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2016-2025 Salinas River Stream Maintenance Program Long-Term Effectiveness Report

A first report review to evaluate the Stream Maintenance Program's overall effectiveness (Water Quality Certification No. 32716WQ02)

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A. INTRODUCTION

BACKGROUND

Section 401 of the Clean Water Act is the main regulatory framework governing the discharge of pollutants into waters of the United States. Along with the U.S. Environmental Protection Agency, the State Water Resources Control Board and the Central Coast Regional Water Quality Control Board ("Central Coast Water Board") have primary responsibility for developing and implementing procedures for regulation under Section 401. Specifically, the Central Coast Water Board, has established procedures for when a state water quality certification must be obtained for a project or program to comply with all applicable water quality standards, limitations, and restrictions. This document, along with various supporting documents and supplements, is used to ensure water quality standards and other pertinent requirements are met for new and ongoing certifications.

The Monterey County Water Resources Agency ("MCWRA") submitted a Water Quality Certification ("Certification") application to the Central Coast Water Board for the Salinas River Stream Maintenance Program ("SMP" or "Program"). The Certification was necessary as the MCWRA proposed to conduct stream maintenance activities in up to 123 secondary channel areas, two selective treatment areas, and three tributary maintenance areas. The areas are defined "Waters of the State" and the intention to dredge or fill such waters, required a Certification to protect water quality and associated beneficial uses from SMP activities including vegetation and sediment management. On August 31, 2016, the Central Coast Water Board issued a Technically Conditioned Water Quality Certification (Number 32716WQ02) for the 2016-2025 Salinas River SMP, Monterey County. The Certification remains in effect until November 30, 2025 provided that compensatory mitigation implementation, monitoring, and reporting requirements and all conditions are followed by MCWRA, the Permittee. In support of the Certification, the Central Coast Water Board has asked to assess the implementation and effectiveness of the SMP after five years, and can propose modifications for the second five-year term, if necessary.

To support effectiveness monitoring the MCWRA developed a Long-Term Effectiveness Plan ("Plan"). The purpose of the Plan is to create a framework to evaluate the SMP's overall effectiveness at achieving projected flood reduction benefits while also protecting beneficial uses and habitat function. A central concept for the Plan is to identify both project- and watershed-based actions that can be implemented to optimize the overall effectiveness of the Program. The Plan provides an outline of the data to be *collected*, the monitoring activities that will be *conducted*, and the analyses to be performed to *evaluate* the Program's effectiveness. For watershed purposes, there is a need to better understand the role of the SMP on watershed health and function over the long-term. This Long-Term Effectiveness Report ("Effectiveness Report") follows the guidelines of the Plan in gathering such information for evaluation and recommendations.

PROGRAM OVERVIEW

The Salinas River SMP is a program involving a cooperative planning and design process with agencies, stakeholders, landowners, and growers. The SMP is a coordinated approach to vegetation and sediment management that is conducted voluntarily by individual property owners, growers, and municipalities along the main stem of the Salinas River (River miles 2 to 94) and three select tributaries: Gonzales Slough, Bryant Canyon Channel, and San Lorenzo Creek. The SMP is a collaborative and science-based approach that allows participants to manage vegetation and sediment in specific Maintenance Areas ("MAs") along the river to maximize flood flow capacity, minimize bank erosion and minimize environmental effects. The SMP helps to protect flooding during and after moderate and large storm

events while enhancing habitat value. The MCWRA, the Resource Conservation District of Monterey County ("RCDMC") and the Salinas River Stream Maintenance Program River Management Unit Association ("RMU Association") developed the current SMP.

The Program area is divided into seven River Management Units ("RMUs") with designed MAs within each RMU. The MAs have been identified and permitted based on available data such as topography, flood flows, and vegetation communities.

Participants can work only in the designated MAs. The design and permitting process for the current SMP refined objectives to ensure maintenance activities accomplish the following:

1. Provide a level of flood risk reduction for the farming community that is meaningful and can be modeled and measured through reductions in water surface elevation, depth and velocity of inundation, and/or duration of inundation.

2. Promote natural hydrologic and geomorphic processes that support steelhead migration and floodplain use, while reducing the impacts of potential stressors such as stream velocity, stream temperature, and floodplain stranding of fish; and,

3. Protect, enhance, create and/or manage habitat types and structures across the Salinas River floodplain to support a suite of native wildlife species, while reducing stressors such as invasive plant infestations and avoiding loss of uncommon, important riparian and wetland habitat types.

The SMP was developed to address flood risk reduction from flows during the predicted 5-year (moderate) and 10-year (large) storm events which in the Salinas River can be up to 45,000 cfs. Studies conducted during the design of the Program noted that program activities and benefits would be primarily localized within the individual MA or the RMU.

The SMP presents protocols accepted which employ a multi-benefit approach for stream maintenance that enhances conveyance capacity of the river corridor by mimicking the sandy-bottomed river's natural, braided form in a manner that protects fish and wildlife habitat. The SMP involves clearing vegetation (often invasive weeds like *Arundo donax*) through mowing and discing and smoothing or removing sediment to open and maintain secondary channels on the river floodplain. These channels are designed to convey high flows during and after large storm events, reducing the risk of flooding onto adjacent farmlands and decreasing pressure on levees. MAs connect with the main stem of the river at their upstream and downstream ends but are at higher elevation than the low flow river channel.

Mitigation for impacts to native riparian vegetation is through *Arundo donax* removal. Participants must also plant trees to mitigate for large tree removal. Biological surveys and monitoring are required for the SMP.

There has been agreement that a "one-size-fits-all" approach for characterizing stream maintenance is limited and that the detailed local methods of the MAs and RMUs concepts are needed. All protocols established in the Certification are important measures of local-specific methods and effectiveness reporting can assist in the advancement of this presentation to support designated MAs.

B. EFFECTIVENESS ASSESSMENT

The goal of this first Effectiveness Report is to analyze the relevant data collected and monitoring conducted, with an emphasis on individual MAs and RMUs, for Years 1-5 of the Program. The data and monitoring are broad in scope and can be categorized by the objectives of:

A. Effectiveness Monitoring
B. Design Verification Monitoring
C. Flood Reduction Monitoring
D. Biological Function Monitoring
E. Watershed Assessment

The key goals and objectives of this report include:

OBJECTIVES

- To obtain pre- and post-activity topographic surveys of one MA for each RMU to monitor sediment transport functions
- To obtain information on MA activation during moderate flow events $\geq$ 5-year
- To monitor stream gage and aerial imagery after moderate flow events $\geq$ 5-year
- To document extent of flooding after larger flow events $\geq$ 10-year
- To obtain high water mark elevation after larger flow events $\geq$ 10-year
- To monitor USGS data and receive velocity data for larger flow events $\geq$ 10-year
- To perform an Arundo transect study in select mitigation areas
- To sample and monitor Arundo mitigation areas for success criteria
- To sample and monitor tree planting sites for success criteria
- To record any critical species into the California Natural Diversity Database ("CNDD")
- To describe the status of studies for abundance of South Central CA Coast Steelhead trout
- To conduct a camera trapping study to compare wildlife observed in maintained areas vs. non-maintained
- To assess interactions of the Program and to provide for improvement of known watershed issues over time
- To identify Program implementation actions that provide watershed scale benefits in coordination with other river management projects and programs

ANALYSES TO BE PERFORMED

- Inspect the topographic survey data before and after moderate flow events
- Inspect model prediction of MA activation vs. outcome after moderate flow events
- Analyze observed extent, time of inundation, and depth of flooding vs characteristics predicted by the hydraulic model for larger flow events
- Assess flooding patterns and conclude if maintenance activities reduced flooding for larger flow events
- Compare trends in plant species composition, diversity, and coverage density to consider biological benefits of mitigation
- Record and compare wildlife species diversity, abundance, and movement between maintained and unmaintained sites
- Analyze the effects of current stream maintenance activities in the watershed
- Determine how to optimize the Program and future efforts as part of other river management planning efforts

PROCESS

MCWRA staff worked closely with RCDMC staff and outside consultants during the preliminary development of the Long-Term Effectiveness Plan. Various disciplines were incorporated into the planning process to make proper and targeted findings needed to develop a comprehensive Plan. The Plan was originally submitted in May 2017 and approved in May 2019. This first Effectiveness Report was also prepared through a similar team effort. The Effectiveness Report utilizes data collected throughout the first 5-years of the SMP for a more comprehensive review and analysis of the Program.

