

2024 Robles Fish Passage Facility Progress Report



Photo of the Lake Casitas Dam spillway, which spilled for the first time since 1998, and graph of historic water storage of Lake Casitas (1959-2024).

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*2024 Robles Fish Passage Facility Progress Report
Casitas Municipal Water District, Oak View, CA.*

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1.0 EXECUTIVE SUMMARY

Casitas Municipal Water District (CMWD) is implementing the Robles Fish Passage Facility Project (Robles Fish Facility) described in the Proposed Action of the Bureau of Reclamation's Biological Assessment (BA); (USBOR 2003). The effects of the Robles Fish Facility were analyzed in the Biological Opinion (BO) prepared by the National Marine Fisheries Service (NMFS 2003a). The 2024 Robles Fish Passage Facility Progress Report is the culmination of monitoring, evaluation, and operational data collected during the reporting period of 01 July 2023 to 30 June 2024.

The Robles Fish Facility monitoring and evaluation studies that were conducted during the 2023-2024 reporting period are included in two main sections of this progress report. The Fisheries Monitoring and Evaluation section includes: upstream fish migration impediment evaluation, sandbar monitoring at the mouth of the Ventura River, fish attraction evaluation, fish passage monitoring, downstream fish passage evaluations, and downstream fish migration through the Robles Reach. The Facility Operation section includes: 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.

Above normal precipitation occurred in the Ventura River Basin during the 2024 fish passage season. Seven BO-defined storm events occurred at the Robles Fish Facility. The sandbar at the mouth of the Ventura River was open and surface flow was maintained for the entire fish migration season. This provided steelhead (*Oncorhynchus mykiss*) the opportunity to immigrate and find suitable spawning habitat in the Ventura River. Eighteen detections of resident *O. mykiss* passing through the Vaki Riverwatcher and the Robles Fish Facility were documented, however the majority were likely multiple detections of fewer fish. Additionally, Lake Casitas spilled for the first time since 1998.

2.0 GENERAL INTRODUCTION

The National Marine Fisheries Service (NMFS) listed the southern California steelhead, *O. mykiss*, as endangered in 1997 (NMFS 1997) under the Endangered Species Act (ESA, 16 U.S.C. § 1531 et seq.) of 1973, as amended. Steelhead were organized into stocks (i.e., groups) of evolutionary significant units (ESU) that were considered to be substantially reproductively isolated from other steelhead stocks and were an important part of the evolutionary legacy of the species. The southern California steelhead ESU included, at that 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 during 2002 (NMFS 2003b). In a later delineating approach, NMFS categorized the anadromous life history form of *O. mykiss* as a distinct population segment (DPS) as described 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” as originally listed. 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. Resident and anadromous *O. mykiss*, where the two forms co-occur and are not reproductively isolated, are still part of the ESU; however, anadromous *O. mykiss* (i.e., steelhead) are now part of a smaller subset identified as the southern California steelhead DPS. Anadromous *O. mykiss* in the southern California DPS exhibit a winter-run life-history pattern during their spawning migrations; see life history discussion below.

Rainbow trout (*O. mykiss*) 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 “steelhead trout” and the resident form are “rainbow trout”. Throughout the range of coastal rainbow trout, the anadromous life history form is widespread (Behnke 1992). There are two general life-history patterns exhibited by adult anadromous steelhead based on when they return from the ocean to spawn in freshwater. The life-history patterns are grouped by either summer or winter spawning runs. There are many exceptions to these patterns, but this general characterization has been used to group steelhead runs by the season in which peak spawning immigration occurs from the ocean (Busby et al. 1996). Summer-run steelhead are generally found in river systems that drain from farther inland, such as the Columbia River basin. Winter-run steelhead are typically found in the coastal systems where river systems are smaller. The winter-run pattern is the more common within the natural range of the species (Busby et al. 1996).

Monitoring and Research of the Robles Diversion and Fish Passage Facility

As stated in the BO (NMFS 2003a), the “Modifications to the Robles Diversion Facility and associated operation criteria have been targeted at improving fish passage conditions within the Robles Reach of the Ventura River while maintaining suitable conditions through the Fish Passage Facility.” The monitoring and evaluation studies and activities related to the modification 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.

5-year Reevaluation of Initial Evaluation and Monitoring Activities

As described in the BO, a 5-year reevaluation of the initial fish flow operations would be conducted to determine if monitoring and evaluations have been completed (NMFS 2003a). The initiation of the 5-year period began in 2006, which was the first year the Robles Fish Facility was fully operational. An annual and ongoing reevaluation began after the 2010 fish passage season. Through the Cooperative Decision Making Process, the Robles Biological Committee will review annually each of the specific evaluations and determine if the original objectives have been addressed and could be discontinued or if additional study would be needed. Due to the highly variable streamflow conditions and low numbers of adult and juvenile steelhead, all objectives of the monitoring and evaluation program have not yet been accomplished. Progress of the evaluations have been slowed by the historic 5-year exceptional drought that affected much of California, and in particular, the southern coast of California that includes the Ventura River Basin. After the 2017 season, the drought in the Ventura River basin had diminished to a moderate level, which continued through 2018 and into 2019. At the start of the 2021 fish passage season, severe drought returned to the basin and increased to an exceptional level by the end of the season. Similarly, at the start of the 2022 fish passage season, drought was considered moderate and finished the season at an extreme level (US Drought Monitor; <https://droughtmonitor.unl.edu>).

Each aspect of the monitoring and evaluation program is assessed annually to determine if sufficient information has been collected to accomplish each objective (CMWD 2005-2023). While significant progress has been made to date, it is recommended that several aspects of the monitoring and evaluation for the Robles Fish Facility be continued during 2025. Sufficient data have been collected for the upstream fish migration impediment evaluation to begin data analysis; the final results from that dataset will be used to make recommendations for long-term fish flow operations.

3.0 UPSTREAM FISH MIGRATION IMPEDIMENT EVALUATION

Introduction

The ability of adult steelhead to swim upstream can be impeded during migration at times of low-river flow (NMFS 2003a). Evaluations at shallow water habitat units (i.e., critical riffles) have commonly been conducted to determine if passage impediments exist for adult and juvenile steelhead in California rivers (Dettman and Kelley 1986; Bratovich and Kelley 1988; Hagar 1996). The Robles Reach, which extends downstream from the Robles Fish Facility approximately 6.5 km (NMFS 2003a) to just upstream of the Santa Ana Boulevard bridge (Appendix 1), is a wide alluvial section of the Ventura River that is composed of active wash deposits of unconsolidated silt, sand, gravel, and boulders (Tan and Jones 2006). Because of this channel morphology and geology, alluvial channels like the Robles Reach have high infiltration rates and cause surface flow to rapidly recede and cease relatively quickly after rain events (Cooke et al. 1992).

An initial assessment of Ventura River potential passage impediments in relation to river discharge was completed by ENTRIX (1999). The physical characteristics of seven potential impediments were evaluated using the Thompson (1972) passage criteria. The Thompson (1972) passage criteria for adult steelhead at critical riffles is a water depth of 0.6 ft for 25% of the total transect width and a continuous portion equal to 10% of the total transect width. ENTRIX (1999) also evaluated the potential impediments using criteria of 0.5 ft and 0.6 ft depth for 25% of the total width and a total width of 8 ft for both depths. The resulting discharge required to meet critical criteria was estimated to be between 40 and 65 cfs. There have been several modifications to the Thompson passage criteria by other researchers; Dettman and Kelly (1986) on the Carmel River used a depth of 0.6 ft over a 5 ft continuous section, a criteria of 0.6 ft depth over an 8-ft section was used on the Santa Ynez River (SYRTAC 2000), and Harrison et al. (2006) used a criteria of 0.6 ft depth over a 10-ft section on the Santa Clara River. Thompson's (1972) depth criterion of 0.6 ft was not based on actual migration observations and

never validated as a minimum condition for passage. Adult salmonids have been observed passing through riffles shallower than the 0.6 ft criterion (Mosley 1982).

The objective of the impediment evaluation is to assess factors that may impede steelhead migrating upstream to the Robles Fish Facility (NMFS 2003a). Because low-river flows have the potential to impede upstream fish migration in the Robles Reach, characterizing the effect of flows on critical riffles in this reach will be the primary focus of the impediment evaluations (NMFS 2003a).

Methods

Selected channel features that may pose an impediment to upstream passage were surveyed multiple times during the fish migration season (January through June) to measure water depth, velocity, and channel width along a transect at each site. The selected sites were planned to be surveyed over a range of discharges from approximately 30-171 cfs (with the upper limit dependent on the ability to safely conduct the surveys), which was correlated with discharge at the Robles Fish Facility. The number of repeated surveys conducted annually has depended on the number and duration of significant rain events, rate of hydrograph recession, previous surveys, and time constraints due to other aspects of the monitoring and evaluation program. The impediment surveys have been conducted since 2010 because of the natural variation of the Ventura River. The currently selected impediment sites (Appendix 2) were resurveyed multiple times to develop a statistically robust data set, given the natural variability of discharge, to rigorously evaluate fish passage in relation to Robles Fish Facility discharge.

Site Selection Process

During the initial phase, the Ventura River was surveyed from the mouth to the Robles Fish Facility (23 km) using standard stream survey techniques and was completed in 2008 (CMWD 2008). This provided physical measurements of all habitat units for the

selection process. The survey methodology 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).

Over the course of three meetings and one conference call between 24 January and 18 June of 2009, the Biological Committee (BC) for the Robles Fish Passage Facility completed an impediment site selection process that culminated in the original selection of eight sites that would be monitored for the impediment evaluation. The BC reviewed physical parameters of the 379 habitat units surveyed and general river characteristics that included: unit type, length, width, water depth, slope, longitudinal location (river km), step height on step units, discharge at Foster Park and the Robles Fish Facility at the time of the surveys, and a river profile for the 23 km of the Ventura River below the Robles Fish Facility. Upon completion of an initial assessment of the data, a list of potential sites was developed that the BC visited in the field on 27 May 2009 to determine if monitoring was warranted. This field and data assessment included regular BC members (at the time of the assessment) Mike Kinsey (BOR), Stan Glowacki (NMFS), Mary Larson (CDFW), and Scott Lewis (CMWD). Mike Gibson (CMWD), hydrologists Bob Hughes (CDFW), and David Crowder (NMFS) also participated in this assessment and selection process.

A flow event that peaked on 20 March 2011 at approximately 20,000 cfs at the USGS Foster Park gage station, a recurrence interval of about 6 years, significantly altered some impediment sites that required modifications to the monitoring. See CMWD (2011) for a detailed description of the high flow caused site alterations. A Biological Committee (BC) field assessment was made on 11 January 2012 to review alterations that occurred and select replacement sites for ones that no longer appeared to be impediments. Regular BC members (at the time of the assessment) Ned Gruenhagen (BOR), Rick Bush (NMFS), Mary Larson (CDFW), and Scott Lewis (CMWD) participated in this review and site-selection process; Mike Gibson (CMWD) and hydrologist Bob Hughes (CDFW) were also involved in this assessment and selection process. Based on this field review, Site 2 was no longer considered a potential impediment due to

channel alteration. Site 10 was identified as a replacement site during the January 2012 field trip. Site 8, which was initially selected during dry conditions, was not considered as restrictive as other potential sites after evaluating data collected during 2010 and 2011. Consequently, Site 8 was replaced with Site 9 during the January 2012 field trip. The complete list of current impediment sites that the BC visited and determined to be satisfactory for monitoring during the 2012 season can be found in Appendix 3. However, when new site selections were made (i.e., 11 January 2012), insufficient flows were available to make final site selections or transect placements. Until March of 2014, the lack of precipitation and subsequent insufficient surface flow did not allow for confirmation of these new sites as potential passage impediments. This confirmation was completed after a March 2014 storm provided the first notable surface flows in 3 years and allowed available members of the BC to visit sites 9 and 10 on 03 March 2014. The confirmation was conducted by Scott Lewis (CMWD), Dana McCanne (CDFW), and Mike Gibson (CMWD).

ENTRIX Study Site Assessments

An effort was made to locate and determine the general status of the ENTRIX (1999) study sites during 2009. Because there were numerous bed-mobilizing runoff events after the study was completed, the status of all study sites was unknown. Based on the site descriptions in the ENTRIX (1999) study report, field surveys were conducted to locate and describe the existing channel conditions at the original site locations. Of the 7 sites originally identified by ENTRIX (1999), only 4 sites were located with some degree of confidence. Of those 4 sites, all were no longer in the primary low-flow channel. Descriptions of the ENTRIX sites are provided in a previous report (CMWD 2011).

Results

During the reporting period, 7 BO-defined storm events occurred (see flow assessment worksheets on pages 89-95). The largest storm event of the season, peaked at 9,650

cfs (Foster Park USGS gage station 11118500) on 4 February 2024, and further altered the Ventura River channel, which was previously modified during 2023. All remaining impediment study sites as of 2023 (Appendix 2) were assessed after the 2023 peak flows and determined to have changed significantly enough that additional sampling would not be comparable. Therefore, no directly comparable water depth transects were conducted during the 2024 fish passage season. However, attempts to reestablish new transect sites in 2024 were made, but no more than 1-2 samples were collected from any site before a subsequent storm peak significantly altered the sites.

Discussion

Data sampled from the population of sites identified as “critical riffles” will be pooled for evaluation to inform recommendations on flows to facilitate fish passage. This includes data collected over 6 seasons and a range of discharges. All impediment sites will be pooled by site and across all years for this initial analysis step. Pooling the data broadly will characterize the full range of data collected at the different impediment sites across a range of hydrologic conditions. All previous impediments will be included for this initial analysis. Additional analyses will be performed on data from specific sites to gain understanding of the relationship of flow to discharge at individual sampling sites.

Exploratory data analyses are needed to determine the most appropriate and informative methods for analyzing the data, including data pooling, any needed data transformations, other model explorations, outlier determinations, and final model ranking and selection. This process will proceed on a parallel track within the BC, culminating in flow recommendations to the Management Committee based on the BC’s evaluation.

3.1 Sandbar Monitoring

Introduction

The Ventura River, like many other California rivers, frequently develops a seasonal sandbar at the mouth during the late spring or summer that is breached by higher river flows in the late fall or winter. If a sandbar develops, which occurs more often during dry years, the resulting lagoon can provide important rearing habitat for steelhead juveniles because abundant food resources are available. Additionally, this can facilitate the physiological and behavioral changes associated with smoltification (Cannata 1998) and enhance marine survival (Bond et al. 2008).

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). As stipulated in the BO, the fish passage augmentation season extends from 01 January through 30 June of each year and commences after the sandbar has been breached at least once during the current year's fish flow operations season. During the fish passage augmentation season, several Robles Fish Facility operation criteria must also be implemented (see NMFS 2003a for a complete list of operational criteria).

Methods

During each sandbar inspection, observations and recordings were made that included: date, time, status of the sandbar, general location of the mouth, tidal stage, water temperature, and discharge at the Robles Fish Facility and the USGS Foster Park gage station. The sandbar was open on 01 January 2024 and its status was monitored once every two weeks through June 2024. Outside of the fish passage augmentation season the sandbar was monitored at least monthly.

Results

During the reporting period, the mouth of the Ventura River was inspected 22 times to determine if the sandbar was open or closed. There were 12 observations made during the fish passage augmentation season (January through June 2024) and 10 observations made outside of the season. The sandbar was open from 01 January 2024 through 30 June 2024 for volitional fish passage (Appendix 4) and remained open into the summer. On days the sandbar was inspected during the reporting period, the mean daily discharge at the USGS Foster Park gage station and the Robles Fish Facility ranged from approximately 15 to 209 cfs and 8 to 199 cfs, respectively. The sandbar was open on the west bank of the estuary for the entire reporting period. For three observations the sandbar was also open on the east bank. Two of these observations, October and December 2023, occurred during high tides when the sandbar was overtopped on the east bank. The third observation occurred on 9 February 2024, which was 5 days after the largest storm event of the season, when surface flow was observed overtopping the sandbar on the east bank and most of the water was exiting along the west bank. However, none of these overtoppings were sufficient to erode the sandbar on the east bank and only provided short-term connections to the ocean.

Discussion

The Ventura River mouth sandbar tends to remain open for volitional fish passage during average to above-average precipitation years and closes only during years with few significant rain events. During years with this common precipitation pattern, the sandbar remains open during the BO-defined fish passage season from January through June (Appendix 5). This pattern commonly includes a period during the summer and fall when the sandbar is closed. A single low precipitation year can produce longer periods of closure (e.g., 2007, 2012, 2016, and 2018). During consecutive dry years, the sandbar will persist into the fish passage season, opening only for short periods after rain events (e.g., 2013-2015). The tendency of the sandbar

to remain open during the fish passage season, in all but very dry years, is likely due to several factors. Although the middle reach of the Ventura River goes dry every year, subsurface water continues to flow during most years and eventually begins to resurface upstream of the confluence with San Antonio Creek. This water resurfacing continues to increase to an area just downstream of the San Antonio Creek confluence. Additionally, tributary flow from San Antonio Creek contributes to the Ventura River via a surface or subsurface connection throughout the year. Finally, treated effluent water from the Ojai Valley Sanitary District at 7.5 river-kilometers (rkm) increases the discharge by about 3 cfs. Continued lower evapotranspiration rates caused by the Thomas Fire effects, and above-average rainfall in 2019 and 2023, have together likely contributed to longer periods of surface/subsurface flow and the open sandbar. These hydrologic and geomorphic features have produced longer surface water in the lower Ventura River and prevent the sandbar from fully forming. The sandbar has remained open during most fish passage seasons, which has been approximately 80% of the time since 2006.

The open or closed status of the sandbar indicates general river passage conditions and potential estuary entry and exit conditions for adult steelhead and juvenile *O. mykiss*, respectively. Accessibility to the Ventura River or ocean exists during most passage seasons when adult steelhead are typically immigrating and smolts are emigrating. However, lagoon conditions optimal for smaller juvenile rearing and growth (i.e., when the sandbar closes and enables the estuary to form a deeper freshwater lagoon; Bond et al. 2008) appear limited during most years of the study period beginning in 2006.

4.0 EVALUATE FISH MOVEMENT THROUGH THE PASSAGE FACILITY

4.1 *Water Velocity and Depth Validation Evaluation*

Robles Fish Facility performance testing or evaluations were conducted during the 2024 fish passage season. However, substantial sedimentation and malfunctioning flow

meters at the Facility prevented the higher priority performance testing from being completed (Table 1). Sedimentation prevented operation of the high flow exit gate and guidance device, and therefore performance testing. Testing equipment and methods were prototyped for the guidance device, therefore after sediment is removed and flows meet study plan conditions, final evaluations can be conducted.

The auxiliary water system was operated at 100% open during this season; however, the maximum discharge observed on the upstream meter was approximately 77 cfs. Only the upstream auxiliary meter was functioning at the start of the season and the lower (downstream) flow meter could not be used to validate the new (upstream) flow meter. The downstream meter could not be accessed for repairs since it was submerged and inside of the auxiliary water pipe (~ 30 ft). The measurement weir gage was used to validate auxiliary flow meter readings during non-spill conditions by subtracting the fishway flow from weir flow. The weir gage was about 20 to 25 cfs higher than the upstream auxiliary meter during these periods. The variance between the two readings was likely attributed to an undetermined issue with the upstream auxiliary meter. Assuming the weir gage was accurate, which appeared to function acceptably during this period, the auxiliary maximum discharge was actually about 95-100 cfs at the typical screenbay operating elevation of about 8 ft. This discharge was lower than expected and similar to observations during 2023. However, as noted in previous progress reports and BO meetings, the extensive sedimentation in the entrance pool has raised the water elevation several feet (~ 3 ft), which in turn decreased the total head differential through the auxiliary water system. Theoretical discharge calculations made using data collected in 2024 suggest that the auxiliary water system can achieve the desired maximum discharge, however operating elevations throughout the facility and into the entrance pool will need further evaluations to verify this. To fully test the capacity of the auxiliary water system, the flow meters will need to be repaired and sediment removed from the entrance pool to original design grade.

Fish ladder vertical slot velocity measurements were replicated during 2024 to validate previous measurements, and also collect velocities at greater resolution than 1-ft increments. The Robles sediment bypass alternatives evaluation, related to the Matilija Dam removal project, necessitated this greater resolution and validation of general flow patterns. The clips below show velocities profiles at all 15 vertical slots of the ladder at 50 cfs, and a photo sequence of a dye release to validate general flow patterns of a ladder cell. All velocity measurements were within the design criteria as specified in the study plan (Rodgers 2006). A full report of the Water Velocity and Depth Validation Evaluation will be completed once data collection has been completed for all tasks the BC determines necessary.

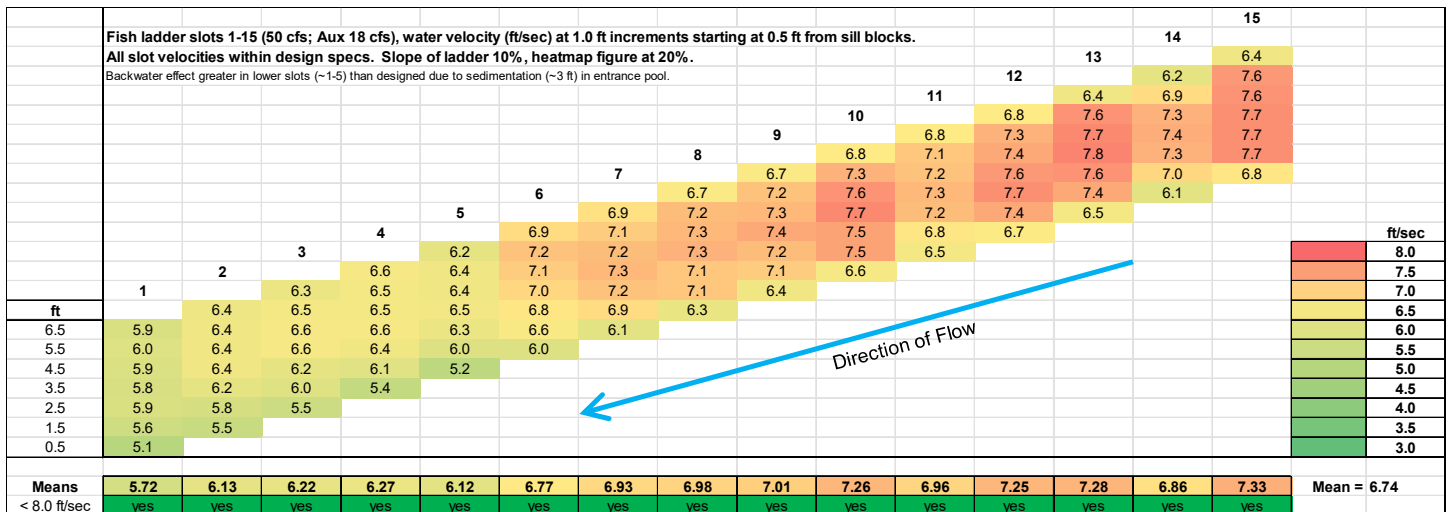


Table 1. Performance testing completion status and remaining priorities.

