1	2	0.20	0	0	0	0		
25	1	1	2	0.16	0	0	0	0		
26	1	1	2	0.18	0	0	0	0		
27	1	1	2	0.16	0	0	0	0		
28	1	1	2	0.17	0	0	0	0		
29	1	1	2	0.16	0	0	0	0		
30	1	1	3	0.16	0	0	0	0		
31	1	1	3	0.17	0	0	0	0		
Monthly Avg	1	1	2	0	0	0	0	0		

January-08		Average Daily Flow FY 07-08						
Date	Source Stream Daily Flows			Forebay Avg. Depth (ft)	Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)		Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	1	1	3	0.2	0	0	0	0
2	2	1	3	0.2	0	0	0	0
3	2	1	3	0.4	0	0	0	0
4	160	130	290	2.0	34	238	8	247
5	282	68	350	6.2	50	245	32	277
6	74	21	95	7.1	40	50	31	81
7	58	19	77	8.1	36	36	29	65
8	64	13	77	8.1	50	45	20	65
9	52	10	62	8.2	50	34	19	52
10	33	8	41	8.2	30	30	7	37
11	17	7	24	7.3	20	20	2	22
12	15	6	21	4.7	18	18	0	18
13	15	5	20	3.9	16	16	0	16
14	12	4	16	3.6	14	14	0	14
15	6	4	10	3.3	8	8	0	8
16	6	4	10	2.2	8	8	0	8
17	6	4	10	2.1	8	8	0	8
18	6	4	10	1.9	8	8	0	8
19	6	4	10	2.0	8	8	0	8
20	6	4	10	1.9	8	8	0	8
21	6	4	9	1.8	6	6	0	6
22	7	4	11	1.9	7	7	0	7
23	289	82	371	2.0	50	316	0	316
24	271	87	358	6.5	50	167	137	304
25	944	261	1205	8.1	50	682	342	1024
26	494	117	611	8.0	50	140	440	580
27	2950	538	3488	8.3	50	3000	200	3200
28	1420	379	1799	6.7	50	1300	200	1500
29	566	159	725	7.7	50	304	310	614
30	360	112	472	7.8	50	170	235	405
31	270	86	356	8.2	50	110	194	304
Monthly Avg	271	69	340	5	28	226	71	297

Bubbler non-operational, flow calculated by visual inspection @ weir & based on Matilija Data  
No data point, value averaged from adjacent data points



February-08

Average Daily Flow FY 07-08

Date	Source Stream Daily Flows			Forebay Avg. Depth (ft)	Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)		Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	225	70	295	8.4	42	129	125	254
2	200	60	260	8.3	42	102	120	222
3	211	76	287	8.1	42	116	125	241
4	187	48	235	8.2	42	75	125	200
5	151	43	194	8.0	42	62	92	154
6	136	39	175	7.6	40	60	92	152
7	126	36	162	7.4	38	57	78	135
8	127	33	160	7.3	36	57	68	125
9	124	31	155	7.3	36	52	73	125
10	117	29	146	7.2	36	52	72	124
11	112	27	139	7.2	36	52	67	119
12	108	25	133	7.1	36	52	62	114
13	106	24	130	7.1	35	52	58	110
14	104	23	127	7.1	35	51	57	108
15	93	21	114	7.1	36	45	57	102
16	85	20	105	7.0	36	45	52	97
17	81	20	101	6.8	36	44	47	91
18	77	19	96	6.7	25	43	42	85
19	73	19	92	6.5	35	42	36	78
20	75	19	94	6.6	34	47	32	79
21	76	18	94	6.7	34	47	34	81
22	93	22	115	6.6	34	62	35	97
23	85	20	105	7.1	34	42	51	93
24	268	56	324	6.8	34	57	218	275
25	205	37	242	7.9	33	33	173	206
26	161	29	190	8.4	42	50	112	162
27	141	26	167	8.3	42	50	93	143
28	129	24	153	8.1	42	54	73	127
29	120	22	142	8.0	42	59	62	121
Monthly Avg	131	32	163	7	38	60	84	144

Bubbler non-operational, flow calculated by visual inspection @ weir & based on Matilija Data

March-08

Average Daily Flow FY 07-08

Date	Source Stream Daily Flows		Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)			Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	114	21	135	7.9	40	59	56	115
2	109	20	129	7.8	40	59	52	111
3	102	19	121	7.7	40	58	45	103
4	97	18	115	7.6	40	57	39	96
5	93	17	110	7.6	39	57	35	92
6	87	17	104	7.5	38	56	31	87
7	84	16	100	7.4	37	61	24	85
8	81	15	96	7.3	37	60	21	81
9	78	15	93	7.3	37	60	18	78
10	74	14	88	7.3	36	56	18	74
11	72	14	86	7.3	36	49	21	70
12	70	14	84	7.2	36	48	20	68
13	68	13	81	7.2	36	48	18	66
14	66	13	79	7.2	36	47	17	64
15	66	13	79	7.2	36	48	16	64
16	66	12	78	7.2	36	47	15	62
17	61	12	73	7.1	36	47	12	59
18	60	11	71	7.0	35	46	11	57
19	58	11	69	7.0	35	46	10	56
20	57	11	68	7.0	35	46	9	55
21	54	10	64	6.9	35	46	7	53
22	52	10	62	6.8	35	45	6	51
23	51	10	61	6.8	35	44	5	49
24	50	10	60	6.8	35	43	5	48
25	48	9	57	6.7	35	43	4	47
26	47	9	56	6.6	34	42	4	46
27	47	9	56	6.6	34	42	3	45
28	43	9	52	6.6	34	41	2	43
29	41	9	50	6.5	34	38	2	40
30	41	9	50	6.5	34	38	1	39
31	40	9	49	6.5	33	38	1	39
Monthly Avg	67	13	80	7	36	49	17	66