C. REVIEW AND DISCUSSION

PROGRAM PARTICIPATION YEARS 1 – 5

In Years 1 – 5, the overall participation level and effort has varied by RMU. As predicted, the first year had the most participation by acreage and areas continued to be retreated on an annual basis. Some work had already begun under a pilot program in 2014 and 2015 which helped to inform the process of the current SMP. The MCWRA and the RCDMC have worked collaboratively with Program participants through the RMU Association. These efforts have resulted in continued, sustained participation in the Program. The amount of work conducted (as measured in MA acres) remains at approximately 18% of the total maximum allowed under the Certification. This is calculated as the combined total acreage from prior phase 1 of 37.9 acres and the new initial in Years 1 – 5 of 122.4 acres in comparison to the Certification's not to exceed acreage of 863.7 acres. Table 1 is a summary of the Program participation and acreage to date.

TABLE 1. PROGRAM PARTICIPATION BY YEAR AND RMU.

Year	MA total	RMU	Total Area (acres)	Total new (acres)
Prior Ph 1	-	-	37.9	37.9
2016	23	1, 3, 4, 5, 6	108.5	70.6
2017	17	1, 3, 4 6	98.6	22.1
2018	17	1, 2, 3, 4, 5, 6	92.7	2.1
2019	22	1, 2, 3, 4, 6	120.4	21.4
2020	24	1, 2, 3, 4, 6	124.4	6.17

DATA COLLECTION AND MONITORING ACTIVITIES

The purpose of the Plan and its tasks are to identify Program- and watershed-based actions that MCWRA can implement to optimize project effectiveness and watershed health and function. Related data collection efforts have been initiated and are continuing for long-term application and analysis. It is unknown if the flow events to monitor some of the results will be triggered during the 10-year permit term. However, in the near-term data and monitoring can be useful for defining watershed monitoring efforts and providing interpretations for broader beneficial measures. This will then be used by watershed planners and others within the Salinas River Basin, for future SMP-activities.

ANALYSIS

The utility of a long-term effectiveness report to provide analysis and assessment varies based on several criteria. In general, the choice of data collection and monitoring methodology was made following careful consideration of the specific effectiveness objectives, the necessary accuracy and

precision of the data, and the available time and resources for the monitoring. More robust methods could be selected when the accuracy and precision of the data are critical, such as longer-term monitoring or the need for more detailed watershed functional assessment. Part of defining sampling objectives and comparing different sampling methodologies is explicitly identifying the most important performance metrics (accuracy, sampling efficiency, and repeatability), as well as the resources that will typically be available for sampling.

The choice of criteria for determining whether a MA or RMU supports flood reduction benefits while protecting beneficial uses and habitat function is an important decision. The ratios and measurements to analyze sediment transport, MA activation, extent of flooding, recruitment of native riparian vegetation and diversity, and increasing wildlife movement use an approach based on information from data collection and monitoring. An advantage of this approach is that, by relying on readily available methodologies developed as part of the SMP, decision for detecting effectiveness is easier than developing accurate estimates of complex watershed functions.

The following sections will describe in detail the five areas of required effectiveness assessment including: 1. Effectiveness Monitoring, 2. Design Verification Monitoring, 3. Flood Reduction Monitoring, 4. Biological Function Monitoring, and 5. Watershed Assessment.

1. EFFECTIVENESS MONITORING

CONDUCT PRE- AND POST-MAINTENANCE TOPOGRAPHIC SURVEYS OF 10% OF ALL MAS IN ALL RMUS AND USE THE SURVEY DATA TO DETERMINE HOW THE MAS ARE FUNCTIONING AND ASSESS THE SEDIMENT TRANSPORT CHARACTERISTICS OF THE MAS.

The purpose of effectiveness monitoring is to identify those Program actions which can optimize watershed health and function. One of those actions is the use of MAs. MAs were developed throughout the Salinas River in order to select areas where maintenance could be focused through the life of the current SMP. This supported the avoidance of unique or highly valuable habitat, as well as, choosing hydraulicly appropriate areas to improve river flows.

Most MAs are in the form of secondary channels which mimic the natural braiding of the Salinas River by running parallel to the low-flow channel and are activated during moderate flows (i.e., 5-year flow events) to increase the flood-carrying capacity of the river. The proposed locations of MAs have been preferentially aligned along meander cutoffs, low-lying undeveloped areas, and former river alignments to mimic the historical braiding of the Salinas River. The sediment transport characteristics and other river morphology data related to secondary channel function have not been captured on the Salinas River at this scale. In order to determine how the MAs are functioning, with regard to flows and to assess the sediment transport characteristics of the MAs, topographic surveys of select MAs were completed. Pre- and post-maintenance topographic surveys of 10% of all MAs in all RMUs were completed. Below is a summary of the data collection and monitoring performed in order to assess MA Program-based effectiveness.

TOPOGRAPHIC SURVEYS

The MCWRA conducted pre- and post-maintenance topographic surveys of 10% of all MAs in all RMUs. The survey data collected included features such as deposition, scour, tie-ins, length of channel, and

centerline. These surveys extended from the low flow channel of the Salinas River on the upstream tie-in point then down through the MA and out the downstream tie-in and back into the low flow channel. All surveys utilized survey-grade GPS or similar instrument, in order to collect relatively accurate horizontal and vertical data. The selected MAs were distributed throughout the Program area by including a minimum of one for each RMU that received work. Table 2 shows the list of RMUs and corresponding MAs which received individual topographic survey data collection for purposes of effectiveness monitoring.

TABLE 2. SUMMARY OF TOPOGRAPHIC SURVEY DATA COLLECTION.

RMU	MA
1	1.06
2	2.05
3	3.18
4	4.22
5	5.10
6	6.11
7	n/a

These select MAs will provide a representative sample of the riverine processed taking place throughout the watershed. These surveys were conducted up to two times, in order to capture the topographic data before and after construction of the MAs. The 1st survey established the baseline data and was performed once vegetation was initially removed, in order to get accurate ground surface data. A 2nd survey occurred during the same maintenance season, only if grading activities occurred, in order to collect the final ground surface data prior to any riverine flows. A third survey would be necessary after any moderate flow events activated the MAs. The use of data, through the analysis of a topographic survey or longitudinal profile, is a measure to provide findings to indicate changes in river morphology after moderate flow events. It is assumed that the MA locations are in a dynamic section of the river and may experience scour or relocation in moderate flow events (5-year or greater). At these specific locations in the watershed the MCWRA is preparing to assess sediment dynamics (scour and deposition) following significant flow events.

The MCWRA monitored all flow events in SMP Years 1 - 5 to record any occurrence of an event equal to or exceeding 25,450 cfs (5-year event), as measured at USGS gage 11152500 near Spreckels. According to measurements obtained from the USGS stream gage there were no recorded occurrences for such a moderate flow event. The peak flow data was obtained by MCWRA from the USGS data and the MCWRA recorded all peak flows and event dates. Table 3 provides a summary of the data collected by the MCWRA for peak flow measurements at the USGS gage 11152500 near Spreckels.