Component	Completed/ Year	Flow Required	Required Flow duration	Anticipated completion	Comments	Completed By	Priority- Flows 30-50 cfs	Priority Flows 700 cfs +
Screens	Yes/2011	671 cfs in channel				Consultant		
Diversion Flume	Yes/2006							
Fishway Vertical Slots	Yes/2018	25-35 cfs in Fishway (34 cfs)	24 hours			Casitas		
	Yes/2020	50 cfs in fishway (50 cfs)	24 hours			Casitas		
	No	50 cfs in fishway + 121 cfs in Auxiliary Pipe	24 hours	After 121 cfs is achieved through the Auxiliary Pipe	River must flow at 2000 cfs for 24 hours to accomplish this task	Casitas		7
Fishway Entrance Gates	Yes/2018	25-35 cfs in Fishway (#5 @ 34 cfs)	24 hours			Casitas		
	Yes/2018	50 cfs in fishway (#5 @ 44 and 50 cfs, #4 @ 50 cfs)	24 hours			Casitas		
	No	50 cfs in fishway + 121 cfs in Auxiliary Pipe (#5 @ 72 cfs, #4 @ 72 cfs, 2019)	24 hours	After 121 cfs is achieved through the Auxiliary Pipe	River must flow at 2000 cfs for 24 hours to accomplish this task	Casitas		3
Auxiliary Water	No	121 CFS in Aux Pipe	24 hours	After 121 cfs is achieved through the Auxiliary Pipe	River must flow at 2000 cfs for 24 hours to accomplish this task	Casitas		4
Entrance Pool	No	400-600 cfs in spillway (400 cfs spill and 50 cfs ladder method testing, 2019)	8 hours	After 121 cfs is achieved through the Auxiliary Pipe		Casitas		1
	No	1200-1500 cfs in spillway	8 hours	After 121 cfs is achieved through the Auxiliary Pipe		Casitas		2
	No	2500-3500 cfs in spillway	8 hours	After 121 cfs is achieved through the Auxiliary Pipe		Casitas		6
Interim Rock Weirs	Yes/2017	20 cfs	4 hours			Casitas		
	Yes/2017	30-40 cfs	4 hours			Casitas		
	Yes/2017	50 cfs	4 hours			Casitas		
Fish Guidance System	No	671 cfs in channel	4 hours			Casitas		8
Forebay	No	1000-2000 cfs	4 hours			Casitas		5
High Flow Fish Exit	Yes/2006	150-200 cfs in channel	4 hours		HF has a continuous read flow meter	Casitas		
	No	600-700 cfs in channel	4 hours			Casitas		9
Low Flow Fish Exit	Yes/2018	20-40 cfs (26 cfs)	2 hours			Casitas		

4.2 Fish Attraction Evaluation

Introduction

River discharge is one of several key environmental factors initiating and facilitating migration of adult and juvenile steelhead, and other salmonids, in natural fluvial environments (Shapovalov and Taft 1954; Banks 1969; Spina et al. 2005). As adults

and juveniles approach fish passage facilities, suitable discharge and water velocities are needed to ensure successful passage (Clay 1995; Beeman and Maule 2001).

The entrance of the fish ladder for the Robles Fish Passage Facility is located approximately 20 m downstream of the spillway gates and is where fish migrating upstream enter and downstream migrating fish exit the facility (i.e., two-way passage facility). The downstream end of the ladder is adjacent to a large pool (entrance pool). The fish ladder entrance was designed for a maximum discharge (i.e., total attraction flow) of 171 cfs (50 cfs through the entire ladder and an additional 121 cfs supplemented at the lower end of the ladder). The reach downstream of the fish ladder entrance is comprised of habitats that steelhead may use during migrations. The distance downstream from the entrance pool to the lowermost rock weir is approximately 200 m. This reach includes all four existing rock weirs and the facility's discharge measurement weir, which also functions as a low-flow road crossing. The habitat types in this reach include the four pools created by the rock weirs, a glide created by the discharge measurement weir, a short riffle, and the entrance pool.

The objective of the fish attraction evaluation is to determine if adult or juvenile steelhead are holding immediately downstream of the Robles Fish Facility during the fish passage augmentation season (NMFS 2003a).

Methods

Three separate methods that covered a range of spatial and temporal scales were employed to determine the presence of *O. mykiss* for the Fish Attraction Evaluation. The methods used included: 1) Weekly bank/snorkel surveys during the fish passage season, 2) post-storm bank/snorkel surveys in the entrance pool during the BO-defined ramp-down period, and 3) post-storm underwater video monitoring at the fish ladder entrance during the ramp-down period.

1) Weekly bank/snorkel fish attraction surveys, a methodology used since 2007, were conducted during the fish passage season from January through June of 2024. The study reach included 200 m downstream and 140 upstream of the fish ladder. The particular survey methodology used (i.e., bank or snorkel) was determined based on water visibility, river discharge, expected steelhead life history stage present at the time of the survey, and safety of surveyors. A combination of bank and snorkel surveys were conducted during the 6-month period. Bank surveys were conducted by one or two surveyors in an upstream direction. The surveyors wore polarized sunglasses to reduce water-surface reflection. Snorkel surveys were conducted by one or two surveyors in an upstream direction. When present, fish species are identified and enumerated to the greatest extent possible permitted by the ambient river conditions and fish densities at the time of each survey. If *O. mykiss* were present, lengths of each fish was estimated to the nearest cm if only a few individuals (generally < 10) were present. In order to collect additional information that may help determine *O. mykiss* upstream and downstream movements through the Robles Fish Facility, an upstream study reach was added in 2009. The upstream study reach included observations in the screenbay of the facility and the area immediately upstream of the low-flow fish exit in the forebay. The total distance of this upstream reach was approximately 140 m.

2) Post-storm bank/snorkel surveys were conducted in the entrance pool during the ramp-down period for all BO-defined storms. This consisted of daily surveys during the 10- or 12-day augmentation period after a storm event. Beginning the day after a BO-defined peak event, a Secchi depth was measured in the entrance pool to determine when surveys could begin. Bank surveys were conducted when visibility was poor and snorkel surveys were conducted after visibility increased (> 1.0 m Secchi), assuming this would allow *O. mykiss* to be observed.

3) The post-storm underwater video monitoring was conducted after a BO-defined storm and during the ramp-down period. After the storm event occurred, video cameras were installed at the entrance of the fish ladder. The video cameras were mounted on a bracket adjacent to the fish ladder entrance and lowered into place to provide

monitoring following the storm event. The cameras recorded the entire 10- or 12-day ramp-down period to a digital video recorder (DVR) and reviewed at a later date.

Results

1) A total of 26 surveys (21 bank and 5 snorkel) were completed during the weekly surveys and no *O. mykiss* were observed (Appendix 6). During the 6-month period, a total of 8,840 m was surveyed by either bank or snorkel methods. Water temperatures during the study period ranged from 9.5 °C to 18 °C and turbidity ranged from 1 to 170 NTUs when the surveys were conducted. The mean daily discharge at the Robles Fish Facility ranged from 23 to 209 cfs at the time of the surveys.

2) There were 7 BO-defined storm events that occurred during 2024. A total of 52 post-storm fish attraction surveys were completed and no *O. mykiss* were observed (Appendix 7). Water temperatures during the study period ranged from 8 °C to 18 °C and turbidity ranged from 4 to 3,093 NTUs when the surveys were conducted. The discharge at the Robles Fish Facility ranged from 37 to 4,452 cfs at the time of the surveys.

3) Post-storm underwater video monitoring was conducted during the 7 BO-defined storm events. A total of 39 days of recordings were made. No *O. mykiss* were observed on the video. Because no adult steelhead were detected in the Riverwatcher, the video was subsampled and reviewed between the hours 0600-1000 h and 1500-1900 h each day and 5 min of every 15-min period. Sedimentation in the entrance pool from 2023 prevented the video system from reaching the bottom of the sampling area and the guide strut used to lower and raise the system was also damaged. Additionally, technical issues with the DVR occurred and video from February monitoring was unable to be reviewed (16 of 39 days). Furthermore, several of the underwater cameras sustained water damage during the season and were replaced. Repairs will need to be made prior to the 2025 fish passage season to restore the full operation capabilities.

4.3 Downstream Fish Passage Evaluation

Introduction

Salmonid fish passage evaluations have been conducted throughout the western United States for many years (Odeh 2000). Methods used to determine if a facility is operating as designed and not causing harm to the intended fish species vary. Early work typically entailed trapping and tagging fish before entering a facility and recapturing them after exiting. Trapping and visual inspections for injuries, PIT tagging, radio telemetry, and acoustical telemetry have been conducted extensively as well.

There are two objectives for the downstream fish passage evaluation. The first is to determine if downstream migrants are successfully passing through the Robles Fish Facility. The second objective is to capture and examine steelhead smolts and kelts to determine if injuries are occurring as they pass downstream through the Robles Fish Passage Facility (NMFS 2003a).

Methods

For a full description of evaluation methods, see section 5.0.

Results

No evaluations for the Downstream Passage Evaluation were conducted during 2024. The downstream trap (used for monitoring and evaluation activities) was not operated during 2024 for a variety of reasons. 1) The 2024 water year was above average and produced many peak runoff events and a high base flow, which only allowed for short operational windows. 2) A large amount of sediment was deposited in the Robles forebay and required frequent sluicing of sediment to maintain facility and fish ladder operations. 3) Lake Casitas reached spill conditions, which required all Robles inflows to be released downstream into the Ventura River, and these flows were determined to

create conditions unsafe for trapping. 4) Continued uncertainty due to the recent listing of steelhead through the California Endangered Species Act (CESA) and the requirement for an Incidental Take Permit providing coverage to Casitas for take of steelhead. 5) Given the slow *O. mykiss* population recovery in the Ventura River basin, and the aforementioned limitations, the effort to collect minimal *O. mykiss* data by operation of a trap was not deemed reasonable. Consequently, no steelhead were captured, and no take occurred from trapping. Coverage through CESA permitting, or other regulatory assurance, will be needed before trapping can resume.

5.0 DOWNSTREAM FISH MIGRATION THROUGH THE ROBLES REACH

Introduction

When the number of fish physically handled for a study is of concern, such as with an endangered species, radio telemetry can be a useful method over others like extensive trapping (Hockersmith et al. 2000). Telemetry information of emigrating steelhead smolts in the Ventura River could provide estimates of survival, travel time and rates through select reaches, migration relative to river discharge, habitat use, and passage success through critical riffles. By tracking tagged fish until the transmitter batteries are fully discharged, it is anticipated that downstream emigration can be monitored to the Ventura River estuary/lagoon, which could contribute to an understanding of estuary rearing, if any, and final emigration to the ocean.

The purpose of the downstream migration evaluation is to determine how successful smolts are at migrating through the Robles Reach (NMFS 2003a). Because of the limited number of steelhead smolts likely passing downstream through the facility, a NMFS approved pilot study using radio telemetry was used for evaluations.

Methods

A weir trap was to be placed and operated approximately 40 m downstream of the Robles Fish Facility. The weir trap consists of a live-box (120 cm for all three dimensions) with an internal fyke. The trap was to be situated in the center of the river channel and thalweg. The live-box internal frame is constructed of PVC pipe and covered with plastic fencing with 1.9-cm diagonal openings. A plastic fence (3-cm openings) supported by T-bar fence posts was to be extended upstream on both sides of the live-box at 30° angles into the river channel. A 1-m gap on the right bank was designed so any adult steelhead could bypass the trap location and move upstream. Because the vast majority of downstream steelhead migrants were expected to be captured from mid-March through mid-June (Shapovalov and Taft 1954; Dettman and Kelley 1986), the trap was intended to be operated from mid-March through June 2023 or until water temperatures exceeded a daily mean of 22 °C, which could negatively impact captured fish (SYRTAC 2000), or the surface water connection was lost in the mainstem of the Ventura River. For a full description of evaluation methods, see the 2023 CMWD monitoring and evaluation study plan (Lewis and Gibson 2023).

Results

As noted previously, the trap was not installed and operated during 2024 and therefore no *O. mykiss* were captured during 2024.

6.0 LONG-TERM MONITORING COMPONENTS

6.1 *Monitoring Robles Facility Operations*

6.1.1 *Facility Status*

The 2023-2024 water year was an above average rainfall year as measured in Matilija Canyon. The 53.95 inches of rain measured at the Matilija Canyon Ventura County station (through 22 May 2024) was 190% of the mean annual rainfall. Seven BO-defined storm events occurred during 2024 and surface flow over the measurement weir was present for the entire fish passage season. Surface flow will likely be present for the remainder of the 2024 calendar year. Lake Casitas reached spill conditions in mid-April 2024 and diversions were initially curtailed, then eventually stopped by late-April 2024. By mid-May 2024, diversion resumed, for several weeks, to maintain a full storage capacity.

Previous annual reports identified several projects, repairs, or significant maintenance to be completed or reported on as to their current status. The principal projects were:

- Install/repared SonTek IQ pipe flow meter in the auxiliary water supply pipe.
The flow meter had numerous communication issues during 2019 that needed to be resolved before the 2020 season; however, water levels did not recede sufficiently to access the supply pipe for repairs until fall 2021. An inspection revealed calcification buildup on the transducers, which were cleaned. The meter was cleaned again in fall 2022. A redundant SonTek meter was temporarily installed and operational at the upstream end of the Auxiliary pipe in fall 2022, but full installation could not be completed before inflows increased at the facility (i.e., parts and time limitations). Both meters had communication issues during 2023. Prior to the start 2024 season, the upstream meter was cleaned and operational. However, the downstream meter was inaccessible because water levels did not recede sufficiently to access the supply pipe for

repairs. During the 2024 season the upstream meter experienced intermittent communication issues.

- Maintenance and repair of auxiliary water supply system.

During the summer of 2022, when the Facility was dry, calcification was removed from the auxiliary diffuser grating by pressure washing and sediment was removed from fish ladder entrance box. During the summer and fall of 2023, this area could not be accessed for cleaning due to continued wet conditions.

- Maintenance of screenbay, fish screens, and fishway.

Dry conditions starting in the summer of 2022 allowed for maintenance items in the screenbay area to be completed. The downstream side of the fish screens (i.e., behind the screens) and fish guidance device were pressure washed to remove calcification. Sediment in the screenbay was removed by hand once conditions were dry. All 15 vertical slot sills were cleaned, scraped/chiseled free of calcification, and lubed to ensure proper operation during periods of low flow. During the summer and fall of 2023, these areas could not be accessed for cleaning due to continued wet conditions.

- Level and flow sensors repair, replacement, and modifications. Level sensors at the fish ladder entrance were programed to read water levels in the entrance pool. Previously this item was not successfully completed due to presumed sensor and SCADA limitations. However, CMWD contracted with a SCADA technician during late 2019 and early 2020 who was able to use the existing level sensors to record this data. Additionally, the technician provided numerous updated monitoring and control modifications to the Robles SCADA system. These included: ability to monitor the entrance pool elevation directly, auxiliary and fishway gate position displayed on SCADA PC screen, and backup fishway flow calculation from elevation. Additionally, many of the primary monitoring and controls can now be tracked or adjusted from the CMWD office without being on-site and provide for more refined operations. It is assumed the original sensors

are reaching their working life limit and will be replaced with radar sensors as the budget allows. Through June of 2022, three of the original seven ultrasonic water level sensors have been replaced with radar sensors. Additionally, a new SonTek flow meter was installed in the fishway during 2020. The new fishway meter had communication issues during 2024, which will need to be resolved before the start of the 2025 fish passage season. During fall 2022, two new radar level sensors were installed downstream of the fish screen baffles (i.e., behind the baffles) on both sides (i.e., east and west) to monitor water levels and will be used to determine effectiveness of prototypes and general diversion efficiency. Radar level sensors are more accurate, dependable, and less affected by temperature variations.

- New diffuser perforated panels for the fish screens and auxiliary water supply. During the 9 BO-defined storms in 2019 and three during 2020, the new diffuser perforated panels did not become obstructed with debris as they previously had. It appears at this time that the new diffuser panels have corrected the issue of debris obstruction and causing reduced flows. Observations will continue to be made to evaluate the effectiveness of the panels. The diffusers were opportunistically cleaned while the facility was shut down for sediment removal in 2019 and only low levels of debris were present. However, during the 2023 storms, the diffuser perforated panels behind the fish screens became obstructed with debris and required cleaning twice. Additionally, this was repeated during the 2024 season and required cleaning once. It is unknown why the panels became plugged the last two years and not the previous few years since the modifications were made, but likely it can be attributed to the increase sediment and debris loads from the prolonged diversions of 2023 and 2024. They will continue to be monitored during future storms to further understand this baffle debris loading issue.
- Prototype evaluation of screen cleaning modifications. Two vertical fish screens were replaced with horizontal screens during 2020 (one on each side of the V-

screen). This, along with several other modifications, were intended to be installed for evaluation. A screen back-wash system was not installed because of the expected chance for significant rain during 2020 and the cost of the system. Double brush arm screen cleaners were installed on the west-side of the V-screen during late 2020 and early 2021. After installation of all brush arms, a significant amount of time was needed to adjust and evaluate all components of the brush cleaning system. This included adjusting individual strips of bristles to the screen face, counterweight amounts, cable guides, cable tension, and cable sheaves. Most of these evaluations were facilitated by the use of a cable tension dynamometer that measured and recorded cable load to ensure the cleaning system was not exceeding design specifications.

On 14 December 2021, during a small storm event, preliminary debris samples from the fish screen were collected to be used as a possible metric to determine the effectiveness of various screen cleaning modifications. Four cycles of sampling occurred, at 5 sampling locations, over an 8-h period when diversion through the fish screens was 150-400 cfs. Samples collected during the rising limb and near peak flow showed no apparent differences between sampling locations. Samples collected during the receding limb of the storm event occurred when discharge passing through the screen was lower and consequently little debris was collected. Further data collection is needed to determine if debris sampling of the fish screen is a viable method to evaluate the effectiveness of various screen cleaning modifications. In addition, velocity measurements across the face of the fish screen were also taken during debris sampling, however it was determined the flow meter was not capable of measuring approach velocities, only sweeping velocities. A new velocity meter was purchased in 2022 as soon as this issue was identified (SonTek FlowTracker®2, Acoustic Doppler Velocimeter), although no BO-defined storm events occurred to collect additional measurements. However, velocity tests in flowing water did verify that the FlowTracker2 could measure water velocities simultaneously in the two perpendicular planes required. During 2023 and 2024,

extensive approach and sweeping velocity data were collected for the prototype screens. Data analyses are ongoing and will be reported to the BC to help determine the next steps of the evaluation program.

- Auxiliary pipeline box debris cover. To prevent debris from entering the auxiliary water supply, a perforated aluminum plate with ¼” holes was installed (November of 2020) on top of the grating, which has 1” x 3” openings. The grating covers the access opening for maintenance and repair of this area. During spill, at high discharges, the entrance pool water elevation is higher than the top of the fish ladder and water flows into the lower portion of the fish ladder, which allows debris to enter through the 1” x 3” openings of the grating. Once debris enters the auxiliary system, debris larger than the baffle holes becomes impinged and reduces flow from of the auxiliary system into the fish ladder. After the numerous storm events of 2023 and 2024, it appears the debris cover was effective at preventing debris from entering the auxiliary water supply. A full assessment will be conducted once dry conditions return and the area behind the auxiliary diffuser panels can be accessed.
- Emergency repairs. The large storm event on 09 January 2023 caused substantial damage at the Robles Fish Passage and Diversion Facility. Two days later, the Casitas Board of Directors adopted a resolution proclaiming the existence of a “local emergency” given the clear and imminent danger to the health, safety and welfare of persons, property and environmental (fish and wildlife) resources within its jurisdiction. Casitas immediately proceeded with the emergency repairs that continued until May 12, 2023. Work involved temporary repairs of the breached and damaged timber cutoff wall. Work also included restoring areas that eroded on the eastern side of the forebay, restoring areas that eroded on the western and eastern sides of the timber cutoff wall, and sediment debris removal from the forebay and screenbay. The Project Completion Report for the Emergency Repair Project was submitted to USACE as required under emergency permitting (CMWD 2023).

6.1.2 Flow Observations and Control

Flow and level measurement devices are located at various locations within the Robles Fish Passage Facility. The primary points for 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 with good rating for low to moderate flows and operated by Casitas Municipal Water District, formerly a USGS station. The gage data is now remotely accessible by CMWD after communication upgrades. A second gaging station at this location is operated by Ventura County and has intermittent operational issues. The CMWD bubbler line was damaged in January and was not operational throughout the 2023 fish passage season. In the summer 2023, the bubbler line was repaired. In addition, the County has abandoned their gaging station and now operates and maintains the CMWD station.
- Matilija Dam Stage Bubbler—located at the dam, this gage provides the lake elevation. Under high flows, the dam acts as a weir. This is one of the primary locations to determine when a hydrograph peak has occurred during a storm. Ventura County extended the bubbler line to a lower elevation in the fall of 2020 to capture future downloads and drawdowns to the water inlet level.
- North Fork Matilija Creek—located approximately 3,000 feet upstream of its confluence with Matilija Creek with good rating for low to moderate flows but does have intermittent operational issues. It is operated by the Ventura County Watershed District. Numerous issues with this gage during 2024 caused it to be of minimal use to determine flow patterns upstream of the Robles Facility.
- Robles-Casitas Diversion Canal—located on the diversion canal approximately 1,300 feet downstream of the Robles headworks in a trapezoidal channel with a good rating for flows up to 600 cfs.
- Ventura River near Meiners Oaks (VRNMO or Measurement Weir)—located approximately 540 feet downstream of the Robles Fish Passage spillway at a concrete weir section with good rating up to 100 cfs. Rating equations are used

above 100 cfs with no verifications at higher flows above 1000 cfs. This is the most reliable flow measurement for releases with a 50-year plus record and a former USGS site. During 2024, the bubbler was damaged during the 4 February 2024 storm and when flows receded repairs were made.

- Fish Ladder—SonTek IQ Plus has been added to this location to measure flow in the fish ladder. It operated normally until the 04 February 2024 storm, and then began to produce inconsistent discharge measurements. It will be repaired or replaced prior to the start of the 2025 fish passage season.
- Auxiliary Water Supply—SonTek IQ Pipe has been installed to obtain flow measurements in the auxiliary water supply. It has had intermittent operational issues, but because water remained in the lower fish ladder through 2020, an inspection was not done until the summer of 2021. The inspection only revealed calcification buildup on the transducers, which were cleaned. A redundant SonTek meter was installed at the upstream end of the Auxiliary pipe in 2022. The downstream meter operated initially in January of 2023, but failed again and the new redundant upstream meter was used. Both meters had communication issues during 2023. The downstream meter was inaccessible during the off-season (wet conditions) to repair and was not functional during the 2024 season. The upstream meter was repaired and operational at the start of 2024 but had intermittent communication, power, and presumed accuracy issues (see above) during the season.

All discharge instrumentation can suffer from inaccuracies caused by clogging of bubbler lines, electronic creep, debris or calcification accumulating on sensors, changes to the measured cross sections, vandalism, or equipment problems. For this reason, the data are verified against field measurements and observations when possible. The information gathered from each of these locations has been summarized as mean daily flows (Appendix 8). The mean daily Robles Fish Facility discharge and corresponding turbidity and temperature measurements for the entire fish passage season are presented in Appendix 9.