April-08

Average Daily Flow FY 07-08

Date	Source Stream Daily Flows		Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)			Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	39	2	41	6	33	33	1	34
2	39	2	41	6	32	32	0	32
3	38	2	40	6	32	32	1	33
4	36	2	38	6	32	32	0	32
5	36	2	38	6	31	31	0	31
6	35	2	37	6	30	30	0	30
7	34	2	36	6	30	30	0	30
8	34	2	36	6	28	28	0	28
9	32	2	34	6	27	27	0	27
10	31	2	33	6	25	25	0	25
11	30	2	32	6	24	24	0	24
12	28	2	30	6	23	23	0	23
13	25	2	27	6	22	22	0	22
14	25	2	27	5	22	22	0	22
15	25	2	27	5	21	21	0	21
16	24	2	26	5	21	21	0	21
17	24	2	26	5	21	21	0	21
18	23	2	25	5	21	21	0	21
19	23	2	25	5	21	21	0	21
20	24	2	26	5	21	21	0	21
21	23	2	25	5	21	21	0	21
22	23	2	25	5	21	21	0	21
23	22	2	24	5	21	21	0	21
24	21	2	23	5	20	20	0	20
25	20	2	22	5	17	17	0	17
26	19	2	21	5	15	15	0	15
27	18	2	20	5	15	15	0	15
28	17	2	19	4	14	14	0	14
29	17	2	19	4	14	14	0	14
30	17	2	19	4	14	14	0	14
Monthly Avg	27	2	29	5	23	23	0	23