TABLE 3. SUMMARY OF PEAK FLOW MEASUREMENTS AT USGS GAGE 111525000 NEAR SPRECKELS.

USGS gage 11152500 – near Spreckels		
Program Year	**Peak flow (cfs)**	**Date of event**
2016	11,700	02/22/2017
2017	1,160	03/24/2018
2018	6,370	02/16/2019
2019	437	04/08/2020
2020	2,470	01/30/2021

Therefore, during the SMP Years 1 – 5, there were no occurrences of moderate flow events in the Salinas River (5-year event) to activate the MAs. In the absence of moderate flow events, the MCWRA is limited in its ability to determine and provide a typical assessment of the sediment transport characteristics of the maintenance areas. The need for effectiveness monitoring is of particular interest to understanding adaptive management. The MCWRA concluded all necessary effectiveness data collection and monitoring activities for Years 1 -5. This will allow the MCWRA to continue to analyze scour and deposition at these specific locations throughout the watershed over time. The determination of effectiveness for Years 1-5 was limited by the absence of moderate flow events. However, the concept of long-term effectiveness is integral to the determination and delineation of how the MA connects to the low-flow channel and tracking other potential alterations. The MCWRA and its monitoring partners will continue to perform topographic surveys to analyze local or regional variation in MAs after moderate storm events, and recommend potential re-design, as necessary.

Recommendation: Continue to conduct topographic surveys, and monitor flow events that may activate MAs. Perform any necessary topographic surveys after such event to compare to pre-flow topography to better understand sediment transport functions in the MAs. Ongoing, effectiveness analysis will occur when moderate flow conditions are present.

Effectiveness monitoring to be performed	**Status (Years 1 – 5)**
1. Develop topographic surveys of select MAs one for each RMU	Complete
2. Monitor additional MAs, if necessary	n/a

2. DESIGN VERIFICATION MONITORING

ACTIVATION OF MAs UNDER THE FLOW CONDITIONS ANTICIPATED BY THE DESIGN; FUNCTION OF MAs AS DESIGNED; INCREASE IN CHANNEL COMPLEXITY (PRIMARY AND SECONDARY CHANNELS, CHANNEL BRAIDING) AS ANTICIPATED IN THE DESIGN; DECREASES IN FLOW VELOCITIES IN THE LOW-FLOW CHANNEL DECREASING AS ANTICIPATED IN THE DESIGN.

The purpose of design verification monitoring is to identify those Program actions which aid in optimizing beneficial hydraulic conditions such as channel complexity. The flood modeling of the Salinas River was extensively developed in 2D to aid in the design of the SMP activities. Existing conditions as well as various project activities were modeled under the 2-year, 5- year, and 10-year flows as well as a recent flow event from March 2011. MAs are assumed to be activated at approximately a 5-year moderate flow event and to flow downstream through the MA or back into the MA based on different hydraulic conditions. All flow events in Years 1 – 5 were monitored for occurrence of an event equal to or exceeding 25,450 cfs (5-year event), as measured at USGS stream gage 11152500 near Spreckels, to answer the following questions:

- Are MAs activated under the flow conditions anticipated by the design?
- Are MAs functioning as designed?
- Is channel complexity (primary and secondary channels, channel braiding) increasing as anticipated in the design?
- Where flow velocity data are available, are flow velocities in the low-flow channel decreasing as anticipated in the design?

In Years 1 – 5 MAs have been constructed, and additional data was planned for collection and analysis. This approach included evaluating Participant MA information, monitoring stream gage data, and comparing aerial imagery during and after moderate flow events. This would allow the MCWRA to better understand if the Program is functioning as designed. We will know if MAs activate at the design flow events, or are modifications to locations or elevations necessary.

The effectiveness of selective vegetation treatment versus full removal of vegetation within a MA will also be considered. The review of archived and current aerial photography is recommended to determine how channel complexity changes after a moderate flow event, at an RMU level. The design verification analysis would include channel complexity achieved through the construction of MAs versus occurring more naturally, as well as if the MAs are diminishing or are reshaped. This then guides whether or not constructing MAs through vegetation or combined with sediment removal has an impact of increasing geomorphic and hydraulic features across the floodplain. Depending on those results, activities that are linked with increasing channel complexity may then be encouraged or optimized in more areas of the river channel.

The MCWRA monitored all flow events in SMP Years 1 - 5 to record any occurrence of an event equal to or exceeding 25,450 cfs (5-year event), as measured at USGS gage 11152500 near Spreckels. According to measurements obtained from the USGS stream gage there were no recorded occurrences for such a moderate flow event (see table 3). The program year of 2016 recorded the highest measured peak flow at 11,700 cfs. During the winter of 2016-17, flows were observed as activating some MAs and visual inspections were made. However, additional analysis were not performed since the flow thresholds were not met. Therefore, no information is available at this time to support design verification of the Program MAs, including whether MAs will be activated as modeled, if channel complexity will increase, or if flow velocities will decrease as designed.

Recommendation: Continue to monitor moderate flow events that may activate MAs and perform any necessary analysis to better understand the channel processes observed. Ongoing, design verification analysis will occur when moderate flow conditions are present.

Design verification monitoring to be performed	**Status (Years 1 -5)**
1. Obtain Participant information on MA activation during moderate flow events ≥ 5-year	n/a. No moderate flows occurred.
2. Monitor stream gage and aerial imagery after moderate flow events > 5-year	Partially complete

3. FLOOD REDUCTION MONITORING

OBSERVE EXTENT OF FLOODING COMPARED TO THE EXTENT OF FLOODING PREDICTED BY THE HYDRAULIC MODEL AND OBSERVE FLOW VELOCITIES COMPARED TO FLOW VELOCITIES PREDICTED BY THE HYDRAULIC MODEL.

The purpose of flood reduction monitoring is to identify if Program actions result in the anticipated level of flood reduction benefit after removal of targeted vegetation. All flow events were monitored for an occurrence of an event equal to or exceeding 42,800 cfs (10-year event), as measured at USGS stream gage 11152500 near Spreckels, to determine whether the Program achieves the anticipated flood reduction benefits.

The analysis shall answer the following questions:

- How does the observed extent of flooding compare to the extent of flooding predicted by the hydraulic model?
- Where flow velocity data are available, how do observed flow velocities compare to flow velocities predicted by the hydraulic model?

In Years 1 – 5 MAs have been constructed, and additional data was planned for collection and analysis. This approach included observing and documenting the extent of flooding, comparing to predictions of the hydraulic model, and observing any changes or reductions to flow velocities. This would allow the MCWRA to better understand if the SMP reduces flooding as designed and investigate whether larger changes in the watershed are impacting river conditions at the RMU level.

The MCWRA monitored all flow events in SMP Years 1 - 5 to record any occurrence of an event equal to or exceeding 42,800 cfs, as measured at USGS gage 11152500 near Spreckels. According to measurements obtained from the USGS stream gage there were no recorded occurrences for such a large flow event (see table 3). Therefore, no information is available at this time to support analysis of flood reduction benefits of the Program MAs, including whether MAs will flood to the extent as predicted by the model and if flooding will be reduced.

Recommendation: Continue to monitor flow events that may assist in verifying if flooding is reduced in RMUs and perform all necessary data collection efforts to determine how the observed extent, time of inundation and depth of flooding compares to the flooding characteristics predicted by the hydraulic model. Ongoing, flood reduction analysis will occur when large flow conditions are present.