Critical Drought Protection Measures (CDPM)—No CDPM modified releases occurred in 2024 because Lake Casitas storage exceeded the CDPM volume of 100,000 ac-ft. The Matilija Dam intake structure was damaged during the high flow events and Ventura County will be making necessary repairs in the near future. Lastly, the BC began meeting in 2021 to start developing the Stage 5 CDPM that will be implemented once Stage 5 storage is reached in Lake Casitas. The meetings were put on hold when the lake exceeded 100,000 ac-ft.

6.1.3 *Costs Associated with Operation and Monitoring*

The BO specified that CMWD provide the costs that are associated with the activity. The following is a summary estimate of direct costs incurred by CMWD during the 2023-24 fiscal year:

- **Fisheries Monitoring:**

Salaries & Benefits	\$ 657,757
Equipment/Material	\$ 55,399
- **Facility Operations:**

Salaries & Benefits	\$ N/A
Equipment/Materials	\$ 71,969
Outside Contracts	\$ 20,790
Utilities	\$ 8,223
- **Capital Improvements:**

Facility repairs/replace	\$ 18,082
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- **Emergency Repairs:**

Robles	\$ 45,213
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6.1.4 *Water Velocity and Depth Validation Evaluation*

Although 7 BO-defined storm events occurred during 2024, high sedimentation of the forebay, screenbay, and entrance pool prevented higher priority performance testing from being completed. All future performance testing will be completed in general accordance with the NMFS approved Performance Evaluation Program and Biological Committee priorities in section 4.1, Table 1.

6.1.5 Recommendations Regarding the Prioritization of Future Activities

The Robles Fish Facility has completed its 19th season of operation. An assessment of the current fish screens and cleaning system was initiated to determine if modifications could be made to improve fish passage and diversion operations. A prototype evaluation plan was completed and distributed to the BC for review during 2019. Implementation of the evaluation plan was ongoing for the 2024 fish passage season.

6.1.6 Recommendations Deemed Necessary to the Operations

Forebay sedimentation and high flows caused significant operational issues during 2023 and emergency repairs were made. However, these emergency repairs were temporary in nature and will need to be completed in the off-season (no/low flows) and once permitting can be completed. Casitas continues to recommend the 16-weir project remain on hold until final plans for Matilija Dam Removal Project are completed. These plans include a High Flow Sediment Bypass as part of the removal project that will likely require significant facility modifications to the Robles Fish Passage Facility project area and have not been determined. The Robles Working Group is currently developing sediment bypass alternatives to be designed, evaluated, and selected. The significantly wet conditions during 2023 and 2024 (15 BO-defined storm events) created numerous operational issues that have not been corrected due to continued wet-channel conditions and required permits. Returning the Robles Fish Passage Facility to design status includes; completion of 2023 cutoff wall temporary repairs, sediment removal from the forebay, sediment removal from inside the facility, sediment removal from the entrance pool, and repairs to the interim rock weirs.

6.2 Fish Passage Monitoring

Introduction

Monitoring of migratory fish moving through fish passage facilities has been conducted using many different methods that include: visual counting, trapping and hand counting, continuous video recording, PIT tagging, radio telemetry, and acoustical telemetry. In each fish passage application, the particular physical and biological conditions (e.g., variable discharge, turbidity, debris, size of facility, and number of fish) usually dictate which method would be most effective. New technologies have been employed to improve fish passage monitoring in turbid conditions specifically. One such monitoring device is the Vaki Riverwatcher® (Riverwatcher). The Riverwatcher has the capability to operate in greater turbidity than more traditional monitoring equipment. Because of this advertised capability, the Riverwatcher was selected to be used in the Robles Fish Facility by the Technical Advisory Group during original facility design.

The primary objective of fish passage monitoring is to provide a long-term index of upstream adults and downstream kelts migrating through the Robles Fish Facility (NMFS 2003a). Although the Riverwatcher has the ability to detect smolt-sized steelhead, the manufacturer recommends it for monitoring fish with body depths ≥ 40 mm (Vaki 2003). Consequently, at the time the Riverwatcher was selected as the monitoring method, it was not known how well it would work at detecting smolt-sized fish given the debris load of the Ventura River (NMFS 2003a).

Methods

Fish migrating upstream and downstream through the Robles Fish Facility were monitored using the Riverwatcher. The Riverwatcher is located in the fish bypass channel, which is the channel between the fish ladder and fish screens. The Riverwatcher consists of two scanner plates with light diodes that transmit beams of infrared light through the water to a corresponding receiver plate. When a fish swims

(or debris drifts) through the infrared light beams, it breaks the light signal and a digital silhouette of the fish is recorded on a computer. Other data recorded when the Riverwatcher scanner is triggered are: date and time, total length (TL) of the fish (from a length/height ratio), swimming speed (m/sec), and direction of the fish movement (upstream or downstream). Additionally, the scanner triggers an underwater camera to record a 10-second video clip (25 frames/sec). Based on this recorded information, all detections are reviewed and classified (see below and Appendix 10).

The Riverwatcher was experiencing technical issues related to malfunctioning video communication during the 2015 monitoring season and was sent to Vaki for servicing. Through diagnostic testing, Vaki concluded no repairs were necessary and did not experience any issues with malfunctioning video. Vaki stated recent improvements to the Riverwatcher system could be integrated into older systems and recommended upgrading the Robles Riverwatcher. This recommendation was discussed and approved by BC members at the 2015 committee meeting. The primary upgrade was changing from an analog camera to a digital camera. In conjunction with updated software, the camera now records video for both upstream and downstream detections. Additional upgrades to the Riverwatcher included: white and infrared lights, cabling, multiplexor, and power supply. To improve video detection of fish, an additional camera was installed and is located upstream of the Riverwatcher scanners in an aluminum tunnel below the Riverwatcher camera. A second DVR camera is located above the Riverwatcher and pointed at the scanner plates. These two DVR cameras are independent of the Riverwatcher system and have to be reviewed separately for detections. The digital cameras recorded continuously at 12 frames/sec and capture about 5 weeks of data until the DVR data storage drive is full. Once the DVR memory is full, it can be exchanged with a second DVR and data can be reviewed.

The Riverwatcher scanner and cameras are positioned at the bottom of an aluminum frame (crowder) covered with 1/2-inch aluminum bars, spaced 1 1/2 inches on center resulting in 1-inch spacing between the bars, which directs the fish to swim between the scanner plates. The crowder can be raised and lowered in guide slots of the fish

bypass channel with the aid of an A-frame hoist for cleaning or repair. The Riverwatcher is usually operated during the entire flow augmentation season as long as sufficient water elevations in the fish bypass are present and debris and turbidity are low enough so the crowder will not be damaged and the Riverwatcher will function properly. During periods of higher debris loads, cleaning and inspections occur multiple times per day. Cleaning and inspections occur once every 2-3 days during periods of low debris.

Prior to 2010, each upstream and downstream Riverwatcher detection was reviewed and classified as either: an adult steelhead, *O. mykiss* non-adult steelhead, other species if identifiable, unknown fish, fish probable, or false detection (see Appendix 10 for detection classification flow chart). At the request of NMFS, this classification system was modified during the review process of the 2010 progress report. It is NMFS' belief that supporting data do not exist to distinguish between the resident *O. mykiss* and anadromous steelhead. All confirmed *O. mykiss* were classified solely as *O. mykiss*. The classifications were determined by using a combination of the silhouette images, estimated lengths, and video clips. In addition, if larger adult sized *O. mykiss* were detected and a useful video clip was recorded, measurements of eye diameter and standard length (SL) were estimated from the video clip to calculate morphometric ratios that were compared to known steelhead and rainbow trout.

A commonly used morphological method to discriminate differences is using body measurements to develop ratios for comparisons, which removes the effects of body size (Strauss and Bond 1990). This is done by comparing SL to the ratio of eye diameter in linear regression. Standard length is measured length from tip of snout to end of hypural plate near the end of the fleshy caudal peduncle, which is unaffected by caudal fin deformities (Anderson and Neumann 1996).

Before 2010, the adult steelhead classification was used if the fish observed was an *O. mykiss* and displayed the typical characteristics of an anadromous adult steelhead, such as black spotting on dorsal, adipose, and caudal fins, black spotting on dorsal side of body, silvery body, vertical edge to caudal fin, ≥ 38 cm TL (Shapovalov and Taft

1954), and eye diameter/SL ratio ≤ 0.045 (CMWD 2008). The new classification method may include juvenile resident, smolts, adult resident, and adult anadromous *O. mykiss* migrating throughout the basin. Conceivably, after more data are collected from the downstream trapping component, or from other Ventura River basin research projects, a more accurate classification system of Riverwatcher detections could be used again.

The “fish unknown” classification was used if a detection was identified to be a fish based on video evidence, but further classification could not be determined due to high turbidity, or inadequate portion of the fish captured within the camera’s field of view. The “fish probable” classification was used if no fish was observed in the video, but the silhouette was similar to that of a typical fish silhouette confirmed by past video evidence. Even with reasonably good video coverage, smaller fish are still able to pass through the Riverwatcher undetected by the video cameras. This occurs if fish swim very close, high, or low relative to the cameras. In addition, this can happen if a fish swims upstream through the scanners but stops before entering the video field of view. High turbidity can also obscure the video detection and identification of fish.

The “false detection” classification was used when no fish was observed in the video and the silhouette was not similar to that of a typical fish silhouette. Because false detections tended to occur frequently during higher discharges, when turbidity and debris are also high, it is likely that most false detections during these periods are caused by debris, high turbidity, and water turbulence. A second video camera is directed at the Riverwatcher scanner plates to help determine the cause of many of the false detections. After reviewing selected time periods when many assumed false detections occurred, it was concluded that debris, air bubbles, and turbulence were indeed the source of the detections. During low-flow periods (< 10 cfs), 99.9% of the time the Riverwatcher was operational, surface water turbulence was likely the cause of most false detections. When turbidity exceeds about 100 NTUs, hundreds of false detections can occur per hour due to high concentration of suspended solids breaking the infrared beams of the scanner plates. When turbidity is less than about 100 NTUs,

false detections from suspended solids are not as frequent, but poor water visibility does not always allow for video confirmation, depending on how close to the camera a fish swims during passage. Once turbidity falls below about 25-30 NTUs, turbidity does not limit the Riverwatcher to detect and confirm fish passing through the facility (Table 2). In spring 2016, the Riverwatcher was tested in an above-ground pool with wooden fish silhouettes at varying water turbidities. This was intended to simulate natural stream conditions to provide further resolution of the operational capabilities of the Riverwatcher (Lewis et al. 2015).

Table 2. Riverwatcher general operational status for ranges of water turbidity (NTUs).

Approximate Turbidity (NTUs)	Riverwatcher status
> 200	Not functional
100-200	Many false scanner detections, not fully functional
30-100	Scanner functional, but unable to confirm with video
< 30	Scanner functional, grid detectable for video confirmation

A standardization test for the Riverwatcher was developed using wooden silhouettes of typical sizes for smolt and adult steelhead. To confirm the Riverwatcher is functioning correctly, this test is conducted before each fish passage season. A more detailed description of this test can be found in Lewis et al. (2015).

Results and Discussion

The Riverwatcher was operated from 20 December 2023 through 30 June 2024. The Riverwatcher was not operated for about 545 hours due to high turbidity and about 148 hours due to high debris (primarily filamentous algae) loads. During the 2024 fish passage season, the crowder was removed from the fish bypass channel and cleaned or inspected 127 times. Finally, the Riverwatcher was not operational for approximately 4 days due to a damaged cable multiplexor which was replaced with a backup unit. A

total of 346 false detections were recorded by the Riverwatcher, of which 134 were upstream and 212 were downstream (Appendix 11).

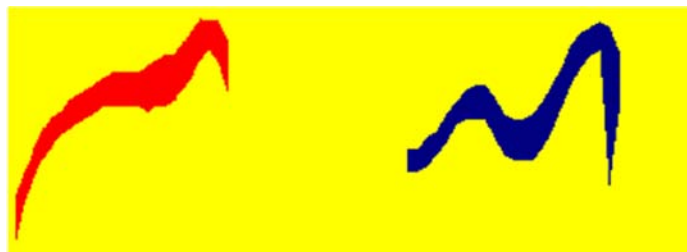
There were 18 *O. mykiss* detections recorded by the Riverwatcher, of which 7 were upstream and 11 were downstream. The mean date of upstream detections was 24 April, and 25 March of downstream detections. The mean total length of upstream detections was 40 cm, and ranged from 30 to 53 cm. The mean total length of downstream detections was 35 cm, and ranged from 24 to 49 cm. Based on phenotypic characteristics, such blue/green color dorsally, red/pink hue along the lateral area, and spotting across their bodies; they were all likely resident rainbow trout. As the *O. mykiss* population in the Ventura River basin continues to increase in abundance, larger mature residents are expected to pass through the Robles Fish Passage Facility during seasonal fluvial migration activity (see CMWD 2010, 2011, and 2012 for examples of larger resident *O. mykiss*). None of the detections displayed the typical characteristics of an anadromous adult steelhead, such as black spotting on dorsal, adipose, and caudal fins, black spotting on dorsal side, silvery body, and vertical edge of caudal fin. Nor did any of the detections exhibit the typical smolting characteristics such as darkening of the dorsal and caudal fin margins, silvering, and loss of parr marks and/or spotting. In addition, there were two fish probable detections, one upstream and one downstream. The downstream detection could not be video verified because the water was too turbid. The upstream detection appeared to have turned around midway through the scanner plates, based on the distorted silhouette, and thus nothing was observed on the video. Both of these detections were most likely *O. mykiss* because the silhouettes and estimate lengths were similar to the known *O. mykiss* detected this year. Additionally, non *O. mykiss* fish (i.e., bass or sunfish) were not detected this year and further supports an *O. mykiss* conclusion. Many of the *O. mykiss* detections occurred within a short period of time (e.g., seconds to minutes) and in opposite directions. Most of these detections plausibly represent only 3 *O. mykiss* passing through the Riverwatcher multiple times because 56% occurred within 24 h during three time periods (Appendix 12). This pattern is not unexpected given that it has been observed frequently over the years of Riverwatcher monitoring (see CMWD 2017 for

more a detailed example). Based on morphology, color, and spotting patterns, many of the fish appeared to be the same, although the lengths estimated by the Riverwatcher varied. For example, the *O. mykiss* detected on 4 March 2024 passed downstream, upstream, and downstream again within an 8-min period but varied in estimated total length by 10 cm (27-37 cm). Variation can occur because total length is calculated using the body depth measured by the Riverwatcher software, which uses the digital silhouette image created as a fish passes through the scanner plates. The silhouette quality can in turn be affected by the size of the fish, swimming speed, consistent swimming speed, and swimming orientation (see Gibson 2012 for Riverwatcher silhouette detection examples and Lewis et al. 2015 for examples of length variation).

The 346 false detections recorded by the Riverwatcher were assumed to be caused from turbidity, debris, turbulence, air bubbles, and settings of the Riverwatcher to detect smaller fish (based on previous detections and videos). The review of the second DVR camera directed at the Riverwatcher scanner plates from past detections provides confidence that these are the likely cause of false detections. None of the detections produced silhouettes that appeared to be fish based on previous experience operating the Riverwatcher. In the event that one of these silhouettes could have been caused by a fish, all detection video clips created by the Riverwatcher were reviewed and no fish were observed. For the 2024 season, the minimum threshold height remained at 28 mm so large numbers of false detections could be eliminated while still attempting to detect steelhead smolts. Based on available *O. mykiss* data from the Ventura Basin, the height of 28 mm was determined to be similar to some of the smallest steelhead smolts expected to emigrate downstream through the Robles Fish Facility. This height corresponds to 146 mm TL and 139 mm FL. The estimated fish detection rate from a Riverwatcher verification study indicated that up to 93% of smolt sized *O. mykiss* will not be detected by the Riverwatcher (Lewis et al. 2015). Additionally, it was concluded that larger-sized fish (i.e., height > 80 mm) appeared to be detected nearly 100% of the time. This height is equal to about 475 mm TL. Shapovalov and Taft's (1954) 9-year study documented only 4% of the total number of adult steelhead were smaller than 475 mm.

Therefore, the number of small adult steelhead that may not be detected would likely be low, and the vast majority of adult steelhead would be detected.

The first documented Pacific Lamprey (*Entosphenus tridentatus*) was observed on 03 May 2024 within the Robles Fish Passage Facility. The crowder was being removed from the passage channel for a regular cleaning when an adult Pacific Lamprey was observed on top of the crowder tunnel (≈ 18 inches). Before the lamprey could be captured and returned to the fishway, it escaped back into the fishway. Upon review of Riverwatcher data, the lamprey was detected during upstream passage (see silhouettes below). Ten hours prior to this observation, 4 detections occurred at about 0230 h, within a 4 min period, and at least two of the silhouettes produced by the Riverwatcher appeared similar to other Pacific Lamprey detections at another fish passage facility with a Riverwatcher (Valley Water 2020). The detections could not be verified with video because no lamprey was observed on the video. In addition, it appears the Robles Fish Passage can successfully provide passage for lamprey, but more data will need to be collected.



7.0 ADDITIONAL BIOLOGICAL AND ENVIRONMENTAL MONITORING STUDIES

7.1 *O. mykiss* Presence/Absence Surveys

Methods

In addition to the fish attraction monitoring, *O. mykiss* relative abundance index surveys were conducted in the Ventura River mainstem between the Robles Fish Facility and the Ventura River mouth, San Antonio Creek, and upstream of the Robles Fish Facility in Matilija and North Fork Matilija creeks. These additional sites were surveyed using both bank and snorkeling methods (depending on water conditions and expected life history stage) but were conducted primarily after storm events for adults and during the rest of the year for smolts, parr, and fry. Methods to estimate fish size and numbers were the same as those used in the fish attraction evaluation. A total of 14 sites were monitored and both pool and riffle habitat at each site were included (Appendix 13).

These additional areas were surveyed to determine if adult steelhead were entering the Ventura River, migrating upstream, holding and spawning, and if they were successfully passing through the Robles Fish Facility. Also, juvenile *O. mykiss* (smolts and residents) were surveyed to learn spatial and temporal distribution patterns.

The survey sites were initially selected based on ease of access, coverage of basin, and assumed chance of detecting *O. mykiss*. However, after all habitat surveys were completed, site selection was also based on quantitative measurements identifying high-quality habitats used for *O. mykiss* juvenile rearing and adult holding.

Results

Peak snorkel counts within each year were generally between 350 and 400 *O. mykiss* until 2013. Due to the exceptional 5-year drought (2012-2016) and post Thomas Fire effects, the peak numbers of *O. mykiss* dropped substantially (Appendix 14). No *O. mykiss* were observed during the reporting period ending in June 2024. However, opportunistic snorkeling upstream of Matilija Dam in Murietta Canyon and Upper North

Fork Matilija Creek revealed adult and young-of-the-year *O. mykiss* (both 2021 and 2022), indicating successful reproduction and early stages of population increase.

7.2 *O. mykiss* Index Spawning Surveys

Methods

Spawning surveys were conducted throughout the Ventura Basin accessible to anadromous steelhead or only to resident rainbow trout (i.e., upstream of Matilija Dam). A total of 21 index sites or reaches were subjectively selected (Appendix 15) with small to medium size gravel that is suitable for steelhead spawning (Shapovalov and Taft 1954; Orcutt et al. 1968). During 2008, the spawning index sites selected were initially distributed broadly within the basin to capture general spawning locations and timing. Since 2008, longer reaches have been added to incorporate and replace previously surveyed discrete sites to accommodate for spawning gravel redistribution after storm events. Additional sites have been added to capture quality spawning habitat and to be more representative of each surveyed sub-basin. This initial information will be used to establish long-term index sites to capture population trends. The spawning surveys were conducted biweekly from January through June. Once spawning was observed, surveys continued until at least 2 surveys were completed and no new redds were detected. Observations were made at spawning sites to identify and count *O. mykiss* redds; redds were identified by typical characteristics (Orcutt et al. 1968; Chapman 1988). Once a redd was identified, physical measurements similar to those recorded by Zimmerman and Reeves (2000) were collected to characterize the redd. The physical measurements were only recorded during the first three years because it was felt sufficient data was collected to characterize redds. Currently, larger redds (likely anadromous) have all measurements collected. Pit and tailspill lengths were measured from the upstream end to the downstream end of each, respectively. Redd width was measured at the widest point of the tailspill (Appendix 16). Water depth was measured at four locations: in the pit, adjacent to the pit, upstream of the pit, and at the tailspill. The surface median (D_{50}) and maximum substrate size of each redd tailspill was

estimated. All adjacent measurements were taken on the thalweg side of each redd. Photos and GPS locations were also recorded for all redds identified. This information will help determine steelhead spawning habitat selection characteristics.

Results

Spawning surveys started in 2008 and counts initially increased from only 3 redds to a high of 165 redds in 2012. Since the peak in 2012, as the current drought intensified or was sustained, the available habitat diminished, and there was a corresponding decrease of adult and juvenile *O. mykiss* populations with significantly lower redd counts. No redds were observed in the index areas during 2024 (Appendix 17).

7.3 Ambient Water Quality Monitoring

To evaluate aspects of the monitoring and evaluation program, water quality data is collected throughout the Ventura River basin (Appendix 18). Water temperatures are recorded at 12 locations throughout the Ventura River basin. The locations include the Ventura River estuary and mainstem, Coyote Creek, San Antonio Creek, North Fork Matilija Creek, and Matilija Creek upstream and downstream of Matilija Dam. The temperature loggers recorded at 30-min intervals. Monthly grab samples are also collected at the same locations with a multiprobe that measures: dissolved oxygen, pH, conductivity, salinity, TDS, and temperature. A monthly water quality profile was also collected in the estuary/lagoon, but is no longer collected as of the 2024 monitoring season. The profiles were collected at approximately the mid-point of the estuary/lagoon and at least four depths are recorded. A continuous turbidity probe is also installed in the Robles Fish Facility near the Riverwatcher. It records water turbidity at 30-min intervals when the bypass is operational. The probe was ungraded at the start of the 2022 Fish Passage Season and now has a measurement range of 0-4000 NTU; a four-fold increase from the previous probe. Turbidity measurements are also collected at several sites upstream, downstream, and within the Robles Fish Facility. All locations were monitored if sufficient water was present. A weather station

at the Robles Fish Facility collects various atmospheric data including: rainfall, temperature, pressure, wind, humidity, and dew point (Appendix 19). Weather station data was collected at Robles for the majority of the reporting period, but due to technical issues, and data from the NOAA Ojai weather station (Station No. USC00046399) was used for from July to September 2023.