May-08

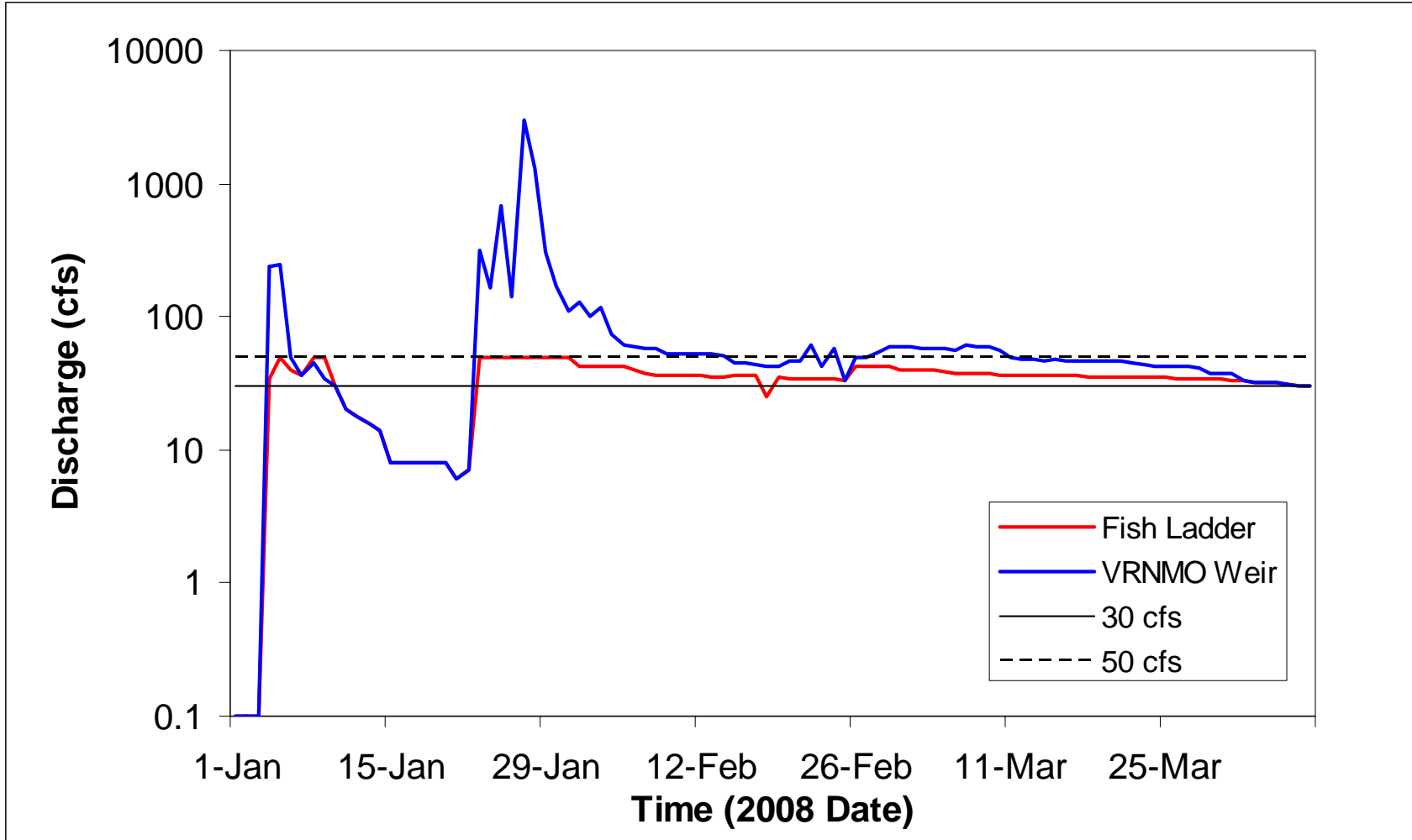
Average Daily Flow FY 07-08

Date	Source Stream Daily Flows			Forebay Avg. Depth (ft)	Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)	Sum of Creek Flows (avg cfs/d)		Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	17	2	19	3.2	14	14	0	14
2	17	2	19	3.3	12	12	0	12
3	16	2	18	3.8	12	12	0	12
4	17	2	19	3.7	13	13	0	13
5	17	2	19	3.5	13	13	0	13
6	18	2	20	3.5	14	14	0	14
7	18	2	20	3.5	14	14	0	14
8	18	2	20	3.5	14	14	0	14
9	17	2	19	3.5	14	14	0	14
10	17	2	19	3.5	13	13	0	13
11	17	2	19	3.6	13	13	0	13
12	17	2	19	3.4	13	13	0	13
13	16	2	18	3.3	12	12	0	12
14	15	2	17	3.2	11	11	0	11
15	14	2	16	3.1	8	8	0	8
16	13	2	15	2.8	5	5	0	5
17	13	2	15	2.7	4	4	0	4
18	12	2	14	2.6	4	4	0	4
19	12	2	14	2.5	4	4	0	4
20	11	2	13	2.4	4	4	0	4
21	12	2	14	2.5	4	4	0	4
22	11	2	13	2.3	4	4	0	4
23	14	2	16	2.7	6	6	0	6
24	15	2	17	3.1	11	11	0	11
25	14	2	16	3.0	10	10	0	10
26	14	2	16	2.9	9	9	0	9
27	14	2	16	2.8	8	8	0	8
28	13	2	15	2.7	7	7	0	7
29	12	2	14	2.6	6	6	0	6
30	12	2	14	2.5	5	5	0	5
31	11	2	13	2.5	4	4	0	4
Monthly Avg	15	2	17	3	9	9	0	9

June-08

Average Daily Flow FY 07-08

Date	Source Stream Daily Flows		Sum of Creek Flows (avg cfs/d)	Forebay Avg. Depth (ft)	Robles Facility Daily Flows			Total Inflow (avg cfs/d)
	Matilija Ck D/S Dam (avg cfs/d)	North Fork Matilija Ck. * (avg cfs/d)			Fishway Ladder (avg cfs/d)	VRNMO Weir (avg cfs/d)	Diversion Canal (avg cfs/d)	
1	11	2	13	2.42	4	4	0	4
2	11	2	13	2.37	4	4	0	4
3	10	2	12	2.32	3	3	0	3
4	11	2	13	2.28	3	3	0	3
5	10	2	12	2.17	3	3	0	3
6	10	2	12	2.01	3	3	0	3
7	10	2	12	2.06	3	3	0	3
8	10	2	12	2.13	3	3	0	3
9	10	2	12	2.09	3	3	0	3
10	10	2	12	2.08	3	3	0	3
11	10	2	12	2.07	3	3	0	3
12	10	2	12	2.09	3	3	0	3
13	10	2	12	2.07	3	3	0	3
14	10	2	12	1.99	3	3	0	3
15	11	2	13	1.92	3	3	0	3
16	11	2	13	2.01	3	3	0	3
17	11	2	13	1.98	3	3	0	3
18	9	2	11	1.90	2	2	0	2
19	7	2	8	1.37	1	1	0	1
20	7	2	8	1.33	1	1	0	1
21	7	2	8	1.31	1	1	0	1
22	7	2	8	1.34	1	1	0	1
23	7	2	8	1.30	1	1	0	1
24	7	2	9	1.22	1	1	0	1
25	7	2	9	1.40	1	1	0	1
26	7	2	9	1.41	1	1	0	1
27	7	2	9	1.39	1	1	0	1
28	7	2	9	1.42	1	1	0	1
29	7	2	9	1.45	1	1	0	1
30	7	2	9	1.36	1	1	0	1
Monthly Avg	9	2	11	2	2	2	0	2



Appendix 14. Graph of discharge below the Robles Facility and through the fish ladder during the period of storm events for 2008.