Flood reduction monitoring to be performed	**Status (Years 1 – 5)**
1. Document extent of flooding after larger flow events $\geq$ 10-year	n/a. No larger flows occurred.
2. Obtain high water mark elevation after larger flow events $\geq$ 10-year	n/a. No larger flows occurred.
3. Monitor USGS data and receive velocity data for larger flow events $\geq$ 10-year	Partially complete

4. BIOLOGICAL FUNCTION MONITORING

PROMOTE RECRUITMENT OF NATIVE RIPARIAN VEGETATION IN AREAS WHERE ARUNDO WAS REMOVED FOR MITIGATION PURPOSES, INCREASE DIVERSITY OF RIPARIAN HABITAT CONDITIONS AND INCREASE WILDLIFE MOVEMENT AND HABITATION WITHIN THE GREATER CHANNEL.

One of the primary objectives of the current Program is the analysis of its overall effect on beneficial uses and habitat function. The purpose of biological function monitoring is to identify those Program actions which can reduce flood risk to agricultural land adjacent to the Salinas River while maintaining or enhancing natural habitat and ecological and hydrological processes. The MAs are designed to spread water across a larger active floodplain area which reduces flooding and brings water to a larger footprint to increase the viability of native vegetation communities. Additionally, the main activities for compensatory mitigation are the eradication of Arundo and the planting of native tree canopy within the watershed. The Program has been designed to specifically avoid the most sensitive and rare habitat types and focus maintenance on areas with more transient, early successional vegetation

and/or areas dominated by Arundo (*Arundo donax*) or dense stands of willow (*Salix spp.*) which have become invasive. This design approach is intended to promote increased diversification of riparian habitat conditions in the larger Program area, including outside of MAs. The MCWRA and the RCDMC have completed biological function monitoring which include observation and analysis designed to assess the following biological elements:

- Recruitment of native riparian vegetation in areas where Arundo was removed for mitigation purposes (outside of designated MAs);
- Increasing diversity of riparian habitat conditions (earlier to later successional vegetation communities); and
- Increasing wildlife movement and habitation within the greater channel.

ARUNDO SURVEYS

Arundo Transect Study

The MCWRA and the RCDMC have tracked progress toward meeting the mitigation success criteria for Arundo removal and assessed plant recruitment and diversity in Arundo removal areas over time. An Arundo transect study site was developed for each RMU where Arundo mitigation occurs for plant community monitoring including RMUs 3, 4, and 6. At each site, four transect surveys were conducted including two (2) inside the Arundo mitigation area, and two (2) "controls" outside the Arundo mitigation area (which represent nearby MAs of untreated non-arundo-invaded riparian vegetation) (Appendix B - table 1).

The transect surveys analyzed for this report were for a period from 2018 – 2020 (RMU 4 and 6) and 2019 - 2020 (RMU 3). The first surveys were conducted the spring prior to the first herbicide treatment. Data, including community composition of plant species, from inside the treated areas was used to compare conditions to the control areas. Based on these inspections, the composition of the treated area can be analyzed to determine if it's approaching the composition of the control areas. The findings shall indicate whether increased plant community composition is occurring on the treated sites or whether more of an active restoration approach shall be considered.

The results of the Arundo transect study are presented in detail as Appendix A. The results indicate that the methods for Arundo treatment and removal are successfully reducing the regrowth of Arundo. The data and monitoring of all 6 treated sites indicate Arundo cover has decreased from an average of 38% to 3.5 % cover. These decreases are in conformance with the 5% or less Arundo cover performance criteria for the Program. The results also indicate that these sites are also providing recruitment opportunity for other vegetation cover, both native and non-native (Appendix A - table 2). The data and monitoring results of all 6 treated sites indicate an increase in vegetation cover percentages when compared with overall cover before treatment. The percent cover of non-Arundo type vegetation increased from on average of 18% before treatment to 48 % after treatment, demonstrating the increased opportunity for non-Arundo type vegetation cover to successfully establish. The results indicate that vegetation density on 4 out of 6 of the treated sites was increased with native species over the time following Arundo treatment. The composition of native cover has increased by ratios ranging from 1.25:1 to 10:1 on the treated sites vs. ratios ranging from 1.2:1 to 8:1 on the control sites. Therefore, these findings support that the treated sites comparatively have similar increases in native cover when compared with the associated control sites. The data to support these findings can be found in Appendix A - table 2.

Plant community species were also recorded at each of the Arundo transect study areas with a total of 76 species identified (Appendix A - table 3). The results of the Arundo transect study indicate an increase in native plant species in the treated sites by 44% and a decrease of 23% in the control sites. The results indicate a marginal increase in non-native plant species (excluding Arundo) in the treated sites of 3% and a larger decrease of 8% in the control sites. These results are presented to analyze the trend among plant species throughout the three treated sites as compared vs. the control sites.

The initial results of the 3-year survey (RMU 4 and 6), and the 2-year survey (RMU 3), indicate recruitment of native riparian vegetation is occurring where Arundo was removed for mitigation purposes. The findings also indicate beneficial plant diversity effects and increased habitat function are occurring at Arundo mitigation sites with increases in native plant species. The data collection and monitoring performed are in the early stages and indications of native vegetation recruitment will take more time to quantitatively evaluate. Longer term trends will help refine conclusions and consider other factors such as drought or prevalence after flooding. More data is needed through additional years of monitoring to provide conclusive evidence and findings on whether diversity is increasing among riparian habitats after treatment of Arundo. The MCWRA and the RCDMC, are focused on Years 6 – 10 to enhance the dataset and provide for continued monitoring at all three Arundo transect sites. The biological function monitoring requirement for recruitment of native plant species in mitigation sites is ongoing.

Arundo Mitigation Areas

All necessary Arundo mitigation sites have been established for Program impacts in years 2016 - 2020. The compensatory mitigation areas are tracked individually, and the cumulative totals are reported in each year's annual report. The current total impacts include 52.27 acres of Early Successional Perennial Riparian (ESPR) and 15.69 acres of Mid-Successional Willow (MSW). The vegetation impacts to ESPR require 1:1 Arundo removal within the MA or 0.5:1 Arundo removal outside the MA (for ESPR). The vegetation impacts to MSW (less than 6") require 3:1 Arundo removal outside the MA. Based on Program impacts to date, the total Arundo treatment required inside the MA is 52.27 acres (for ESPR) and the actual Arundo treated inside the MA is 62.8 acres. The total Arundo treatment required outside the MAs is 60.6 acres (for MSW) and the actual Arundo treated outside MAs is 81.4 acres. The monitoring of all Arundo removal areas started in Year 2018 for RMU 4 and 6, and in 2019 for RMU 3. The start to begin monitoring was delayed two years because of unfavorable drought conditions which didn't allow for the use of chemical control on the Arundo removal areas. The methods for Arundo removal are accomplished using commonly accepted practices (mowing and spraying). In the years of 2016 and 2017, non-chemical control through mowing (cutting) and other manual methods (cutting and disking) were used. The mechanical methods employed did begin the process of Arundo removal; however, the reduction of the stands and cover for progress the following year was minimal. The MCWRA reported this in the annual reports for 2016 and 2017 and the monitoring began in 2018.

The preliminary results from the Arundo transect study can be highlighted for achievements towards performance criteria. The Arundo transect study has shown Arundo removal performance on target to meet the criteria of 5% or less. The initial indications from the Arundo study indicates it is highly likely that Arundo cover will meet the required performance in all Arundo removal areas. Staff will be working on the necessary documentation agreed upon to document implementation of final performance criteria over time. When the performance criteria is met, monitoring will be discontinued, and the areas will be removed from the Arundo program. If further treatment is needed this will be reported as well.

New Arundo Growth in MAs

Annual Arundo surveys are performed to document the establishment of any new Arundo growth areas within designated MAs. Biological monitors perform visual inspections of MAs during the pre-maintenance surveys and map all new Arundo growth areas for such occurrences. The retreatment of those areas would then be planned for during the following maintenance season. No new Arundo growth areas were observed during the past 5 maintenance seasons (2016 – 2020); therefore, no further review of the new Arundo growth is necessary at this time.