7.4 Estuary/Lagoon Monitoring

The sandbar is monitored during the fish passage season to determine if it is open. If open, Robles Fish Facility operating criteria must be met per the BO. Outside of the passage season, monitoring has been conducted and expanded to better understand the nature of the Ventura River sandbar and how it may affect fish passage year-round and potential estuary/lagoon rearing capacity. The estuary/lagoon has been monitored monthly for water depth as part of the water quality monitoring, but is no longer measured as of the 2024 monitoring season. In addition, the surface area has been measured every 6 months. However, the spring 2020 survey was not conducted because of COVID-19 protocol issues with having two people in one kayak. Together, these physical measurements can provide a general index of rearing capacity of the Ventura River estuary/lagoon over time. From 2008 through 2011, which were wetter years, the estuary/lagoon depth and size varied. However, since the beginning of the drought in 2012, estuary/lagoon depth and surface area have remained somewhat uniform (Appendix 20).

7.5 Surface Flow Monitoring

The Ventura River, like most rivers in southern California, has significant reaches that lose surface flow during most years after storm flows recede. To quantify this natural pattern, surface flows have been observed and documented since the end of 2007. Similar to sandbar monitoring, clear patterns have become apparent. During normal and wet precipitation years, there are typically surface flows throughout the length of the Ventura River mainstem during the fish passage season lasting 9 to 29 weeks.

However, even during these years, the Robles Reach can go dry shortly after storms occur. During the 17-year monitoring period (8/14/2007 to 6/30/2024), surface flow through the entire Robles Reach was only present 21% of the time. During the same 17-year time period, surface flow monitoring documented 11 years (~ 65%) when dry channel conditions extended upstream of Robles, and during the peak drought years (2014-2016) this extended 1.7 km upstream of Robles. Beginning with the drought in 2012, the Robles Reach was dry for long periods of time (e.g., 2 years), even extending downstream of the reach up to 3.1 km below the confluence of San Antonio Creek. However, there was approximately a 1.0 km reach immediately downstream of the San Antonio Cr. confluence that remained wet throughout the drought due to the tributary's subsurface flow contribution. This drought-induced pattern significantly contracted, both spatially and temporally, due to increased precipitation and runoff during the 2017 monitoring period. During 2020, precipitation was about 88% of average and surface flow continued for a longer period and farther downstream than typical (Appendix 20). These longer base flows may have been related to Thomas Fire effects that modified the watershed hydrologic cycle and in-channel infiltration dynamics. In addition, the much higher than average flows of 2019 contributed to the observed increased base flows of the post Thomas Fire channel dynamics. Below-average precipitation during 2021 produced little runoff and insignificant surface flow in the Robles Reach; only one brief surface connection occurred (≈ 6 h) following a rain event on 28 January 2021 (Appendix 21). During 2022, the pattern was similar to 2021 with increased spatial and temporal occurrences generally proportional to increased precipitation. During 2023 and 2024, surface flow was maintained for the entire fish passage season.

7.6 Photographic Index Sites

Photographic index sites were established throughout the Ventura River basin in 2007 to monitor general changes in the stream channel morphology, water conditions, and riparian zones. There are a total of 14 sites where upstream and downstream photos are taken (Appendix 22). The sites were re-visited twice during the reporting period, in September 2023 and March 2024. A representation of the patterns within the mainstem

of the Ventura River (Appendix 23) shows the general trend that has been observed with increasing riparian and within channel vegetation over time since 2016.

Observations correlated with channel modifying storm events suggest the closer in time since the last channel bed mobilizing event, the higher the probability of a subsequent bed mobilizing event for a given discharge. The Ventura River channel stability increases in time due to vegetation, compaction, mineralization, etc. Furthermore, the longer the time between channel-changing events, a larger discharge is required to produce a channel-changing event. The 2023 high-flow events were large enough to remove the riparian vegetation, most notably in the lower river.

7.7 Underwater Video Monitoring

As time allowed, a pilot study of an underwater video monitoring system was continued to determine if remote monitoring for adults or smolts is feasible within the Ventura River or tributaries. The monitoring system could be placed at Robles or selected locations when water conditions were suitable to record fish rearing, holding, or migrating. The system consisted of an underwater video camera attached to a DVR that can record for 6-8 hours at a time. The system was powered by a 12-volt DC battery so the system could be placed anywhere within the basin. The video recordings were reviewed to determine presence or absence and relative numbers of *O. mykiss*. If this pilot study is successful, it may be expanded and developed into a more quantitative monitoring tool. This system was also used at the fish ladder entrance during post-storm observations. Underwater video monitoring was not conducted during the 2024 fish passage season.

7.8 Stranding Surveys

Stranding surveys were conducted during the reporting period as part of other monitoring and evaluations (i.e., impediment, snorkel, and spawning surveys). No stranded *O. mykiss* were observed during 2024.

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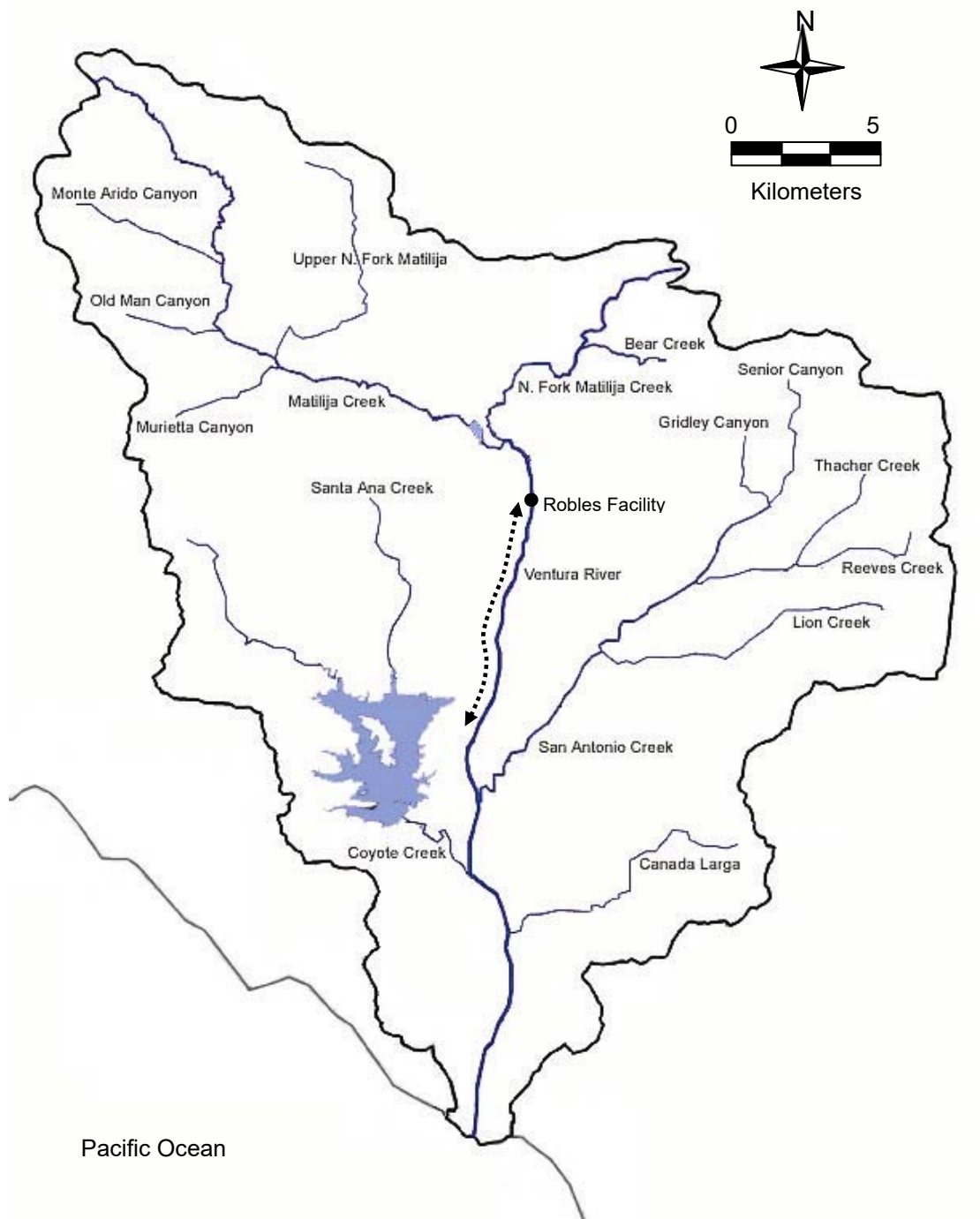
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9.0 APPENDICES



Appendix 1. Basin map of the Ventura River. The Robles Fish Passage Facility is identified by the black dot and the Robles Reach is identified by the dashed line downstream of the Robles Facility.

Appendix 2. Summary data of impediments sites for upstream fish migration impediment evaluations at the beginning of the 2024 fish passage season.

Site No.	Latitude (N)	Longitude (W)	rkm	Habitat Type ^a	Site Description	Length (m)	Slope (%)	Percent Substrate ^b						Active Channel Width (m)
								SO	SD	GR	CB	BD	BR	
10-2 ^c	34.365265°	-119.311082°	11	RI	Near Casitas Springs at bottom of levy	38.2	1.0	0	0	10	70	20	0	44.5
3-2 ^c	34.373789°	-119.308417°	12	RB	Near Casitas Springs at top of levy	22.0	3.7	10	5	10	65	10	0	27.0
4 ^c	34.384743°	-119.310030°	14	RI	0.5 km upstream of San Antonio Cr. confluence	23.8	5.0	0	0	0	15	85	0	27.9
5-2 ^c	34.396095°	-119.309537°	15	RI	0.4 km downstream of Santa Ana Blvd. bridge	8.4	7.0	0	5	5	45	45	0	50.6
6-5 ^c	34.411318°	-119.301491°	17	CB	1.4 km upstream of Santa Ana Blvd. bridge	26.1	5.0	0	0	0	65	35	0	33.8
9 ^c	34.426708°	-119.301831°	19	RI	0.2 km upstream of Hwy 150 bridge	67.9	1.5	0	0	0	30	70	0	32.4
7 ^c	34.438184°	-119.299528°	20	RB	1.1 km upstream of Hwy 150 bridge	31.6	2.0	5	0	10	40	45	0	65.9

^aThe habitat types are: RB = rapid with protruding boulders, RI = riffle, and CB = cascade over boulders.

^bThe substrate types are: SO = silt and organics, SD = sand, GR = gravel, CB = cobble, BD = boulders, and BR = bedrock.

^cSite was substantially altered by high flows and sediment during 2017 (4), 2019 (6-5), or 2023 (10-2, 3-2, 5-2, 9, 7) and is no longer monitored.

Appendix 3. Completed transects through 2024 at impediment sites for target downstream discharge releases from the Robles Fish Facility.

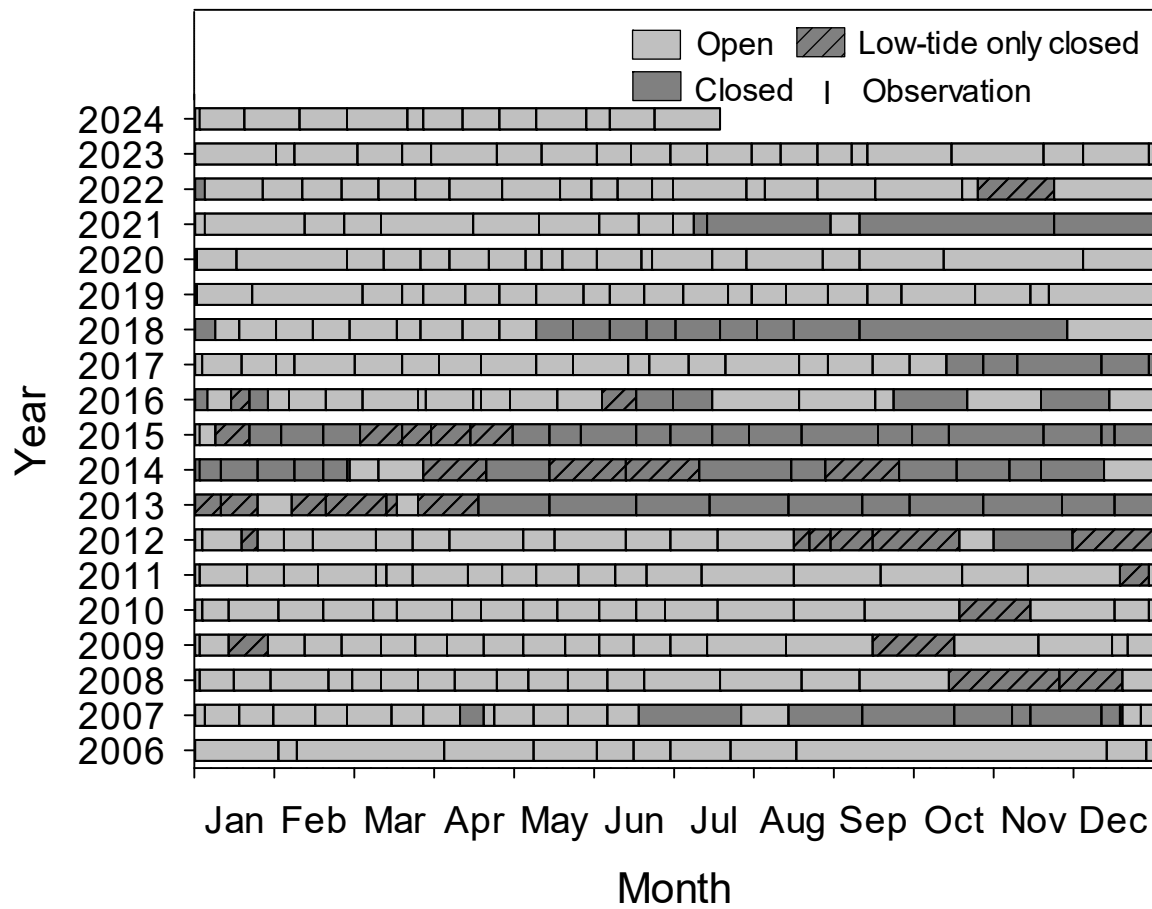
Impediment Sites									
Robles Discharge (cfs)				6-2	6-4				
	3-2	4	5-2	6-3	6-5	7	9	10	10-2
171	x		x	x, x			x	x	
100	x	x	x			x	x	x	x
82	x, x	x	x		x	x, x	x, x	x	x
74	x	x	x, x	x, x	x	x	x		x
68	x		x		x	x	x		x
62	x	x, x, x, x	x	x		x	x	x	x
56	x		x	x	x	x	x	dry	x
50	x	x	x	x, x	x	x, x	x	x, x	x
40	x	x, x, x	x, x	x	x	x, x, x	x, x, x	x	x
30	x	x, x	x, x	x	x, x	x, x, x	x, x, x	x, x	x
20	x	x	x		x	x	x		x

Completed transects rounded to nearest Robles discharge (e.g., the four transects measured for Site 4 at 62 cfs ranged from 61-63 cfs) based on mean 2.6 rkm/h lag time and averaging hourly discharge of released water from Robles. Colors correspond to year of survey: x = 2010, x = 2011, x = 2014, x = 2017, x = 2018, and x = 2019. Sites 4, 6-2 through 6-5, and 10 (gray columns) were altered by storm flows over time and data are no longer collected. All remaining sites were altered by storm flow in 2023, and data are no longer collected.

Appendix 4. Ventura River sandbar monitoring data from July 2023 through June 2024.

Date	Sandbar Breached (Y/N)	Time (24h)	Tide Height (ft)	Tidal State	High Tide		Low Tide		Mean Daily Discharge at Foster ^a (cfs)	Mean Daily Discharge at Robles (cfs)	Notes
					Time (24h)	Height (ft)	Time (24h)	Height (ft)			
7/14/2023	Y	16:10	3.63	flood	19:55	5.99	13:41	2.61	35.4	23	Open west bank
7/31/2023	Y	15:15	2.30	flood	20:54	7.04	14:41	2.22	27.3	16	Open west bank
8/11/2023	Y	11:50	3.05	ebb	8:51	3.58	12:55	2.95	24.9	19	Open west bank
8/25/2023	Y	13:21	4.03	flood	16:52	5.22	12:07	0.90	29.2	19	Open west bank
9/8/2023	Y	8:50	3.66	ebb	8:03	3.71	11:59	3.31	26.1	15	Open west bank
9/14/2023	Y	8:55	4.29	flood	10:07	4.73	3:59	0.20	25.2	14	Open west bank
10/16/2023	Y	9:44	5.76	flood	10:19	5.83	4:10	1.70	20.2	10	Open west, high tide east
11/20/2023	Y	9:48	3.04	slack	14:51	4.57	9:32	3.05	15.9	11	Open west bank
12/5/2023	Y	14:42	3.48	flood	15:24	3.53	10:45	2.76	14.8	8	Open west bank
12/29/2023	Y	10:01	5.70	slack	9:54	5.73	17:30	-0.50	39.5	22	Open west, high tide east
1/2/2024	Y	10:51	3.40	flood	12:41	3.60	7:46	2.70	39.2	23	Open west bank
1/19/2024	Y	9:55	1.20	ebb	4:01	5.30	11:47	0.40	38.3	22	Open west bank
2/9/2024	Y	14:15	-1.06	ebb	8:22	6.73	15:35	-1.76	227	75	Open west and east
2/27/2024	Y	15:12	1.00	ebb	10:29	4.50	16:46	0.60	180	68	Open west bank
3/21/2024	Y	13:27	0.39	ebb	8:05	4.96	15:01	-0.35	89.3	32	Open west bank
3/27/2024	Y	12:10	3.65	ebb	11:21	3.80	16:56	1.21	74.4	31	Open west bank
4/12/2024	Y	14:50	2.96	ebb	13:56	3.05	18:06	2.33	92.2	37	Open west bank
4/26/2024	Y	14:11	2.71	ebb	12:17	3.09	16:35	2.18	209	199	Open west bank
5/10/2024	Y	14:00	3.18	ebb	12:48	3.38	17:06	2.35	147	115	Open west bank
5/29/2024	Y	9:21	-0.27	slack	1:27	4.90	9:25	-0.27	90.8	63	Open west bank
6/7/2024	Y	14:20	2.85	ebb	11:53	3.57	16:11	2.40	66	48	Open west bank
6/24/2024	Y	12:36	3.58	flood	13:05	3.63	6:25	-1.14	33.9	30	Open west bank

^aUSGS gauging station number 11118500, downstream of Foster Park.



Appendix 5. Sandbar status at the mouth of the Ventura River from 2006 through June of 2024. Each observation is indicated by a vertical line and the sandbar status was assumed to remain unchanged until the next observation.

Appendix 6. Weekly fish attraction counts at the Robles Fish Facility during 2024.

Date	Method	Direction	Length (m)	Temp (°C)	Turbidity (NTU)	Robles	Species ^b	Count
						Discharge (cfs) ^a		
1/3/2024	BANK	Downstream	200	13	15	23	NFO	0
1/3/2024	BANK	Upstream	140	13	15	23	NFO	0
1/11/2024	SNORKEL	Downstream	200	9.5	7	23	NFO	0
1/11/2024	SNORKEL	Upstream	140	9.5	7	23	NFO	0
1/16/2024	BANK	Downstream	200	13	7	23	NFO	0
1/16/2024	BANK	Upstream	140	13	7	23	NFO	0
1/25/2024	BANK	Downstream	200	14	15	23	NFO	0
1/25/2024	BANK	Upstream	140	14	15	23	NFO	0
1/30/2024	BANK	Downstream	200	16	3	25	NFO	0
1/30/2024	BANK	Upstream	140	16	3	25	NFO	0
2/9/2024	BANK	Downstream	200	15	170	75	NFO	0
2/9/2024	BANK	Upstream	140	15	170	75	NFO	0
2/16/2024	BANK	Downstream	200	14	5	36	NFO	0
2/16/2024	BANK	Upstream	140	14	5	36	NFO	0
2/25/2024	BANK	Downstream	200	13	7	83	NFO	0
2/25/2024	BANK	Upstream	140	13	7	83	NFO	0
3/1/2024	BANK	Downstream	200	15	31	52	NFO	0
3/1/2024	BANK	Upstream	140	15	31	52	NFO	0
3/5/2024	BANK	Downstream	200	11	3	33	NFO	0
3/5/2024	BANK	Upstream	140	11	3	33	NFO	0
3/11/2024	BANK	Downstream	200	15	4	33	NFO	0
3/11/2024	BANK	Upstream	140	15	4	33	NFO	0
3/22/2024	SNORKEL	Downstream	200	14	2	32	NFO	0
3/22/2024	SNORKEL	Upstream	140	14	2	32	NFO	0
3/26/2024	BANK	Downstream	200	14	2	31	NFO	0
3/26/2024	BANK	Upstream	140	14	2	31	NFO	0
4/4/2024	BANK	Downstream	200	14	10	84	NFO	0
4/4/2024	BANK	Upstream	140	14	10	84	NFO	0
4/10/2024	BANK	Downstream	200	13.5	29	52	NFO	0
4/10/2024	BANK	Upstream	140	13.5	29	52	NFO	0
4/19/2024	BANK	Downstream	200	15	7	85	NFO	0
4/19/2024	BANK	Upstream	140	15	7	85	NFO	0
4/25/2024	BANK	Downstream	200	15	5	209	NFO	0
4/25/2024	BANK	Upstream	140	15	5	209	NFO	0
4/30/2024	SNORKEL	Downstream	200	18	4	167	NFO	0
4/30/2024	SNORKEL	Upstream	140	18	4	167	NFO	0
5/8/2024	BANK	Downstream	200	16.5	2	125	NFO	0
5/8/2024	BANK	Upstream	140	16.5	2	125	NFO	0
5/16/2024	SNORKEL	Downstream	200	16	2	101	NFO	0
5/16/2024	SNORKEL	Upstream	140	16	2	101	NFO	0
5/24/2024	BANK	Downstream	200	16	1	66	NFO	0
5/24/2024	BANK	Upstream	140	16	1	66	NFO	0

Appendix 6 cont.

Date	Method	Direction	Length (m)	Temp (°C)	Turbidity (NTU)	Robles Discharge (cfs) ^a	Species ^b	Count
5/30/2024	BANK	Downstream	200	17	1	60	NFO	0
5/30/2024	BANK	Upstream	140	17	1	60	NFO	0
6/7/2024	BANK	Downstream	200	18	1	48	NFO	0
6/7/2024	BANK	Upstream	140	18	1	48	NFO	0
6/13/2024	BANK	Downstream	200	18	1	43	NFO	0
6/13/2024	BANK	Upstream	140	18	1	43	NFO	0
6/17/2024	SNORKEL	Downstream	200	18	1	34	NFO	0
6/17/2024	SNORKEL	Upstream	140	18	1	34	NFO	0
6/24/2024	BANK	Downstream	200	17	1	30	NFO	0
6/24/2024	BANK	Upstream	140	17	1	30	NFO	0
		Upstream	3,640				Upstream	0
		Downstream	5,200				Downstream	0
		Total	8,840				Total	0

^aDaily mean discharge recorded by instrumentation at the Robles Fish Passage Facility (Appendix 8).

^bOMY = *O. mykiss* and NFO = no fish observed.

Appendix 7. Post-storm fish attraction surveys and counts of *O. mykiss* at the Robles Fish Facility for 2024 Storm Events.