Tree surveys

The MCWRA and the RCDMC monitor native tree planting areas annually prior to and during the maintenance season. There are two tree planting sites with ongoing monitoring which include sites in RMU 4 (near MA 4.22) and RMU 5 (MA 5.10). Only specific native trees may be planted as mitigation in order to increase diversity with the riparian area. Once these tree plantings become established, they will increase diversity of the habitat conditions. The planting sites of 4.22 and 5.10 were established in 2017 and 2016, respectively. The trees that were planted near 4.22 in 2017 did not survive initially and were replaced in 2018. However, all those trees were damaged in the winter of 2021 because of River Fire debris flows and heavy runoff in late January 2021. The MCWRA, the RCDMC and the Program participant will be investigating a new site and begin replanting in work season 2021. The trees planted near 5.10 are performing well. No remedial actions are needed at this time to achieve final performance criteria. The determination of meeting final performance criteria is not available at this time and therefore the MCWRA will continue monitoring and ensuring maintenance.

Critical status species

The Program was developed with avoidance as a key component to reduce potential impacts including those to critical status species. There are established work windows and work locations that avoid impacts to flowing water, avoid the need to dewater which could impact fish or amphibians, and avoid using large equipment during nesting bird season. The Program provides specific Best Management Practices and avoidance measures to address impacts resulting from implementation and includes a biological monitoring program to ensure direct take of species is reduced to the greatest extent during annual Program implementation. The MCWRA and the RCDMC monitor for special status species prior to and throughout the maintenance season. The MCWRA and the RCDMC have recorded all critical species into the California Natural Diversity Database, as necessary.

Studies on South Central California Coast Steelhead abundance

The MCWRA continues to monitor the status of South Central California Coast ("SCCC") Steelhead trout (*Oncohynchus mykiss*) in the Salinas River watershed in a limited capacity while work continues on the Salinas River Habitat Conservation Plan and associated Conservation Strategy that will define future mitigation and monitoring efforts. Salinas River flows and reservoir storage are targeted throughout the year to ensure specific flow triggers are occurring through the river to provide beneficial conditions for the protection of SCCC Steelhead trout. Adult escapement monitoring has been conducted in the mainstem Salinas River during winters of 2011-14, 2016-18 to provide information on upstream migration timing and abundance. Spring-time juvenile outmigration monitoring has occurred in the Arroyo Seco (2010-12, 2017) and Nacimiento (2010-14, 2017) and Salinas (2010-12, 2017) rivers to quantify juvenile production and gather data on outmigration

characteristics. To provide information on distribution and densities of juvenile steelhead, index monitoring has been conducted on the Arroyo Seco and Nacimiento rivers during the summer and early fall between 2010 and 2018. Index reach monitoring is planned for the summer of 2021.

WILDLIFE SURVEYS

Wildlife Monitoring Study

The MCWRA and the RCDMC contracted with Pathways for Wildlife to conduct a pilot wildlife camera trapping study. The study is titled *Salinas River Wildlife Monitoring Study 2018: Long Term Effectiveness Assessment for the Salinas River Stream Maintenance Program*, dated December 2018 and is provided as Appendix B. The purpose of the study was to address if the removal of Arundo and other riparian vegetation, could increase the movement of wildlife as a result of increased permeability through channels. One site was chosen in four of the RMUs for the pilot study including: RMU 1 (MA 1.8), RMU 3 (3.18), RMU 4 (MA 4.26), and RMU 6 (MA 6.07) (Appendix B - figure 4). The four RMU sites were equipped with a total of sixteen camera stations, four stations at each study site. The information about the sixteen camera stations details camera set-up including, whether the camera was in a control or treated channel, and the habitat type at each station (Appendix B - table 1). The total detections recorded by the sixteen camera stations summed up to a total of 1,666 (Appendix B - table 2). The four highest detections and percentage of species recorded include: deer (*Odocoileus hemionus*) at 43% with 718 records, coyote (*Canis latrans*) at 37% with 614 records, wild pig (*Sus scrofa*) at 12% with 200 records, and bobcat (*Lynx rufus*) at 5% with 76 records.

The study found the combined treated channels resulted in having the highest number of detentions of wildlife with 1,085 records. The combined control areas had a total of 581 detections. The combined treated channels with removal of vegetation account for 65% of the wildlife moving through them versus 35% of the detections recorded in the combined control areas (Appendix B - table 4). The higher number of detections in the cleared channels versus the controls, which consisted of nearby dense unmanaged riparian areas, indicates that the removal of vegetation in the cleared channels is helping facilitate higher degrees of wildlife movement through them. The study demonstrates that maintenance of the treated channels is effective for increasing wildlife movement and habitation.

There was also an increase in wildlife detections after the mowing of three of the four study sites. For example, during mowing in September and the following months there was an increase in the number of multiple species detections in the RMU 4 treated channel (Appendix B – chart 8). The same pattern of increased wildlife detections after moving was recorded in RMU 3 in the treated channel. After mowing there was an increase of multiple species detections. The detection rate ranged between 27 and 45 throughout August, September, and October and then spiked up to 114 detections in November (Appendix B – chart 9). There was also a large decrease in the amount of detections recorded in the control sites during the month of November. The report states one possibility for this is that more animals were traveling in the treated channels than in the control areas. The pattern continued with RMU 1. After the mowing in September, there were 106 more detections recorded in October (Appendix B – chart 10). The RMU 6 had the lowest detection rate with only 71 total detections, with 61 detections in the control and 10 in the treated areas (Appendix B – chart 11). RMU 1, 3, and 4 all had high rates of wildlife detections compared to RMU 6. The habitat characteristics were similar in each RMU but varied by habitat type and quality. For example, RMU 1 consisted of a larger habitat with a higher vegetation biodiversity and tree cover compared to RMU 6, which could influence the difference in the number of detections between the RMUs. However, the

landowner at the RMU 6 site reported consistent trespassing on his property by people driving through on ATVs, motor bikes, and tractors. While checking cameras the study biologists routinely found new bullet casings and liquor bottles throughout the study area. In fact, one of the study cameras was destroyed by being run over by a trespassing tractor. The conclusion is there is relatively low human impact and disturbance with the other RMU 1, 3, and 4 channels surveyed, when compared with RMU 6. The study cites there have been many studies showing the negative effects of human disturbance on wildlife movement and habitat use caused by human disturbance. The described human disturbance may have accounted for the overall low rate of detections recorded in RMU 6 when compared with RMUs 1, 3, and 4. The higher rate of detections in the control for RMU 6 may also account for animals preferring to travel in the dense cover rather than exposed to the treated open channels in attempting to avoid human disturbance.

The objective of the camera trapping study was met with the Salinas River Wildlife Monitoring 2018 Study. The results from the study provide findings and evidence that the Program is increasing wildlife movement and habitation within the greater channel. The study appropriately evaluated if maintenance (clearing of vegetation) within the treated channels would facilitate higher degrees of wildlife movement through them than the control areas, which are unmanaged and consist of dense vegetation. The combined treated channels accounted for 65% of the wildlife moving through them versus 35% of the detections recorded in the combined controls areas. The study cites there is strong evidence that maintenance within the channels increases wildlife movement. Additionally, there were increases in wildlife detections after the mowing in three of the four study sites. The cleared channels had twice the amount of detections or more in the months after mowing. The study suggests that maintaining open routes by removal of dense vegetation facilitates wildlife movement through treated channels. With the increase of habitat fragmentation in the Salinas Valley floor, it is important to help facilitate wildlife movement through the Salinas River to maintain healthy wildlife populations. The study is comprehensive and can be used to support the Program by providing findings for the effects on beneficial use and habitat function.

In conclusion, in Years 1 – 5, the MCWRA has participated in, funded, and implemented various efforts to support biological monitoring for the Program. The MCWRA completed an Arundo transect study and contracted for a comprehensive wildlife movement study. These studies provide meaningful biological research and analysis to support Program effects to beneficial uses and habitat function.

Recommendation: Ongoing, continue to collect and analyze information indicative of the Program's overall effect on beneficial uses and habitat function. Continue monitoring Arundo sites for native plant recruitment and diversity. Ensure all Arundo and tree mitigation areas are monitored for performance criteria. Continue all annual special species inspections and record all information into the CNDD, and continue to conduct abundance studies on SCCC Steelhead trout.

Biological function monitoring to be performed	**Status (Years 1 – 5)**
1. Sample and monitor Arundo mitigation areas for recruitment of native riparian vegetation, increase diversity of riparian habitat conditions, and/or success criteria	Complete
2. Sample and monitor tree planting sites for success criteria	Complete
3. Record any critical species into the CNDD, if warranted	Complete
4. Conduct studies on SCCC steelhead abundance	Complete
5. Conduct a camera trapping study to compare wildlife observed in maintained areas vs. non-maintained	Complete

5. WATERSHED ASSESSMENT

OPTIMIZE WATERSHED HEALTH AND FUNCTION WHILE ACHIEVING MCWRA RIVER MANAGEMENT OBJECTIVES, AND ASSESS INTERACTIONS BETWEEN STREAM MAINTENANCE, KNOWN WATERSHED ISSUES, RIVER MANAGEMENT ACTIVITIES, AND CUMULATIVE EFFECTS ON THE WATERSHED HEALTH AND FUNCTION.

The MCWRA manages various projects throughout the Salinas River Basin and is working on major studies that will assist in both the collection of relevant data and the analyses to assess river management issues. Such projects, in combination with the intensive land use in the region, have contributed to water management challenges. Among these are maintaining stream flows for agriculture and species habitat; controlling periodic flooding and high levels of invasive plants; and dealing with poor water quality, loss of riparian vegetation, encroachment on the stream channel, and ad-hoc bank stabilization. To help address the complex management challenges on the Salinas River, the MCWRA has developed a Salinas River Long-Term Management Plan ("LTMP"), is pursuing the Salinas River Habitat Conservation Plan ("HMP") and associated Conservation Strategy, and is in the final stages of performing the Salinas River Groundwater Basin Investigation ("Basin Investigation"). The Salinas Valley Basin Groundwater Sustainability Agency ("SVBGSA") has also assumed the responsibility for the development and implementation of Groundwater Sustainability Plans ("GSP") for the Basin. The LTMP, HCP, Basin Investigation, and GSP are set to include proposed actions to assess SMP type activities to provide and promote beneficial effects within the larger context of the Salinas River watershed. SMP type activities such as cutting and removal of flow-constricting vegetation (both native and non-native), controlling invasive vegetation (mainly *Arundo donax*, Arundo, and *Tamarix parviflora*, Tamarisk), and promoting a canopy of native riparian trees through restoration measures, are multi-benefit measures that can optimize watershed health and function.

STUDIES

Salinas River Long-Term Management Plan (LTMP)

The purpose of the LTMP is to describe a multi-benefit management program that addresses needs related to MCWRA facilities and operations, as well as related issues such a flood risk reduction, water supply, water quality, natural resource conservation, threatened and endangered species management, and federal and state Endangered Species Act compliance. The LTMP was released in 2019 and is the next step to establishing comprehensive solutions to water resource management along the Salinas River. MCWRA developed this management strategy in partnership with all interested parties to meet the goals and objectives for the entire system, while maintaining necessary flexibility and building off existing work, including the work of the current SMP.

Successful management of the Salinas River, as described in Chapter 2 of the LTMP, should include "stream maintenance". "Stream maintenance" is identified as one of the six "Management Objectives" of the LTMP of which the other categories include "General", "Lagoon management", "Water resource management", "Habitat and connectivity", and "South-Central California Coast steelhead". Within each category, the LTMP objectives and actions are further organized into four subcategories: research and analysis, planning tasks, projects, and activities. The goals of the LTMP are to be supported by future "research and analysis", and "planning tasks" for objectives such as stream maintenance. For example, the research and analysis of stream maintenance are necessary to gain a better understanding of the

complex issues at hand. The action recommended by the LTMP includes conducting additional research into the historic ecology of the Salinas River to inform what is the "natural" state of the river, particularly after removal of extensive stands of invasive vegetation. Also included is a need to understand how sandbars shift during high flows, so the results can be used to inform adaptive management and optimize vegetation management programs. The stream maintenance planning tasks of the LTMP also include:

1. Establishing an equitable funding mechanism for implementing stream maintenance activities that allocates cost of maintenance and associated mitigation across all beneficiaries,
2. Developing a practical and implementable (i.e., able to be permitted by the regulatory agencies) vegetation management program for the entire Salinas River mainstem and select tributaries within the LTMP management area, and
3. Developing a practical and implementable (i.e., able to be permitted by the regulatory agencies) invasive species (plant and animal) management program for the entire Salinas River mainstem and select tributaries within the LTMP management area

Planning and coordination efforts over the last several decades have brough the stakeholders of the Salinas River to a point in time where there is a collective understanding of the need to collaborate on management of the Salinas River. There is also a lot known about the management needs of the Salinas River Basin. Data from a strong and growing body of research, permits and management plans is available from which to draw guidance and recommendations. As such, while a single objective or action may have a relatively limited scope, the intent for the LTMP implementation is that suites of management actions be considered and implemented together to meet a variety of multi-benefit management goals. The planning considerations for stream maintenance are described in the LTMP and may help to drive future implementation framework. The land use authorities of the Salinas Valley include multiple cities, County of Monterey, and state and federal agencies. The Salinas River channel and floodplain is owned by hundreds of private parties and this represents a shared responsibility. Significant progress on identifying long-term solutions for the management of the Salinas River that include flood reduction, water resource management, stream maintenance, and habitat management for threatened and endangered species have been made since the approval of the Program's 401 Certification in 2016. The LTMP is complete and now the MCWRA and others can apply the LTMP to inform development of a future MCWRA HCP and other planning documents. The informed development will assist in further consideration of stream maintenance activities as either coordinated with other future plans or possibly as part of the SVBGSA GSPs. More information on the Salinas River Management Program and LTMP are available here at www.salinasrivermanagementprogram.org.

Groundwater Sustainability Plan (GSP)

Under the forthcoming Groundwater Sustainability Plans ("GSP"), the associated SVBGSA will have broad authority and flexibility in approach to ensure the Salinas Valley Basin achieves sustainable groundwater management. While the primary focus of the GSPs is groundwater, there could (and should) be coordination with long-term basin management in areas such as stream maintenance. As such, GSPs may be a good tool to incorporate aspects of the LTMP including stream maintenance of the Salinas River.

Salinas River Habitat Conservation Plan (HCP)

The MCWRA must develop an HCP to comply with the federal Endangered Species Act, and MCWRA intends to develop a conservation strategy for species that meets regulatory needs while also

supporting the needs of landowners/growers. Operation of MCWRA facilities and river management of the Salinas River lagoon may cause "take" of a number of species including Steelhead trout, Tidewater goby, Western snowy plover, Western spineflower, California red-legged frog, Lease Bell's vireo, and Bank swallow, as defined by the Endangered Species Act ("ESA"). The HCP, under Section 10 of the ESA, will address long-term water operations and maintenance that don't have a federal nexus. The HCP will be based, in part, on the LTMP management objectives and the existing biological opinions.