Date	Time	Method	Location	Temp (°C) ^a	Turbidity (NTU) ^a	Robles Discharge (cfs) ^a	Species ^b	Count
2/2/2024	12:00	Bank	Entrance Pool	10	357	45	NFO	0
2/3/2024	12:00	Bank	Entrance Pool	11	23	55	NFO	0
2/4/2024	12:00	Bank	Entrance Pool	11	1582	2883	NFO	0
2/5/2024	12:00	Bank	Entrance Pool	12	3093	1359	NFO	0
2/6/2024	12:00	Bank	Entrance Pool	12	957	165	NFO	0
2/7/2024	12:00	Bank	Entrance Pool	10	436	60	NFO	0
2/8/2024	12:00	Bank	Entrance Pool	8	181	97	NFO	0
2/9/2024	12:00	Bank	Entrance Pool	11	170	75	NFO	0
2/10/2024	12:00	Bank	Entrance Pool	11	207	67	NFO	0
2/11/2024	12:00	Bank	Entrance Pool	10	62	63	NFO	0
2/12/2024	12:00	Bank	Entrance Pool	11	39	56	NFO	0
2/13/2024	12:00	Bank	Entrance Pool	14	18	56	NFO	0
2/14/2024	12:00	Bank	Entrance Pool	11	9	53	NFO	0
2/15/2024	12:00	Bank	Entrance Pool	14	6	45	NFO	0
2/16/2024	12:00	Bank	Entrance Pool	12	5	36	NFO	0
2/20/2024	12:00	Bank	Entrance Pool	14	311	4452	NFO	0
2/21/2024	12:00	Bank	Entrance Pool	14	218	1082	NFO	0
2/22/2024	12:00	Bank	Entrance Pool	14	70	258	NFO	0
2/23/2024	12:00	Bank	Entrance Pool	9	28	146	NFO	0
2/24/2024	12:00	Bank	Entrance Pool	13	14	95	NFO	0
2/25/2024	12:00	Bank	Entrance Pool	13	7	83	NFO	0
2/26/2024	12:00	Bank	Entrance Pool	13	9	74	NFO	0
2/27/2024	12:00	Bank	Entrance Pool	15	10	68	NFO	0
2/28/2024	12:00	Bank	Entrance Pool	15	15	63	NFO	0
2/29/2024	12:00	Bank	Entrance Pool	14	30	67	NFO	0
3/1/2024	12:00	Bank	Entrance Pool	13	31	52	NFO	0
3/2/2024	12:00	Bank	Entrance Pool	14	59	40	NFO	0
4/1/2024	12:00	Bank	Entrance Pool	16	87	155	NFO	0
4/2/2024	12:00	Bank	Entrance Pool	11	31	144	NFO	0
4/3/2024	12:00	Bank	Entrance Pool	12	12	160	NFO	0
4/4/2024	12:00	Bank	Entrance Pool	12	10	84	NFO	0
4/5/2024	12:00	Bank	Entrance Pool	14	10	71	NFO	0
4/6/2024	11:00	Bank	Entrance Pool	9	27	67	NFO	0
4/7/2024	10:30	Bank	Entrance Pool	11	42	65	NFO	0
4/8/2024	10:30	Bank	Entrance Pool	10	37	60	NFO	0
4/9/2024	11:00	Bank	Entrance Pool	10	39	53	NFO	0
4/10/2024	10:30	Bank	Entrance Pool	14	29	52	NFO	0
4/11/2024	12:00	Bank	Entrance Pool	15	13	47	NFO	0
4/12/2024	12:00	Bank	Entrance Pool	13	20	37	NFO	0
4/14/2024	12:00	Bank	Entrance Pool	11	121	65	NFO	0
4/15/2024	11:30	Bank	Entrance Pool	13	39	92	NFO	0
4/16/2024	12:00	Bank	Entrance Pool	11	12	93	NFO	0

Appendix 7 cont.

Date	Time	Method	Location	Temp (°C) ^a	Turbidity (NTU) ^a	Robles	Species ^b	Count
						Discharge (cfs) ^a		
4/17/2024	12:00	Bank	Entrance Pool	15	9	84	NFO	0
4/18/2024	12:00	Bank	Entrance Pool	17	6	84	NFO	0
4/19/2024	12:00	Bank	Entrance Pool	14	7	85	NFO	0
4/20/2024	12:00	Bank	Entrance Pool	17	7	100	NFO	0
4/21/2024	12:00	Bank	Entrance Pool	18	6	113	NFO	0
4/22/2024	12:00	Bank	Entrance Pool	15	5	170	NFO	0
4/23/2024	12:00	Bank	Entrance Pool	15	3	224	NFO	0
4/24/2024	12:00	Bank	Entrance Pool	14	5	215	NFO	0
4/25/2024	12:00	Bank	Entrance Pool	16	5	209	NFO	0
4/26/2024	12:00	Bank	Entrance Pool	17	4	199	NFO	0

^aEnvironmental conditions at time of survey.

^bOMY = *O. mykiss* and NFO = no fish observed.

Appendix 8. Monthly flow summary for Robles Fish Facility, reporting year 2023-2024.
 Note: As October 2025, some data is currently missing (M) in electronic form per VCPWA (see for details www.vcwatershed.net/hydrodata/).

**Ventura River Flow Assessment
 Reporting Year 2023 -2024**

Jul-23	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source Stream Mean Daily Flows				Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
1	23	11	34	20	27	0	27	16	42
2	22	11	33	20	21	0	21	24	46
3	22	11	33	20	22	0	22	22	44
4	22	11	33	20	22	0	22	21	43
5	22	10	32	20	22	0	22	21	43
6	21	10	31	20	22	0	22	20	42
7	21	10	31	20	22	0	22	20	42
8	21	10	31	20	22	0	22	21	42
9	20	10	30	20	22	0	22	20	42
10	20	9	29	20	22	0	22	18	40
11	19	9	28	20	23	0	23	13	36
12	19	9	28	20	23	0	23	11	34
13	19	9	28	20	22	0	22	9	31
14	18	9	27	20	23	0	23	5	28
15	18	9	27	20	22	0	22	2	24
16	17	8	25	20	22	0	22	0	22
17	17	8	25	20	22	0	22	0	22
18	17	8	25	20	22	0	22	0	22
19	17	8	25	20	22	0	22	0	22
20	16	8	24	20	21	0	21	0	21
21	16	8	24	20	21	0	21	0	21
22	16	7	23	20	20	0	20	0	20
23	16	7	23	20	20	0	20	0	20
24	15	7	22	20	19	0	19	0	19
25	15	7	22	20	18	0	18	0	18
26	15	7	22	20	18	0	18	0	18
27	15	7	22	20	17	0	17	0	17
28	14	6	20	20	17	0	17	0	17
29	14	6	20	20	16	0	16	0	16
30	14	6	20	20	16	0	16	0	16
31	14	6	20	20	16	0	16	0	16
Totals	555	263	818	620	644	0	644	244	887

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

 Represents change on date dictated by storm flow augmentation ramp-down schedule.

 Peak flow met BO definition of potential migration event.

 Fishway flow meter malfunction. Calculated fishway used.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

Aug-23	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source Stream Mean Daily Flows				Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck. (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
1	13	6	19	20	15	0	15	0	15
2	13	6	19	20	15	0	15	0	15
3	13	6	19	20	15	0	15	0	15
4	13	6	19	20	16	0	16	0	16
5	13	6	19	20	16	0	16	0	16
6	12	6	18	20	15	0	15	0	15
7	12	6	18	20	15	0	15	0	15
8	12	6	18	20	15	0	15	0	15
9	12	6	18	20	16	0	16	0	16
10	14	7	21	20	18	0	18	0	18
11	15	7	22	20	19	0	19	0	19
12	14	7	21	20	17	0	17	0	17
13	13	7	20	20	18	0	18	0	18
14	13	7	20	20	16	0	16	0	16
15	12	7	19	20	15	0	15	0	15
16	12	7	19	20	14	0	14	0	14
17	11	7	18	20	13	0	13	0	13
18	11	7	18	20	13	0	13	0	13
19	12	7	19	20	14	0	14	0	14
20	15	7	22	20	18	0	18	0	18
21	20	7	27	20	21	0	21	6	27
22	16	7	23	20	20	0	20	0.02	20
23	14	7	21	20	21	0	21	0	21
24	14	7	21	20	20	0	20	0	20
25	13	7	20	20	19	0	19	0	19
26	13	7	20	20	19	0	19	0	19
27	12	7	19	20	18	0	18	0	18
28	12	7	19	20	11	0	11	0	11
29	12	7	19	20	16	0	16	0	16
30	11	7	18	20	15	0	15	0	15
31	11	6	17	20	15	0	15	0	15
Totals	403	203	606	620	507	0	507	6	513

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

Sep-23	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source Stream Mean Daily Flows				Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck. (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
1	12	6	18	20	15	0	15	0	15
2	12	6	18	20	16	0	16	0	16
3	12	6	18	20	17	0	17	0	17
4	12	6	18	20	17	0	17	0	17
5	12	6	18	20	17	0	17	0	17
6	12	6	18	20	17	0	17	0	17
7	11	6	17	20	17	0	17	0	17
8	11	6	17	20	16	0	16	0	16
9	11	6	17	20	15	0	15	0	15
10	11	6	17	20	15	0	15	0	15
11	11	6	17	20	15	0	15	0	15
12	10	6	16	20	14	0	14	0	14
13	11	6	17	20	14	0	14	0	14
14	11	6	17	20	14	0	14	0	14
15	11	6	17	20	14	0	14	0	14
16	11	6	17	20	14	0	14	0	14
17	11	6	17	20	14	0	14	0	14
18	11	6	17	20	14	0	14	0	14
19	11	6	17	20	14	0	14	0	14
20	11	6	17	20	14	0	14	0	14
21	11	6	17	20	14	0	14	0	14
22	11	6	17	20	14	0	14	0	14
23	11	6	17	20	15	0	15	0	15
24	11	6	17	20	14	0	14	0	14
25	10	5	15	20	14	0	14	0	14
26	10	5	15	20	13	0	13	0	13
27	10	5	15	20	13	0	13	0	13
28	10	5	15	20	13	0	13	0	13
29	10	5	15	20	13	0	13	0	13
30	10	5	15	20	14	0	14	0	14
Totals	329	176	504	600	441	0	441	0	441

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). Discharge Estimated

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

Auxiliary pipe flow meter malfunction. Discharge estimated.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

Oct-23	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source Stream Mean Daily Flows				Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
1	10	5	15	20	14	0	14	0	14
2	10	5	15	20	14	0	14	0	14
3	10	5	15	20	14	0	14	0	14
4	10	5	15	20	13	0	13	0	13
5	9	5	14	20	12	0	12	0	12
6	9	5	14	20	11	0	11	0	11
7	9	5	14	20	10	0	10	0	10
8	8	5	13	20	10	0	10	0	10
9	8	5	13	20	10	0	10	0	10
10	9	5	13	20	10	0	10	0	10
11	9	5	13	20	10	0	10	0	10
12	9	5	13	20	10	0	10	0	10
13	8	5	13	20	10	0	10	0	10
14	8	5	13	20	10	0	10	0	10
15	8	5	13	20	10	0	10	0	10
16	8	5	13	20	10	0	10	0	10
17	8	5	12	20	9	0	9	0	9
18	8	5	12	20	10	0	10	0	10
19	8	5	12	20	10	0	10	0	10
20	7	5	12	20	10	0	10	0	10
21	7	4	12	20	10	0	10	0	10
22	8	4	12	20	10	0	10	0	10
23	8	4	12	20	10	0	10	0	10
24	8	4	12	20	11	0	11	0	11
25	8	M	M	20	11	0	11	0	11
26	8	M	M	20	11	0	11	0	11
27	8	M	M	20	11	0	11	0	11
28	8	M	M	20	11	0	11	0	11
29	8	M	M	20	11	0	11	0	11
30	8	M	M	20	11	0	11	0	11
31	8	M	M	20	11	0	11	0	11
Totals	258	115	317	620	334	0	334	0	334

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing

TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

Nov-23	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source Stream Mean Daily Flows				Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
1	8	M	M	20	10	0	10	0	10
2	7	M	M	20	10	0	10	0	10
3	7	M	M	20	10	0	10	0	10
4	7	M	M	20	10	0	10	0	10
5	7	M	M	20	10	0	10	0	10
6	7	M	M	20	10	0	10	0	10
7	7	M	M	20	10	0	10	0	10
8	7	M	M	20	10	0	10	0	10
9	8	M	M	20	10	0	10	0	10
10	8	M	M	20	10	0	10	0	10
11	8	M	M	20	10	0	10	0	10
12	8	M	M	20	10	0	10	0	10
13	7	M	M	20	10	0	10	0	10
14	7	M	M	20	10	0	10	0	10
15	9	M	M	20	10	0	10	0	10
16	11	M	M	20	12	0	12	0	12
17	10	M	M	20	12	0	12	0	12
18	9	M	M	20	12	0	12	0	12
19	9	M	M	20	11	0	11	0	11
20	9	M	M	20	11	0	11	0	11
21	9	M	M	20	10	0	10	0	10
22	8	M	M	20	10	0	10	0	10
23	8	M	M	20	10	0	10	0	10
24	8	M	M	20	10	0	10	0	10
25	8	M	M	20	10	0	10	0	10
26	8	M	M	20	11	0	11	0	11
27	8	M	M	20	10	0	10	0	10
28	8	M	M	20	10	0	10	0	10
29	8	M	M	20	11	0	11	0	11
30	8	M	M	20	11	0	11	0	11
Totals	245	0	0	600	311	0	311	0	311

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

Weir heavily impacted by sediment or periods of spill exceeded reliable accuracy of rating table, discharge estimated.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source	Stream Mean	Daily Flows		Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
Dec-23									
1	8	M	M	20	10	0	10	0	10
2	8	M	M	20	10	0	10	0	10
3	8	M	M	20	10	0	10	0	10
4	8	M	M	20	9	0	9	0	9
5	8	M	M	20	8	0	8	0	8
6	8	M	M	20	8	0	8	0	8
7	8	M	M	20	8	0	8	0	8
8	8	M	M	20	9	0	9	0	9
9	8	M	M	20	10	0	10	0	10
10	8	M	M	20	10	0	10	0	10
11	8	M	M	20	10	0	10	0	10
12	8	M	M	20	10	0	10	0	10
13	8	M	M	20	10	0	10	0	10
14	8	M	M	20	10	0	10	0	10
15	8	M	M	20	5	8	8	0	8
16	8	M	M	20	10	0	8	0	8
17	8	M	M	20	9	0	8	0	8
18	8	M	M	20	8	0.03	8	0	8
19	12	M	M	20	14	0.3	11	0	11
20	43	M	M	20	20	0	19	13	31
21	514	M	M	20	32	5	4357	258	4615
22	150	M	M	20	29	0	4013	151	4164
23	66	M	M	20	21	0	23	49	72
24	48	M	M	20	20	0	21	30	51
25	45	M	M	20	20	0	22	25	47
26	37	M	M	20	20	0	21	19	40
27	28	M	M	20	20	0	21	12	33
28	25	M	M	20	20	0	21	9	30
29	24	M	M	20	21	0	22	7	29
30	28	M	M	20	21	0	22	12	34
31	23	M	M	20	21	0	22	7	29
Totals	1185	0	0	620	447	14	8761	592	9353

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source	Stream Mean	Daily Flows		Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
Jan-24									
1	21	M	M	20	23	0	23	5	28
2	21	M	M	20	23	0	23	4	27
3	21	M	M	20	23	0	23	5	27
4	20	M	M	20	21	0	22	4	26
5	19	M	M	20	22	0	22	3	26
6	18	M	M	20	23	0	23	3	26
7	18	M	M	20	22	0	23	2	25
8	18	M	M	20	22	0	22	2	24
9	17	M	M	20	23	0	23	0	23
10	17	M	M	20	22	0	23	0	23
11	17	M	M	20	23	0	23	0	23
12	17	M	M	20	23	0	24	0	24
13	16	M	M	20	23	0	23	0	23
14	16	M	M	20	23	0	23	0	23
15	15	M	M	20	22	0	23	0	23
16	15	M	M	20	22	0	23	0	23
17	15	M	M	20	21	0	23	0	23
18	14	M	M	20	21	0	22	0	22
19	14	M	M	20	21	0	22	0	22
20	16	M	M	20	23	0	24	0	24
21	18	M	M	20	22	0	23	3	26
22	39	M	M	20	22	0	24	35	59
23	49	M	M	20	21	0	23	38	60
24	37	M	M	20	22	0	23	24	47
25	27	M	M	20	22	0	23	12	36
26	25	M	M	20	22	0	24	10	33
27	24	M	M	20	22	0	24	9	32
28	22	M	M	20	22	0	24	8	31
29	21	M	M	20	22	0	24	6	30
30	21	M	M	20	22	0	25	5	30
31	20	M	M	20	23	0	26	4	30
Totals	648	0	0	620	686	0	719	180	899

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Weir heavily impacted by sediment or periods of spill exceeded reliable accuracy of rating table, discharge estimated.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source	Stream Mean	Daily Flows		Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
Feb-24									
1	329	M	M	20	39	0	1164	215	1379
2	138	M	M	56	42	4	45	127	172
3	92	M	M	56	48	6	55	54	109
4	1920	M	M	50	42	5	2883	62	2945
5	1510	M	M	>171	43	35	1359	239	1597
6	667	M	M	171	37	76	165	154	319
7	511	M	M	100	46	75	60	306	366
8	411	M	M	82	48	49	97	338	435
9	331	M	M	74	51	24	75	317	392
10	281	M	M	68	49	18	67	254	321
11	245	M	M	62	49	14	63	210	272
12	217	M	M	56	46	10	56	168	224
13	195	M	M	56	48	8	56	156	212
14	167	M	M	50	49	4	53	141	194
15	147	M	M	40	45	0	45	135	180
16	138	M	M	30	36	0	36	130	166
17	130	M	M	30	32	0	31	122	153
18	136	M	M	30	33	0	31	124	155
19	1510	M	M	30	39	1	6187	192	6379
20	1130	M	M	>171	32	10	4452	118	4570
21	660	M	M	>171	49	76	1082	351	1433
22	501	M	M	171	54	76	258	466	724
23	415	M	M	100	51	51	146	390	536
24	358	M	M	82	49	27	95	341	436
25	318	M	M	74	49	18	83	291	373
26	289	M	M	68	49	15	74	259	333
27	264	M	M	62	49	12	68	231	299
28	243	M	M	56	49	8	63	214	277
29	226	M	M	56	50	10	67	192	260
Totals	13479	0	0	1730	1301	633	18914	6297	25211

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met commencement of new release schedule.

Fishway flow meter malfunction. Calculated fishway used.

Auxiliary pipe flow meter malfunction. Discharge estimated.

Weir heavily impacted by sediment or periods of spill exceeded reliable accuracy of rating table, discharge estimated.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source	Stream Mean	Daily Flows		Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
Mar-24									
1	247	M	M	40	49	3	52	249	300
2	316	M	M	30	43	0	40	385	425
3	285	M	M	30	36	0	33	338	371
4	251	M	M	30	36	0	33	280	313
5	231	M	M	30	36	0	33	254	287
6	243	M	M	30	36	0	34	269	303
7	233	M	M	30	36	0	33	253	286
8	214	M	M	30	36	0	34	228	262
9	203	M	M	30	37	0	35	214	248
10	194	M	M	30	37	0	35	201	237
11	186	M	M	30	34	0	33	191	224
12	178	M	M	30	31	0	31	185	216
13	171	M	M	30	31	0	31	175	206
14	164	M	M	30	31	0	31	169	200
15	157	M	M	30	31	0	31	159	190
16	152	M	M	30	31	0	31	155	186
17	146	M	M	30	31	0	32	145	176
18	141	M	M	30	31	0	32	139	171
19	137	M	M	30	31	0	32	134	165
20	132	M	M	30	31	0	32	128	160
21	128	M	M	30	31	0	32	122	154
22	124	M	M	30	31	0	32	118	150
23	128	M	M	30	31	0	32	121	153
24	120	M	M	30	31	0	32	112	144
25	114	M	M	30	31	0	32	107	139
26	109	M	M	30	30	0	31	96	128
27	106	M	M	30	31	0	31	93	124
28	103	M	M	30	31	0	31	90	121
29	113	M	M	30	28	0	45	81	126
30	443	M	M	30	42	7	312	415	726
31	633	M	M	171	51	50	549	523	1073
Totals	6102	0	0	1081	1063	60	1835	6128	7963

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source	Stream Mean	Daily Flows		Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
Apr-24									
1	429	M	M	171	56	74	155	422	577
2	342	M	M	100	54	49	144	308	452
3	294	M	M	82	48	19	160	239	399
4	269	M	M	74	49	11	84	253	337
5	251	M	M	68	48	8	71	235	307
6	230	M	M	62	48	7	67	202	269
7	218	M	M	56	49	6	65	189	255
8	202	M	M	56	49	5	60	178	238
9	190	M	M	50	49	2	53	168	221
10	181	M	M	50	50	1	52	156	209
11	173	M	M	40	45	1	47	155	202
12	167	M	M	30	37	0	37	158	195
13	206	M	M	30	39	0	38	202	240
14	245	M	M	74	51	7	65	271	337
15	207	M	M	100	50	20	92	219	311
16	172	M	M	82	49	21	93	166	258
17	157	M	M	74	49	17	84	148	232
18	150	M	M	68	49	17	84	134	218
19	144	M	M	62	49	17	85	126	211
20	137	M	M	56	49	25	100	105	205
21	131	M	M	56	49	31	113	85	198
22	127	M	M	50	53	54	170	40	210
23	123	M	M	50	57	75	224	0	224
24	119	M	M	50	57	75	215	0	215
25	116	M	M	40	58	75	209	0	209
26	111	M	M	30	57	75	199	0	199
27	106	M	M	30	57	75	192	0	192
28	103	M	M	30	57	75	184	0	184
29	99	M	M	30	58	76	174	0	174
30	96	M	M	30	58	76	167	0	167
Totals	5495	0	0	1781	1532	996	3482	4160	7643

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

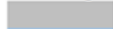
Auxiliary pipe flow meter malfunction. Discharge estimated.

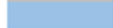
**Ventura River Flow Assessment
Reporting Year 2023 -2024**

May-24	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source Stream Mean Daily Flows				Robles Facility Mean Daily Flows				
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
1	93	M	M	30	57	75	160	0	160
2	90	M	M	30	59	76	155	0	155
3	88	M	M	30	57	75	150	0	150
4	87	M	M	30	55	74	146	0	146
5	86	M	M	30	54	74	144	0	144
6	81	M	M	30	52	58	135	0	135
7	78	M	M	30	54	33	130	0	130
8	75	M	M	30	52	33	125	0	125
9	73	M	M	30	52	29	118	0	118
10	71	M	M	30	53	26	115	1	115
11	70	M	M	30	54	23	109	0	109
12	70	M	M	30	55	22	107	0	107
13	68	M	M	30	55	21	104	0	104
14	65	M	M	30	57	20	103	0	103
15	63	M	M	30	56	20	103	0	103
16	60	M	M	30	55	20	101	0	101
17	59	M	M	30	54	20	99	0	99
18	57	M	M	30	53	19	97	0	97
19	55	M	M	30	51	19	93	0	93
20	54	M	M	30	54	17	92	0	92
21	52	M	M	30	59	12	89	0	89
22	51	M	M	30	56	16	90	0	90
23	51	M	M	30	51	11	78	8	86
24	50	M	M	30	52	4	66	16	82
25	49	M	M	30	51	6	68	13	80
26	48	M	M	30	50	4	63	14	78
27	47	M	M	30	50	5	64	11	75
28	45	M	M	30	51	6	64	9	73
29	44	M	M	30	51	6	63	9	72
30	43	M	M	30	51	6	60	9	70
31	43	M	M	30	51	5	57	10	68
Totals	1966	0	0	930	1661	835	3146	101	3247

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). **Discharge Estimated**

M=Missing TBD=To be determined

 Represents change on date dictated by storm flow augmentation ramp-down schedule.