To date, the MCWRA has completed development of the LTMP (with funding from the California Coastal Conservancy), and the HCP and EIR/EIS will follow in phases. The MCWRA received a Section 6 grant to partially fund these efforts but the final grant agreement has stalled and so the funding is not yet accessible. MCWRA continues to seek opportunities to secure additional funding to support the effort. The HCP was initially thought to take approximately 3 years to complete (finalize HCP & EIR/EIS 2022) and the timeline has been extended to secure the necessary funding resources. A consultant has been hired and a Staff Working Group has been established to begin developing the HCP. A draft list of covered activities and species have been developed. Biological surveys and watershed evaluations are being conducted to assist in finalizing the covered activities and species list. A Charter has been developed and signed with the National Marine Fisheries Service and US Fish and Wildlife that describes each Agency's roll and commitment to developing the HCP. This group also considers approaches to short-term coverage such as a low-effect HCP for specific activities such as lagoon management. Although progress has been made on beginning the HCP the more robust analysis and EIR/EIS will not be completed until the full funding is available. The revised timeline is unknown at this time.

Salinas Valley Groundwater Basin Investigation (Basin Investigation)

In July 2014, Monterey County initiated a comprehensive water resources assessment of the Salinas Valley Groundwater Basin titled the Salinas Valley Groundwater Basin Investigation ("Basin Investigation"). A primary objective of the Basin Investigation is to assess the general health of the Salinas Valley Groundwater Basin regarding its ability to provide a sustainable supply of water for land use activities projected to the year 2030.

The first phase of the Basin Investigation concluded in 2015 with delivery of the *State of the Basin* report from Brown & Caldwell, which provided a near-term assessment of conditions in basin. The second phase of the Basin Investigation has been conducted primarily by the U.S. Geological Survey ("USGS") and includes construction of an integrated groundwater-surface water model for use in evaluating water budgets, groundwater elevations, and seawater intrusion under both current and future conditions. Development of the Salinas Valley Integrated Hydrologic Model ("SVIHM") began in January 2016 as a cooperative effort between Monterey County and the USGS. Simultaneously, the Monterey County Water Resources Agency (MCWRA) has been working in cooperation with the USGS and private consultants to develop the Salinas Valley Operational Model ("SVOM"). The SVIHM is a model that simulates historical conditions and reflects changes in historical hydrology and land use over the simulation period. The SVOM is an "operational" model that couples the structure and calibrated parameters of the SVIHM with a module that simulates operation of Nacimiento and San Antonio reservoirs.

The SVOM allows modeling of future scenarios or proposed projects; its use is integral to completion of the Basin Investigation, along with the SVIHM. The SVIHM can provide estimates of groundwater storage, surface and subsurface storage and flows, groundwater-surface water interactions, and hydrologic budgets. The SVOM can be used as a baseline for evaluation of potential water supply

projects, to quantify future project benefits, and to evaluate changes in current conditions resulting from future changes in land use or climate conditions. The efforts of the Basin Investigation will be available to assist in both the collection of relevant data and the analyses to assess the SMP and its effects within the larger context of the Salinas River watershed within Monterey County.

In conclusion, in Years 1 – 5, the MCWRA has prepared, participated in, and funded ways to implement watershed assessments with the goal of optimizing watershed health in the Salinas River. Major studies underway are by MCWRA and others as sources for future detailed watershed assessments which can be used to evaluate stream maintenance interactions within the Salinas River. These studies and their implementation will provide the necessary research and analysis, and planning tasks, to successfully implement stream maintenance actions that optimize watershed health and function while working in conjunction with other river management related project and programs.

Recommendation: Partially met; there are benefits demonstrated to the watershed because of the Program. Ongoing, studies are pending. By 2025, the MCWRA will have more information to identify how the long-term goals of the SMP can be supported in larger watershed efforts underway for the Salinas River Basin.

Watershed assessment to be performed	**Status (Years 1 – 5)**
1. Identify SMP implementation actions which continue progress on improving known watershed issues, such as flood control, river flows, reservoir releases, water quality, habitat loss, ecological function loss, and fish habitat and passage	Partially complete; Ongoing, studies anticipated to contribute necessary research & analysis, planning, and funding.
2. Analyze interactions between the SMP and all other MCWRA river management activities, such as reservoir operations and activities downstream	Ongoing, see above
3. Assess the cumulative effect of the SMP and all other MCWRA river management activities on watershed health and function	Ongoing, see above

D. SUMMARY AND RECOMMENDATIONS

This first review Effectiveness Report supplements the specific procedures and protocols accepted for regulatory approval of the SMP by the Central Coast Water Board. Analysis of multi-benefit functions involves collecting data over time within the units of the RMUs and MAs. The potential for Program benefits were typically defined by the Central Coast Water Board and one of the goals of the Certification is to use all data and monitoring to predict and verify project and watershed benefits. In Years 1 – 5, the MCWRA, the RCDMC, and the RMU Association have implemented and monitored assessment methodologies developed for detecting effectiveness of the SMP. Sections 1- 5 of this Effectiveness Report have discussed how the results of data collection, monitoring, and analyses are either complete, partially complete, or ongoing. The categories of watershed health that are optimized in the RMUs and MAs as a result of the SMP include: flood control, groundwater management, river flows, reservoir releases, water quality, habitat enhancement, ecological function enhancement, and fish habitat and passage. Each of these categories of watershed health are supported by activities of the Salinas River SMP (see table 4).

TABLE 4. SALINAS RIVER SMP ACTIVITIES AND ASSESSMENT METHODOLOGIES DETECTING EFFECTIVENESS.

Salinas River SMP vegetation management activities	Categories of watershed health to optimize in RMUs and MAs	Available assessment methodologies developed as part of the SMP
Cutting and removal of flow-constricting vegetation (both native and nonnative) within the MAs to maintain flow. Removal of sediment within the MAs to maintain flow. Controlling invasive vegetation, mainly *Arundo donax* (Arundo) and *Tamarix parviflora* (tamarisk). Promoting a canopy of native riparian trees through restoration measures.	Flood control	Effectiveness monitoring, Design verification monitoring, Flood reduction monitoring, Watershed assessment
	Groundwater management	Biological function monitoring, Watershed assessment
	River flows	Effectiveness monitoring, Design verification monitoring, Flood reduction monitoring, Watershed assessment
	Reservoir releases	Biological function monitoring, Watershed assessment
	Water quality	Biological function monitoring, Watershed assessment
	Habitat enhancement	Biological function monitoring, Watershed assessment
	Ecological function enhancement	Biological function monitoring, Watershed assessment
	Fish habitat and passage	Biological function monitoring, Watershed assessment

The assessments performed in this first Effectiveness Report support findings and recommendations that indicate: effectiveness monitoring, design verification monitoring, and flood reduction monitoring are complete, partially complete, and/or ongoing and can be more fully assessed with the occurrence of moderate to large flow events; biological function monitoring is complete and/or ongoing with results showing benefits to plant community species and coverage, reductions in Arundo cover to levels of 5% or less, promotion of native tree cover, successful avoidance of special status species, studies to measure abundance of SCCC Steelhead trout, and increased wildlife movement as a result of MA vegetation removal; and, finally watershed assessment is partially complete and ongoing with major studies underway and goals to authorize further resources to consider and implement integrated river and basin management of the Salinas River.

In summary, the stream maintenance program protocols specified in the Certification have been used for the last 5 years during the program. During this period, monitoring and analysis concludes the Salinas River SMP, as designed, is optimized for effectiveness, and is promoting watershed health and function. The MCWRA, the RCDMC, and the RMU Association will promote the Program and major studies have already identified the Program as a priority project needing increased implementation and participation. The SMP is aimed to continue in Years 6 -10 and the final Effectiveness Report in 2025 will ensure that Program effectiveness and optimization are properly analyzed and assessed (see Table 5).

TABLE 5. SUMMARY OF EFFECTIVENESS ASSESSMENT STATUS THROUGH YEARS 1 - 5.

Long-Term Effectiveness Assessment Recommendations		
Description	Status/Outcome	Recommendation
Effectiveness monitoring: MCWRA shall conduct pre- and post-maintenance topographic surveys of 10% of all MAs in all river management units, and shall use the survey data to determine how the maintenance areas are functioning and assess the sediment transport characteristics of the maintenance areas.	Moderate flows (5-yr or greater) were absent during years 1 – 5; therefore, unable to assess if MAs are functioning and whether *sediment transport characteristics can be analyzed in the MAs.*	Ongoing, effectiveness analysis will occur when flow conditions allow. No recommendation for modification at this time.
Design verification monitoring: MCWRA shall analyze all flow events equal to or exceeding 25,450 cfs (5-year event), as measured at USGS stream gage 11152500 near Spreckels, to answer the following questions, at a minimum: • Are MAs activated under the flow conditions anticipated by the design? • Are MAs functioning as designed? • Is channel complexity (primary and secondary channels, channel braiding) increasing as anticipated in the design? • Where flow velocity data are available, are flow velocities in the low-flow channel decreasing as anticipated in the design?	Moderate flows (5-yr or greater) were absent during years 1 – 5; therefore, unable to assess if MAs were *activated as modeled*; if *channel complexity has increased*, or if *flow velocities are decreasing as designed*.	Ongoing, design verification analysis will occur when flow conditions allow. No recommendation for modification at this time.
Flood reduction monitoring: MCWRA shall analyze all flow events equal to or exceeding 42,800 cfs, as measured at USGS stream gage 11152500 near Spreckels, to determine whether the Project achieves the anticipated flood reduction benefits. The analysis shall answer the following questions, at a minimum: • How does the observed extent of flooding compare to the extent of flooding predicted by the hydraulic model? • Where flow velocity data are available, how do observed flow velocities compare to flow velocities predicted by the hydraulic model?	Larger flows (10-yr or greater) were absent during years 1 – 5; therefore, unable to assess if MAs were *flooded to the extent as predicted by the model*, and if *flooding was reduced*.	Ongoing, flood reduction analysis will occur when flow conditions allow. No recommendation for modification at this time.
Biological function monitoring: MCWRA shall collect and analyze information indicative of the Project's overall effect on beneficial uses and habitat function. Biological function monitoring shall include observation and analysis designed to assess the following elements, at a minimum: • Recruitment of native riparian vegetation in areas where arundo was removed for mitigation purposes (outside of designated maintenance areas); • Increasing diversity of riparian habitat conditions (earlier to later successional vegetation communities); and • Increasing wildlife movement and habitation within the greater channel.	Compensatory mitigation for program impacts was achieved through use of dedicated Arundo mitigation areas. Due to continued drought conditions, additional years are needed to monitor and analyze the natural *recruitment of native riparian habitat conditions and diversity in Arundo mitigation areas*, and the *success of tree re-planting activities*. Special status species monitoring was implemented, and the data reported annually to the California Natural Diversity Database.	Ongoing; Arundo mitigation tracking, Arundo transect study, and tree re-planting monitoring activities to continue. Additional analyses and time needed to assess native riparian vegetation recruitment, increasing diversity of habitat conditions, and success of tree re-planting mitigation. No recommendation for modification at this time. Complete; wildlife assessment study concludes maintained

	Salinas River flows and reservoir storage are continually monitored to meet flow targets for SCCC steelhead. The impact to the species is lessened by reducing the dominance of Arundo in Salinas River riparian areas Wildlife monitoring study in 2018 documented an increase in wildlife movement and activity in maintained areas when compared to unmaintained areas.	areas are beneficial to movement and habitation within the greater channel as compared to non-maintained areas.
Watershed assessment: MCWRA shall collect and analyze information to assess the Project and its effects within the larger context of the Salinas River watershed in Monterey County, with the long-term goal of identifying implementation actions that optimize watershed health and function while also achieving MCWRA river management objectives. Watershed assessment shall include analysis of the following, at a minimum: i. The interaction between the Project and known watershed issues, such as flood control, river flows, reservoir releases, water quality, habitat loss, ecological function loss, and fish habitat and passage; ii. The interaction between the Project and all other MCWRA river management activities (current and planned), such as reservoir operations and activities downstream; iii. The cumulative effect of the Project and all other MCWRA river management activities (current and planned) on watershed health and function;	The Salinas River Long-Term Management Plan (LTMP) is the start of the process of a more comprehensive solution to water management along the Salinas River. MCWRA has developed a management strategy through the LTMP to meet the goals and objectives for the entire system. The strategy will clearly define benefits, build upon public/private partnerships, and be compatible with existing land and water rights and uses. Under the forthcoming Groundwater Sustainability Plans ("GSP"), the associated Groundwater Sustainability Agencies ("GSA") will have broad authority and flexibility in approach to ensure the Salinas Valley Basin achieves sustainable groundwater management. While the primary focus of the GSPs is groundwater, there is anticipated coordination with long-term basin management in areas such as stream maintenance. The Habitat Conservation Plan (HCP) will be based, in part, on the LTMP management objectives and the existing biological opinions. To date, the MCWRA has completed development of the LTMP (with funding from the California Coastal Conservancy), and the HCP and EIR/EIS will follow in phases. In July 2014, Monterey County initiated a comprehensive water resources assessment of the Salinas Valley Groundwater Basin titled the Salinas Valley Groundwater Basin Investigation (Basin Investigation). Development of the Salinas Valley Integrated Hydrologic Model (SVIHM) began in January 2016 as a cooperative effort between Monterey County and the USGS. Simultaneously, the Monterey County Water Resources Agency (MCWRA) has	Partially complete; there are benefits demonstrated to the watershed as a result of the Program. Ongoing; studies are pending. To help address the complex management challenges on the Salinas River, the MCWRA has developed the LTMP. This multi-benefit management program is intended to serve the needs of MCWRA facilities and operations; address river management challenges for flood control, water supply, and water quality; and outline strategies for conserving and managing natural resources, including threatened and endangered species. The recommendation is to then transition from a LTMP to a Habitat Conservation Plan (HCP). The HCP, under Section 10 of the Endangered Species Act (ESA), will address long-term water operations and maintenance. The HCP will be based, in part, on the LTMP and the existing biological opinions. The SVBGSA's GSPs may be a good tool to incorporate aspects of the LTMP including stream maintenance of the Salinas River. The Basin Investigation and the SVIHM are underway and anticipated to provide estimates of groundwater storage, surface and subsurface storage and flows, groundwater-surface water interactions, and hydrologic budgets. The SVOM can be

	been working in cooperation with the USGS and private consultants to develop the Salinas Valley Operational Model (SVOM). The SVIHM is a model that simulates historical conditions and reflects changes in historical hydrology and land use over the simulation period. The SVOM is an "operational" model that couples the structure and calibrated parameters of the SVIHM with a module that simulates operation of Nacimiento and San Antonio reservoirs. The SVOM allows modeling of future scenarios or proposed projects; its use is integral to completion of the Basin Investigation, along with the SVIHM.	used as a baseline for evaluation of potential water supply projects, to quantify future project benefits, and to evaluate changes in current conditions resulting from future changes in land use or climate conditions. The efforts of the Basin Investigation will be available to assist in both the collection of relevant data and the analyses to assess the SMP and its effects within the larger context of the Salinas River watershed within Monterey County.

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