 Peak flow met BO definition of potential migration event.

 Fishway flow meter malfunction. Calculated fishway used.

**Ventura River Flow Assessment
Reporting Year 2023 -2024**

Jun-24	(1)	(2)	(1) + (2)	B.O. Required Flow Release (cfs)	(3)	(4)	(5)	(6)	(5) + (6)
	Source Stream Mean Daily Flows		Robles Facility Mean Daily Flows						
	Matilija Ck D/S Dam* (cfs)	North Fork Matilija Ck.* (cfs)	Sum of Creek Flows (cfs)		Fishway Ladder (cfs)	Auxiliary Pipe (cfs)	VRNMO Weir (cfs)	Diversion Canal (cfs)	Total Inflow (cfs)
1	42	M	M	30	51	1	57	10	67
2	41	M	M	30	50	1	57	10	67
3	41	M	M	30	51	0.9	55	10	65
4	39	M	M	30	50	0.6	53	9	62
5	38	M	M	30	50	0.03	50	9	59
6	38	M	M	30	49	0	49	9	58
7	38	M	M	30	48	0	48	9	56
8	38	M	M	30	47	0	46	10	56
9	37	M	M	30	47	0	46	11	57
10	37	M	M	30	47	0	46	10	56
11	36	M	M	30	46	0	45	9	54
12	34	M	M	30	45	0	44	9	52
13	33	M	M	30	44	0	43	9	51
14	32	M	M	30	42	0	41	9	50
15	30	M	M	30	40	0	39	9	48
16	30	M	M	30	39	0	37	9	46
17	31	M	M	30	36	0	34	11	45
18	30	M	M	30	32	0	31	13	44
19	29	M	M	30	32	0	31	12	43
20	29	M	M	30	32	0	31	11	42
21	28	M	M	30	32	0	30	10	41
22	28	M	M	30	32	0	30	10	40
23	28	M	M	30	32	0	30	9	39
24	26	M	M	30	32	0	30	8	38
25	25	M	M	30	32	0	30	7	37
26	24	M	M	30	32	0	30	7	36
27	24	M	M	30	32	0	30	6	35
28	24	M	M	30	32	0	30	6	35
29	26	M	M	30	32	0	30	6	36
30	24	M	M	30	32	0	30	5	35
Totals	960	0	0	900	1194	4	1181	269	1451

*Flow data from Matilija Ck and North Fork Matilija Ck are preliminary and subject to change (VCWPD). Discharge Estimated

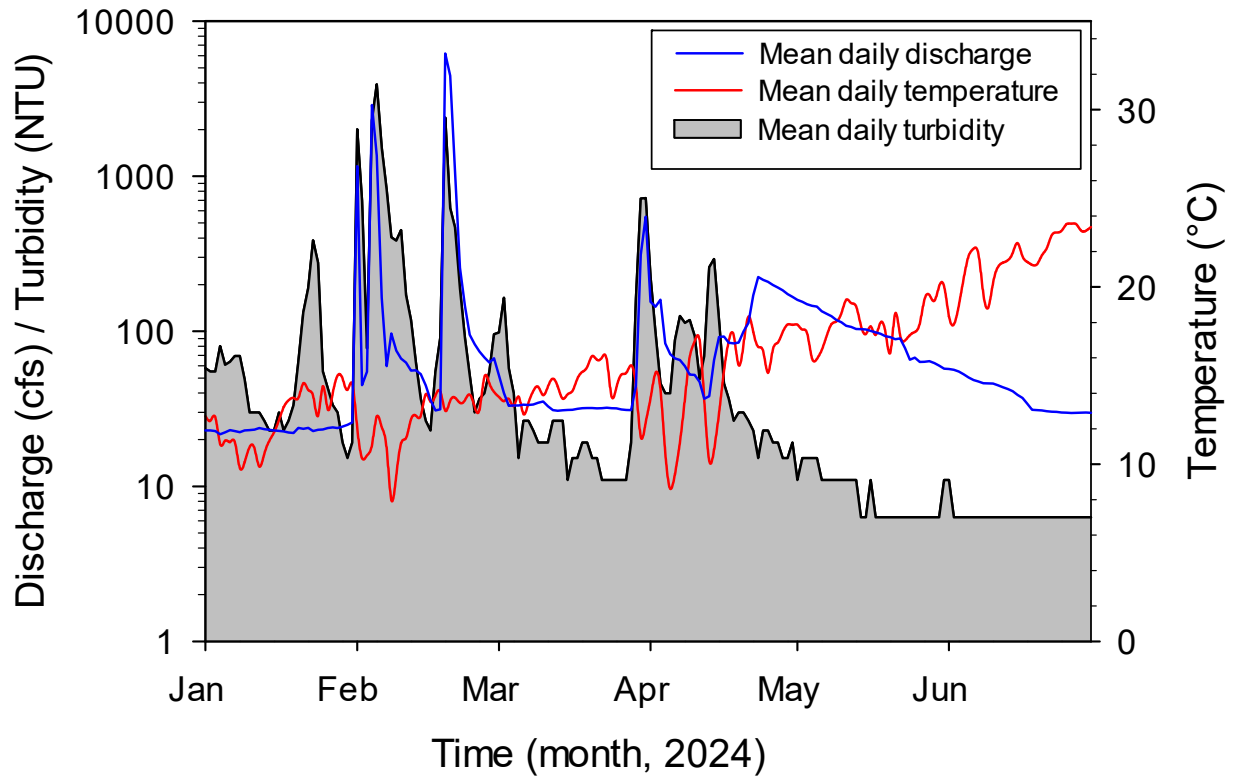
M=Missing TBD=To be determined

Represents change on date dictated by storm flow augmentation ramp-down schedule.

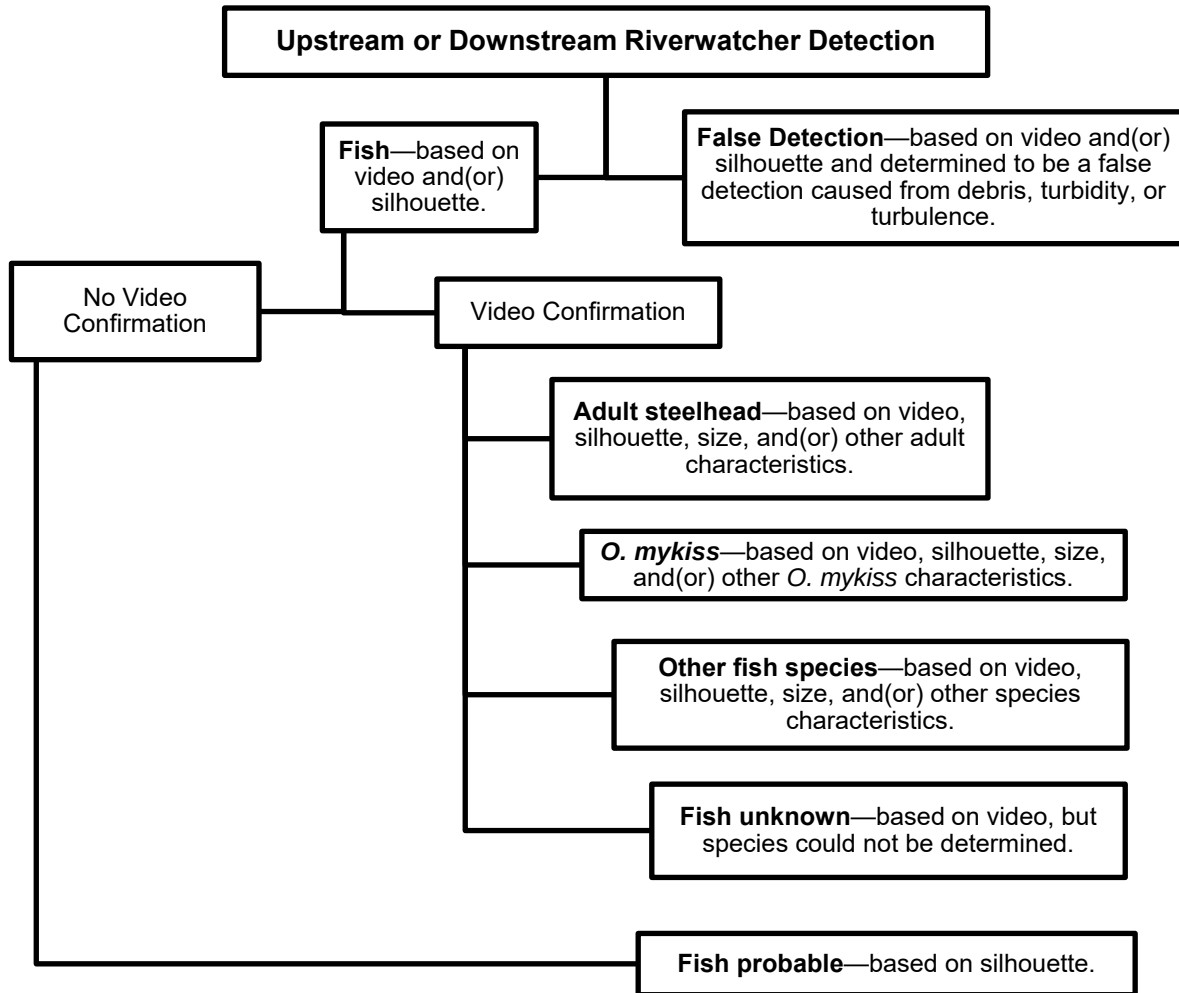
Peak flow met BO definition of potential migration event.

Fishway flow meter malfunction. Calculated fishway used.

Auxiliary pipe flow meter malfunction. Discharge estimated.



Appendix 9. Mean daily discharge, water temperature, and turbidity at the Robles Fish Facility during the 2024 fish passage season.



Appendix 10. Riverwatcher detection classification flow chart outlining decision pathways for upstream and downstream detections.

Appendix 11. Summary of Riverwatcher detections for the 2024 fish passage season.

	Upstream	Downstream
<i>O. mykiss</i>	7	11
Fish, non <i>O. mykiss</i>	0	0
Fish, unknown	0	0
Fish, probable	1	1
False detections	134	212
Total	142	224
Mean date - <i>O. mykiss</i>	4/25/2024	3/25/2024
Mean date - fish, non <i>O. mykiss</i>	n/a	n/a
Mean date - fish, unknown	n/a	n/a
Mean date - fish, probable	4/8/2024	2/26/2024
Mean time - <i>O. mykiss</i> (24h)	8:58	13:14
Mean time - fish, non <i>O. mykiss</i> (24h)	n/a	n/a
Mean time - fish, unknown (24h)	n/a	n/a
Mean time - fish, probable (24h)	11:53	14:05
Mean length ^a - <i>O. mykiss</i> (cm)	40.7	35.3
Mean length ^a - fish, non <i>O. mykiss</i> (cm)	n/a	n/a
Mean length ^a - fish, unknown (cm)	n/a	n/a
Mean length ^a - fish, probable (cm)	37.4	38.8
Mean daily temperature - <i>O. mykiss</i> (°C)	18.0	15.4
Mean daily temperature - fish, non <i>O. mykiss</i> (°C)	n/a	n/a
Mean daily temperature - fish, unknown (°C)	n/a	n/a
Mean daily temperature - fish, probable (°C)	13.6	13.1
Mean daily turbidity - <i>O. mykiss</i> (NTU)	7.5	7.9
Mean daily turbidity - fish, non <i>O. mykiss</i> (NTU)	n/a	n/a
Mean daily turbidity - fish, unknown (NTU)	n/a	n/a
Mean daily turbidity - fish, probable (NTU)	37.0	8.9
Mean daily turbidity - false detections (NTU)	51.2	50.4
Mean daily discharge - <i>O. mykiss</i> (cfs)	61.1	37.0
Mean daily discharge - fish, non <i>O. mykiss</i> (cfs)	n/a	n/a
Mean daily discharge - fish, unknown (cfs)	n/a	n/a
Mean daily discharge - fish, probable (cfs)	60.0	74.0
Mean daily discharge - false detections (cfs)	26.3	48.9

^aLength calculated by formula: $TL = 687.68 / (1 + \exp(-(D - 50.78)/23.97)) / 10$ where D is Riverwatcher measured body depth (mm).

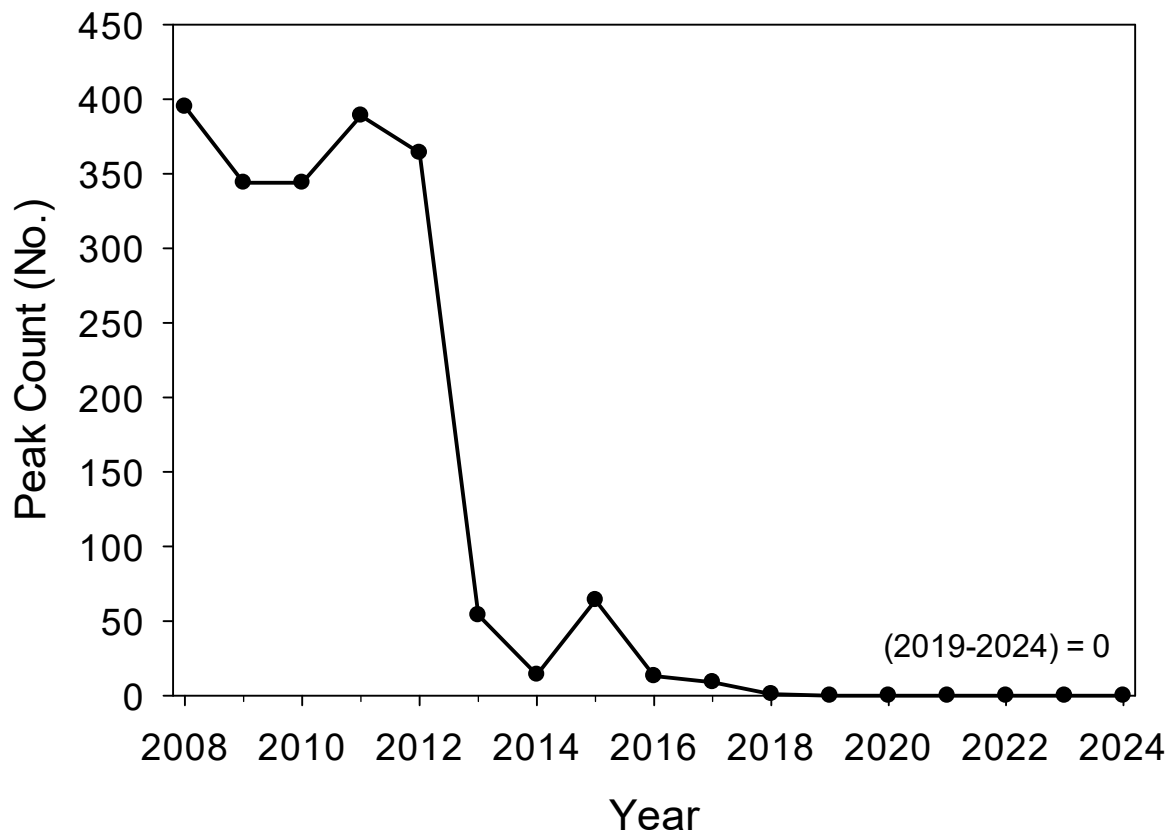
Appendix 12. Date, time, TL, direction, discharge, turbidity, and temperature at time of all upstream and downstream Riverwatcher detections that were determined to be fish.

Date	Time (24h)	Fish Category	Total Length ^a (cm)	Direction	Mean Daily Discharge (cfs)	Daily Turbidity (NTU)	Mean Daily Temperature (°C)
2/16/24	18:06	<i>O. mykiss</i>	30.3	Down	36.0	5	13.5
2/17/24	1:52	<i>O. mykiss</i>	35.3	Down	31.0	15	13.9
2/18/24	12:59	<i>O. mykiss</i>	37.4	Down	31.0	28	14.1
2/26/24	14:05	Fish Probable	38.8	Down	74.0	9	13.1
3/3/24	12:59	<i>O. mykiss</i>	33.8	Up	33.0	16	13.7
3/4/24	18:26	<i>O. mykiss</i>	30.3	Down	33.0	10	13.3
3/4/24	20:14	<i>O. mykiss</i>	26.8	Down	33.0	10	13.3
3/4/24	20:26	<i>O. mykiss</i>	30.3	Up	33.0	10	13.3
3/4/24	20:26	<i>O. mykiss</i>	37.4	Down	33.0	10	13.3
3/9/24	18:44	<i>O. mykiss</i>	35.3	Down	35.0	4	14.4
3/19/24	10:24	<i>O. mykiss</i>	42.3	Up	32.0	4	15.5
3/28/24	6:29	<i>O. mykiss</i>	37.4	Down	31.0	4	15.6
4/4/24	21:41	<i>O. mykiss</i>	24.8	Down	84.0	10	10.7
4/8/24	11:53	Fish Probable	37.4	Up	60.0	37	13.6
5/2/24	11:29	<i>O. mykiss</i>	37.4	Up	155.0	3	17.6
5/10/24	0:13	<i>O. mykiss</i>	44.3	Up	115.0	2	18.5
6/25/24	3:21	<i>O. mykiss</i>	44.3	Down	30.0	1	23.5
6/25/24	3:21	<i>O. mykiss</i>	44.3	Up	30.0	1	23.5
6/25/24	3:24	<i>O. mykiss</i>	49.3	Down	30.0	1	23.5
6/26/24	3:59	<i>O. mykiss</i>	53.1	Up	30.0	1	23.6

^aLength calculated by formula: $TL = 687.68 / (1 + \exp(-(D - 50.78)/23.97)) / 10$ where D is Riverwatcher measured body depth (mm).

Appendix 13. *O. mykiss* relative abundance survey index sites in the Ventura Basin.

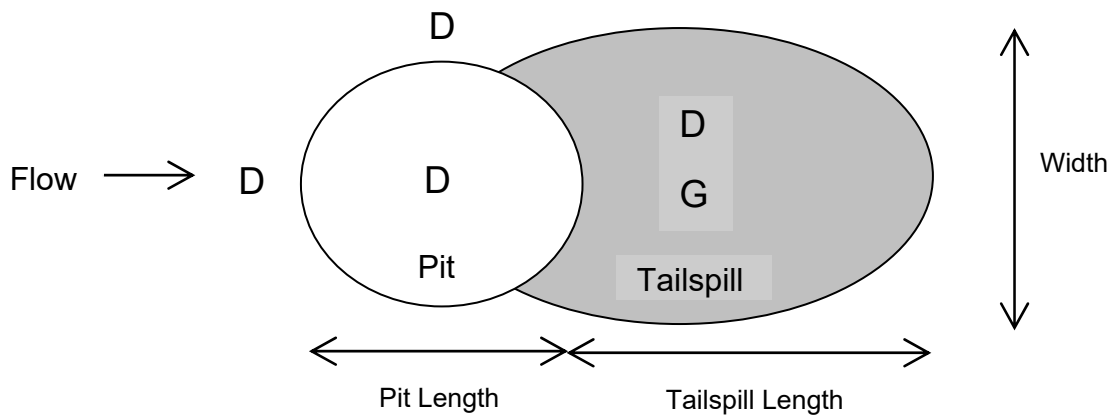
Site No.	Location	River km	Site	Lat.	Long.	Length (m)	Width (m)
1	Ventura River	0.9	Main Street pool	34.28126	-119.30887	25.1	10.0
		0.9	Main Street riffle	34.28164	-119.30893	34.0	8.0
2	Ventura River	9.4	Foster Park pool 1	34.35236	-119.30790	25.0	15.4
		10.0	Foster Park pool 2	34.35508	-119.30988	46.0	16.0
		9.7	Foster Park riffle	34.35308	-119.30877	45.0	11.0
3	Ventura River	13.0	San Antonio conf. pool 1	34.38042	-119.30752	33.0	22.0
		13.0	San Antonio conf. riffle	34.38011	-119.30755	42.0	14.0
		12.9	San Antonio conf. pool 2	34.37969	-119.30781	50.0	10.0
4	Ventura River	18.8	Hwy 150 pool 1	34.42643	-119.30220	43.3	14.0
		18.8	150 pool 2	34.42689	-119.30123	49.5	9.0
		18.7	Hwy 150 riffle	34.42576	-119.30258	43.6	11.0
5	Ventura River	22.1	Land Cons. pool 1	34.45342	-119.29314	50.1	19.1
		22.2	Land Cons. pool 2	34.45448	-119.29293	48.6	15.1
		22.1	Land Cons. Riffle	34.45411	-119.29315	44.6	18.8
6	Ventura River	23.2	Robles weir pools	34.46306	-119.29058	58.7	19.0
		23.3	Robles glide	34.46368	-119.29065	78.3	17.3
		23.4	Robles entrance pool	34.46446	-119.29058	39.8	21.8
		23.4	Fish ladder entrance box	34.46460	-119.29062	15.0	3.0
		23.5	Robles screenbay	34.46451	-119.29133	42.2	13.5
		23.5	Robles forebay	34.46503	-119.29053	33.0	17.2
7	San Antonio Cr.	0.2	Lower San Antonio pool 1	34.38088	-119.30542	16.0	6.0
		0.2	Lower San Antonio riffle	34.38098	-119.30711	20.2	3.5
		0.4	Lower San Antonio pool 2	34.38103	-119.30657	40.0	6.0
8	San Antonio Cr.	9.4	Upper San Antonio riffle	34.43268	-119.25090	25.0	5.0
		9.5	Upper San Antonio pool	34.43241	-119.25095	19.8	5.5
9	NF Matilija Cr.	0.1	Lower NF pool 1	34.48508	-119.30105	7.3	13.3
		0.1	Lower NF pool 2	34.48533	-119.30138	7.9	10.9
		0.2	Lower NF riffle	34.48523	-119.30198	17.8	8.0
10	NF Matilija Cr.	6.6	Upper NF pool	34.50956	-119.27520	29.0	9.0
		6.6	Upper NF riffle	34.50933	-119.27528	33.1	7.5
11	Matilija Cr.	0.3	Lower Matilija pool	34.48282	-119.30170	21.1	24.7
		0.3	Lower Matilija riffle	34.48302	-119.30154	15.9	8.0
12	Matilija Cr.	2.1	Upper Matilija pool	34.49190	-119.31599	89.4	13.7
		2.1	Upper Matilija riffle	34.49233	-119.31704	51.0	9.0
14	San Antonio Cr.	4.3	Fraser St. pool	34.40276	-119.28169	12.8	13.8
		4.4	Fraser St. riffle	34.40291	-119.28157	30.8	5.9
15	Ventura River	8.5	Bedrock pool	34.34539	-119.29931	50.0	17.0
		8.5	Bedrock pool riffle	34.34569	-119.29958	37.0	6.0



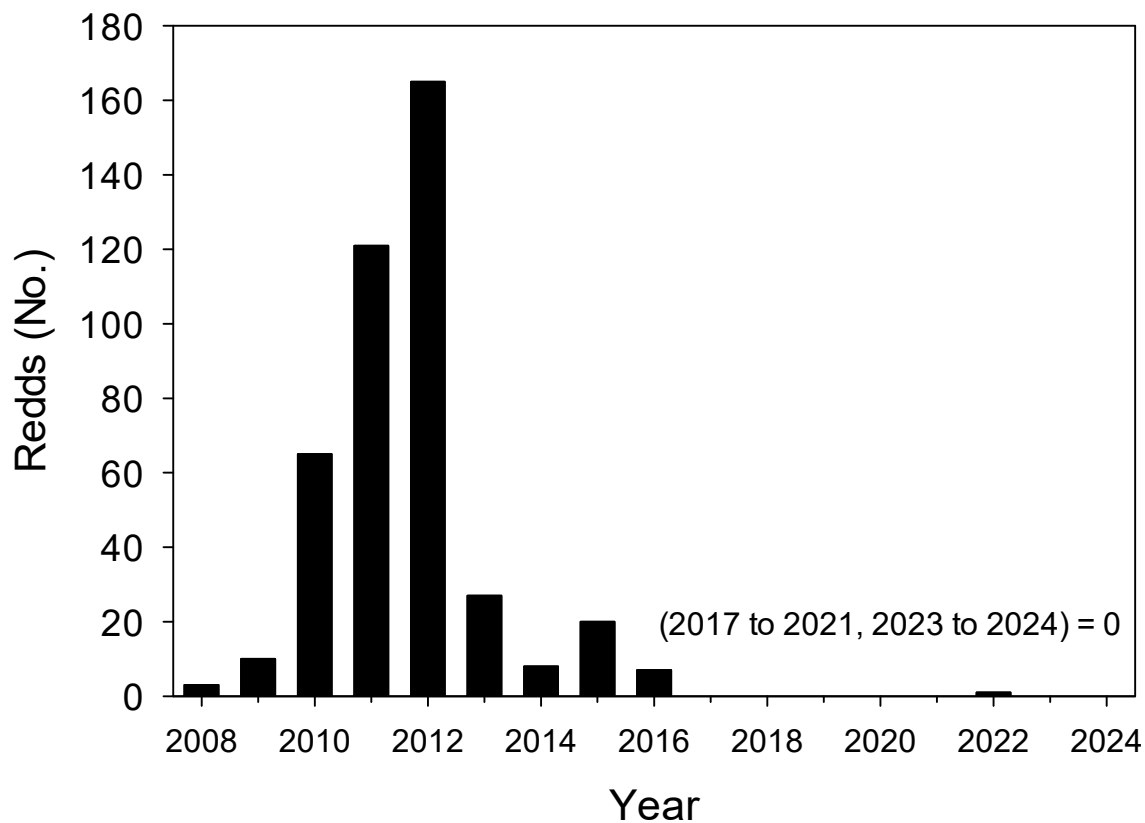
Appendix 14. Peak snorkel counts of *O. mykiss* during the period 2008-2024 at survey index sites in the Ventura Basin.

Appendix 15. *O. mykiss* spawning index sites in the Ventura Basin.

Site No.	Unit	Location	River km	Description	Lat.	Long.	Length (m)	Width (m)	Spawning Area (m ²)
24	1	Ventura River	0.8	Main St. Bridge	34.28085	-119.30862	220.0	10.0	2,200
2	1	Ventura River	7.9	Near Treatment Plant	34.34030	-119.29782	90.0	18.0	1,620
	2		8.1	Near Treatment Plant	34.34208	-119.29849	39.0	20.0	780
4	1	Ventura River	15.5	Near Santa Ana Blvd bridge	34.39950	-119.30853	26.7	8.0	214
5	1	Ventura River	18.7	Upstream of Hwy 150	34.42641	-119.30227	18.0	10.0	180
6	1	Ventura River	22.1	Land Conservancy pool tailout	34.45334	-119.29309	18.1	19.5	353
	2		22.2	Land Conservancy pool tailout	34.45445	-119.29298	16.3	14.7	240
7	1	Ventura River	23.3	Robles-1st weir pool	34.46334	-119.29061	15.4	23.9	368
	2		23.4	Robles tailout of entrance pool	34.46436	-119.29045	18.2	21.9	399
8	2	Ventura River	24.3	Upstream of Robles	34.46504	-119.29032	6.2	15.4	95
	3		23.4	Upstream of Robles forebay	34.46504	-119.29032	80.0	6.0	480
12	1	NF Matilija Cr.	0.7	Lower NF Matilija Cr.	34.48825	-119.30525	41.0	9.0	369
13	1	NF Matilija Cr.	6.6	Downstream of Wheeler Gorge	34.50911	-119.27501	23.0	8.0	184
	2		6.6	Downstream of Wheeler Gorge	34.50960	-119.27528	22.3	8.0	178
14	1	Matilija Cr.	1.9	Lake Matilija delta	34.49000	-119.31446	26.2	14.6	383
	2		2.1	Upstream of Lake Matilija	34.49198	-119.31645	15.0	10.0	150
	3		2.2	Upstream of Lake Matilija	34.49209	-119.31661	315	9.0	2,835
15	1	Matilija Cr.	8.4	End of Matilija Road	34.50456	-119.37449	20.0	19.0	380
17	1	Ventura River	9.3	DS of Foster to US reach	34.35069	-119.30463	1750	11.0	19,250
18	1	Ventura River	12.3	Casitas Springs	34.37354	-119.30877	60	12.0	960
	2		12.7	Casitas Springs	34.37712	-119.30721	230	9.0	2070
19	1	San Antonio Cr.	0.0	Mouth to end of Old Cr. Rd. reach	34.38030	-119.30738	2160	8.0	17,280
20	1	San Antonio Cr.	4.2	DS to US of Frasier St.	34.40197	-119.28237	180	8.0	1,440
21	1	San Antonio Cr.	7.8	Camp Comfort reach	34.42493	-119.26110	690	5.0	3,450
22	1	San Antonio Cr.	9.5	Upper San Antonio Cr. reach	34.43269	-119.25087	640	5.0	3,200
23	1	NF Matilija Cr.	0.1	Lower NF Matilija Cr.	34.48520	-119.30118	120	6.0	720
25	1	NF Matilija Cr.	4.1	Near Wheeler's Springs Reach	34.50826	-119.28955	300	4.5	1,350
26	1	NF Matilija Cr.	1.0	Downstream of NF gage bridge	34.49049	-119.30586	302	4.3	1,299
27	1	Matilija Cr.	5.7	Upstream Matilija hot springs	34.50030	-119.34993	105	8.0	840
Total =									63,266



Appendix 16. Diagram of *O. mykiss* redd measurements (cm), (D) = locations of depth measurements and (G) = location of gravel substrate sampling.



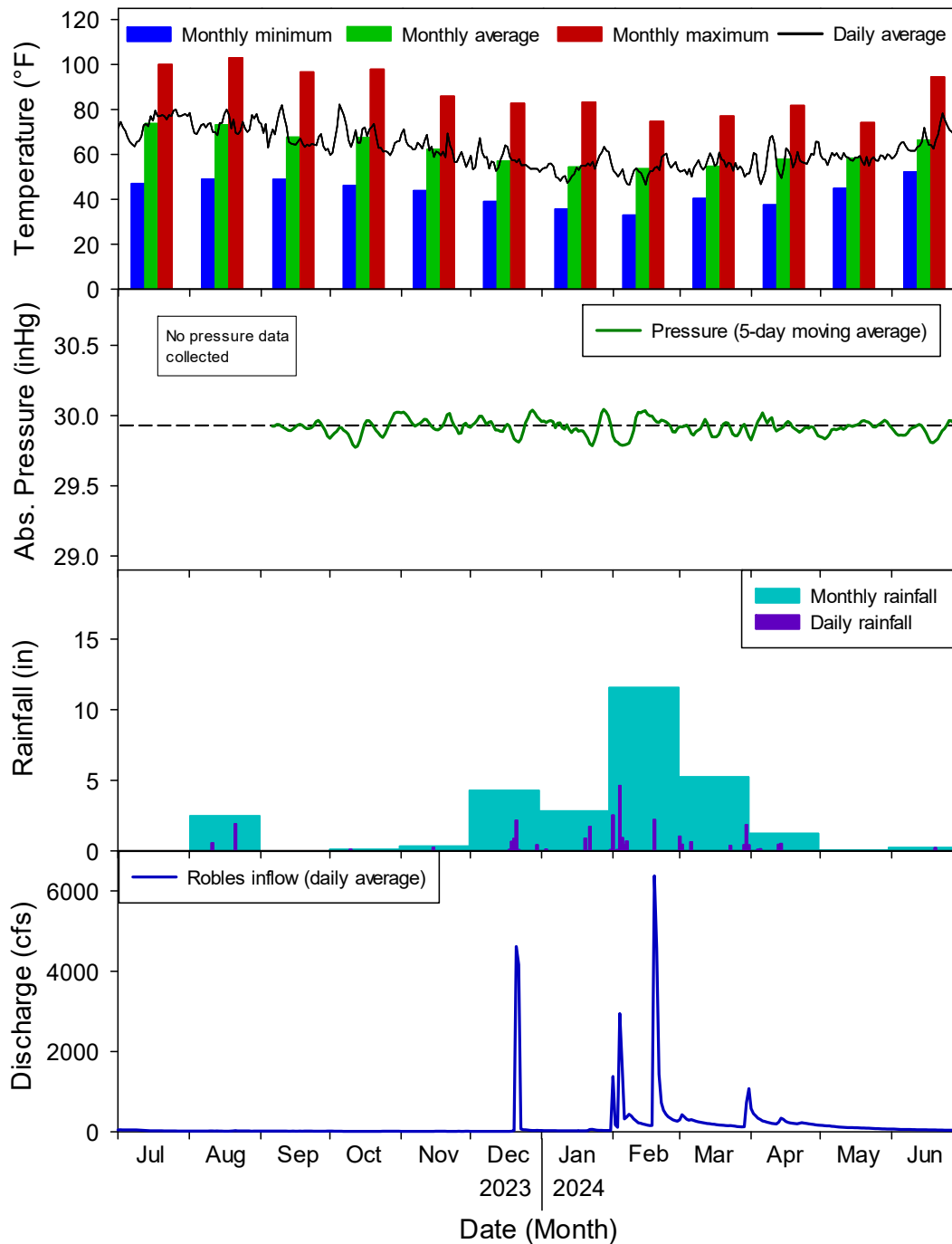
Appendix 17. Total number of *O. mykiss* redds counted at index spawning sites from 2008 through 2024 spawning years.

Appendix 18. Water quality monitoring sites and sampling summary.

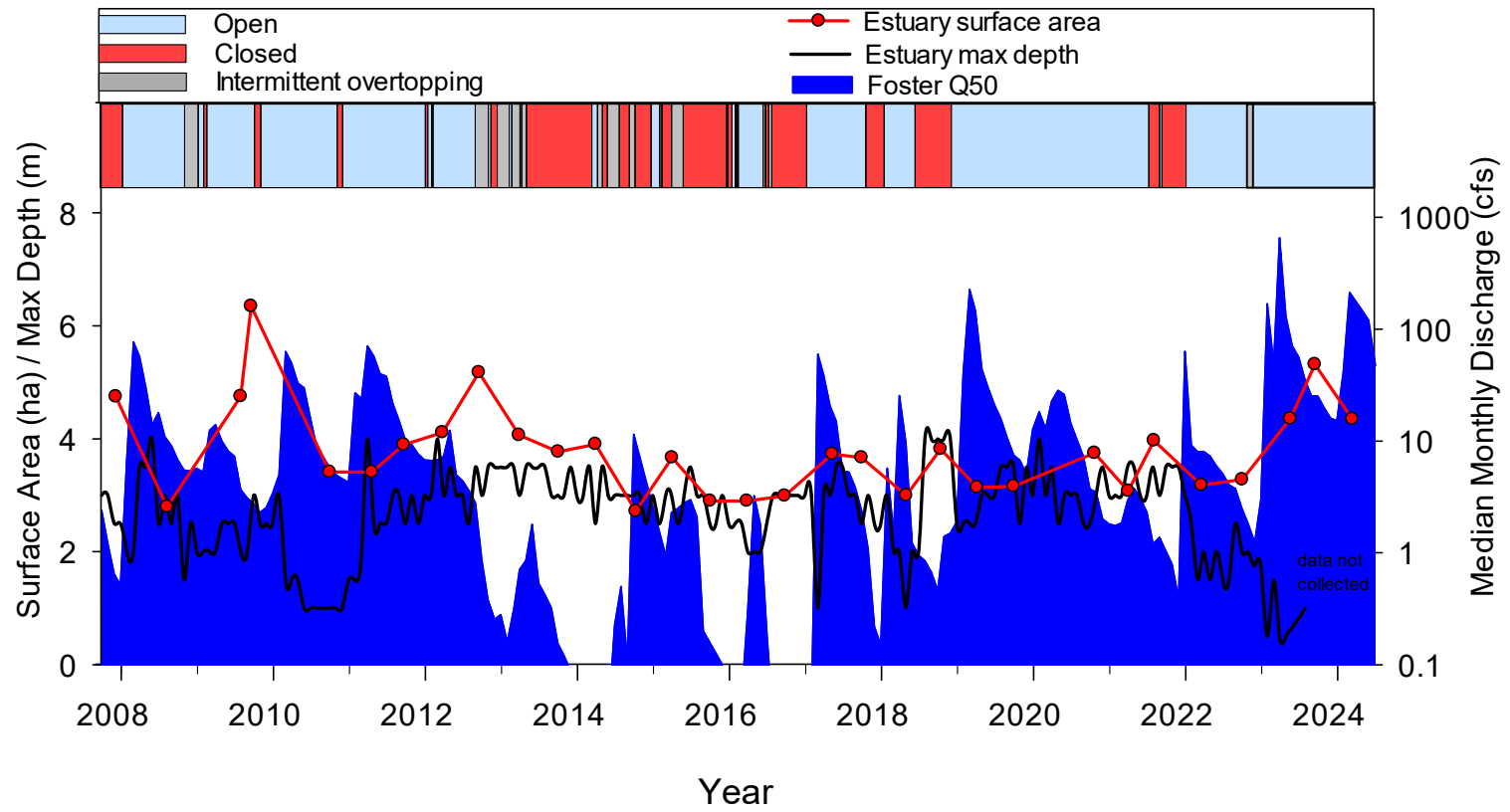
Site Number	Site Description	Site Location ^a	Sampling Method ^b	Sampling Type	Frequency
1	Estuary	V 0.3 km	Multiparameter	Grab	Monthly
2	Main St. Bridge	V 1.0 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
3	Foster Park	V 9.7 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
4	Santa Ana Blvd Bridge	V 15.5 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
5	Hwy 150 Bridge	V 18.7 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
6	Robles Dam	V 23.5 km	Temperature Multiparameter Turbidity Weather	Continuous Grab Continuous Continuous	30 min Monthly Hourly 30 min
7	North Fork Matilija	N 1.3 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
8	Below Matilija Dam	M 1.0 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
9	Above Matilija Dam	M 2.1 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
10	Middle Matilija	M 8.5 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
11	Lower San Antonio	S 0.3 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
12	Middle San Antonio	S 9.5 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
13	Lower Coyote	C 0.4 km	Temperature Multiparameter	Continuous Grab	30 min Monthly
14	Fraser St.	S 4.4 km	Temperature	Continuous	30 min

^aSite location is identified by the river system and kilometers from its confluence. C = Coyote Creek, M = Matilija Creek, N = North Fork Matilija Creek, S = San Antonio Creek, V = Ventura River.

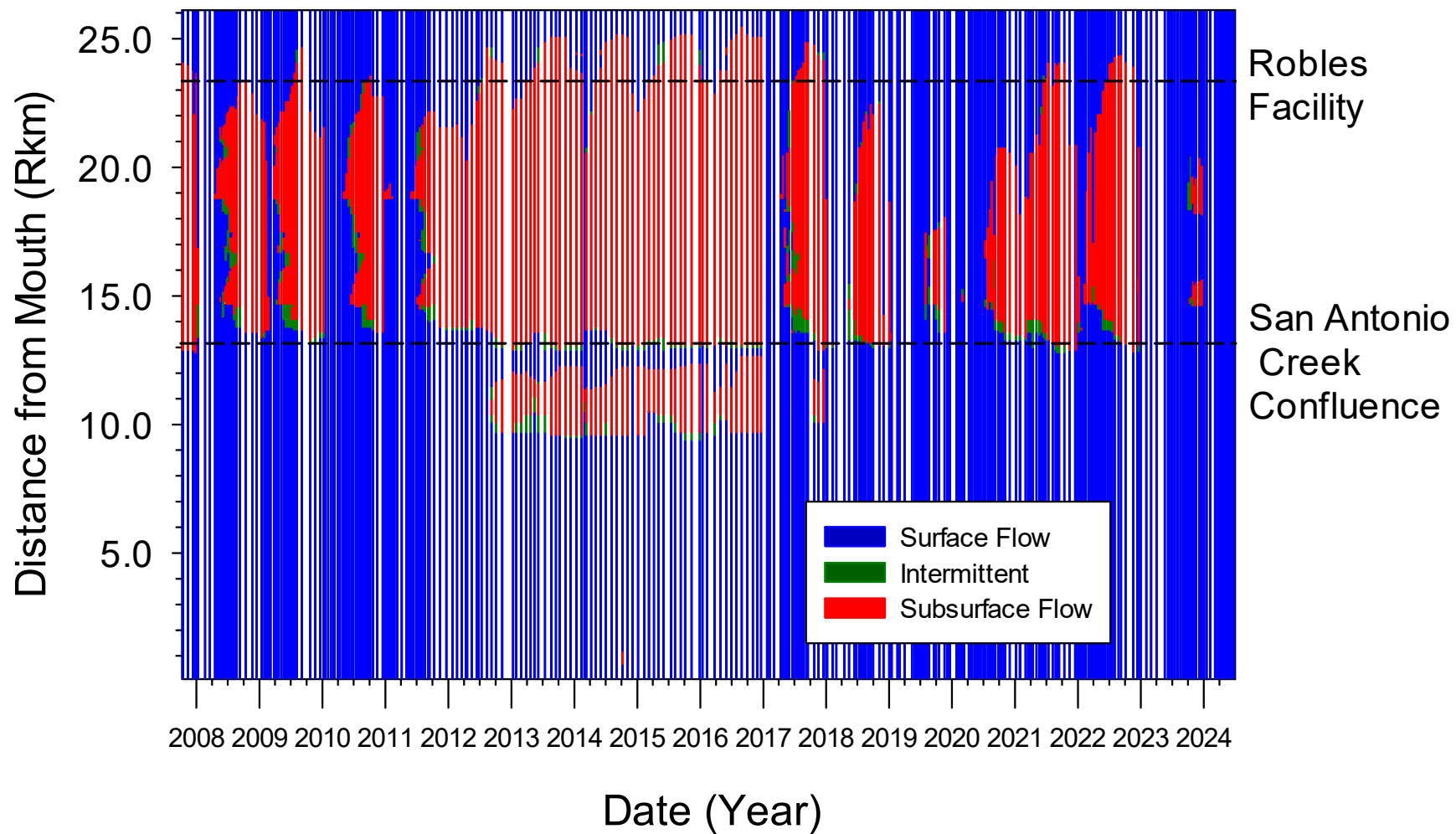
^bTemperature data were collected using programmable loggers. Multiparameter water quality probe was used to collected water quality data including: temperature, dissolved oxygen, conductivity, salinity, pH, turbidity (separate meter). Turbidity data was collected using a programmable logger.



Appendix 19. Summary of weather and discharge data at the Robles Fish Facility for the reporting period.



Appendix 20. Ventura River estuary/lagoon water depth, surface area, sandbar status, and discharge at Foster Park from 2008 to 2024.

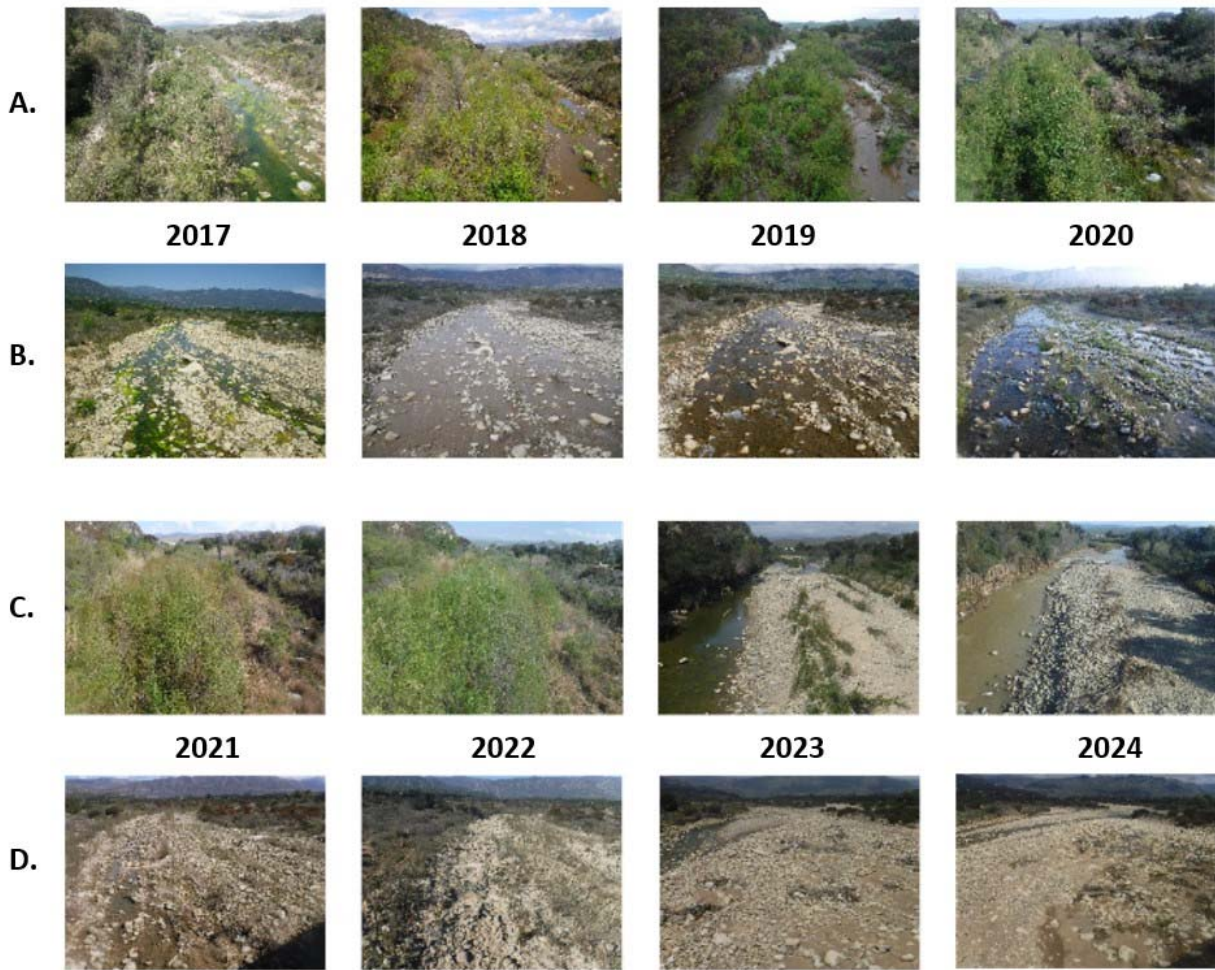


Appendix 21. Ventura River channel surface and subsurface flow status for the lower 26 km from 2007 to 2024.

Appendix 22. Photographic monitoring sites within the Ventura River basin.

Site Number	Site Description	Site Location ^a	Photo Direction	Frequency
1	Train bridge in estuary, east bank	V 0.3 km	Downstream	Biannual
2	Train bridge in estuary, west bank	V 0.3 km	Upstream Downstream	Biannual
3	Main Street Bridge	V 1.0 km	Upstream Downstream	Biannual
4	Shell Road Bridge	V 5.2 km	Upstream Downstream	Biannual
5	Casitas Vista Road Bridge (Foster Park)	V 9.7 km	Upstream Downstream	Biannual
6	Santa Ana Boulevard Bridge	V 15.5 km	Upstream Downstream	Biannual
7	Highway 150 Bridge	V 18.7 km	Upstream Downstream	Biannual
8	Robles Fish Passage Facility	V 23.5 km	Downstream	Biannual
9	Camino Cielo Road Bridge	V 25.7 km	Upstream Downstream	Biannual
10	Highway 33 Bridge at NF Matilija USGS Gauging Station	N 1.3 km	Upstream Downstream	Biannual
11	End of North Matilija Road	M 8.5 km	Upstream Downstream	Biannual
12	Highway 33 Bridge near Old Creek Road	S 0.3 km	Upstream Downstream	Biannual
13	Creek Road near Creek Lane	S 9.5 km	Upstream Downstream	Biannual
14	Santa Ana Road Bridge	C 0.4 km	Upstream Downstream	Biannual

^aSite location is identified by the river or tributary system and kilometers from its confluence.
C = Coyote Creek, M = Matilija Creek, N = North Fork Matilija Creek, S = San Antonio Creek, V = Ventura River.



Appendix 23. Multiple-year photo comparison of ephemeral/intermittent and perennial reaches of the Ventura River. Photo series Row A and Row C are looking upstream from the bridge near the Shell Rd exit off Hwy 33. Photo series Row B and Row D are looking upstream from Hwy 150 Bridge.

Flow Assessment at Robles Diversion and Fish Passage Facility
Standard and Critical Drought Protection Measures (Stage 3-4, 100k - 65k af)

Date: 2-2-24 Time: 8:50 Prepared by: Scott Lewis

Storm Peak Discharge			
	date	time	cfs
North Fork Matilija Cr	2-1	6:50	7313 (error)
Matilija Cr above dam		6:35	457/422
Matilija Dam		8:10	13/1095.53
Matilija Cr at Hot Spr.		8:05	993
Robles Canal		8:30-9:00	≈ 400
Robles Weir			≈ 900
Total Robles Inflow	2-1	↓	≈ 1300-1400
BO Defined Storm Event: <u>Y/N</u>			
BO Defined Overlapping Event: <u>Y/N</u>			

Current Discharge (Day 1 after peak)		
	time	cfs
North Fork Matilija Cr	8:20	1892 (error)
Matilija Cr above Reservoir	7:40	106/99
Matilija Dam	8:25	0/1099.76
Matilija Cr at Hot Springs	8:20	184
Robles Canal	8:50	150
Robles Weir	8:50	32
Total Robles Inflow	8:50	182

(VC/USGS)
(cfs/ft)

VR - Foster, VC 9:00 1827
 VR - Foster, USGS 9:10 2080
 SANC 6:45 612

Date Matilija Reservoir Filled: NA
 Count of Days: NA

Lake Casitas volume 173,286; 72.8%

CDPM Method:

- ☐ <30 days - M4 - Modified Overlapping Release
☐ ≥30 days - M9 - Matilija Download with Initial Release
☒ Standard Release
☐ Back-to-Back Release

M9 - Matilija Download						
Day	Date	Robles Release	Robles Inflow		Matilija Inflow	Matilija Outflow
			Canal	Weir		Elevation
1	2-2	56				
2	2-3	56				
3	2-4	50				
4	2-5	↓				
5	2-6					
6	2-7					
7	2-8					
8	2-9	↓				
9	2-10					
10	2-11	50				
11	2-12	40				
12	2-13	30				
13						
14						
15						
16						
17						
18						

Initial Release			
Day After Peak	Release (cfs)	Determining Inflow (cfs)	
1	171	334 to 871	
2	100	274 to 334	
3	82	247 to 274	
4	74	227 to 247	
5	68	207 to 227	
6	62	187 to 207	
7	56	167 to 187	
8	56	NA	
9	50	50 to 167	
10	50	NA	
11	40	NA	
12	30	NA	

Back-to-Back Release			
Day After Release	Release (cfs)	Determining Inflow (cfs)	
1	100	247 to 800	
2	74	204 to 247	
3	61	181 to 204	
4	54	150 to 181	
5	50	NA	
6	50	NA	
7	50	NA	
8	50	NA	
9	40	NA	
10	30	NA	

Comments:

Flow Assessment at Robles Diversion and Fish Passage Facility
Standard and Critical Drought Protection Measures (Stage 3-4, 100k - 65k af)

Date: 2-5-24 Time: 9:00 Prepared by: Scott Lewis

Storm Peak Discharge			
	date	time	cfs
North Fork Matilija Cr	2-4	19:15	31744/2562
Matilija Cr above dam		18:05	6225/6120*
Matilija Dam		19:45	8930/1100.17
Matilija Cr at Hot Spr.		-	error
Robles Canal		20:00	<20
Robles Weir		20:00	~ 7000*
Total Robles Inflow			
2-4		~20:00	~ 8K-11K
BO Defined Storm Event: <u>Y/N</u>			
BO Defined Overlapping Event: <u>Y/N</u>			

VR-Foster VC 20:55 11613
 VR-Foster us65 20:55 9650
 VR-OVSD 20:40 10263
 SANC 21:00 3519

* = errors

Lake Casitas volume _____

CDPM Method:

- ☐ <30 days - M4 - Modified Overlapping Release
☐ ≥30 days - M9 - Matilija Download with Initial Release
☒ Standard Release
☐ Back-to-Back Release

Date Matilija Reservoir Filled: NA
 Count of Days: NA

forebay peak 2-4 19:15 12.69ft

Current Discharge (Day 1 after peak)		
	time	cfs
North Fork Matilija Cr	7:20	6914/407
Matilija Cr above Reservoir	7:30	7/NA*
Matilija Dam	6:25	1893/1097.15
Matilija Cr at Hot Springs	6:30	1901
Robles Canal	8:00	398
Robles Weir	8:00	836*
Total Robles Inflow		
8:00		~ 2300

(rating/model)

> ~ 1900 + 400 = 2300

2300 - 398

VR-Foster VC 7:35 2844
 VR-Foster us65 7:15 3080
 VR-OVSD 7:35 2502
 SANC 7:45 1054

3080 - 1054 = 2026

M9 - Matilija Download

Day	Date	Robles Release	Robles Inflow		Matilija Inflow	Matilija Outflow	Matilija Elevation
			Canal	Weir			
1	2-5	7671	~ 2300				
2	2-6	171	~ 400-600				
3	2-7	100					
4	2-8	82					
5	2-9	74					
6	2-10	68					
7	2-11	62					
8	2-12	56					
9	2-13	56					
10	2-14	50					
11	2-15	40					
12	2-16	30					
13							
14							
15							
16							
17							
18							

Initial Release

Day After Release Peak	(cfs)	Determining Inflow (cfs)
1	171	334 to 671
2	100	274 to 334
3	82	247 to 274
4	74	227 to 247
5	68	207 to 227
6	62	187 to 207
7	56	167 to 187
8	56	NA
9	50	50 to 167
10	50	NA
11	40	NA
12	30	NA

Back-to-Back Release

Day After Release Peak	(cfs)	Determining Inflow (cfs)
1	100	247 to 600
2	74	204 to 247
3	61	181 to 204
4	54	150 to 181
5	50	NA
6	50	NA
7	50	NA
8	50	NA
9	40	NA
10	30	NA

Comments:

Flow Assessment at Robles Diversion and Fish Passage Facility
Standard and Critical Drought Protection Measures (Stage 3-4, 100k - 65k af)

Date: 2-20-24 Time: 9:30 Prepared by: Scott Lewis

Storm Peak Discharge			
	date	time	cfs
North Fork Matilija Cr	2-19	06:15	13800/1366
Matilija Cr above dam		06:00	2*/1110
Matilija Dam		08:50	3034/1097.75
Matilija Cr at Hot Spr.		—	error
Robles Canal		08:45	230
Robles Weir		08:45	9k/5595
Total Robles Inflow			
2-19		~09:00	~4500-5500
BO Defined Storm Event: ☒ N			
BO Defined Overlapping Event: Y ☒ N			

VR-Foster VC 08:35 7084
 VR-Foster usgs 09:05 5740
 SANC 08:05 3003

Current Discharge (Day 1 after peak)		
	time	cfs
North Fork Matilija Cr	07:35	6677/347
Matilija Cr above Reservoir	07:40	2*/451
Matilija Dam	07:35	1476/1096.90
Matilija Cr at Hot Springs	—	error
Robles Canal	08:10	264
Robles Weir	08:10	4164/1888
Total Robles Inflow		
08:10		~1800-2150

VR-Foster VC 08:00 2300
 VR-Foster usgs 07:15 2690
 SANC 08:15 899

* = errors
 Lake Casitas volume 196,927 (82.7%)

CDPM Method:

- ☐ <30 days - M4 - Modified Overlapping Release
☐ ≥30 days - M9 - Matilija Download with Initial Release
☒ Standard Release
☐ Back-to-Back Release

Date Matilija Reservoir Filled: NA
 Count of Days: NA

M9 - Matilija Download

Day	Date	Robles Release	Robles Inflow		Matilija Inflow	Matilija Outflow	Matilija Elevation
			Canal	Weir			
1	2-20	7671	~1800-2150				
2	2-21	7671	~1039		08:30		
3	2-22	171	~666		09:45		
4	2-23	100					
5	2-24	82					
6	2-25	74					
7	2-26	68					
8	2-27	62					
9	2-28	56					
10	2-29	56					
11	3-1	40					
12	3-2	30					
13							
14							
15							
16							
17							
18							

Initial Release

Day After Release Peak	(cfs)	Determining Inflow (cfs)
1	171	334 to 671
2	100	274 to 334
3	82	247 to 274
4	74	227 to 247
5	68	207 to 227
6	62	187 to 207
7	56	167 to 187
8	56	NA
9	50	50 to 167
10	50	NA
11	40	NA
12	30	NA

Back-to-Back Release

Day After Release Peak	(cfs)	Determining Inflow (cfs)
1	100	247 to 600
2	74	204 to 247
3	61	181 to 204
4	54	150 to 181
5	50	NA
6	50	NA
7	50	NA
8	50	NA
9	40	NA
10	30	NA

Comments:

Flow Assessment at Robles Diversion and Fish Passage Facility
Standard and Critical Drought Protection Measures (Stage 3-4, 100k - 65k af)

Date: 3-31-24 Time: 08:00 Prepared by: Scott Lewis

Storm Peak Discharge			
Location	date	time	cfs
North Fork Matilija Cr	3-30	04:45	7376/971
Matilija Cr above dam		03:40	1142
Matilija Dam		04:55	469/1096.18
Matilija Cr at Hot Spr.		04:40	876
Robles Canal		05:00	498
Robles Weir			1183
↓ ↓			
Total Robles Inflow	3-30	05:00	1681
BO Defined Storm Event: (Y) N			

Current Discharge (Day 1 after peak)		
Location	time	cfs
North Fork Matilija Cr	07:35	3943/293 (rating/mod)
Matilija Cr above Reservoir	07:40	940
Matilija Dam	07:25	325/1096.03 (cfs/ft)
Matilija Cr at Hot Springs	07:35	713
Robles Canal	07:45	514
Robles Weir		494
↓		
Total Robles Inflow	07:45	1008

VR-Foster VC 3-30 07:00 1533
 VR-Foster USGS 07:00 1600
 SanC 05:35 638

Lake Casitas volume 222,008 ac-ft (93.3%)

Release/CDPM method:

- ☐ <30 days - M4 - Modified Overlapping Release
☐ ≥30 days - M9 - Matilija Download with Initial Release
☒ Standard Release: ≥ 150 cfs and 2x inflow of any 3 days before peak.
☐ Back-to-Back Release: ≥ 150 cfs and 2x largest flow of last 3 days before peak (days 6-12 only).

Date Matilija Res. filled: NA
 Count of storage days: NA

M9 - Matilija Download							
Day	Date	Robles Release	Robles Inflow Canal	Matilija Weir	Matilija Inflow	Matilija Outflow	Matilija Elevation
1	3-31	171	new storm peak on 3-31				
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							

Initial Release			
Day After Release Peak	(cfs)	Determining Inflow (cfs)	
1	171	334 to 671	
2	100	274 to 334	
3	82	247 to 274	
4	74	227 to 247	
5	68	207 to 227	
6	62	187 to 207	
7	56	167 to 187	
8	56	NA	
9	50	50 to 167	
10	50	NA	
11	40	NA	
12	30	NA	

Back-to-Back Release			
Day After Release Peak	(cfs)	Determining Inflow (cfs)	
1	100	247 to 600	
2	74	204 to 247	
3	61	181 to 204	
4	54	150 to 181	
5	50	NA	
6	50	NA	
7	50	NA	
8	50	NA	
9	40	NA	
10	30	NA	

Comments:

Flow Assessment at Robles Diversion and Fish Passage Facility
Standard and Critical Drought Protection Measures (Stage 3-4, 100k - 65k af)

Date: 4-1-24 Time: 08:30 Prepared by: Scott Lewis

Storm Peak Discharge			
Location	date	time	cfs
North Fork Matilija Cr	3-31	00:40	4349/334
Matilija Cr above dam		00:30	1183/1100
Matilija Dam		00:30	562/1096.23
Matilija Cr at Hot Spr.		01:40	928
Robles Canal		01:45	529
Robles Weir			876
Total Robles Inflow	3-31	01:45	1405
BO Defined Storm Event: ☒ N			

VR-Foster VC 3-31 04:00 981
 VR-Foster USGS 03:30 1050
 SANVC 15:50 426

Current Discharge (Day 1 after peak)		
Location	time	cfs
North Fork Matilija Cr	07:50	2925/177
Matilija Cr above Reservoir	08:00	698/457
Matilija Dam	07:20	102/1095.93
Matilija Cr at Hot Springs	07:50	459
Robles Canal	08:30	451
Robles Weir		132
Total Robles Inflow	08:30	591

VR-Foster VC 08:30 314
 VR-Foster USGS 317
 SANVC 317

Lake Casitas volume 227,797 ac-ft (96.1%)

Release/CDPM method:

- ☐ <30 days - M4 - Modified Overlapping Release
☐ ≥30 days - M9 - Matilija Download with Initial Release
☒ Standard Release: ≥ 150 cfs and 2x inflow of any 3 days before peak.
☐ Back-to-Back Release: ≥ 150 cfs and 2x largest flow of last 3 days before peak (days 6-12 only).

Date Matilija Res. filled: NA

Count of storage days: NA

* errors

M9 - Matilija Download							Initial Release			
Day	Date	Robles Release	Robles Inflow Canal	Robles Inflow Weir	Matilija Inflow	Matilija Outflow	Matilija Elevation	Day After Release Peak	Release (cfs)	Determining Inflow (cfs)
1	4-1	171						1	171	334 to 671
2	4-2	100						2	100	274 to 334
3	4-3	82						3	82	247 to 274
4	4-4	74						4	74	227 to 247
5	4-5	68						5	68	207 to 227
6	4-6	62						6	62	187 to 207
7	4-7	56						7	56	167 to 187
8	4-8	56						8	56	NA
9	4-9	50						9	50	50 to 167
10	4-10	50						10	50	NA
11	4-11	40						11	40	NA
12	4-12	30						12	30	NA
13										
14										
15										
16										
17										
18										

Back-to-Back Release			
Day After Release Peak	Release (cfs)	Determining Inflow (cfs)	
1	100	247 to 600	
2	74	204 to 247	
3	61	181 to 204	
4	54	150 to 181	
5	50	NA	
6	50	NA	
7	50	NA	
8	50	NA	
9	40	NA	
10	30	NA	

Comments:

Flow Assessment at Robles Diversion and Fish Passage Facility
Standard and Critical Drought Protection Measures (Stage 3-4, 100k - 65k af)

Date: 4-14-24 Time: 09:50 Prepared by: Scott Lewis

Storm Peak Discharge			
Location	date	time	cfs
North Fork Matilija Cr	4-13	19:05	2894*
Matilija Cr above dam		18:15	602*/337
Matilija Dam		18:55	0/1093.28
Matilija Cr at Hot Spr.		19:55	353
Robles Canal		20:45	357
Robles Weir			52
↓ ↓			
Total Robles Inflow	4-13	20:45	409
BO Defined Storm Event: <u>0</u> /N			

VR Foster VC 4-13 22:00 176
 VR Foster USGS ↓ 22:00 174
 SANC ↓ 19:00 312

Current Discharge (Day 1 after peak)		
Location	time	cfs
North Fork Matilija Cr	09:20	2178*
Matilija Cr above Reservoir	08:40	460*/193
Matilija Dam	09:25	0/1093.28
Matilija Cr at Hot Springs	09:20	230
Robles Canal	09:50	196
Robles Weir		50
↓		
Total Robles Inflow	09:50	246

VR Foster VC 4-14
 VR Foster USGS ↓
 SANC

VC/USGS
(cfs/ft)

Lake Casitas volume 234,592 (98.6%)

Release/CDPM method:

- ☐ <30 days - M4 - Modified Overlapping Release
☐ ≥30 days - M9 - Matilija Download with Initial Release
☒ Standard Release: ≥ 150 cfs and 2x inflow of any 3 days before peak.
☐ Back-to-Back Release: ≥ 150 cfs and 2x largest flow of last 3 days before peak (days 6-12 only).

* errors

Date Matilija Res. filled: NA
 Count of storage days: NA

M9 - Matilija Download								Initial Release			
Day	Date	Robles Release	Robles Inflow		Matilija Inflow	Matilija Outflow	Matilija Elevation	Day After Release Peak	Release (cfs)	Determining Inflow (cfs)	
			Canal	Weir						to	
1	4-14	74						1	171	334	to 671
2	4-15	68						2	100	274	to 334
3	4-16	62						3	82	247	to 274
4	4-17	56						4	74	227	to 247
5	4-18	56						5	68	207	to 227
6	4-19	50						6	62	187	to 207
7	4-20	50						7	56	167	to 187
8	4-21	50						8	56		NA
9	4-22	50						9	50	50	to 167
10	4-23	50						10	50		NA
11	4-24	40						11	40		NA
12	4-25	30						12	30		NA
13											
14											
15											
16											
17											
18											

Back-to-Back Release			
Day After Release Peak	Release (cfs)	Determining Inflow (cfs)	
1	100	247	to 600
2	74	204	to 247
3	61	181	to 204
4	54	150	to 181
5	50		NA
6	50		NA
7	50		NA
8	50		NA
9	40		NA
10	30		NA

Comments:

Flow Assessment at Robles Diversion and Fish Passage Facility
Standard and Critical Drought Protection Measures (Stage 3-4, 100k - 65k af)

Date: 4-15-24 Time: 08:00 Prepared by: Scott Lewis

Storm Peak Discharge			
Location	date	time	cfs
North Fork Matilija Cr	4-14	15:50	3502*
Matilija Cr above dam		14:40	651*/397
Matilija Dam		16:05	0/1093.26
Matilija Cr at Hot Spr.		16:05	438
Robles Canal		16:45	423
Robles Weir			79
↓ ↓			
Total Robles Inflow	4-14	16:45	500
BO Defined Storm Event: <u>7</u> N			

VR Foster VC 4-14 17:00 271
 VR Foster us6s ↓ 16:50 265
 SANC ↓ 16:10 331

Current Discharge (Day 1 after peak)		
Location	time	cfs
North Fork Matilija Cr	07:35	2382*/62 (rating/Mm)
Matilija Cr above Reservoir	07:10	517*/248 (VC/us6s)
Matilija Dam	07:25	0/1093.29 (ft/s/ft)
Matilija Cr at Hot Springs	07:35	290
Robles Canal	08:17	236
Robles Weir		81
↓		
Total Robles Inflow	08:17	317

VR Foster VC 4-13 200
 VR Foster us6s ↓ 176
 SANC ↓ 283

Lake Casitas volume 235,119 (99.8%)

Release/CDPM method:

- ☐ <30 days - M4 - Modified Overlapping Release
☐ ≥30 days - M9 - Matilija Download with Initial Release
☒ Standard Release: ≥ 150 cfs and 2x inflow of any 3 days before peak.
☐ Back-to-Back Release: ≥ 150 cfs and 2x largest flow of last 3 days before peak (days 6-12 only).

* errors

Date Matilija Res. filled: NA
 Count of storage days: NA

M9 - Matilija Download									Initial Release			
Day	Date	Robles Release	Robles Inflow		Matilija Inflow	Matilija Outflow	Matilija Elevation		Day After Peak	Release (cfs)	Determining Inflow (cfs)	
1	4-15	100							1	171	334 to 671	
2	4-16	82							2	100	274 to 334	
3	4-17	74							3	82	247 to 274	
4	4-18	68							4	74	227 to 247	
5	4-19	62							5	68	207 to 227	
6	4-20	56							6	62	187 to 207	
7	4-21	56							7	56	167 to 187	
8	4-22	50							8	56	NA	
9	4-23	50							9	50	50 to 167	
10	4-24	50							10	50	NA	
11	4-25	40							11	40	NA	
12	4-26	30							12	30	NA	
13									Back-to-Back Release			
14									Day After Peak	Release (cfs)	Determining Inflow (cfs)	
15									1	100	247 to 600	
16									2	74	204 to 247	
17									3	61	181 to 204	
18									4	54	150 to 181	
									5	50	NA	
									6	50	NA	
									7	50	NA	
									8	50	NA	
									9	40	NA	
									10	30	NA	

Comments: