Meeting of the Central Valley Flood Protection Board
December 19, 2014

Staff Report

Riverbottom Park Habitat Restoration Project
(Fresno County)

1.0 – REQUESTED ITEM

Consider Central Valley Flood Protection Board (Board) approval to allow the applicant to restore habitat for Riverbottom Park property along the San Joaquin River on the border of Fresno and Madera Counties (Attachment A) by Draft Permit No. 18995 (Attachment B).

2.0 – APPLICANT

City of Fresno PARCS Department, 1515 E. Divisadero, Fresno, CA 93721.

Project design and permit application were conducted by River Partners on behalf of the City of Fresno.

3.0 – PROJECT LOCATION

The project is located within the San Joaquin River floodway at Riverbottom Park..on the border of Fresno and Madera Counties in California. The 63-acre property is bounded by the San Joaquin River (Fresno-Madera county line) to the north, and a railroad line to the west. The property is owned in fee title by the City of Fresno (see Attachment A).

The applicant initially submitted one application for two properties (Riverbottom Park in Fresno County, and the Schneider property in Madera County). Upon the Board staff recommendation the applicant re-submitted stand-alone applications for Riverbottom Park (Application No. 18995) and the Schneider property (Application No. 18996) habitat restoration projects. These properties are currently closed to public access; and they rarely experience flooding or high water events sufficient to cause bank erosion.

4.0 – PROJECT DESCRIPTION

The proposed environmental restoration activities include planting of native vegetation on previously degraded primary and secondary floodplain lands along the San Joaquin River as described in the submitted Restoration Plan (see Attachment B, Exhibit A). Approximately 24 acres of riparian forest and one acre of herbaceous pollinator species are proposed to be planted. Invasive weed populations will also be treated, leaving existing native vegetation intact. Site preparation will include clearing debris and weeds. A drip irrigation system will be installed above-ground.

5.0 - AUTHORITY OF THE BOARD

California Water Code § 8534, 8590 – 8610.5, and 8700 - 8710

California Code of Regulations, Title 23 (Title 23)

- § 6, Need for a Permit
- § 13, Evidentiary Hearings
- § 112, Streams Regulated and Nonpermissible Work Periods
- § 131, Vegetation

6.0 – PROJECT ANALYSIS

The project restoration plan describes the ecological design to restore and enhance riparian and upland habitat. A summary of project background, objectives, and benefits is presented below along with reviews of hydraulic and geotechnical analyses, a Vegetation Management Plan, and findings relative to the project's consistency with 2012 Central Valley Flood Protection Plan and adjacent property owners.

6.1 – Project Background

Approximately six (6) percent of the riparian forest community remains in the San Joaquin Valley (CalFed, 1999). The San Joaquin River and its tributaries are distressed ecosystems in which natural processes can no longer maintain riparian forest and grassland communities. Historical and ongoing water diversion, flow regulation, floodplain leveling and clearing, sand and gravel mining, and invasive species function

as major stressors on native plant and wildlife communities. The cumulative effects of these stressors are manifested in the numerous special status species currently under federal or State protection that can only be found in these riparian ecosystems. The width of the riparian corridor adjacent to the San Joaquin River is greatly reduced or altogether absent as compared to historical levels, reducing the amount of quality upland habitat available species in river's edge. In addition, adjacent uplands have been leveled and are largely in agricultural production or residential development, and as a result no longer provide vegetative cover to serve as riparian corridors.

6.2 – Project Objectives

According to the Restoration Plan the primary objective of the project is to increase and improve riparian habitat and connectivity that will have multi-species benefits and will serve as an important wildlife corridor while also providing recreational opportunities. Target wildlife species for the project include Federal- and State-listed endangered species such as the valley elderberry longhorn beetle, least Bell's vireo, western yellow-billed cuckoo, Swainson's hawk, Neotropical migrant songbirds, year-round resident and wintering water birds, waterfowl, raptors and deer.

6.3 – Project Benefits

- Reduce the extent of invasive weeds within the designated floodway and on adjacent lands
- Improve wildlife habitat quality along the San Joaquin River
- Increase habitat connectivity along the San Joaquin River
- Improve landscape aesthetics within designated public recreation areas

6.4 – Hydraulic Analysis

The Hydraulic Analysis Report (see Attachment B, Exhibit D) analyzed the project for its potential impacts to floodwaters due to implementation of the Restoration Plan. The methodology used to determine anticipated hydraulic impacts associated with the proposed project was to develop an existing condition model and compare the results with those from a project condition model. The existing condition is based on existing conditions along the San Joaquin River floodway. The model was then modified to develop a second set of conditions reflecting the proposed restoration project. Computed maximum water surface elevations from the model simulations were compared to determine if there are any anticipated hydraulic impacts due to the project.

The California Department of Water Resources' one-dimensional HEC-RAS hydraulic model of the San Joaquin River Flood Control Project developed for the Central Valley Hydrology Study was used to simulate existing and project conditions. The model's

baseline Manning's roughness coefficients for existing conditions were modified to reflect the long-term vegetation conditions anticipated by the restoration plan.

The existing and project condition models were simulated in steady-state conditions using the Board's designated floodway design flow (20,000 cubic feet per second), and the 100-year (71,000 cubic feet per second) and 200-year (110,000 cubic feet per second) flood discharges.

The computed water surface elevations and the differences in water surface elevations for the existing condition and project condition predict that the maximum increase is 0.14 foot for the Board's designated floodway design flow, 0.37 foot for the 100-year flood and 0.47 foot for the 200-year flood .

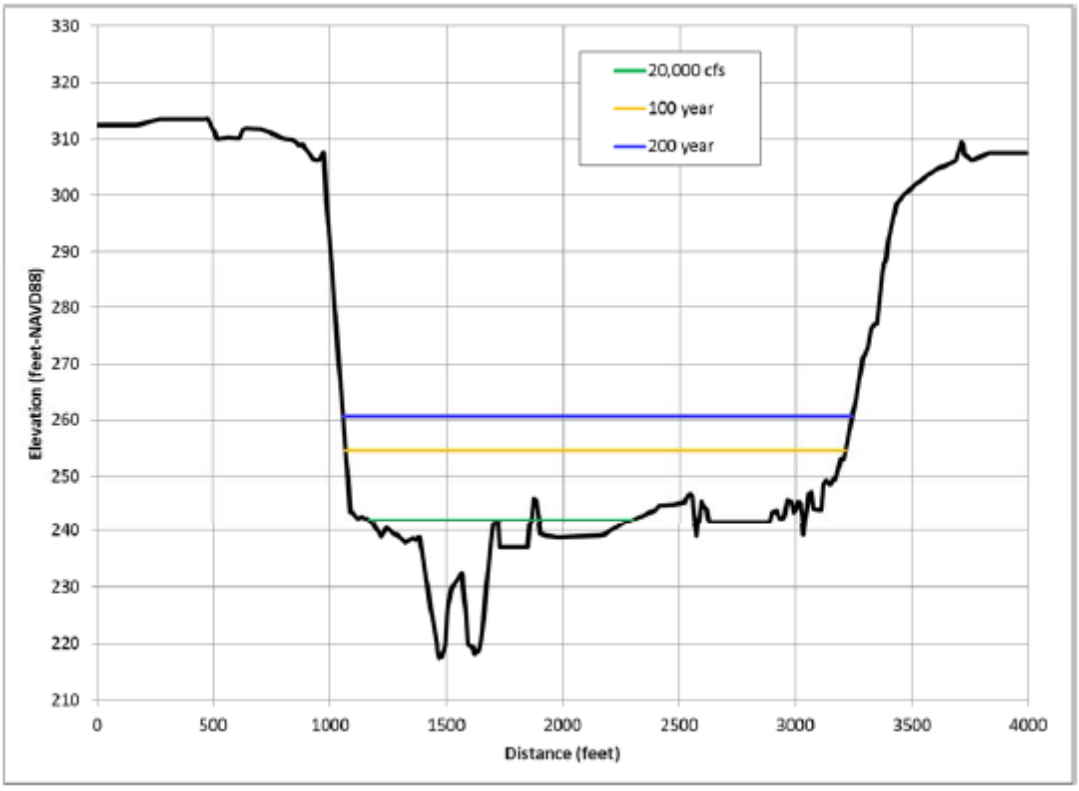


Figure 1: Comparison of water surface elevations from Board designated floodway flow (20,000 cubic feet per second), the 100-year flood (71,000 cubic feet per second) and 200-year flood (110,000 cubic feet per second) at the project location (Reference: see Attachment B, Exhibit D)

The hydraulic analysis results show that the water surface along the project reach is typically a minimum of 55 feet below the top of the adjacent bluffs for the Board's designated floodway flow, 45 feet below for the 100-year flood and 40 feet below for the 200-year event. Such a high freeboard is because the proposed project is located along a reach of the San Joaquin River contained by two high bluffs.

In summary, Board staff determined that the small anticipated increase in water surface elevations will not have an adverse impact because of the availability of high freeboard.

6.5 – Geotechnical Analysis

The proposed project does not involve any grading, compaction, seepage and stability issues or foundation for structures; therefore a geotechnical analysis was not required.

6.6 – Vegetation Management Plan

A Vegetation Management Plan describes desirable outcomes for floodplain vegetation and provides guidance for the City of Fresno and San Joaquin Conservancy who are responsible for property maintenance (see Attachment B, Exhibit C). As clearly stated in the Vegetation Management Plan, the "Long term management of the properties is funded through the existing budgets of the landowners". Details of maintenance actions for various vegetation zones are described in the Vegetation Management Plan.

6.7 – Project Consistency with the Central Valley Flood Protection Plan

The proposed restoration project is consistent with 2012 Central Valley Flood Protection Plan (CVFPP) due to the following anticipated project benefits:

- Improve Flood Risk Management by developing land uses that are consistent with floodway management objectives.
- Improve Operation and Maintenance (O&M) by treating and removing invasive weeds and establishing predictable vegetation communities with known roughness and defined maintenance requirements within the designated floodway.
- Promote ecosystem functions by restoring native vegetation that supports target wildlife species, treating invasive weeds, and improving habitat connectivity along the San Joaquin River.
- Improve institutional support by partnering State and local agencies with local non-government organizations to manage riverside and floodplain lands for flood management and ecosystem restoration.

6.8 – Adjacent Landowners

Board staff notified all adjacent property owners of the proposed project on September 29, 2014, and to date no objections or protests have been received.

7.0 – AGENCY COMMENTS AND ENDORSEMENTS

The comments and endorsements associated with this project, from all pertinent agencies are shown below:

- There are no federal, State or local levees along this reach of the river until approximately 22 miles downstream of the project site at river mile 220, and there is no local maintenance agency associated with this project.

- The U.S. Army Corps of Engineers (USACE) Sacramento District comment letter was received on December 16, 2014 for this application. The letter indicates that the USACE District Engineer has no comments or recommendations regarding flood control because the proposed work does not affect a federally constructed project. The letter is incorporated it into the permit as Exhibit B.

8.0 – CEQA ANALYSIS

The Board staff determined that the project is exempt from CEQA under a Class 3 Categorical Exemption (CEQA Guidelines Section 15303) covering new construction of facilities, and a Class 4 Categorical Exemption (CEQA Guidelines Section 15304) covering minor alterations to land.

9.0 – SECTION 8610.5 CONSIDERATIONS

1. Evidence that the Board admits into its record from any party, State or local public agency, or nongovernmental organization with expertise in flood or flood plain management:

   The Board has considered all the evidence presented in this matter, including the permit application and all supporting material, this staff report and all attachments, and any other evidence presented by any individual or group.

2. The best available science that related to the scientific issues presented by the executive officer, legal counsel, the Department or other parties that raise credible scientific issues.

   In making its findings the Board has used the best available science relating t the issues presented by all parties. On the important issue of hydraulic impacts the applicant used the HEC-RAS one-dimensional flow model, which is considered by

many experts as one of the best available and applicable scientific tools for the purpose of modeling river hydraulics. All accepted industry standards for the work proposed under this permit application as regulated by Title 23 have been applied to the review of this permit.

3. Effects of the decision on the entire State Plan of Flood Control, and consistency of the proposed project with the Central Valley Flood Protection Plan as adopted by Board Resolution 2012-25 on June 29, 2012:

   There will be no adverse effect to the entire State Plan of Flood Control as the hydrologic impacts from the proposed project are considered to be insignificant due to the availability of 40 feet freeboard for the 200-year flood event. The proposed project is compatible with the Central Valley Flood Protection Plan as it will promote ecosystem functions which are a supporting goal of the Central Valley Flood Protection Plan.

4. Effects of reasonable projected future events, including, but not limited to, changes in hydrology, climate, and development within the applicable watershed:

   Any increase in water surface elevation due to future events, such as changes in hydrology, climate, and development within the applicable watershed will have minimal impact on the San Joaquin River floodway at this location due to the large amount of freeboard provided by the high bluffs on both sides of the river.

10.0 – STAFF RECOMMENDATION

Board staff recommends that the Board:

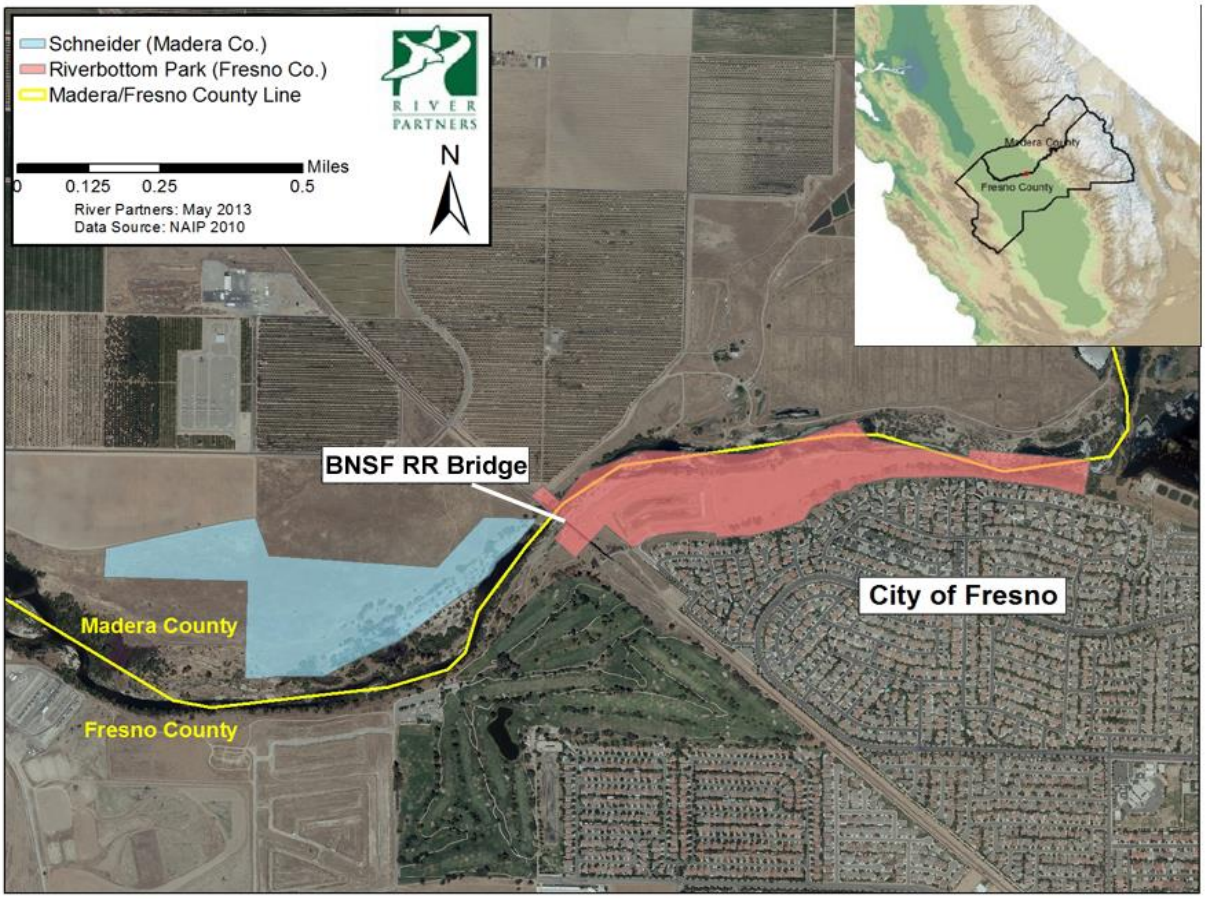
- find the project to be exempt from CEQA;
- approve Draft Permit No. 18995 (in substantially the form provided); and
- direct the Executive Officer to take the necessary actions to prepare and execute the permit and file a Notice of Exemption with the State Clearinghouse.

11.0 – LIST OF ATTACHMENTS

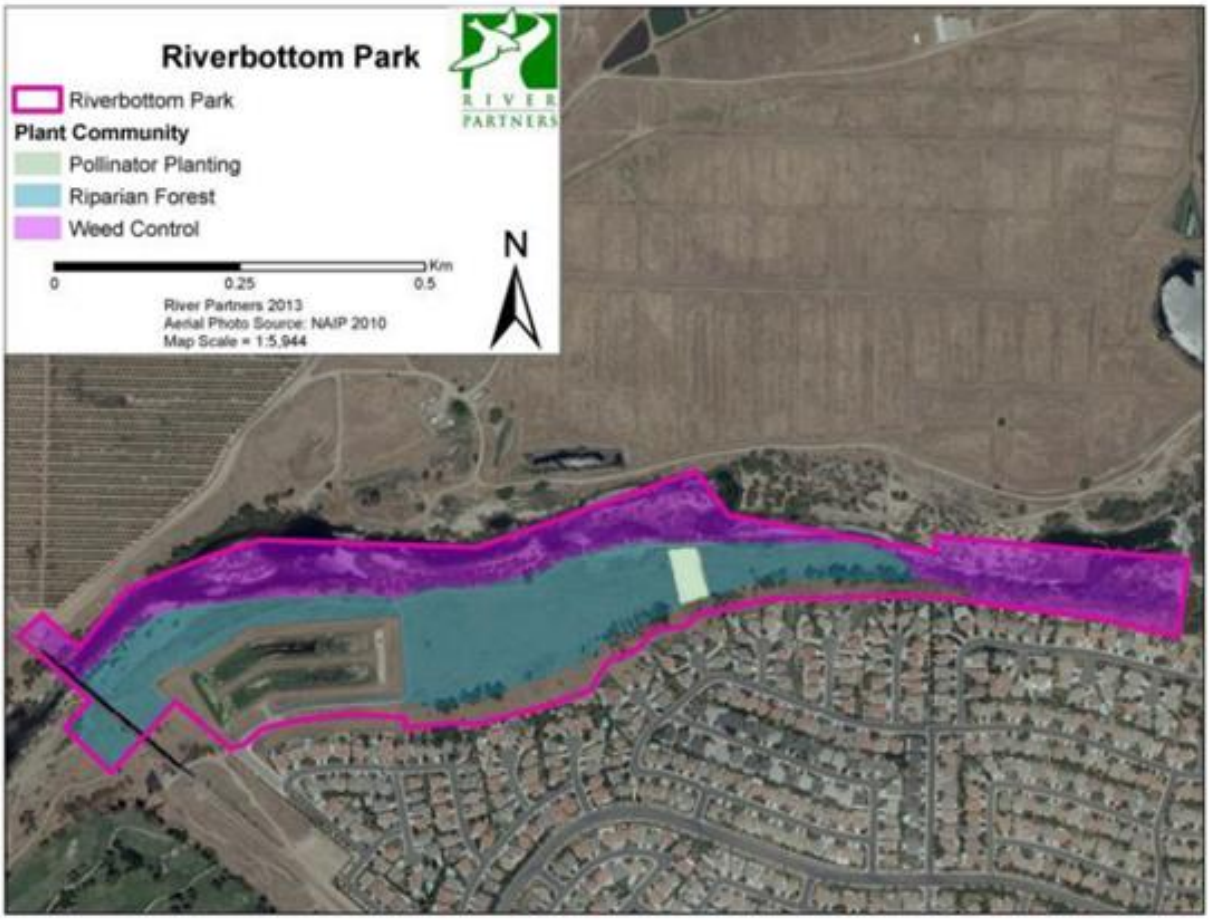
A. Project Location Maps
B. Draft Permit No. 18995
    Exhibit A, Restoration Plan
    Exhibit B, USACE Letter Dated December 16, 2014
    Exhibit C, Vegetation Management Plan
    Exhibit D, Hydraulic Analysis Report

Prepared by:	Ali Porbaha
Environmental Review:	James Herota, Senior Environmental Scientist
Document Review:	Eric Butler P.E., Planning Branch Chief
	Len Marino P.E., Chief Engineer
	Leslie Gallagher, Chief Counsel, Acting Executive Officer

Attachment A_Project Location



Attachment A_Project Location



DRAFT

STATE OF CALIFORNIA
THE RESOURCES AGENCY

THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18995 BD

This Permit is issued to:

City of Fresno PARCS Department
1515 E. Divisadero
Fresno, California 93721

To carry out a Project Restoration Plan for the San Joaquin River Parkway on the City's 63-acre Riverbottom Park property including planting of native vegetation on previously degraded primary and secondary floodplain lands. Project plantings consist of approximately 24 acres of riparian forest and one (1) acre of herbaceous pollinator species. Invasive weed populations across the remainder of the property will be treated, leaving existing native vegetation intact. Site preparation includes clearing debris and weeds. A drip irrigation system will be installed above-ground. Weed control and irrigation will be performed during the growing season for three (3) years. Property management and long-term maintenance requirements are described in the project Vegetation Management Plan.

The project is located within the San Joaquin River floodway at Riverbottom Park. The property is bounded by the San Joaquin River (Fresno-Madera county line) to the north and a BNSF railroad line to the west, and is owned in fee title by the City of Fresno. Project site GPS coordinates are: 36.850998, -119.899361.

(Section 27, 32, 33, 34, T12S, R19E, MDB&M, San Joaquin River, Fresno County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: _____

_____
Executive Officer

Attachment B_Draft Permit

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18995 BD

THIRTEEN: All work approved by this permit shall be in accordance with the submitted "Restoration Plan for the San Joaquin River Parkway Riverbottom Park and Schneider Property Habitat Restoration Project" (as it applies to the Riverbottom Park property in Fresno County) dated April 10, 2014, except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood Protection Board. The Restoration Plan has been incorporated into the permit as Exhibit A.

LIABILITIES AND INDEMNIFICATION

FOURTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted restoration project and shall defend, indemnify, and hold the Central Valley Flood Protection Board, and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns

(collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

FIFTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board, and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

SIXTEEN: The Central Valley Flood Protection Board and Department of Water Resources shall not be held liable for any damages to the permitted restoration project resulting from flood fight, operation, maintenance, inspection, or emergency repair.

SEVENTEEN: The San Joaquin River Parkway, Riverbottom Park and Schneider Property Habitat Restoration Project shall be subordinate to the purpose of California Water Code 8609 and to the flowage easements held by the Sacramento and San Joaquin Drainage District (i.e. The Central Valley Flood Protection Board).

AGENCY CONDITIONS

EIGHTEEN: The letter from the U.S. Army Corps of Engineers, Sacramento District dated December 16, 2014 is attached to this permit as Exhibit B and is incorporated by reference.

PRE-CONSTRUCTION

NINETEEN: Upon receipt of a signed copy of the issued permit the permittee shall contact the Central Valley Flood Protection Board by telephone at (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

TWENTY: The permittee will be responsible for securing any necessary permits incidental to habitat manipulation and restoration work completed in the flood control project, and will provide any biological surveying, monitoring, and reporting needed to satisfy those permits.

TWENTY- ONE: The permittee agrees to incur all costs associated with acquiring any local, State, or federal permitting that may be necessary to resolve conflicts that may occur between the conditions contained in this permit and any of the terms and conditions that these agencies might impose under the laws and regulations they administer and enforce.

CONSTRUCTION

TWENTY- TWO: No construction work of any kind shall be done during the flood season from November 1st to July 15th without prior approval of the Central Valley Flood Protection Board.

TWENTY- THREE: The permittee shall be responsible for repair of any damages to the floodway due to construction, operation, or maintenance of the proposed project.

TWENTY- FOUR: All debris generated by this project shall be disposed of outside of the floodway.

CONSTRUCTION MATERIALS

TWENTY- FIVE: No material stockpiles, temporary buildings, or equipment shall remain in the floodway during the flood season from November 1st to July 15th.

VEGETATION / ENVIRONMENTAL MITIGATION

TWENTY- SIX: The submitted Vegetation Maintenance Plan has been incorporated into the permit as Exhibit C and shall be a fully enforceable condition of this permit. Any material changes to the plan after the date of issuance of this permit, shall be submitted to the Central Valley Flood Protection Board's Chief Engineer for approval.

TWENTY- SEVEN: The irrigation system shall be removed from the floodway upon completion of the three year establishment period.

TWENTY- EIGHT: Cleared trees, brush or prunings shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1st to July 15th.

TWENTY- NINE: Areas where plantings are lost due to erosion may be replanted pursuant to the Project Restoration Plan (Exhibit A).

THIRTY: After each period of high water, debris that accumulates at the project site shall be removed from the floodway when reasonably determined as necessary by Central Valley Flood Protection Board.

POST-CONSTRUCTION

THIRTY - ONE: Upon completion of the project, the permittee shall submit a final planting plan to: Central Valley Flood Protection Board, 3310 El Camino Avenue, Room 151, Sacramento, California 95821.

OPERATIONS AND MAINTENANCE

THIRTY - TWO: The project shall be maintained so as to not increase the design water surface elevation of the San Joaquin River by more than that which is documented in the Technical Memorandum by MBK Engineers titled “Riverbottom Park and Schneider Property Habitat Restoration Project Hydraulic Impact Analysis", dated August 1, 2014, which is incorporated into this permit as Exhibit D.

THIRTY - THREE: Any feature of the restoration project which adversely impacts the successful execution, function, maintenance, or operation of the San Joaquin River floodway and downstream flood control project levees must be removed or mitigated by the permittee at permittee’s expense upon request by the Central Valley Flood Protection Board. If the permittee does not remove or mitigate for these adverse impacts upon request, the Central Valley Flood Protection Board reserves the right to remove or mitigate the impacts at the permittee's expense.

THIRTY- FOUR: The permittee shall restore the project site to the initial as-constructed and approved project design conditions pursuant to the permittee’s Restoration Plan and Vegetation Management Plan if the Central Valley Flood Protection Board determines that the project is adversely impacting flood conveyance capabilities or water surface elevations in the San Joaquin River floodway.

PROJECT ABANDONMENT, CHANGE IN PLAN OF FLOOD CONTROL

THIRTY - FIVE: If the project land is to be sold, the transfer of interest shall not occur without written notification to the Central Valley Flood Protection Board and all the permit conditions shall be transferred to the new owner. The Permittee is required to notify the prospective new owner of the need to apply for a name change permit from the Central Valley Flood Protection Board.

THIRTY- SIX: If the project or any portion thereof, is to be abandoned in the future, the permittee shall abandon the project under direction of the Board at the permittee's cost and expense.

THIRTY- SEVEN: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted restoration project if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central Valley Flood Protection Board may remove the permitted restoration project at the permittee's expense.

END OF CONDITIONS

Restoration Plan for the San Joaquin River Parkway, Riverbottom Park and Schneider Property Habitat Restoration Project

Prepared for:

California Wildlife Conservation Board

City of Fresno

&

San Joaquin River Conservancy

RIVER PARTNERS

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Suggested citation:

River Partners. 2013. Restoration Plan for the San Joaquin River Parkway, Riverbottom Park and Schneider Property Habitat Restoration Project. T. Meadows, A. Rayburn and J. Rentner. Modesto, California.

Acknowledgements

The following individuals contributed to this conceptual restoration plan:

Name	Affiliation
Trevor Meadows	River Partners
Julie Rentner	River Partners
Andrew Rayburn, Ph.D.	River Partners
Jeff Holt	River Partners
Stephen Sheppard	River Partners
Tom Griggs, Ph.D.	River Partners
Irma Yepez-Perez	City of Fresno
Tony Hernandez	City of Fresno
Sharon Weaver	San Joaquin River Parkway & Conservation Trust, Inc
Melinda Marks	San Joaquin River Conservancy
Joshua Morgan	San Joaquin River Conservancy
Chris Acree	Revive the San Joaquin
Richard Sloan	River Tree Volunteers

EXECUTIVE SUMMARY

The Restoration Plan (Plan) for the San Joaquin River Parkway, Riverbottom Park, and Schneider Property Habitat Restoration Project (Project) describes the ecological design to restore and enhance approximately 147 acres of riparian and upland habitat near the Burlington Northern Santa Fe railroad crossing on the site of the future Riverbottom Park (south of the river), Schneider Property (north of the river), and state property along the San Joaquin River, Fresno and Madera Counties, California. The Riverbottom Park property is owned by the City of Fresno, and is an important piece in the overall San Joaquin River Parkway Master Plan (Conservancy 2000). The Schneider Property is owned in title by the San Joaquin River Conservancy. The primary goal of the Plan is to increase and improve riparian habitat and connectivity that will have multi-species benefits and will serve as an important wildlife corridor while also providing recreational opportunity. Target wildlife species for the Project include Federal- and State-listed endangered species such as the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*; VELB), least Bell's vireo (*Vireo bellii pusillus*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis)*, Swainson's hawk (*Buteo swainsoni*), Neotropical migrant songbirds, year-round resident and wintering water birds, waterfowl, raptors and deer.

A site evaluation examined soil texture, structure, depth to water table, root growth, weed populations, hydrology, and existing native vegetation, as well as past land use and current conditions. Based upon the site evaluation, five plant associations and a native herbaceous layer are suited to be planted on the Project site. This Plan describes how the designed plant communities interact with current recreational usage.

Monitoring and adaptive management are integral parts of riparian restoration. An annual monitoring timeline will allow for rapid adjustment of management actions based on these monitoring results. The entire planting pattern will be stored in an electronic database for quick information retrieval; this structure will also for hypothesis testing regarding the effects of site factors (e.g., soil factors, hydrology, and plant tolerances) on the success of the planting design. Wildlife monitoring conducted by collaborating organizations could further contribute to effective adaptive management.

RESTORATION PLAN FOR THE SAN JOAQUIN RIVER PARKWAY, RIVERBOTTOM PARK AND SCHNEIDER PROPERTY HABITAT RESTORATION PROJECT FRESNO COUNTY, CALIFORNIA

I. INTRODUCTION

A. Project Overview

The Restoration Plan (Plan) for the San Joaquin River Parkway, Riverbottom Park and Schneider Property Habitat Restoration Project (Project) describes the ecological design and implementation activities for restoring approximately 147 acres of riparian and upland habitat along the San Joaquin River in Fresno and Madera Counties (Figure 1). The Project benefits the San Joaquin River ecosystem and associated native wildlife species by increasing total riparian habitat between Friant Dam and Highway 99, which is the western boundary of the San Joaquin River Parkway. The Project will also provide public benefit by increasing recreational opportunities along the San Joaquin River within the San Joaquin River Parkway and consistent with the Parkway Master Plan.

The primary goal of this Plan is to increase and improve riparian, upland and wetland habitat that will provide multi-species benefits and also support low-impact recreational activity on the site. Potential wildlife targets include federal- and state-listed species such as the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*; VELB), least Bell's vireo (*Vireo bellii pusillus*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis)*, Swainson's hawk (*Buteo swainsoni*), and will support the efforts of the reintroduction of spring run Chinook salmon (*Oncorhynchus tshawytscha*). Raptors, waterfowl, Neotropical migratory songbirds, year-round residents, wintering water birds, and deer will also benefit from restoration efforts. A detailed monitoring program will provide the necessary data to make adaptive management decisions. The proposed Project is designed to be consistent with the potential future development of a trail and public river access within the Project area. Habitat restored through the Project will improve future wildlife observation and environmental interpretation opportunities, and provide shade for the planned trails.

Approximately 6% of the riparian forest community remains in the San Joaquin Valley (CalFed 1999). The San Joaquin River and its tributaries are all anthropogenically distressed ecosystems in which natural processes can no longer maintain riparian communities. Water diversion, flow regulation, floodplain leveling and clearing, sand and gravel mining, and invasive species function as major stressors on native plant and wildlife communities. Cumulative effects of these stressors are manifested in the numerous special status species currently under Federal or State protection that can only be found in these riparian ecosystems. The width of the riparian corridor adjacent to the San Joaquin River is greatly reduced or absent compared to historical levels, reducing the amount of quality upland habitat (forage and cover) available for riparian-obligate species. In addition, uplands have been leveled and are largely in agricultural production or residential development, which do not provide the necessary vegetative cover to serve as riparian corridors. The efforts proposed in the Plan will restore 147 acres of riparian habitat within this highly degraded region.

B. Cooperative Relationships and Funding Sources

Funding for the Project has been granted by the San Joaquin River Conservancy (a State agency) through the California Wildlife Conservation Board (WCB); specifically the California Clean Water, Clean Air, Safe Neighborhood Parks and Coastal Protection Fund Section 5096.650 (b) (5). The City of Fresno (Riverbottom Park) and the San Joaquin River Conservancy (Schneider Property) are the landowners of the two parcels involved in the Project and have entered agreements with River Partners (Grantee). Project assistance through public outreach and local contracting will come from Revive the River and River Tree Volunteers. The Plan considers conservation recommendations presented in the Riparian Bird Conservation Plan (RHJV 2004) and PRBO Conservation Science reports (Geupel et al. 1996, Small et al. 1999, Hammond et al. 2002) to improve habitat structure for riparian-associated bird species.

C. Project Goals and Objectives

This document presents a specific restoration plan for 147 acres including areas along the San Joaquin River at Riverbottom Park and the Schneider Property that, once implemented, should meet the following objectives:

- Restore or improve high quality riparian, upland and wetland habitat on approximately 147 acres on Riverbottom Park (63 acres) and Schneider Property (62 acres);
- Increase habitat connectivity within the Project area relative to existing riparian habitat;
- Provide habitat for Federal- and State-listed species including the valley elderberry longhorn beetle, least Bell's vireo, western yellow-billed cuckoo, blunt-nosed leopard lizard, Swainson's hawk, and support the efforts to reintroduce spring run Chinook salmon;
- Provide habitat for other riparian-obligate wildlife and fish;
- Establish self-sustaining native plant communities within a three-year period;
- Plant approximately 28,000 native trees and shrubs;
- Reduce extent of existing invasive weeds, and increase community resistance to weed invasion by planting a dense herbaceous understory;
- Increase landscape aesthetics and enhance planned recreational uses;
- Use an adaptive management approach to ensure project success; and
- Build partnerships with Federal, State, and local entities.

D. Summary of Special Considerations

- Creating functional wildlife habitat, while maintaining the future utility of a public recreation space;
- Establishing quality habitat on extreme topography;
- Considering the concerns of multiple stakeholders;
- Deterring herbivory by cows, rodents, and deer until establishment of the restoration;
- Actively maintaining infrastructure (irrigation system) in a highly utilized public space;

- Aggressively controling Red sesbania (*Sesbania punicea*), yellow starthistle (*Centaurea solstitialis*) tree of heaven (*Ailanthus altissima*), eucalyptus (*Eucalyptus camaldulensis*) and other invasive species from spreading.

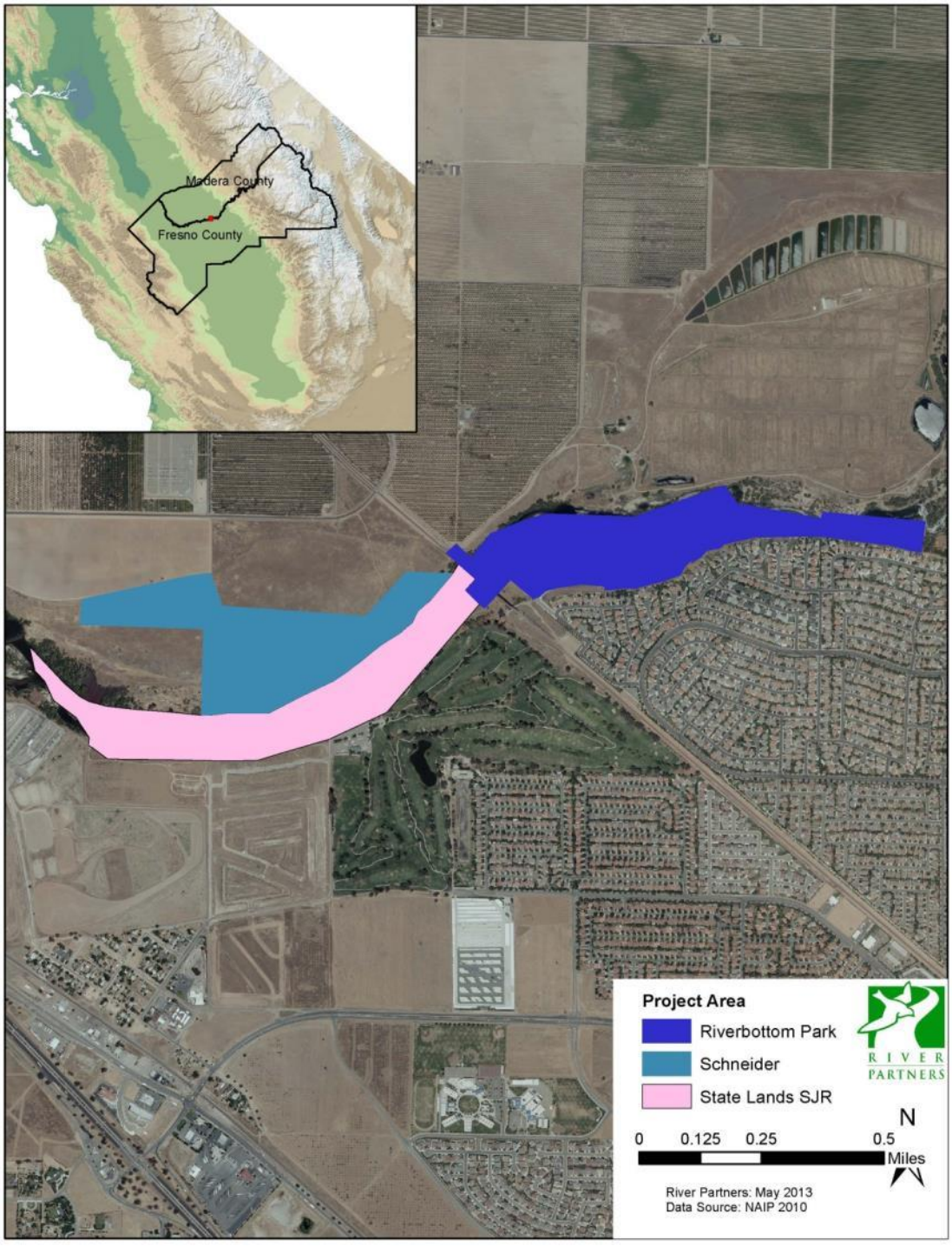


Figure 1. Project Location: Riverbottom Park and Schneider Ranch, Fresno and Madera County, California.

E. Purpose of Restoration Plan

The purpose of the Plan is to:

- Identify project goals and objectives;
- Summarize the site land-use history, soils, hydrology, vegetation, and wildlife;
- Outline the current understanding of the physical and biological factors that influence site ecology (i.e., a conceptual site model);
- Describe the planting design and the rationale for its selection;
- Describe the implementation process including field preparation, planting methods, irrigation design and schedule, and methods of weed control;
- Outline project monitoring; and
- Provide a timeline for project tasks.

II. SITE DESCRIPTION

A. Location

The Project is composed of two properties found along the San Joaquin River on the northeast border of the city of Fresno, California. The Burlington Northern Santa Fe railroad crossing of the San Joaquin River falls approximately between the two properties. Riverbottom Park (63 acres, Fresno County) abuts the southern edge of the San Joaquin River to the east of the railroad crossing and is owned in fee title by the City of Fresno. The Schneider Property (62 acres, Madera County) abuts the northern edge of the river just to the west of the Burlington Northern Santa Fe railroad crossing, and is owned in fee title by the San Joaquin River Conservancy. The river, from low water mark to low water mark as mapped by the California State Lands Commission, is owned in fee title by the State as state sovereign land.

The Riverbottom project site and a portion of the Schneider property are within the historic floodplain of the San Joaquin River (Figure 16). Along this stretch of the San Joaquin River, the floodplain is confined by the higher-elevation river bluffs. At the Riverbottom project site, the floodplain extends south from the river to 20-25 m bluffs, leaving little room for large-scale river meander. The Schneider Property on the north side of the river has a greatly reduced floodplain, with elevation gains within only 20 meters of the property line nearest the river on the south end of the property. The bluffs to the south of Riverbottom Park are in residential housing while the bluffs to the north of the Schneider Property are primarily agricultural fields. Most of the remnant native riparian vegetation is confined to the river channel and banks. Because of its close proximity to residential areas, the Project site has the potential to become a focal point of interest in the community served by the expanding San Joaquin River Parkway.

B. Land-use History

Prior to the acquisition of the Schneider Property by the Conservancy, the property was mined for gravel on the lower floodplain and grazed by cattle. In the 1950s gravel mining began on the Schneider Property, leaving behind two ponds and a lower floodplain that floods between 2,500 and 3,000 cfs (evident through historical photos of

the project area; Figures 9 and 10). Large portions of the river were excavated for sand and gravel leaving a severely-altered river system. Unauthorized cattle grazing still occurs on this site today.

As far back as 1946, Riverbottom Park has not been under agriculture, which is unique for flat riverfront property in the San Joaquin Valley. Riverbottom Park has a history of recreational use considering its relatively easy access near the historic Burlington Northern Santa Fe railroad crossing. Recreational usage has increased since the expansion of residential housing to the bluffs' edge overlooking the park in 1998 and the transfer of the deed to the City of Fresno in 1999 that officially established it as a public property. The stormwater detention ponds constructed by the Fresno Metropolitan Flood Control District in the early 1990's, as well as the railroad crossing, are still in use adjacent to the Riverbottom Park site.

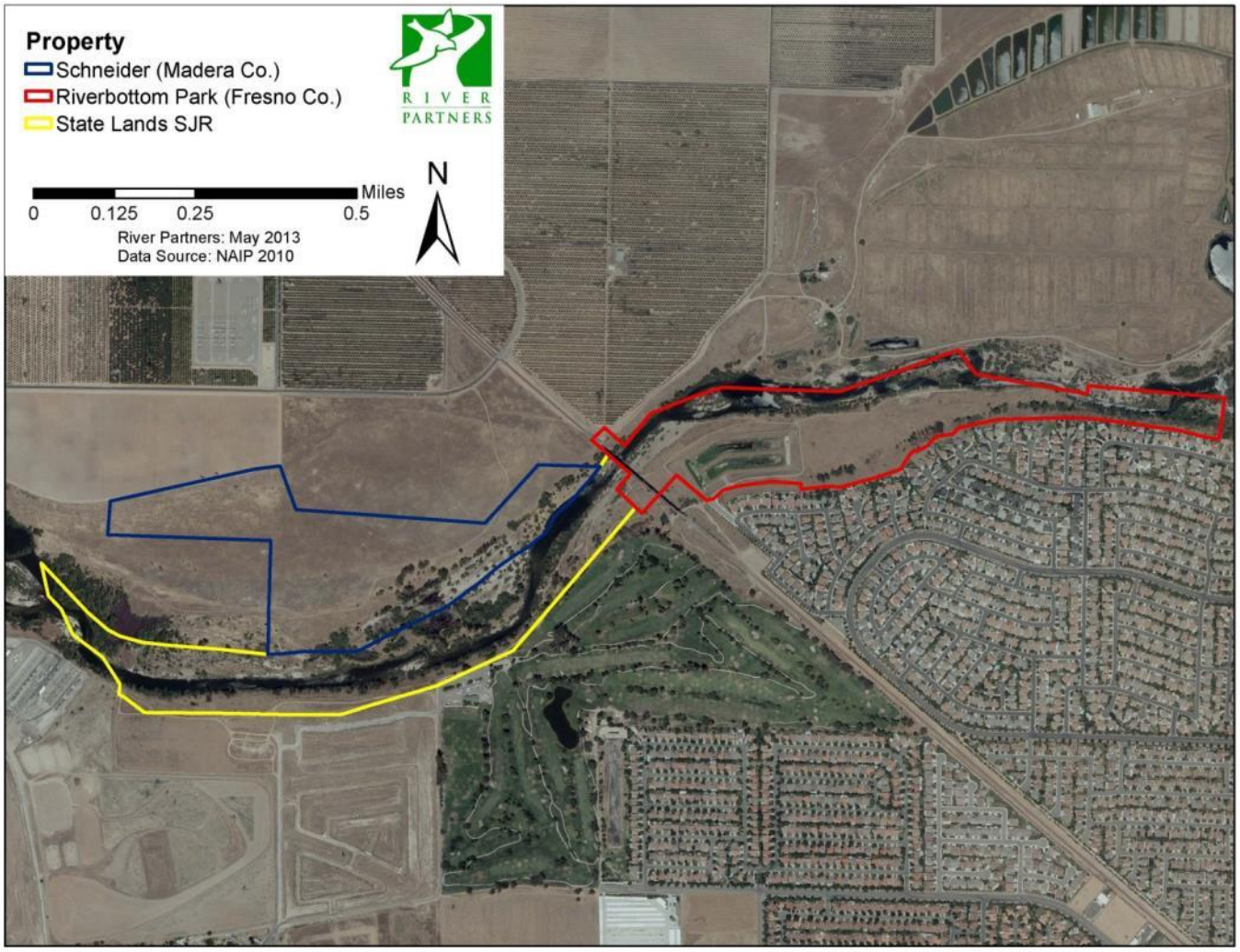


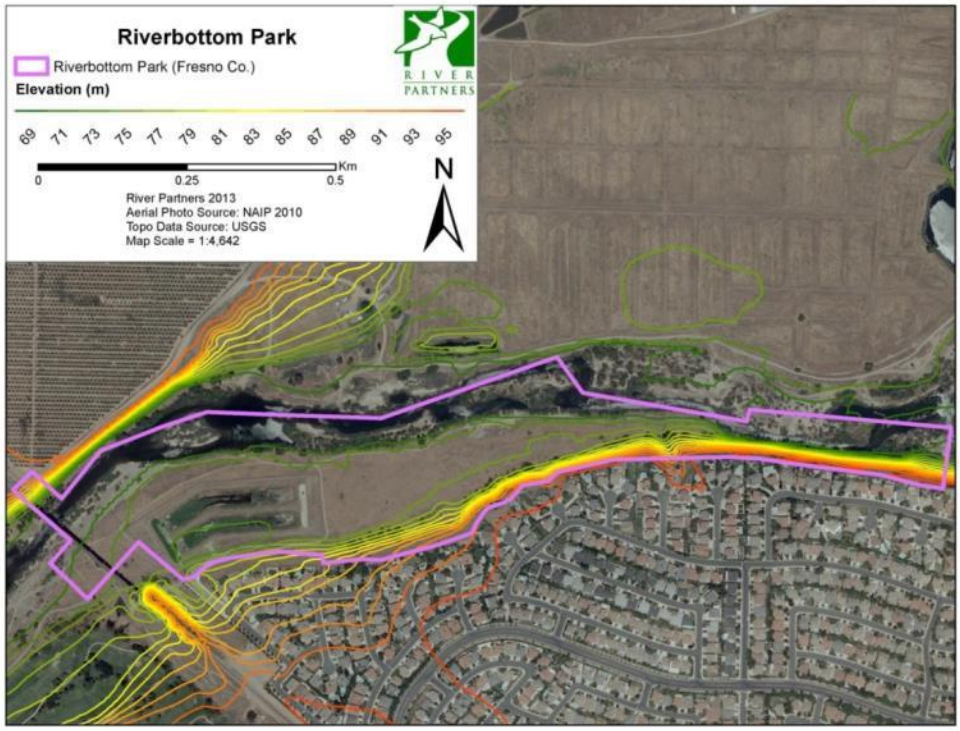
Figure 2. Project Boundaries for Riverbottom Park and Schneider Property, Fresno and Madera Counties, California.

C. Topography

Human activity has greatly altered the topography of the Project sites, especially the Schneider Property. As evident from historic photos, gravel pit mining in the 1950s lowered the floodplain on the Schneider Property near the river, leaving small permanent ponds and a channel that now floods around 2,500 cfs. The remainder of the Schneider Property has never been leveled for agriculture because of its slope. Elevations on the property range from 69 m a.s.l. at the floodplain and gravel pits to 91 m a.s.l. at the top of the bluffs on the northwest edge (Figure 3). The Schneider Property is characterized by a gradual slope, but exhibits steep sloping on the bluffs along the northwest and northeast borders of the property.

Topography of Riverbottom Park has also been altered by human activity, but on a much smaller scale. Dating as far back as 1946, it does not appear that the Park has ever been mined for gravel or leveled for agriculture. The construction of the Burlington Northern Santa Fe Railroad crossing and Fresno Metropolitan Flood Control District ponds are human alterations to the Riverbottom Park project site that have little impact to the restoration since neither of those alterations are within the restoration footprint. Riverbottom Park is relatively level compared to the Schneider Property. The roughly 0.25 km floodplain increases in elevation by only 2 m in a southerly direction from the San Joaquin River, but rises steeply (20 m) at the bluffs to the southern edge of the Property (Figure 3).

The Plan proposes no alterations to existing topography. Topography of the Project site presents challenges that are addressed in plant community (Plan section) and irrigation design (Plan section).



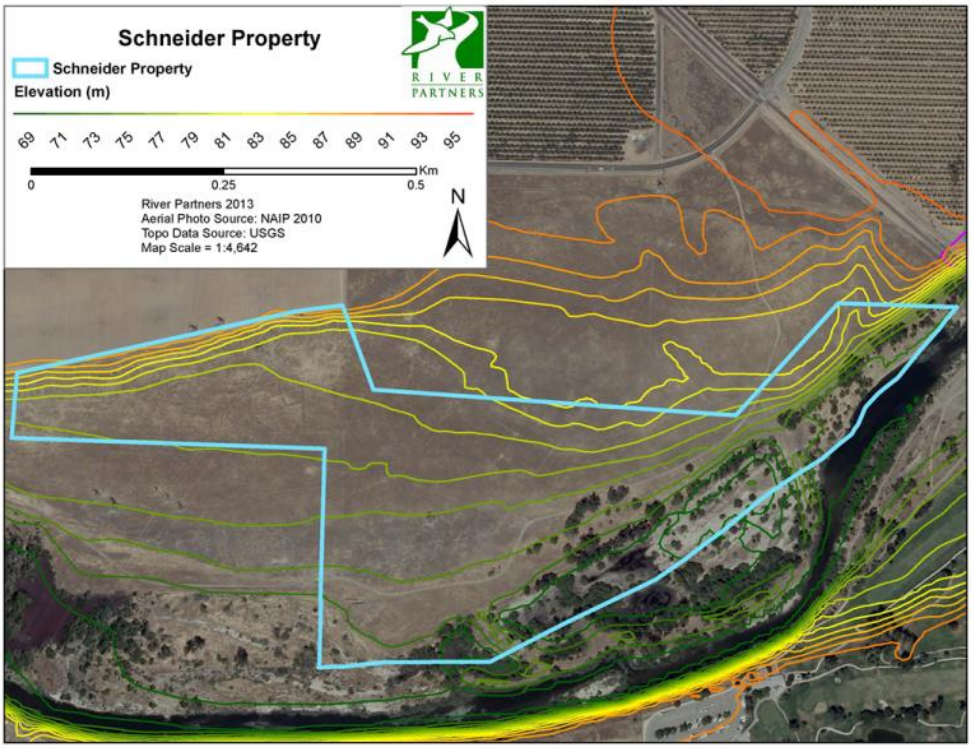


Figure 3. Topography, Riverbottom Park and Schneider Property, Fresno and Madera Counties, California.

D. Soils

Dynamic river processes create heterogeneous floodplain soils that vary in texture, structure, and stratification. These variable soil characteristics greatly affect riparian vegetation composition, structure, and patterns. Soils on the Project sites are a mosaic of sandy loam alluvial soil types derived primarily from granite, characteristic of alluvial floodplains.

Rocky areas that lack topsoil on the Schneider Property, riverwash at Riverbottom Park and areas of highly compacted soils along existing roads will present challenges to the restoration effort. These poor soil conditions will require specific planning that is documented in Planting Design of this report.

1. General Soil Series Information

The Project sites are composed of ten soil mapping units (SMUs) as delineated by the NRCS Web Soil Survey**.** Soils from the Grangeville series make up a large portion of the acres to be restored at both the Riverbottom Park and Schneider Property. The Grangeville series is typical for the east side of the San Joaquin Valley and provides the majority of aggregate resources. Other soils present on the project site include bands of Hanford and Tujunga soils below the terrace escarpments, which lead up to the higher elevation river bluffs (Table 1).

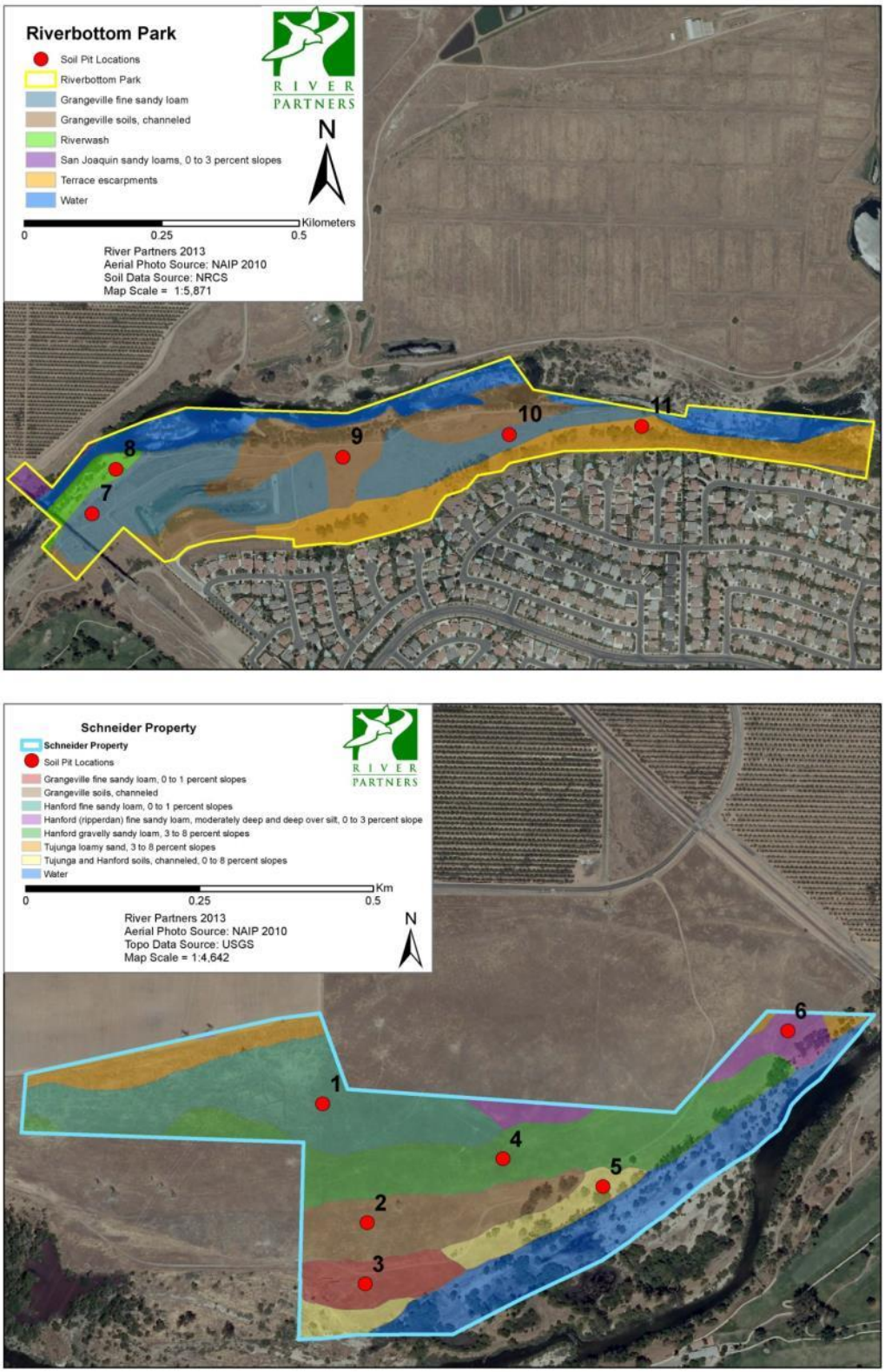


Figure 4. Soil Series, Riverbottom Park and Schneider Property, Fresno and Madera Counties, California.

2. Soil Analysis

A & L Western Agricultural Laboratories, Inc. provided soil analysis of twelve samples collected on-site by River Partners Biologists in July 2013 (Appendix I). Analysis found that pH on both restoration sites fell within optimum range for plant growth (5.5 - 7), excluding one sample (found on the north side of the Schneider Property on Hanford sandy loam soils), which had a relatively high pH of 7.5. This slightly alkaline soil should have no detrimental effect on plant growth or uptake of nutrients by the native plant species in the Oak Woodland community planned for the area (Plan section). A very high calcium concentration was found in one soil analysis from a sample on the east side of Riverbottom Park, on Grangeville soils. Elevated calcium might result in slight stunting of plants grown in these soils, but should ultimately have little detrimental effects on the Pollinator Planting community planned for the area (Figure 15). Low organic matter was found in samples from most sample sites throughout the project area. This was expected considering the intense cattle grazing on the Schneider Property, and the dominance of invasive annual grasses on both project sites that tend to return very little organic matter to soils. Restoration activities proposed in the Plan will likely enhance the organic matter status of soils on the sites.

3. Backhoe Pit Information

Eleven backhoe pits were dug on the restoration sites July 18-19, 2013 to determine soil texture, rooting depth, as well as depth to soil moisture and water table.

The soil excavations on the restoration sites indicated that roots of trees and shrubs would be able to penetrate to depths of up to 108 in, indicating that on most of the sites there would be no limitation to root growth given typical rooting depths of native trees and shrubs described in the Plan. At soil pit 2 (Figure 4), however, excavation and rooting depth were limited to a mere 6 in because of rock near the soil surface. Shallow rooting grasses and forbs were present on this rocky Grangeville soil series, suggesting that the Pollinator Planting community (Planting Design) can be supported by these shallow rocky soils. Shallow roots were primarily annual forbs and grasses that exploit surface moisture during the spring and die in the summer when moisture is not available. Roots were observed at greater depths, but were tree roots that mine the subsoil for moisture.

In general, the pits on the restoration site displayed riparian alluviation through layering and the pit depth was limited due to friable sandy soils or cobble. This prevented excavations from reaching the water table. Soil moisture, however, was observed (Appendix II) around depths of 7 ft. Soil pits 5 (Schneider Property) and 7 (Riverbottom Park) showed characteristic evidence of wetting and drying through gley mottled soils (dotted with iron oxides) (Appendix II). This is a typical feature of soil found in riparian systems on active floodplains. It is expected that these soil types can support riparian vegetation and associated upland plant species over the long term.

Table 1. Summary of typical soil conditions found at Riverbottom Park and the Schneider Property (NRCS 2008), Fresno and Madera Counties, California.

	Grangeville soils, channeled	**Grangeville fine sandy loam 0-1% slopes**	**Grangeville fine sandy loam**	**Grangeville soils, channeled**	**Hanford fine sandy loam**	**Hanford sandy loam, benches**
Mapping unit	Gp	GaA	Gf	Gp	HaA	HdA
Locations	Along river channel; Fields 4-5	Schneider Property in the Southwest	Floodplain of Riverbottom Park	Riverbottom floodplain, Schnieder Property: West	Schneider Property: Northwest	Schneider Property: North and Eastern
% Slope	0-2%	0-1%	0-2%	0-2%	0-1%	3-9%
Texture	Course loamy mixture	Fine sandy loam	Fine sandy loam	Sandy loam	Fine sandy loam	Sandy loam
Depth of soil	Very Deep	Very Deep	Very Deep	Very Deep	Very Deep	Very Deep
Drainage	Somewhat poor	Somewhat poor	Somewhat poor	Somewhat poor	Well drained	Well drained
Permeability	Moderately rapid	Moderately rapid	Moderately rapid	Moderately slow	Moderately rapid	Moderately rapid
Available water capacity	Moderate	Moderate	Moderate	Moderate	Moderate	High
Limitations to plant growth	Slight erosion hazard, surface runoff negligible or very low	None	None	None	None	None

	Hanford gravelly sandy loam	**Riverwash**	**Terrace escarpments**	**Tujunga loamy sand**	**Tujunga and Hanford soils, channeled**
Mapping unit	HeB	Rh	ThF	TwB	TzB
Locations	Schneider Property: band through center of property	Riverbottom: Northwest along river	Riverbottom: bluff faces to the south	Schneider Property: bluff faces to the north west	Schneider Property: central and southwest
% Slope	3-8%	0-2%	30-70%	3-8%	0-8%
Texture	Gravelly sandy loam	Coarse sand	Variable	Loamy sand	Sandy loam
Depth of soil	Very Deep	Shallow to none	Variable	Very Deep	Very Deep
Drainage	Well drained	Excessively drained	Variable	Somewhat excessively drained	Somewhat excessively drained
Permeability	Rapid	Rapid	Variable	Rapid	Rapid
Available water capacity	Low	Very low	Very low	Low	Moderate
Limitations to plant growth	None	Near non-soils. Riparian vegetation will not be limited.	Slight erosion hazard, surface runoff negligible or very low	Slight erosion hazard, surface runoff negligible or very low	None

E. Hydrology

1. History and Current Conditions

The 366 mi long San Joaquin River is the largest river in the Central Valley, draining approximately 31,800 mi^2, with an annual average flow of 4.5 million ac-ft. The San Joaquin River originates as two upper forks on the south-central slope of the Sierra Nevada range. Historically, its flows have peaked in spring and early summer with snowmelt runoff from the Sierra Nevada Mountains.

The main stem and tributaries of the San Joaquin River are now extensively dammed and diverted. The river is typically divided into two sections with the upper reaches above Friant Dam and the lower section on the valley floor. Four hydroelectric dams exist on the upper reaches of the river. Below the confluence of its forks stands the most significant barrier on the main stem San Joaquin River, Friant Dam. Construction of Friant Dam, was begun in 1937 and completed in 1942 under the direction of the U.S. Bureau of Reclamation (BOR). Because of a work stoppage in the wake of WWII, the downstream water conveyance systems were not completed. Construction of the associated diversion tunnels and canals was completed in 1944, which initiated the filling of the reservoir. Downstream from Friant Dam are numerous structures designed to move water into canal systems in addition to the hundreds of pumping points for irrigation water. With the construction of the Eastside Bypass and other diversions, the dry riverbed below Gravelly Ford downstream of the Project site had little chance of receiving any measurable flows, typically only receiving water in flood stage events.

In 2006, after 18 years of litigation, a settlement was reached to provide suitable fish habitat in the San Joaquin River below Friant Dam and to support a healthy self-sustaining salmon population downstream to the mouth of the Merced River. Interim flows began in October 2009 to allow data collection in sections of the historic riverbed that had remained dry for decades. Full restoration flows are scheduled to start in January 2014 and may help to stabilize ground water levels.

Friant Dam was constructed for the main purpose of providing water for agriculture, with flood control considered only a secondary benefit on the lower San Joaquin River. River flows since the dam's construction are far less variable than pre-dam flows, with extremes that are much less severe. Daily mean flows regularly approached or exceeded 1,000 cfs before the construction of Friant Dam, but now only sporadically exceed that mark in the post-dam period. USGS river data at Friant (river gage #11251000) for the pre-dam period of record 1907-1944 show greater variation in daily stream flows compared to the post-dam period 1945-present (Figure 5).

River data pre-1944 show a typically high range of annual peak stream flows (Figure 6; min=3,380 cfs, max=77,200 cfs, range=73,820 cfs). After the construction of Friant Dam, the range of stream flow variation below the dam narrowed considerably. The lowest annual peak flow in the post-dam period has been 161 cfs in 1966 and the maximum peak flow was 60,300 cfs in 1997 (which was an uncontrolled release due to overtopping of the dam caused by unexpected volumes of inflow resultant from a rare warm winter storm). For comparison, the largest pre-dam flood event on record peaked at 77,200 cfs on December 11, 1937. In the 35 year period on record before the dam

was completed, there were 25 peak events greater than 10,000 cfs, while in the 67 year post-dam period, only six events occurred of a magnitude greater than 10,000 cfs.

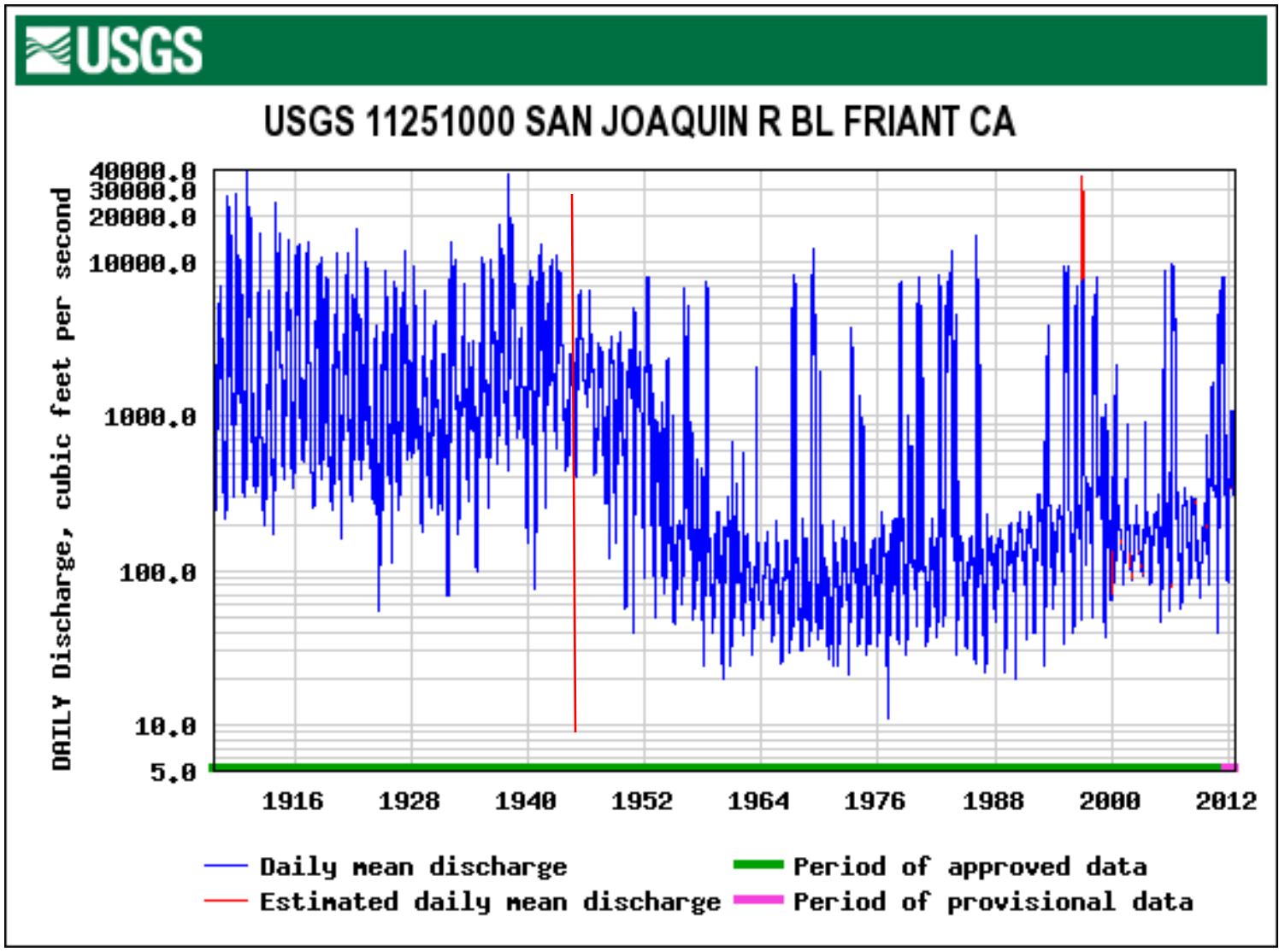


Figure 5. San Joaquin River stream flow below Friant Dam for the period of record 1907-2012. Vertical red line indicates 1944, the year Millerton Lake began to fill.

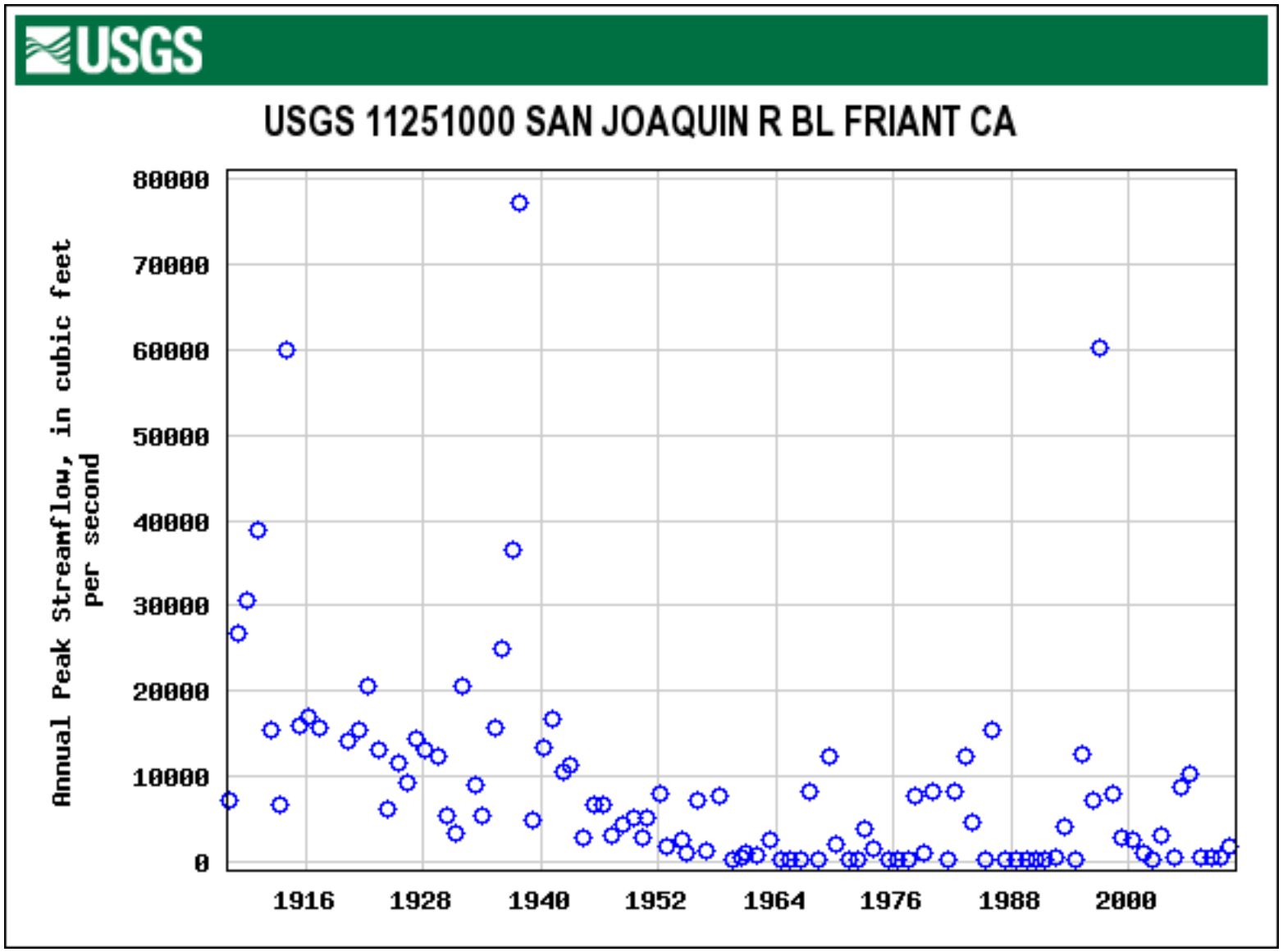


Figure 6. San Joaquin River annual peak stream flows below Friant Dam for period of record at gage #11251000.

A comparison of the two peak flow years on record for the San Joaquin River, pre-and post-Friant Dam, reveal two very different flood years. The annual hydrograph for water year 1937 shows winter and spring flows of much higher magnitude, variation, and longer duration (Figure 7) than the floods of 1997 (Figure 8), the largest on record since this dam was constructed. Since the construction of Friant Dam, water availability has been lower than initially anticipated by the U.S. Bureau of Reclamation, especially during the drought period of 1987-1992. This generated further controversy with agricultural water users downstream, over water quality and quantity for irrigation (BOR 2008).

The Riverbottom Park and the Schneider Property are along the San Joaquin River, approximately 20 miles downstream from the Friant Dam. In its current regulated state, the San Joaquin River rarely exceeds its banks at the project area, leaving little chance for the recharge of historic oxbows and side channels. The river now remains fixed in its current channel, with little opportunity for lateral migration.

Historic aerial photos show evidence of this once extremely dynamic river action on the landscape prior to the construction of Friant Dam. Evidence of river meander in the form of oxbow lakes, side channels, exposed sand bars, scour and sand deposition on the floodplain are clear in an aerial photo (Figure 9) of the site dating from 1946, which is post-dam construction. Exposed sandbars that appeared in historic aerial photos on the Schneider Property have since been mined for their sand and gravel, leaving small ponds along the river channel.

In this static condition, recruitment and survival of native riparian trees, especially those species adapted to a natural hydrograph (i.e. willows and cottonwoods), will be rare at this site. These species evolved to recruit and establish depending upon dynamic flow events at times coincident with seed-set and active scouring that would prepare mineral seedbeds for germination. With the eventual reintroduction of salmon to the river it is imperative to create and enhance shaded riverine aquatic habitat and introduce woody debris to the river ecosystem.

2. Water Table Depth

Knowing the depth to the water table over time at a given site is critical for an accurate site assessment of riparian and associated communities. Flood frequency and duration directly affect ground water elevations, which in turn influence the connectivity to the floodplain. Ten soil pits were dug on site to determine depth to soil moisture and the water table (Appendix II). Plant communities are recommended in the Plan that can tolerate these fluctuating water levels near the edge of the river and also thrive on the drier slopes and upland areas adjacent to the river. Soil pits reached soil moisture at 5 to 7 feet on most sites in mid-July but were unable to reach the water table because of the friable soils collapsing into the holes at 7 to 11 feet. Observations of soil moisture and established trees (sycamores and eucalyptus) allude to a water table that can be reached by established riparian species, even in summer months.

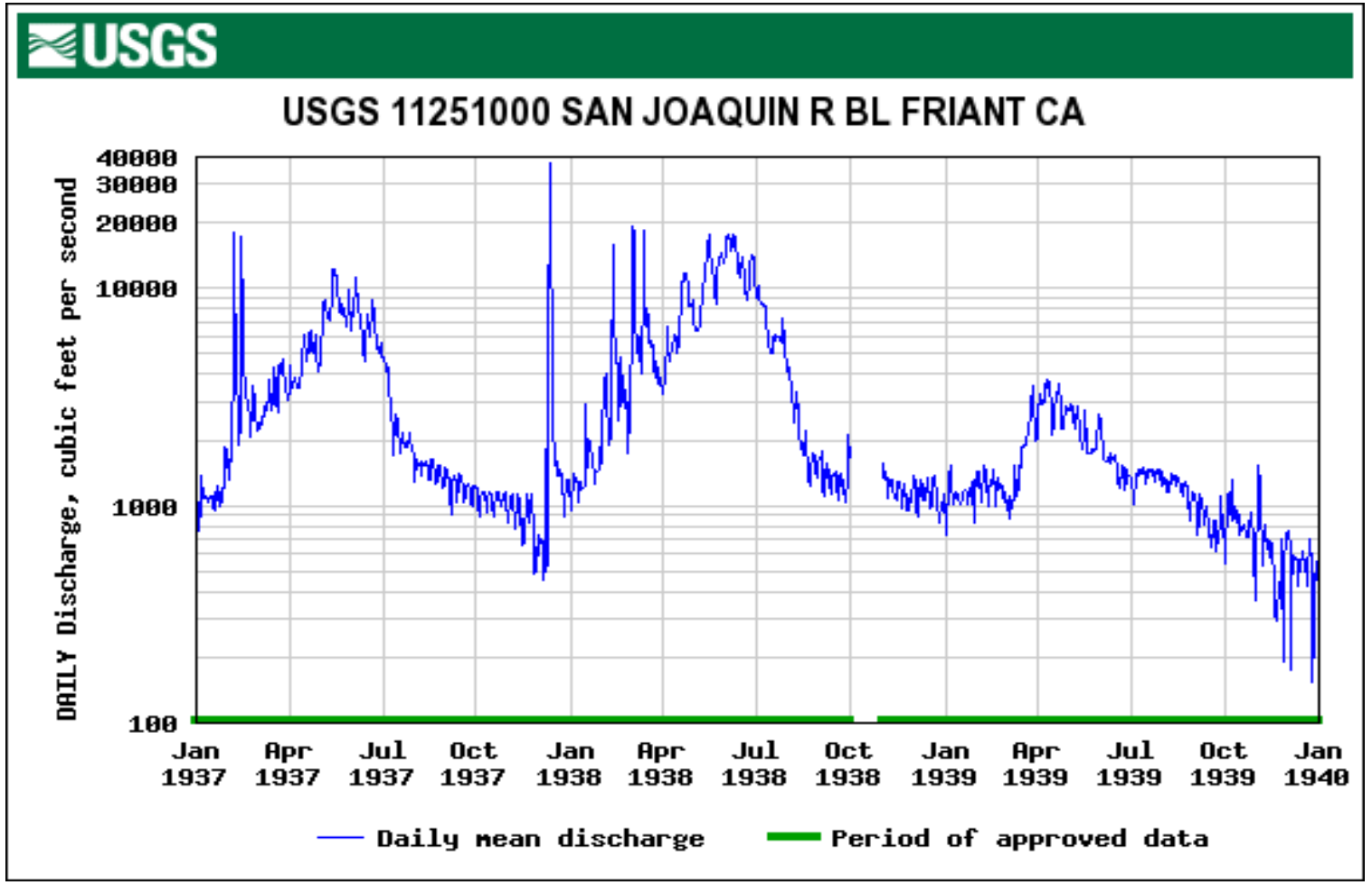


Figure 7. Hydrograph for water year 1937, showing the largest winter flood event prior to the construction of Friant Dam.

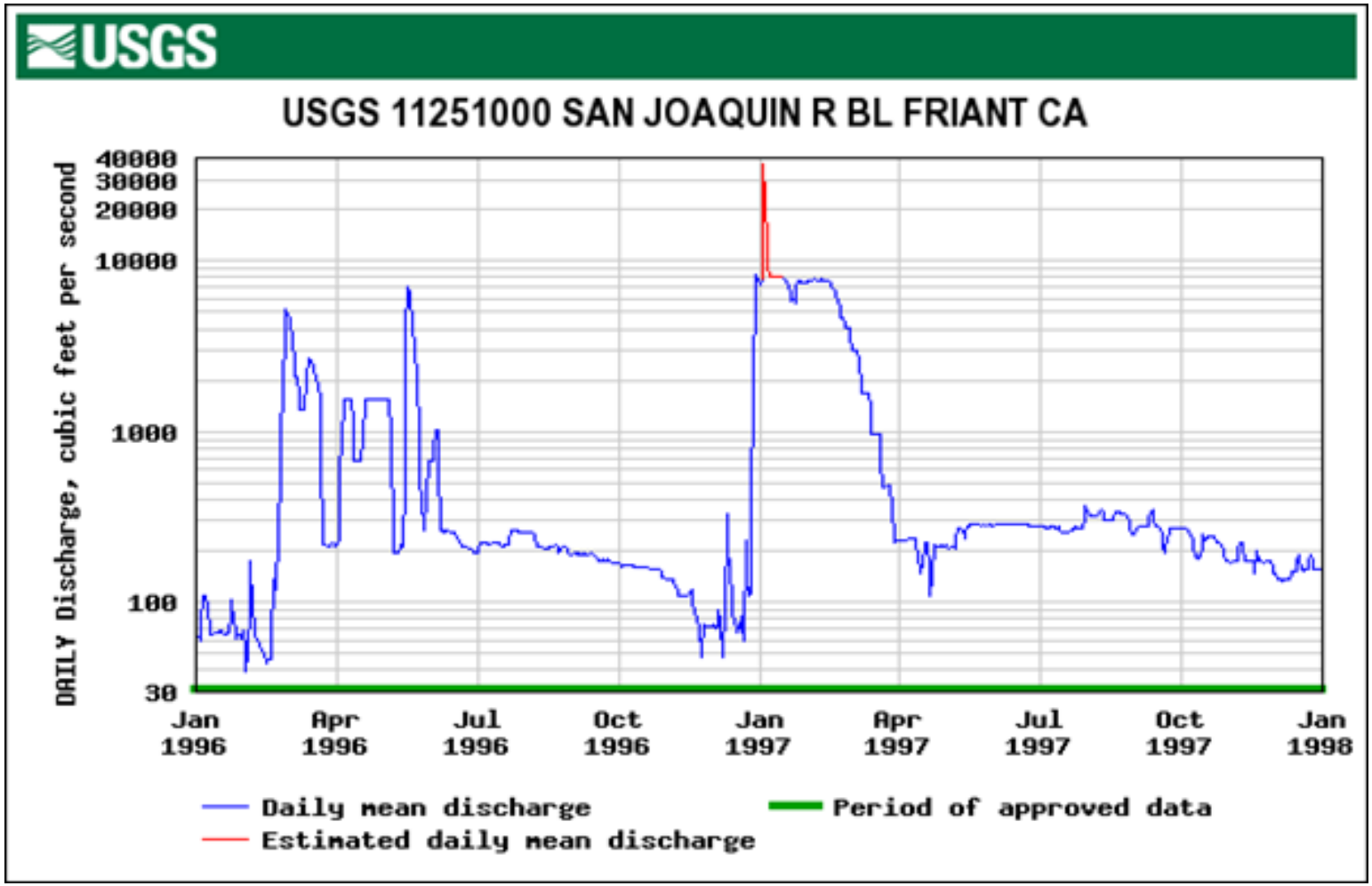


Figure 8. Hydrograph for water year 1997, San Joaquin River below Friant Dam, the largest flood event on record post dam construction.

Figure 9. 1946 historic aerial photographs of Riverbottom Park (top) and Schneider Property (bottom), Fresno and Madera Counties, California. Courtesy of USGS.

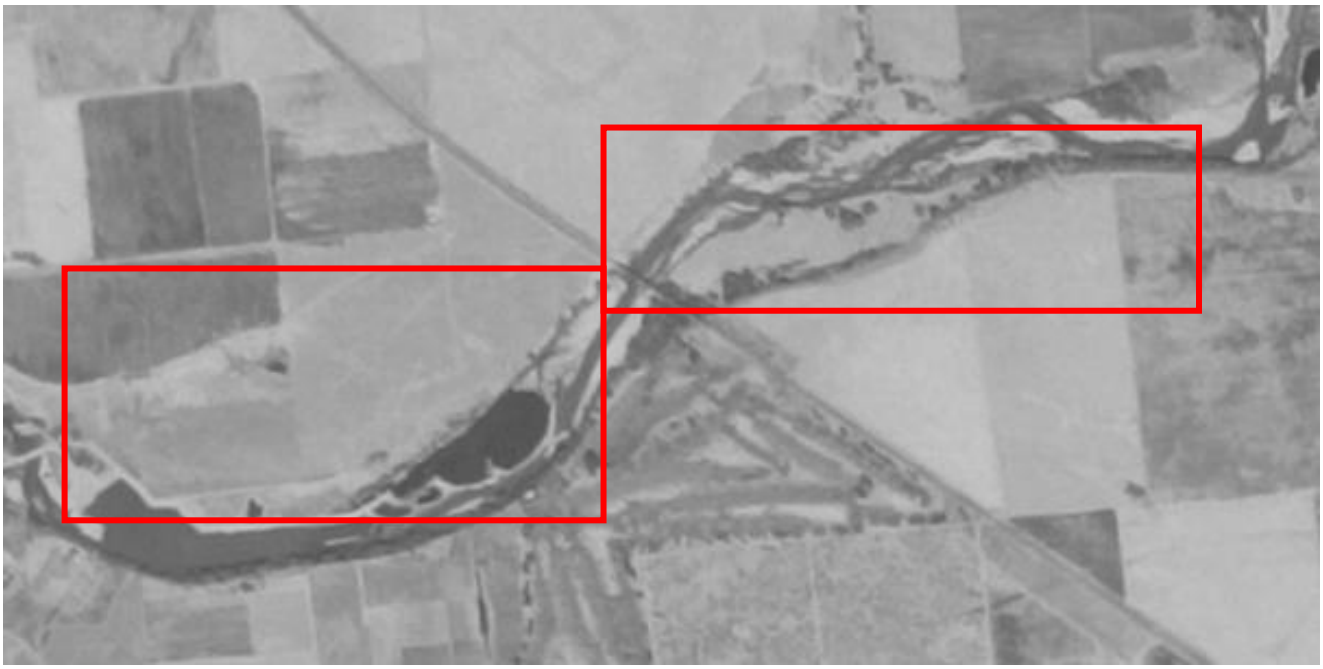


Figure 10. 1954 historic aerial photograph of Schneider Property (left) and Riverbottom Park (right), Madera and Fresno Counties, California. Courtesy of USGS.

Figure 11. 1962 historic aerial photograph of Schneider Property (left) and Riverbottom Park (right), Madera and Fresno Counties, California. Courtesy of USGS.

Figure 12. May, 23, 1969 historic aerial photograph of Schneider Property (left) and Riverbottom Park (right), during a high water event (8,500cfs), Madera and Fresno Counties, California. Courtesy of USGS.

Figure 13. 1975 historic aerial photograph of Schneider Property (left) and Riverbottom Park (right), Madera and Fresno Counties, California. Courtesy of USGS.

Figure 14. 1978 historic aerial photograph of Schneider Property (left) and Riverbottom Park (right), Madera and Fresno Counties, California. Courtesy of USGS.

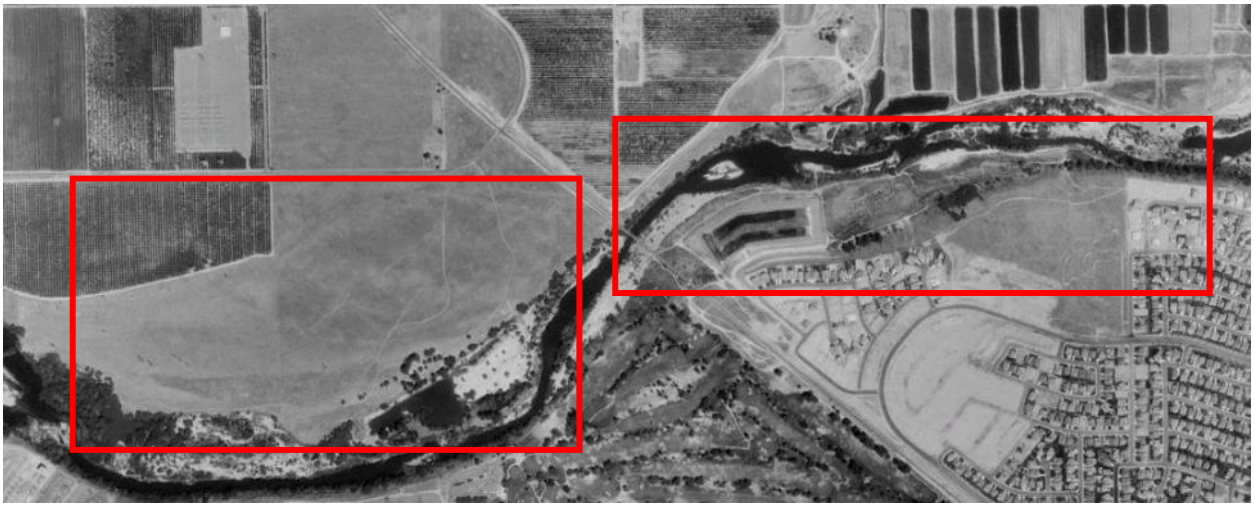


Figure 15. 1998 historic aerial photograph of Schneider Property (left) and Riverbottom Park (right), Madera and Fresno Counties, California. Courtesy of USGS. Notice the residential housing and percolation pond construction.

Figure 16. April 25, 2011 historic aerial photograph of Schneider Property (left) and Riverbottom Park (right), Madera and Fresno Counties, California. Documenting the 2011 flood. Courtesy of USGS **.**

Figure 17. September 15, 2013 aerial photograph of Schneider Property (left) and Riverbottom Park (right), Madera and Fresno Counties, California. This photograph illustrates current site conditions. Courtesy of USGS and Google Earth**.**

F. Vegetation

Currently, both project sites are dominated by a mixture of invasive weeds, primarily ripgut brome (*Bromus diandrus*), Italian rye (*Festuca perennis*), and yellow starthistle (*Centaurea solstitialis*) on the floodplains and uplands away from the river edge (Figure 18). Wild oat (*Avena fatua*), black mustard (*Brassica nigra*), and Bermuda grass (*Cynodon dactylon)* are present to a lesser degree in the uplands. Annual invasive weeds have a general life strategy in which they absorb near-surface soil moisture quickly in early spring, then die back as thatch that shades native seedlings. As a result, annual invasive weeds tend to strongly compete with native seedlings for both water and light. Under current conditions, without active restoration, it is unlikely that native vegetation will recolonize the Project area. Large stands of tree of heaven (*Ailanthus altissima*) can be found along the base of the north facing bluffs at Riverbottom Park, interspersed with Western sycamore (*Platanus racemosa*). These stands are most likely in direct competition with recruiting and established Western sycamore that prefer this location due to both the water runoff from the bluffs and the north-facing slopes that allow this area to retain soil moisture. The invasive red gum eucalyptus (*Eucalyptus camaldulensis*) can be found in an established stand on the floodplain of the Schneider Property. In the ponds (caused by gravel pit mining on the Schneider Property), river islands and along the river channel (Riverbottom Park), red Sesbania (*Sesbania punicea*) has established. Rattlebox has become a prolific invasive further upstream, crowding out native vegetation on the river's edge.

Figure 18. Invasive annual grasses currently dominate this upland field targeted for restoration at Riverbottom Park, Fresno County, California.

Figure 19: Upland vegetation on the Schneider Property Project site is primarily grazed invasive annual grasses.

Remnant bands of native riparian vegetation cling to the edges of the river (and gravel pits on the Schneider Property) on both sites; these are dominated by black willow, sandbar willow, Oregon ash, box elder, Western sycamore, Freemont cottonwood, and buttonbush (Appendix III). Restoration plantings will connect these remnant bands of vegetation to create a network of habitat for riparian-obligate mammals and birds. Western sycamore (*Platanus racemosa*), elderberry (*Sambucus nigra*), California rose (*Rosa californica)*, mulefat (*Baccharis salicifolia*), California buckwheat (*Eriogonum fasciculatum*), and bush lupine (*Lupinus albifrons)* are among the native woody species still found on the upper floodplain of Riverbottom Park, although their numbers are relatively low (Figure 22). The restoration design will incorporate existing native plants, where possible, to increase habitat connectivity.

Figure 20: Native woody riparian vegetation along the San Joaquin River at on the San Joaquin River State Lands.

Figure 21: Schneider Property Restoration Site: Uplands dominated by invasive annual grasses with riparian vegetation on the lower floodplain along the River.

Native perennial herbaceous plants found throughout the project area that can be considered for collection and dispersal to compete with invasive weeds include: mugwort (*Artemisia douglasiana*), gumplant (*Grindelia camporum*), evening primrose (*Oenothera biennis*), creeping wild rye (*Leymus triticoides*), saltgrass (*Distichlis spicata*) and narrowleaf milkweed (*Asclepias fascicularis*). Other annual natives that seem to be thriving on site and may also be considered for collection and dispersal include: doveweed (*Eremocarpus setigerus*), vinegar weed (*Trichostema lanceolatum*), fiddleneck (*Amsinckia intermedia*), spike weed (*Hemizonia pungens*), California poppy (*Eschscholzia californica*) and heliotrope (*Heliotropium curvassicum*).

G. Wildlife

Even though the Project sites have been degraded by human activity, wildlife still actively use site space and resources. A comprehensive list of wildlife species documented on the Project site was developed during site assessments (Appendix V). Numerous state and federally listed wildlife species may benefit from restoration activities conducted during the Project (Table 2).

Table 2. Federal and State-listed Endangered, Threatened, and Candidate Species occurring or potentially occurring near Riverbottom Park or Schneider Property.

Name	Scientific Name	Status
Least Bell's Vireo (extirpated)	*Vireo bellii pusillus*	FE, CE
Bald Eagle	*Haliaeetus leucocephalus*	FT, CE
Yellow Warbler	*Setophaga petechia*	FSC
Spring Run Chinook Salmon (extirpated)	*Oncorhynchus tshawytscha*	FT, CT
Valley Elderberry Longhorn Beetle	*Desmocerus californicus diamorphus*	FT
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	FC, CE
American Peregrine Falcon	*Falco peregrinus anatum*	FSC, CE
Willow Flycatcher	*Empidonax trailii*	FSC, CE
Bank Swallow	*Riparia riparia*	FSC, CT
Swainson's Hawk	*Buteo swainsoni*	FSC, CT

ESU – Evolutionary Significant Unit
FE – Federal-listed Endangered Species
FT – Federal-listed Threatened Species
FC – Federal Candidate Species
FSC – Federal Species of Concern
[1]FT effective June 6, 2006
CE – California State-listed Endangered Species
CT – California State-listed Threatened Species
CSC – California Species of Concern

Figure 22. Remnant Western sycamore and blue elderberry along the north facing bluffs edge on the Riverbottom Project Site.

1. Least Bell's Vireo

Least Bell's vireos have been documented breeding on restoration sites planted by River Partners on the San Joaquin River National Wildlife Refuge and in remnant riparian forests at the Merced National Wildlife Refuge in recent years. This represents a return to the Valley by this breeding riparian songbird after an estimated 60 years of extirpation. Like several other endangered riparian species in California, the species relies upon dense riparian shrub and willow cover, in this case for breeding habitat, and has suffered from the clearing of riparian vegetation from the floodplains (RHJV 2004). Active restoration at the Project site, especially the flexible stem riparian forest, will enhance habitat conditions for this recolonizing species by creating more potential breeding habitat along the San Joaquin River system.

2. Valley Elderberry Longhorn Beetle

The Valley elderberry longhorn beetle spends most of its life cycle within and on its host plant, blue elderberry. Floodplain clearing throughout the valley has resulted in widespread loss of riparian forests and the beetles' host plant. Furthermore, cattle grazing and river regulation has inhibited regeneration of the blue elderberry, and many

existing host plants are senescing or succumbing to fungal infections (USFWS 1984). The federal recovery plan for this species calls for protection of valley elderberry beetle habitat along the San Joaquin River, among other Central Valley rivers (USFWS 1984). Restoration will enhance habitat conditions for this species on the project site by planting hundreds of blue elderberry plants in clusters throughout the Project area and by protecting remaining remnant elderberry.

3. Fish

Riparian restoration near the San Joaquin River will increase shaded riverine aquatic habitat throughout the project area, as well as increasing terrestrial inputs to the aquatic environment such as vegetation, woody debris, and invertebrates. Efforts to restore the spring run of Chinook salmon in the San Joaquin River will be aided by the Project.

Other threatened and at-risk species including western yellow-billed cuckoo and Swainson's hawk may occur near Riverbottom Park or the Schneider Property and could benefit from this project (Table 2). Restoration efforts will also provide high quality habitat for other native wildlife species including California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), and wintering migratory bird species. River Partners specifically designs habitat features into the restoration based on the habitat needs of each target species (Table 3).

Table 3. Habitat requirements and design goals for targeted wildlife species.

Target Species	Status	Habitat Requirements	Design Goals/Considerations
Least Bell's Vireo	Endangered	Structurally diverse riparian woodlands, including cottonwood-willow forests, oak woodlands, dense shrubs.	Restore suitable nesting habitat; Plant diverse vegetative structure, shrub clusters, willow thickets, and dense understory.
Valley Elderberry Longhorn Beetle	Threatened	Riparian and associated upland habitat in the Central Valley where blue elderberry, the beetle's host plant, grows.	Plant elderberry plants in riparian shrub habitat.
Western Yellow-billed Cuckoo	Endangered	Riparian habitat dense with willow and cottonwood species.	Plant diverse vegetative structure, shrub clusters, willow thickets, and dense understory.
Swainson's Hawk	Threatened	Riparian habitat with mature trees suitable for nesting sites adjacent to productive foraging habitat.	Restore suitable nesting habitat; Plant diverse vegetative structure, shrub clusters, willow thickets, and dense understory.
Yellow Warbler	Candidate	Structurally diverse riparian woodlands, including cottonwood-willow forests, oak woodlands, dense shrubs.	Plant diverse vegetative structure, shrub clusters, willow thickets, and dense understory.

III. CONCEPTUAL SITE MODEL

The principles described in this section will guide the implementation of the project.

This conceptual site model:

- Presents our understanding of the physical and biological factors that influence site ecology.
- Outlines our restoration strategy.
- Provides an overview of the plant design.
- Identifies ecological benefits and targeted wildlife species.

A. Past Environmental Conditions

Prior to the construction of Friant Dam in the 1940's, the Project site was still influenced by seasonal flooding. Lateral meander is evident in historic aerial photos dating back to 1946, which show active side channels, exposed sand bars, small oxbow lakes holding water, and visible scour and deposition patterns on the landscape (Figure 9). These ephemeral side channels provided habitat for the currently extirpated salmon that once flourished in the river. Remnants of a once lush riparian corridor are visible along the river channel, but after the construction of Friant Dam, changes in hydrology reduced the connection of native vegetation to the water table (Riverbottom Park) and gravel mining damaged floodplains (Schneider Property) (Figure 10). With the construction of the dam and the subsequent gravel operations, the river remained fixed over time in its main channel.

B. Likely Successional Patterns without Restoration

The Project is on a path of slow willow scrub and mixed riparian forest succession in thin bands along the river's edge, with heavy weed competition. Uplands have very little recruitment of woody natives considering the high competition with a thick mat of invasive annual weeds. Loss of the historic disturbance regime, especially floods and fire, and the regenerative processes that they activate will result in a fairly static and senescing vegetation community. The river may occasionally exceed its banks as it did in the 1997 flood (which approximated a flood that has a 1% probability of occurring in any year), but overall there is little opportunity for river and floodplain reconnection in its present state. Loss of floodplain connectivity inhibits geomorphic processes such as sand deposition, scour, and creation of floodplain topography. Furthermore, new tree (cottonwood, willow) recruitment on lower terraces is unlikely with the disturbed hydrograph. Weed competition may seriously inhibit native plant establishment in the most historically disturbed areas and is providing a large seed bank for future dispersal.

C. Comparison to Nearby Vegetation (Reference sites)

A fundamental component of a restoration plan is the identification of reference sites. These sites act as guides for developing the list of species to be planted and their pattern across the restoration site. Due to the long history of human modifications to flow patterns and topography, reference sites near Riverbottom Park and the Schneider

Property are few to non-existent. Historical photographs of the project area show diverse riparian vegetation extending out from the river across through portions of the floodplain, varying in individual plant stature and density. At Riverbottom Park mature vegetation (including what appears to be sycamore, willows, and cottonwoods, and possible Valley Oak) can be seen along the river's edge as well as near the train tracks and along the base of the bluffs (Figure 9). The Schneider Property was characterized by the same dense and diverse riparian vegetation extending out from the river's edge, but upland portions of the Project site had already been used for cattle grazing, so it is difficult to determine plant composition.

Today, native vegetation at Riverbottom Park still maintains some diversity in a thin band along the river's edge (Appendix IV). Patches of blue elderberry, California rose, and bush lupine are still found spread throughout the upper floodplain. Mature western sycamore, blue elderberry, California rose and bush lupine cling to the base of the bluffs, while mule fat, elderberry, coyote brush and sandbar willow can still be found by the train crossing. The Schneider Property exhibits native riparian vegetation in the low lying areas that were previously mined for gravel. Higher on the Schneider Property floodplain elderberry, sycamore, and black willow still hold on near the eucalyptus grove but the uplands are dominated by invasive annual grasses. A lone elderberry can be found at the base of the bluffs to the north. The plant communities of nearby lands containing native vegetation will be used as reference to provide continuity in the vegetative community and as possible seed/plant sources.

D. Restoration Strategies

We recommend the following strategies to implement the grant to restore habitat on the Riverbottom Park and Schneider Property:

- **Employ active restoration techniques to establish riparian and upland vegetation.** Active restoration, a strategy where modern farming techniques are used to establish riparian vegetation, includes intensive site preparation, on-going weed control which uses herbicides as necessary, irrigation through the growing season for up to four years, and planting of several month old saplings from nursery grown container stock. Advantages of this method are: a) a demonstrated success of over 70% survival after three years in the Central Valley; and b) the use of similar techniques to those used to establish commercial orchards, which provides the opportunity to contract with local farmers to carry out the implementation, a great outreach benefit.

  Passive restoration entails a strategy that uses minimum inputs to restore floodplain habitat. As currently practiced, this method involves: a) site preparation that removes all weed mulch and crop residue through disking, burning, and/or prolonged flooding; and b) flooding the field in early spring. Managed flooding of the field attempts to mimic the recession limb of the annual hydrograph such that the soil surface is exposed by slowly drawing down the water level at the time willow and cottonwood seeds are dispersing in April and May. Ideally, seedlings would establish and grow to be 3 to 5 feet tall saplings by the end of year one.

Unfortunately, non-native agricultural weed seeds already in the soil can germinate and rapidly outgrow native seedlings, slowing their growth and eventually killing them through shading effects. This is a primary reason that passive techniques have rarely been successful in the Central Valley for large-scale restoration. The logistics of weed control with passive restoration would be complex because wet soils in the early spring can limit access to fields by spraying machinery, allowing the weeds an advantage of early growth.

- **Recognize current site conditions.** The target vegetation is not a "historical" endpoint, but is based on a historical overview and a pragmatic assessment of current site conditions (floodplain and uplands filled with non-native species, and a significantly changed hydrograph). Based on these conditions, most of the site is well suited for the rapid establishment of native riparian forest, oak woodlands and shrub communities.
- **Link existing habitat patches with restoration plantings to increase habitat connectivity.** Currently the majority of available habitat is in a thin dense band along the San Joaquin River (both Riverbottom Park and Schneider Property), and along the north facing bluffs on the southern edge of Riverbottom Park. By enhancing this remaining habitat (weed treatment) and restoring between the remaining habitat, anthroprogenic disturbance and edge effect will be reduced. This will enhance the quality of wildlife habitat.
- **Use an adaptive management approach for implementation of the project.** River Partners recommends an adaptive management approach (River Partners 2008) to provide a framework to evaluate project progress and respond to new information. These practices have resulted in high plant survival rates, accelerated natural recruitment of native species (through changes in microclimate and presence of seed sources), and documented wildlife benefits in short periods of time (three years).

E. Identification of Ecological Benefits and Targeted Wildlife Species

Riparian ecosystems are critical as habitat for birds and other organisms. These ecosystems also have a structural benefit by providing shade and a source of in-stream wood critical for native fish populations (Opperman and Merenlender,2007). Riparian ecosystems harbor the most diverse bird communities in the arid and semi-arid portions of the western United States (Knopf et al. 1988, Dobkin 1998, Saab et al. 1999). These ecosystems may also provide the most important avian habitat in California by providing corridors for neo-tropical migrants and habitat for resident avian fauna (Manley and Davidson 1993).

The Riparian Habitat Joint Venture (RHJV) has identified several species of birds as indicators of ecologically healthy riparian systems (Riparian Habitat Joint Venture 2004). These species are termed riparian focal species and collectively their habitat requirements serve as an umbrella for all riparian bird habitat needs. These birds require a diversity of habitat structure (Figure 23). Habitat requirements for other targeted species will be incorporated into the plant design (Table 4). For example, to

attract least Bell's vireo breeding on the river, we may plant shrubby willows and a dense herbaceous understory. Elderberry is planned to be planted on site, which is within the historic range of VELB, and will provide possible habitat for VELB . Additionally, the plant design may also integrate structural elements designed to provide shaded riverine aquatic habitat and sources of large woody debris (LWD) which, coupled with floodplain re-connectivity has the potential to improve habitat for native fish populations (Opperman and Merenlender 2007).

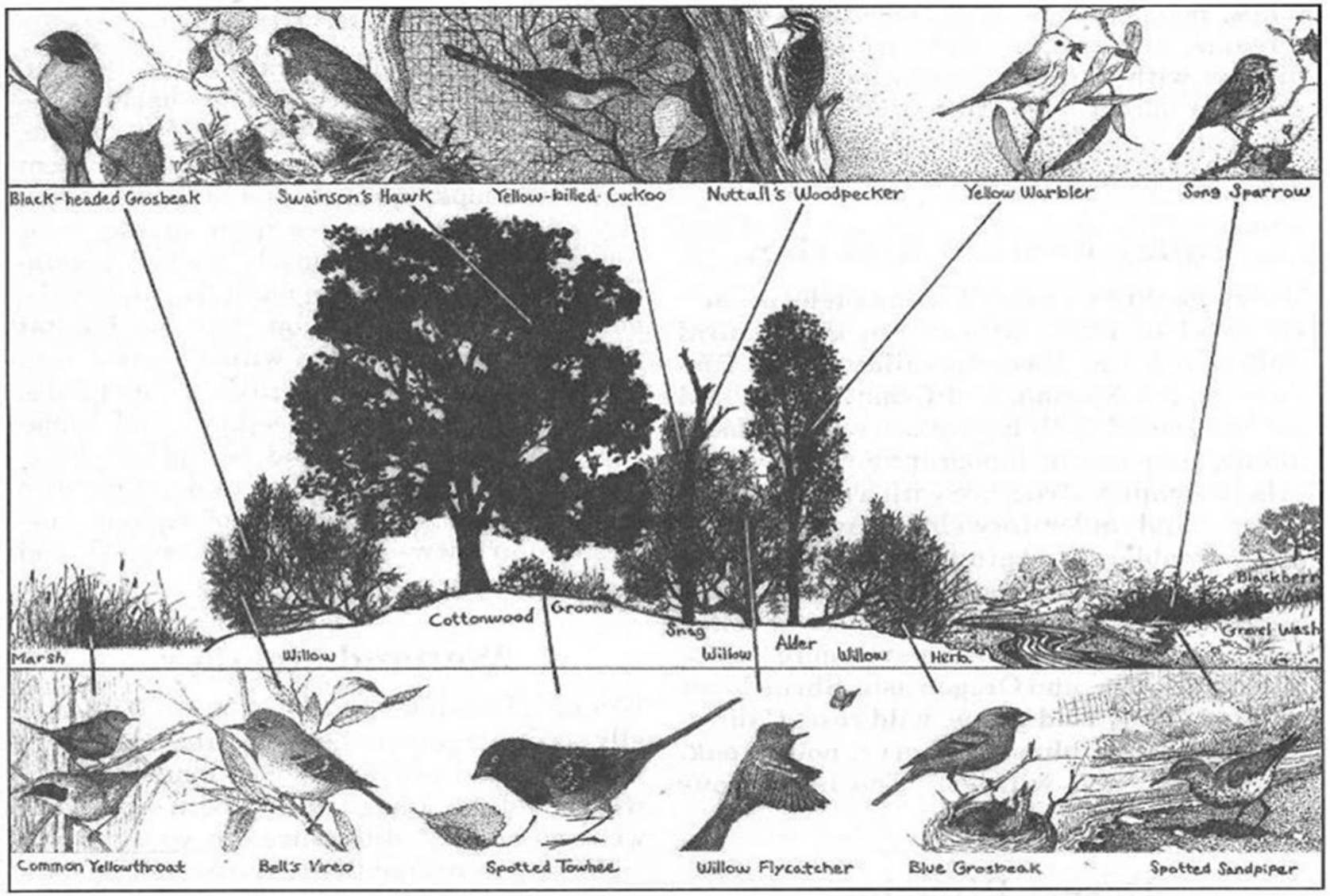


Figure 23. Avian riparian habitat usage and species requirements (RHJV 2000).

Table 4. Summary of Neotropical migrant bird habitat requirements (RHJV 2004).

Bird Species	Territory/Patch Size	Proximity to Water	Vegetation Structure	Nesting	Species Presence
Least Bell's Vireo (*Vireo bellii pusillus*)	0.8-1.2 ha (2-3ac); >250m wide patch	Within 300m	Dense willow shrubs 3-5m tall; mugwort understory	Nest low, within 1m of ground	Extripated Rare
Black-headed Grosbeak (*Pheucticus melanocephalus*)	200m x 50m	50-300m	Vertical complex - Cottonwood, willows, wild grape	Nest height 3-4m	Breeding Common
Blue Grosbeak (*Guiraca caerulea*)	----	In riparian zone	Low herbaceous, upright stems, open canopy	Nest height 0.6-3m	Breeding Rare
Common Yellow-throat (*Geothlypis trichas*)	0.4-2 ha (1-5 ac)	In riparian zone	Tall emergent wetland edges	Nest height 0-0.6m	Breeding Fairly Common
Song Sparrow (*Melospiza melodia*)	Variable	Near, within 50m	Open canopy; dense herbaceous layer; gumplant, evening primrose	Low to ground; <1m	Breeding Common
Swainson's Hawk (*Buteo swainsoni*)	Variable, depending on proximity to foraging habitat	Not riparian obligate	Tall trees in riparian zone near open foraging areas	Nest in tall trees	Breeding Fairly Common
Warbling Vireo (*Vireo gilvus*)	1.2 ha (3 ac)	Associated with streams	Large trees with semi-open canopy	Variable height	Breeding Fairly Common
Willow Flycatcher (*Empidonax traillii*)	<1.0 ha (<2.5 ac)	Nests near water	Dense willows; 0-3m height of dense cover, low tree cover	Nests near water; height 0.6-3m	Breeding Rare
Wilson's Warbler (*Wilsonia pusilla*)	0.4-1.2 ha (1-3 ac)	Nests near water	Willow, alder, and shrub thickets	Usually nests on ground	Breeding Fairly Common
Yellow-breasted Chat (*Icteria virens*)	<5 ha (<12 ac)	Prefers near wetlands	Dense thickets of willows and blackberries	Nests in vines and shrubs	Probable Breeder Rare
Western Yellow-billed Cuckoo (*Coccycus americanus occidentalis*)	8-40 ha (19.8-98.8 ac)	Nests near or over water	Willow-cottonwood thickets	Nest 1.3-13m high	Extripated Rare
Yellow Warbler (*Setophaga petechia)*	0.06-0.75 ha	Wet areas	Willows, cottonwoods, early Successional	----	Probable Breeder Fairly Common

IV. PLANTING DESIGN

River Partners has developed a site-specific planting design which represents a synthesis of the available information on site conditions, using the principles of landscape ecology (Silveira *et al*. 2003, USFWS 2006), project objectives and PRBO Conservation Science (PRBO) recommendations (Geupel *et al*. 1987). Plant associations are based on the vegetation series concept described by Sawyer and Keeler-Wolf (1995). Plant series are named for the dominant plant species, but every series also contains other associated plant species. The similar "association" concept provides a useful descriptive label for vegetation differences that allows for design flexibility depending upon project goals. It does not specify arrangement, density, or other quantifiable factors that must also be addressed to translate the conceptual design to field implementation.

The composition and density of the association is based on several site-specific factors:

- Soil properties (texture, stratification, seasonal water table);
- Topography/hydrology (flood regime);
- Proximity to existing vegetation;
- Habitat characteristics for targeted species; and
- Management considerations.

The plant composition for the Project site has been selected from locally occurring species and designed to promote quick growth of trees and shrubs to provide a diversity of niches for wildlife and an herbaceous understory layer for forage, cover and additional weed control. The primary goals of this particular planting design will be:

- Protect and improve the water quality in the San Joaquin River for fish and wildlife;
- Increase the acreage and connectivity of existing riparian habitat for the benefit of resident and migrating wildlife;
- Improve the recreational and environmental interpretation opportunities along the San Joaquin River Parkway; and
- Establish high-quality native herbaceous understory planted to maximize weed control such as creeping wild rye (*Leymus triticoides*), mugwort, and gumplant (*Grindelia camporum*).

A. Design Considerations

Physical and biological factors (soils, topography and hydrology) determine site potential, limiting what will grow on an area. River Partners looks at these components as well as evidence of past riparian communities to determine what plant species are best suited for a project. Based on these factors, Riverbottom Park can support riparian forest, shadescale scrub, pollinator plantings and a layer of herbaceous understory species. The Schneider Property has differing site characteristics, being higher and more disconnected from the water table as well as having an exposed south facing slope. Based on these factors, the Schneider Property can support flexible stem riparian forest, riparian forest, oak woodland, shadescale scrub and pollinator communities. The

design also incorporates essential habitat elements to conserve, restore and enhance riparian habitat for threatened and endangered species and other organisms. Additionally, recommendations from PRBO (Geupel *et al*. 1997) are integrated into the design in order to provide quality habitat for focal bird species. However, wildlife objectives and management issues also influence the arrangement, composition, and vegetation associations that are selected. We refer to these factors as "design considerations" (Table 5).

Table 5. Design considerations for riparian vegetation restoration, Riverbottom Park and Schneider Property, Fresno and Madera County, California.

Objective/Factor	Example of Project Design Considerations
Provide immediate (< 3 years) habitat benefits and high probability of long-term survivorship.	• In the short term, relatively transient species (cottonwood and willows) will provide several generations of targeted bird species with nesting and foraging habitat. Planting a mixed riparian forest, maximizes quality habitat as the slow growing, but shade tolerant oaks mature.
Maintain high plant species and vegetative structural diversity.	• PRBO data suggests that bird diversity is highest in areas with 5-7 shrub species over a 50-m^2 area. Design considerations include varying density across the site to allow light gaps and create structural differences (grouping trees together will create pockets of shade and light gaps), creating vegetation patches (grouping small shrubs together will mimic larger plants and may attract desirable wildlife species faster than if they were grown apart), and considering herbaceous plantings between plant rows.
Extreme sun exposure and poor soils.	• Exposed soils on the south facing slopes of the Schneider Property will need special consideration due compaction from grazing and direct sun, which greatly increases the temperature of the microclimate in this field. Selecting drought tolerant plants such as mulefat, coyote brush and quail bush (implemented into the shadescale scrub community). Vinegar weed and Doveweed could also be broadcast in this area.
Current unauthorized cattle grazing on the Schneider Property.	• Placement of a barbed wire fence along the Schneider Property Boundary to discourage soil compaction and herbivory of cattle.
Provide valley elderberry longhorn beetle habitat.	• Plant clusters of its host plant, blue elderberry, in appropriate areas of the site. This drought tolerant species is already found throughout much of the site.
Minimize weed sources, provide native habitat on project edges.	• During the active restoration period control weeds along access roads, on planting sites, and in buffer zones around plantings to reduce weed seed source and weed dispersal potential. Plant native herbaceous understory to displace weeds in designated weed control areas.

The primary objective of the Project is to create high quality riparian and upland habitat that will function as an important wildlife corridor that will be rich in biodiversity. Specific design considerations support these objectives:

- Restore and enhance habitat for threatened, endangered, and/or Neotropical migrant riparian species including valley elderberry longhorn beetle, Swanson's hawk, least Bell's vireo, yellow warbler, and black-headed grosbeak (*Pheucticus melanocephalus*);.
- Provide breeding habitat for shrub-nesting resident bird species including wrentit (*Chamaea fasciata)*, song sparrow (*Melospiza melodia mailliardi*), California quail, and spotted towhee (*Pipilo maculatus*);
- Provide shrub understory habitat for wintering migrant songbirds that occur along the San Joaquin River, including fox sparrow (*Passerella iliaca*), white-crowned sparrow (*Zonotrichia leucophrys*), golden-crowned sparrow (*Zonotrichia atricapilla*), Lincoln's sparrow (*Melospiza lincolnii*), hermit thrush (*Catharus guttatus*), and ruby-crowned kinglet (*Regulus calendula*);
- Plant a site-appropriate native plant community;
- Establish native plant species within a three-year period;
- Use local seed and cutting sources;
- Maintain existing native plants;
- Control invasive weeds where they occur in high densities in the designated project area, to reduce weed seed sources; and
- Monitor native plants in restoration plantings at the end of the growing season for four growing seasons.

Another design consideration unique to this Project is recreational usage. The site of the planned Riverbottom Park is informally heavily used for jogging, walking, and most of all swimming and barbecuing. For these reasons, existing informal access paths will be left in place (Figure 24) and the area planned for a planned future parking lot will not be vegetated through this restoration (Figure 26). To ensure these existing paths are not crowded by vegetation they will be maintained through plant spacing and selection. All viney species (blackberry, rose) in the planting tiles near the existing informal access paths will be replaced by less sprawling species on the paths' edge, and plants will be planted no closer than 10 feet from either side. A popular site at Riverbottom Park is a gravel bar at its northwest end people affectionately call "the beach". The existing path leading to this area, as well as the gravel bar itself will not be vegetated, to allow unimproved recreation to continue on site. A second gravel bar along the river near the center of the property is used frequently by fisherman (Figure 24). Weed control is the only action proposed on this gravel bar; it will remain open for continued use. Looping paths at Riverbottom Park total 2.8 km and can be utilized as fire breaks, especially the access path established at the base of the bluffs below the residential homes to the south. The Schneider Property sees less usage because of its location and locked access gate.[1] Existing roads will be left open on this site for access to maintain the site

[1] The upland Schneider property is closed to the public, with the exception of authorized supervised groups. The Conservancy is required by statute to close to the public any of its lands which it is unable to properly operate and maintain for park uses.

as well as for future recreation. The main access road will be left open, (drip lines may be buried beneath the road for the duration of the restoration) as well as an access path to the river itself. Existing informal access paths proposed for restoration Project use at the Schneider Property total 0.8 km.

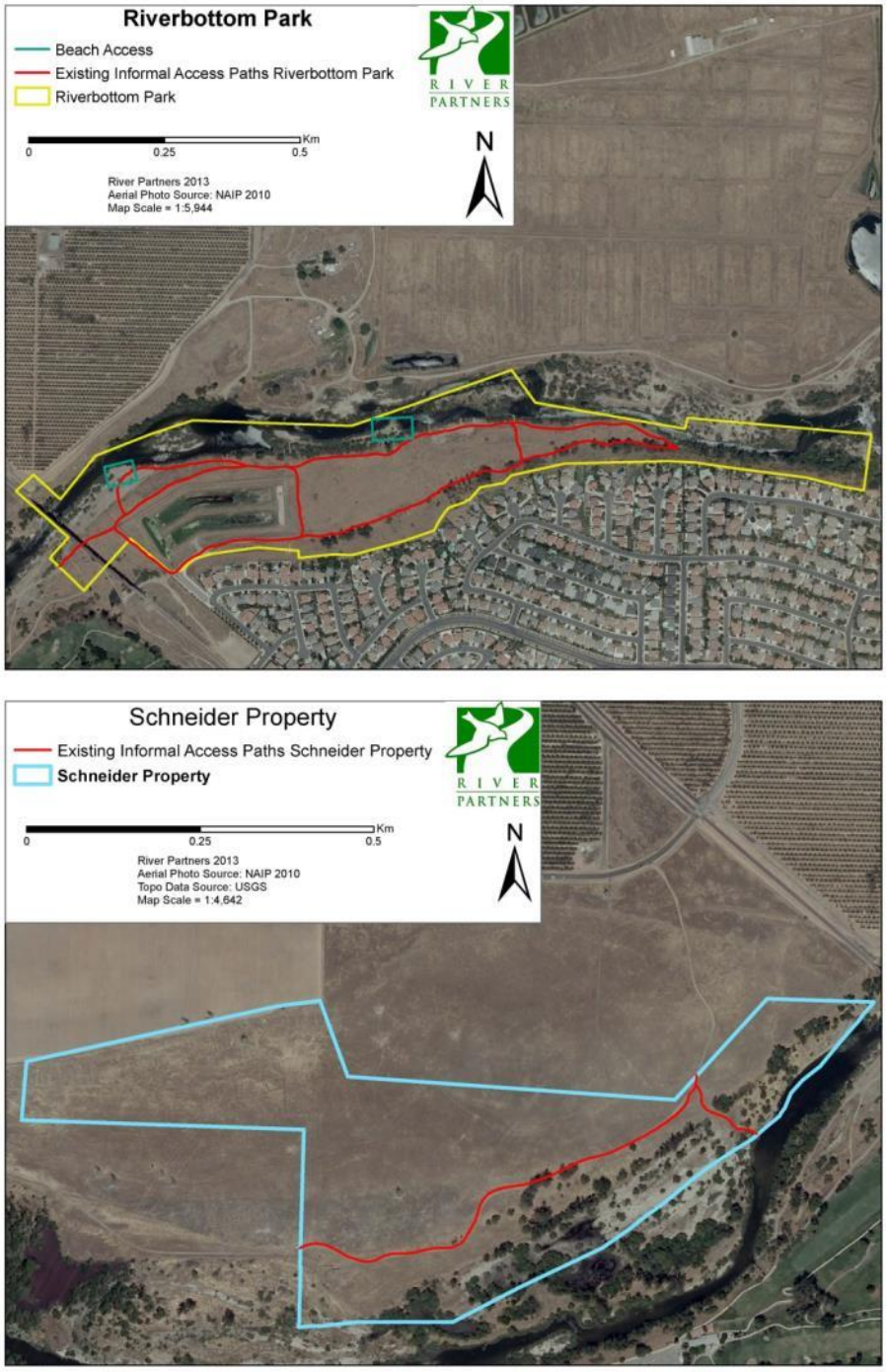


Figure 24. Proposed Access Considerations for Riverbottom Park (top) and the Schneider Property (bottom), Fresno and Madera Counties, California.

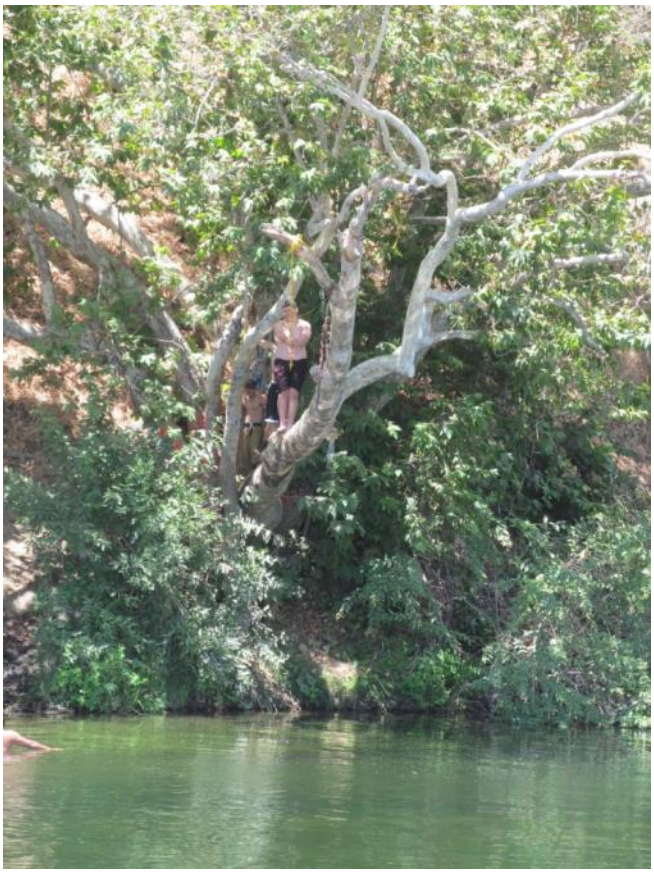


Figure 25. Families recreating at the Riverbottom Park site, Fresno County, California

B. Rationale for Plant Associations

Using our knowledge of site conditions and design considerations, River Partners developed five plant associations to be planted on Riverbottom Park and Schneider Property (Table 6). The planting pattern has been designed to achieve a network of riparian corridors for wildlife of conservation concern, as described above. High density plantings will benefit many of the Neotropical migrant songbirds which require dense shrubby vegetation (RHJV 2004). River Partners expects at least 70% survival of its restoration plantings at the end of the three year maintenance period. After maintenance is discontinued, plant survival will depend upon differences of soil textures and water table depths. Variable plant survival may result in a heterogeneous habitat structure that will provide usable and more naturally occurring spacing, densities and diversity. Abundant blackberry rose, golden currant, and willow in the planting design will form dense thickets that will expand and connect existing riparian shrub habitat. Coyote brush, blue elderberry, and shrubby willows will function as trellis species providing habitat structure for multiple inhabitants. Pollinator Plantings will allow for light breaks in habitat structure, but also play an important role by providing usable habitat in soil conditions where it would be difficult to establish woodies.

C. Composition and Location of Planting Associations

The overall density and numbers of each plant species are presented by planting area in Tables 7-12. Based on specific physical and biological conditions, River Partners developed five vegetation associations that vary by species composition, depending on their location or physical characteristics and project design requirements.

A variety of native plants will be included in the planting palette to provide structural elements such as dense shrub or willow clusters, large nesting trees, and open foraging fields. A dense aggressive understory will provide a measure of weed control and limit the establishment and spread of invasive species. River Partners has been successful in establishing this type of understory on past projects, which has resulted in virtually 100% cover by native woody and herbaceous species within restored areas.

Table 6. Rationale for plant associations, Riverbottom Park and Schneider Property, Fresno and Madera Counties, California.

Association	Planting Location Characteristics	Design Characteristics	Habitat Benefits
Riparian Forest	Soil: sandy to fine sandy loam Water Table: between 10-25 ft.	Focus on diversity, flood and drought tolerant species. Density: 272 plants/acre	Favored by many Neotropical migrants. Because of rapid growth, provides quick structure and habitat for wildlife.
Oak Woodland	Soil: sandy to fine sandy loam Water Table: >30 ft.	Includes species of drought tolerant trees and shrubs Density: 227 plants/acre	Favored by many resident and migratory birds. Dense shrubs and trees. Acorns and berries will eventually provide a food source for a variety of species.
Flexible Stem Riparian Forest	Soil: sandy to fine sandy loam Water Table: 10-20 ft.	Species selected can tolerate fluctuating water levels. Density: 227 plants/acre	Favored by resident and migratory birds.
Shadescale Scrub	Soils: cobble, sandy to fine sandy loam Water Table: <20 ft.	Species selected will be drought tolerant. Density: 227 plants/acre	Provide habitat and food to a host of species. Plants will seed and flower throughout the year.
Pollinator Planting		Species selected will be shallow rooted and flowering. Densely Planted	Favored by pollinators. Will provide food to foraging birds.
Herbaceous Understory	All plant associations	Densely planted; composed of aggressive herbaceous understory species. Goal is 100% cover by native species.	Provide varied vegetative mosaic. Reduce invasions by non-native weeds. Provide nesting habitat and substrate for birds.


Restoration Communities
State Lands
Riverbottom Park
Schneider Property
Plant Community
Flexible Stem Riparian Forest
Oak Woodland
Pollinator Planting
Riparian Forest
Shadescale Scrub
Weed Control
RIVER PARTNERS
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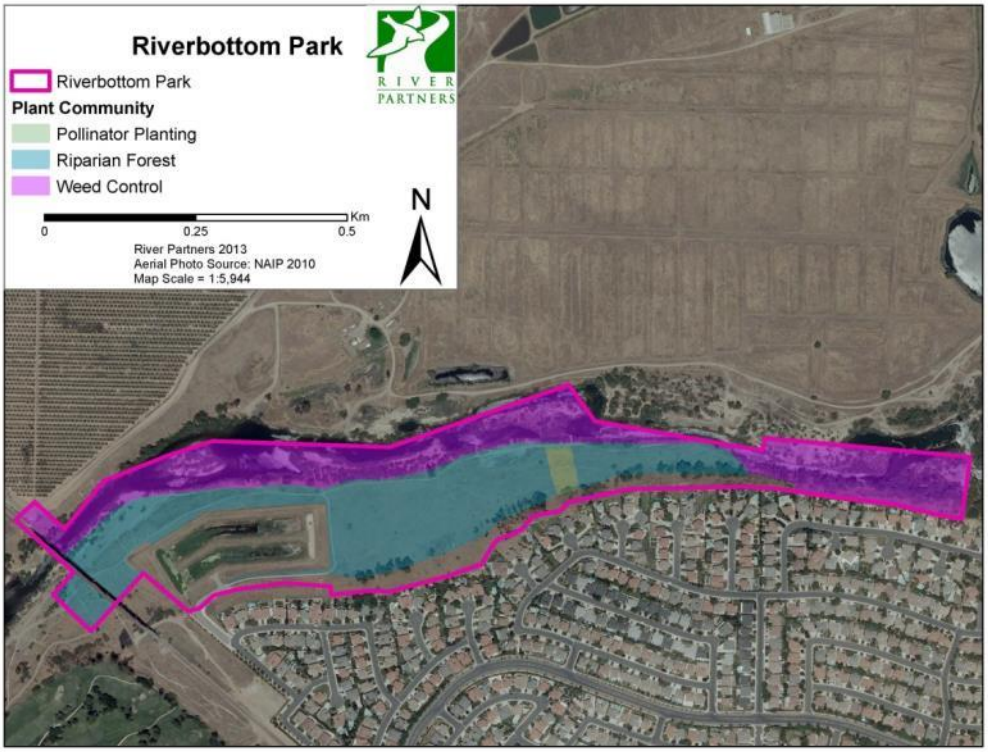
River Partners 2013
Aerial Photo Source: NAIP 2010
Topo Data Source: USGS
Map Scale = 1:11,065


Riverbottom Park
Riverbottom Park
Plant Community
Pollinator Planting
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River Partners 2013
Aerial Photo Source: NAIP 2010
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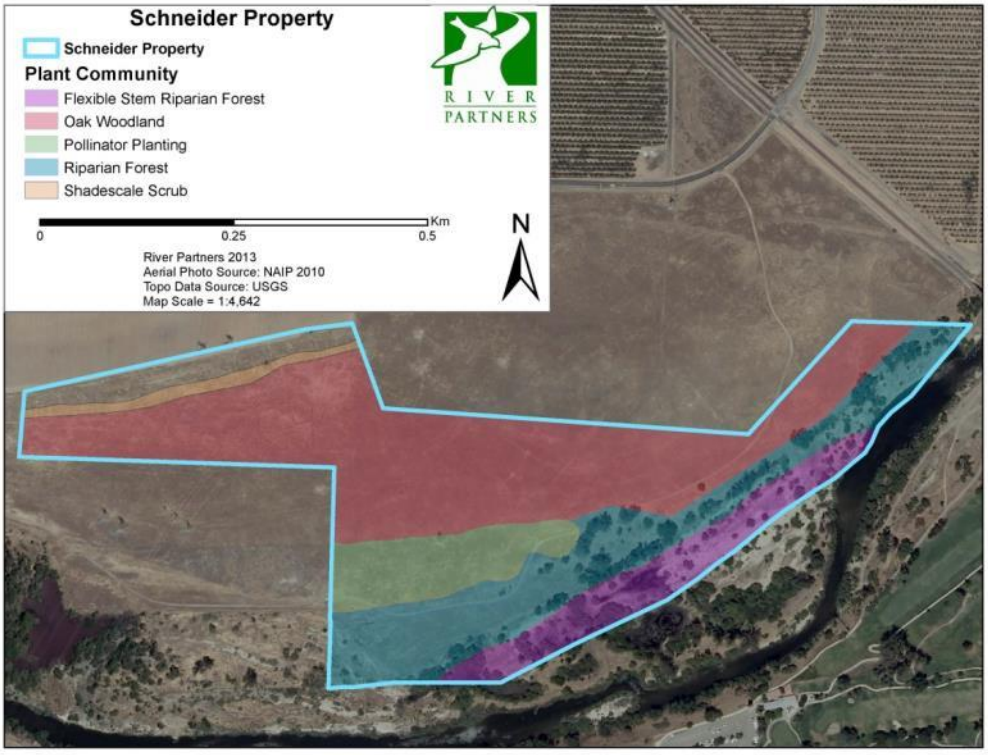

Figure 26. Plant Communities for Riverbottom Park and Schneider Property, Fresno and Madera Counties, California.

1. Riparian Forest Association

The Riparian Forest Association will be planted on the flat open floodplains at both Riverbottom Park and the Schneider Property. This association is within the designated floodway for both Riverbottom Park and the Schneider Property. For this reason driplines and plants will run parallel to the San Joaquin River's flow and will be planted with high percentages of flexible stemmed plants (36%) that will bend with the river's velocity during a flood event. Species selected for this association have a high flood tolerance, but are able to adapt to a fluctuating water table. Therefore, planting in this area will focus on ash, buttonbush, cottonwood and willows at a density of 272 plants/acre (Table 7). The plant and row spacing in this association will be 10 feet plants and 16 feet between rows and will be irrigated by dripline. A total of 38.2 acres were found to be suitable for this plant association on the Project site (24 acres at Riverbottom Park, 14.2 acres at the Schneider Property). Much of the area planned for this association on the Schneider property already has established woody species. We plan on killing or removing all non-native woody species within this planting type, including the large Eucalyptus trees found near the center of this planned plant association. Eucalyptus is invasive and competes with native vegetation on site. Oils in the leaf litter and on the trees themselves increase fire hazards and fire intensity, and the acidic leaves prevent the growth of an understory. These trees are large enough to provide nesting habitat, and are planned to be girdled and treated with herbicide in fall or winter to not infringe on the Migratory Bird Treaty Act. Driplines and plantings will

avoid existing riparian vegetation, but will serve to enhance existing habitat through increasing density and diversity. This planting focuses on diversity (17 woody species) and resilience to varying site conditions. This association has a higher density because the target community is a forest, not a woodland or savahna.

Table 7. Composition of the Riparian Forest Association, Riverbottom Park and Schneider Property, Fresno and Madera Counties, California.

Common name	Species composition (%)	Density (plant/acre)	Total Number
Sandbar willow	4	11	420
Black willow	8	22	840
Arroyo willow	2	6	229
Oregon ash	6	16	611
California blackberry	6	16	611
Fremont cottonwood	4	11	420
Golden current	6	16	611
California rose	8	22	840
Valley oak	8	22	840
Box elder	4	11	420
Buttonbush	6	16	611
Western sycamore	6	16	611
Mule fat	6	16	611
Coyote brush	6	16	611
Blue elderberry	8	22	840
Quail bush	8	22	840
Bush lupine	4	11	420
TOTAL	**100**	**272**	**10,390**

2. Pollinator Planting Association

The Pollinator Planting Association is designed and used for three separate ecological reasons. The first and most obvious reason for this association is to attract and support pollinators. Pollinator attracting plants are often showy and aesthetically pleasing, but they also support pollinators crucial to Central Valley agriculture as well as the wildlife who feed upon them. The second reason is that the “Grangeville soils, channeled” at the Schneider property were found to be only 3-6 inches deep, with a layer of rock near the surface. Invasive annual grasses continued to persist on these shallow soils, but woody species would be unable to establish. This assemblage of species could establish and compete with invasive annuals on shallow soils while still providing wildlife benefits on the 5.59 acres of this soil type. The final ecological reason for this association is that it provides light gaps and structural heterogeneity. By providing differing structural components to a habitat restoration over multiple spatial scales, you are increasing the number of possible niches for wildlife to inhabit.

The total acreage of this association is 6.59 (5.59 acres Schneider Property, 1 acre Riverbottom Park). A differing irrigation system will be used on the pollinator planting because micro emitters will work best to establish these species. Micro-emitters will require more pressurized lines than the driplines used in the woody species centric plantings. Emitters will be placed every 10 feet down the irrigation lines. Species in this association are both perennial and annuals. A diversity of species are planned for this

community that can tolerate both flood and drought, to ensure resilience (Table 8). These plant species bloom at differing times throughout the growing season, ensuring that it will remain an attractant to pollinators from spring to fall.

Table 8. Composition of the Pollinator Planting Association, Riverbottom Park and Schneider Property, Fresno and Madera Counties, California

Pollinator Planting	Annual or Perennial	Seeding Rates (PLS/Acre)	Plug Rates (Plugs/Acre)	Planting Rates (Plants Per Acre)
California poppy (*Eschscholzia californica*)	A	0.5	-	-
Tansy phacelia (*Phacelia tanacetifolia*)	A	0.25	-	-
Common tidytips (*Layia platyglossa)*	A	0.25	-	-
Vinegarweed (*trichostema lanceolatum*)	A	0.25	-	-
Fiddleneck (*Amsinckia intermedia*)	A	0.25	-	-
Gumplant (*Grindelia camporum)*	P	0.5	-	-
Mugwort *(Artemesia douglasiana)*	P	0.25	-	-
Spikeweed (*Hemizonia pungens*)	P	0.25	-	-
Milkweed (*Asclepias fascicularis*)	P	0.5	-	-
Telegraph Weed (*Heterotheca grandiflora*)	P	0.25	-	-
Small Fescue (*Festuca microstachys*)	P	0.25	-	-
Yarrow (*Achillea millefolium*)	P	0.5	-	-
Purple Needle grass (Stipa pulchra)	P	0.25	-	-
Creeping wildrye (*Elymus triticoides)*	P	-	500	-
Basket sedge (*Carex barbarae*)	P	-	500	-
Naked Buckwheat (*Eriogonum nudum*)	P	-	-	25
Bush lupine (*Lupinus albifrons*)	P	-	-	25

3. Oak Woodland Association

This plant community will cover the upland areas on the Schneider Property (29.78 acres) that have greater depth to the water table and more sun exposure due to the south facing aspect of the slope. Plant species of this association will be drought tolerant species of shrubs and trees (Table 9). There is very little remnant native vegetation, and the area planned for this association is currently dominated by invasive

annual weeds. In 25-50 years this association will grow into a Valley oak and Sycamore woodland with a diverse herbaceous understory. Valley oak and Sycamore will be the dominant tree species for this planting design, which will be planted at a density of 227 plants/acre. Row spacing will be 16 feet and the plant spacing will be 12 feet in this association. Pressurized drip lines will be utilized to water this sloped planting. Driplines will be buried underneath the main road running through Schneider property to avoid inconvenience and damage.

Table 9. Composition of the Oak Woodland Association, Schneider Property, Madera County, California.

Common name	Species composition (%)	Density (plant/acre)	Total Number
California blackberry	10%	23	685
Golden currant	8%	18	536
California rose	10%	23	685
Valley oak	10%	23	685
Western sycamore	4%	9	268
Mulefat	8%	18	536
Coyote brush	10%	23	685
Blue elderberry	10%	23	685
Quail Bush	10%	23	685
Bush lupine	8%	18	536
Honey mesquite	6%	13	387
Naked buckwheat	6%	13	387
TOTAL	**100**	**227**	**6,760**

4. Shadescale Scrub Association

The south facing slope on the Schneider Property presents a unique set of challenges to the planting design. These slopes are exposed to constant sun and xeric conditions. Drought tolerant (coyote brush, mulefat, and quailbush), plants we currently use on our levee restoration projects, and those that do well germinating and stabilizing slopes (naked buckwheat) are planned into this association. A total of 1.5 acres at the base of the bluff in the northwest corner of the Schneider Property was found to be suitable for this plant association (Figure 26). This association will be planted at a density of 195 plants/acre (Table 10) to mimic the lower densities of this habitat type and to reduce fire risk (considering this habitat type boarders the edge of the property). The row spacing will be 16 feet and the plant spacing will be 16 feet, providing a more open, less water competitive association. Only 5 pressurized driplines at the base of the bluff will be needed to support this association. Less water will be required to establish this community. Wildlife will benefit from having a shrub dominated habitat (only 4% of this habitat type remains in the San Joaquin Valley).

Table 10. Composition of Shadescale Scrub Association, Riverbottom Park and Schneider Property, Fresno and Madera Counties, California.

Common name	Species composition (%)	Density (plant/acre)	Total Number
California blackberry	8%	16	24
Golden currant	6%	12	18
California Rose	8%	16	24
Mulefat	10%	20	31
Coyote brush	12%	23	35
Blue Elderberry	12%	23	35
Quail bush	16%	31	47
Bush Lupine	12%	23	35
Honey mesquite	4%	8	12
Naked buckwheat	12%	23	35
TOTAL	**100**	**195**	**296**

5. Flexible Stem Riparian Forest

This association will be planted over the top of abandoned gravel mining operations within the designated floodway of the Schneider Property. The gravel bench was lowered during mining operations in the 1950's and 60's, leaving this portion of the Schneider Property to flood at only 2,000 cfs. For this reason driplines and plants will run parallel to the San Joaquin River's flow and will be planted with high percentages of flexible stemmed plants (50%) that will bend with the river's velocity during a flood event. Flood tolerant species (willows, ash, and buttonbush) dominate this association because of the shallow water table and higher occurrence of flooding. Blue elderberry and coyote brush cannot tolerate long periods of inundation and will not be included in this association. A density of 227 plants/acre will be planted at a row spacing of 16 feet and a plant spacing of 12 feet. A total of 6.92 acres were found to be suitable for this plant association on the Schneider Property. Much of the area planned for this association on the Schneider property already has established woody species. We plan on killing or removing all non-native woody species within this planting association, including an infestation of Sesbania. Driplines and plantings will avoid existing riparian vegetation, but will serve to enhance existing habitat through increasing density and diversity.

Table 11. Composition of the Flexible Stem Riparian Forest Association, Schneider Property, Madera Counties, California.

Common name	Species composition (%)	Density (plant/acre)	Total Number
Sandbar willow	10	23	159
Black willow	8	17	118
Arroyo willow	6	14	97
Oregon ash	6	14	97
California blackberry	12	27	187
Fremont Cottonwood	4	9	62
Golden currant	10	23	159
California Rose	10	23	159
Valley Oak	2	5	34
Box elder	6	14	97

Buttonbush	8	18	125
Western sycamore	4	9	62
Red willow	6	14	97
Mule Fat	8	17	118
TOTAL	**100**	**227**	**1,571**

6. Herbaceous Understory Planting

Woody plant species will be given a year to establish before herbaceous understory plants are broadcast or plugged. This practice has two main goals: first to allow woody species to establish before understory species (which could pose as competition during the early life stages of woody plants) are planted, and second to exhaust the site of invasive weeds through a year of intensive treatments. These treatments will avoid native herbaceous plants that are already established on site to encourage recruitment and native diversity. This is done through selective spraying, disking and hoeing. After a year, a dense, aggressive native understory will be planted throughout the restoration to prevent the establishment and limit the extent of invasion by exotic weeds. Moreover, incorporation of herbaceous plants will provide important wildlife habitat, produce native plant seed sources. Mugwort is an especially important component of riparian communities and appears to be good competitor against invasive non-native species).

Recent understory plantings on the San Joaquin River National Wildlife Refuge of mugwort, gumplant, and creeping wild rye resulted in virtually 100% cover after two growing seasons. Very few weeds were found in these planted areas. We believe these species will be an effective form of weed control in restored areas (Table 11). All of these species are currently present on Riverbottom Park and Schneider Property. Considering the Schneider Property is mostly upland and south facing, the restoration will experiment with drought tolerant understory species.

Table 12. Herbaceous understory species and seeding rates to be planted within woody plant associations.

Herbaceous Species	Plant Association			
	Riparian Forest	Flexible Stem Riparian Forest	Oak Woodland	Shadescale Scrub
	Recommended seeding rates in pounds of PLS/ac			
Creeping wildrye (*Elymus triticoides*)	6	6	6	3
Gumplant (*Grindelia camporum var. camporum)*	2.6	2.6	2.6	2.6
Mugwort *(Artemesia douglasiana)*	0.5	0.5	0.5	-
Spikeweed (*Hemizonia pungens*)	0.25	0.25	0.25	0.5
Milkweed (*Asclepias fascicularis*)	1	1	1	-
Telegraph Weed (*Heterotheca grandiflora*)	0.5	0.5	0.5	1.5
Purple Needle grass (*Stipa pulchra*)	0.25	0.25	0.25	0.5
Yarrow (*Achillea millefolium*)	0.5	-	0.5	0.5
Blue wild rye (*Elymus glaucus*)	-	-	0.25	0.25

Small Fescue (*Festuca microstachys*)	-	-	0.25	0.25
Basket sedge (*Carex barbarae*)	Live plugs	Live plugs	-	-
Saltgrass (*Distichlis spicata*)	Live plugs	Live plugs		

Maintenance activities, including disking, mowing, and herbicide application during the active restoration period will prevent invasive plants from establishing. However, at the end of the project, restored areas could be at risk of invasion by weeds. Native grass should be planted along access corridors and field perimeters.

Pure live seed (PLS) seeding rates for harvested species (mugwort, gumplant, milkweed, spikeweed and yarrow) will be calibrated based on bulk seed weight and viability. Creeping wild rye seed will be purchased and seeding rate will be approximately 6 lbs. PLS/acre. Basket sedge will be planted as live plugs grow out at a local nursery.

7. Weed Control

Remnant riparian vegetation clings to the edge of the San Joaquin River where it boarders Riverbottom Park and state lands to the west of Riverbottom Park, and South and West of the Schneider Property. This riparian vegetation exhibits diversity and density that used to sprawl onto the surrounding floodplains before the disruption of the hydrograph and other anthropogenic disturbances. This area is too dense to try to plant with woody species, but instead will be treated for invasive weeds to increase the chances of survival and recruitment by native species. Red Sesbania is the main concern in this management area. It has begun to infest this reach of the river and has been seen further upriver dominating riverbanks, outcompeting native riparian vegetation. Mechanical means as well as aquatic safe herbicides will be used to treat this prolific invasive, along with any other non-native species mapped for weed control.

D. Planting Tiles and Baseline Data

River Partners has developed a computer database system that identifies the plant species at a particular row and planting location within the field. This planning tool allows us to develop specific planting patterns that will create a vegetation mosaic of structural patterns within the restoration planting. Using this approach, each plant receives a computer-generated label that lists its row and plant number, location, plant species name and number code. The labels can be installed on stakes in the field prior to planting, allowing for clear communication of the plan to the planting crew. In the future, the database can be an important adaptive management tool because it will allow you to discern any patterns in a plant species' survival rate or growth patterns across a field.

Within each association the main planting subunits are expressed as "tiles" (Appendix II). Each tile covers an area of 5 rows by 10 planting locations within each row. Each tile will be replicated as often as needed to fill in the area for a particular association.

V. PROJECT IMPLEMENTATION

A. Environmental Compliance and Permitting

1. Permits

A portion of the project area is within the Central Valley Flood Protection Board's designated floodway (Figure 27) and may require a Central Valley Flood Protection Board Encroachment Permit. A hydraulic analysis will be performed to determine project impacts on the floodway, if any. Existing riparian vegetation and any nesting birds will be avoided and protected during the duration of the Project. A CEQA Mitigated Negative Declaration has already been filed by the City of Fresno, and a Categorical Exemption by the Conservancy (Class 4 "Minor Alterations of Land"). The U.S. Fish and Wildlife Service documented evidence of Valley elderberry longhorn beetle on the golf course adjacent to Riverbottom Park, and across the river from the Schneider Property in 1989. 14 of 20 elderberry surveyed exhibited Valley elderberry longhorn beetle exit holes. A U.S. Fish and Wildlife Service: Enhancement of Survival Permit 10(a)(1)(A) will be used to enable River Partners to restore and maintain restored vegetation within the 100 foot buffer of existing VELB habitat (elderberry) on site. A streambed alteration agreement (California Fish and Game Code Section 1600) will be secured.

a. Herbicide Application Permits

River Partners recommends the use of Roundup™ (glyphosate), Rodeo, and 2-4-D Weedar for most general applications, with Transline™ or Milestone ™ (for yellow star-thistle control), Telar™ and Garlon 3A™ (both used for perennial pepperweed), being more species-specific options. The Fresno County Ag Commission is the permitting agency for pesticide applications. Our licensed applicator holds the appropriate permits for the application of herbicides.

b. Access

Riverbottom Park is owned by the City of Fresno, who will be the point of contact for access to this site. The Schneider Property is owned by the San Joaquin River Conservancy, who will be the point of contact for access to the site.

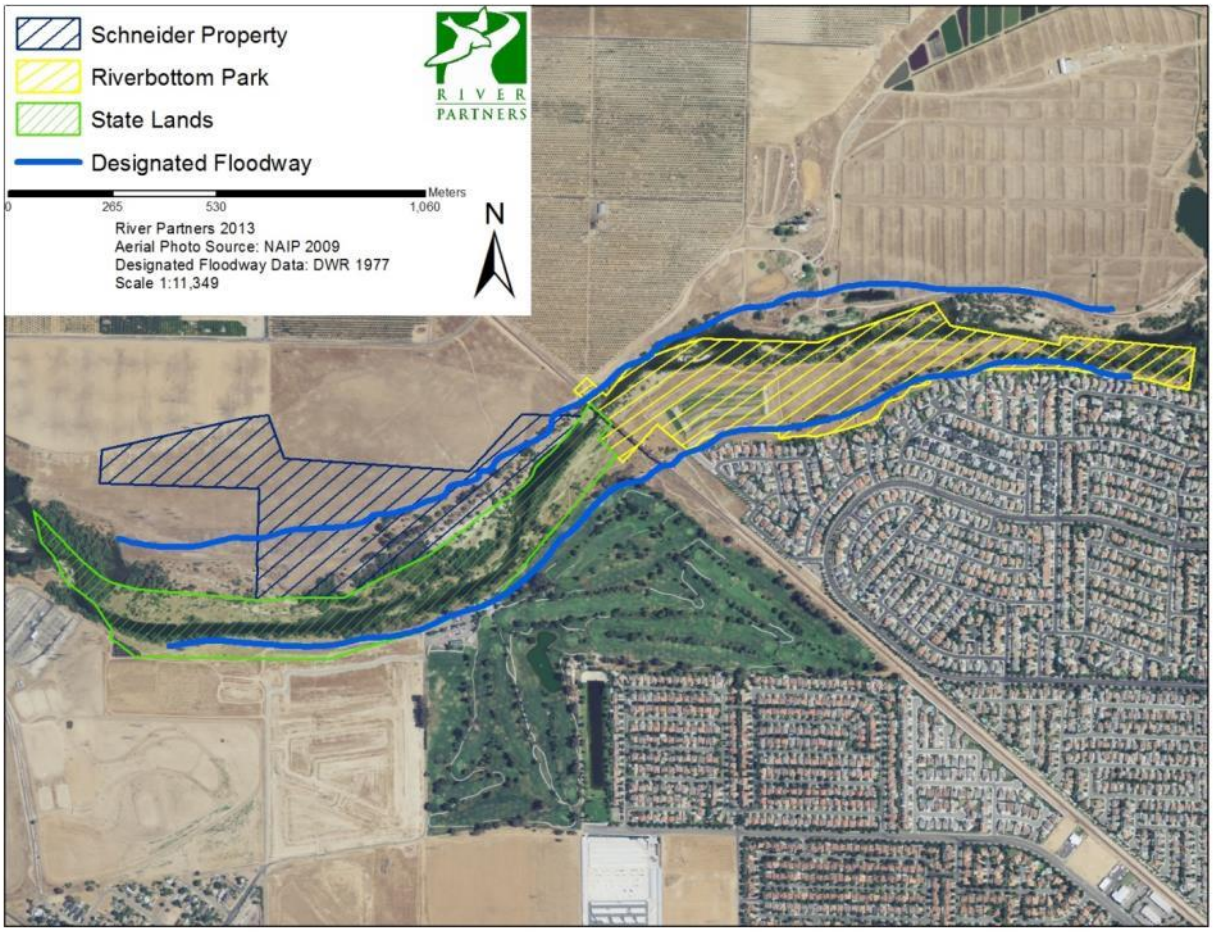

Figure 27. Project Area Geo-referenced with Designated Floodway.

2. Plant Tags and Flag Coding

River Partners has developed an efficient method of laying out a field for restoration. Each plant location is assigned a label based on its location within the planting tile in each field. Labels are attached to stakes that are pushed into the ground along the planting row or drip line at the proper plant spacing. This allows for a relatively error free installation since each plant species is clearly marked on the label. Color coded flag arrangements are also used to document dead or missing plants during our routine monitoring programs. This method allows for easy recognition of a particular plant species which will allow replants to be installed by people who may not be familiar native plant identification.

B. Site Preparation

1. Restoration Fields

It is recommended that all fields be mowed, disked or hand cleared to remove the majority of undesirable herbaceous material to bare dirt. After the field is treated, 90 days should be allowed before planting to avoid negative effects from the herbicide.

Some of the more heavily compacted soils may require ripping then disking to prepare for eventual planting.

The steeper slopes of the bluffs (both properties) will not be cleared, disked, irrigated, or mechanically planted. Work on these slopes will require extensive hand labor. It is possible that a Bobcat [R] tractor with an auger could access portions of these slopes to make the process of site preparation more efficient.

2. Avoidance Buffers

There are elderberry plants on site that will need adequate buffer zones during the restoration process. Per the Conservation Guidelines for Valley Elderberry Longhorn Beetle (USFWS 1999) avoidance of all activity within 100 feet of VELB is recommended. We will pursue permitting to allow us to enhance habitat within these buffers. Existing, sparse riparian vegetation is present on site and within the restoration areas. These native plant species will need to be avoided as required by the California Fish and Game Code Section 1600.

C. Irrigation System

All woody plantings will be drip-line irrigated, either with in line emitters or micro emitters dependent on budget and planting tile. Each plant will have three 0.5 GPH emitters, one on center and two 18 inches on either side of plant to provide adequate water. We will water each plant for 24 hours once per week. Actual watering times will fluctuate based on plant needs and climate conditions. Micro emitters or sprinklers will provide the best understory results where flood irrigation is not possible or feasible. Micro emitters will be utilized on both Pollinator Planting plant associations. The water source for will be a submersible pump in the San Joaquin River for both sites. Pump size and power will be determined when the irrigation system is designed.

We will be subcontracting to an irrigation design company to design a site specific irrigation plan will produce the best results. This is an area where using agricultural grade materials provide the long term benefits and cost-values. River Partners uses local contractors in our restoration operations.

D. Plant Material Collection and Propagation

Field cuttings of willows, cottonwood and mulefat will be collected from suitable locations and planted during January and February. Additional species grown out as container stock at nurseries (blackberry, coyote brush, elderberry, golden currant, Oregon ash, box elder, bush lupine, quail bush, buttonbush, honey mesquite and California rose) can be planted as materials become available with the optimal timing being late fall or early winter. Most of the seeds of these species have been collected, processed and shipped to an appropriate nursery to grow out. Coyote brush, and bush lupine will be collected this December and next June respectively. Seeds of herbaceous understory plants will also be collected on or near the project site for future dispersal. Collection will occur during project year one to be dispersed in project year two. These herbaceous understory plants will be planted in appropriate locations in years 2 and 3 of the project. Western sycamore will need to be collected as live green cuttings and

transferred to a nursery for propagation. Due to hybridization, seed collection provides the opportunity for impure genetics. These cuttings will be grown out at local nurseries next summer and planted as container stock. Valley oak will be direct seeded from acorns collected near the project site.

E. Plant Installation

1. Woody Species

Planting of stem-cuttings should occur in tandem with collection in the winter months when plants are dormant. Live cuttings of Western sycamore will be collected and planted in spring. Live cuttings of this species are needed to ensure the risk of hybridization with non-native sycamores is avoided (plains sycamore is a non-native decorative sycamore that has been planted along Santa Fe road atop the bluffs overlooking Riverbottom Park). Shrubs propagated by nursery operators can be planted in spring, fall or winter because they are started from seed and grown to potted stock. Valley oak acorns can be direct seeded in fall or winter.

2. Herbaceous Species

Native grass (creeping wildrye), and forbs (mugwort, gumplant, milkweed, spikeweed and yarrow) seeds will be planted in year 2 on sites that are determined to be appropriate. This will be done through the broadcasting of seed or the planting of plugs. Special attention will be made to establish an understory where native competition is most needed (along paths and roadsides)

F. Plant Maintenance

1. Plant Protectors

Plant protectors that protect young plants from herbicide spray can greatly enhance cost efficiencies by allowing for quick application of herbicides to recruiting weeds. Often misprinted milk cartons can be used for this purpose. Milk cartons will be stapled to a wooden stake and driven into the ground around a newly planted individual. The milk carton is fully biodegradable making collection and disposal unnecessary. Milk carton plant protectors provide little protection from large herbivores like cattle and deer. Approximately 4 inches of wood shavings can be applied as mulch around each plant to hold soil moisture and minimize weed growth.

2. Weed Control

During the growing season weeds will be controlled as needed by spraying glyphosate on the planting rows. The aisles between the rows will be mowed, disked, hoed or sprayed as needed to remove weeds. On the project site near the river in weed control areas, herbicides that are safe to be used near water will be utilized.

3. Irrigation Schedule

Because of the dry summers typical of the climate in the area, irrigation will be required. Irrigation will be applied with the goal that plants will become self-sufficient after the third growing season.

In the first growing season, the rapidly growing seedlings have roots only in the surface (the top 1-2 feet) of the soil profile. The rooting zone must be kept moist through the season to ensure optimum growth and survival. On loam soils, a frequency of once every 10 days is sufficient; irrigation on sandy soils may need to be more frequent. The intervals between irrigations are dependent upon soil texture, depth to water table, the weather conditions, and plant water stress. Because we propose a mixture of species with different water demands, the plants will be carefully observed to maintain a balance of soil moisture that is acceptable for xeric species like valley oak and elderberry as well as more mesic species like sandbar and red willow.

The strategy for the second and third year is to train the roots to grow deep toward the water table. Roots at depth (15-20 feet) may be able to tap into the water table on the site and out-compete more shallow-rooted weeds. Less frequent deep watering will encourage roots to grow deeper, well below the roots of the weeds, allowing the woody species exclusive use of available deep moisture. As the tree's roots grow deeper, the time between irrigations become longer (4-8 weeks in year 2, 3-4 months in year 3), allowing the soil surface layers to dry, thereby reducing weed vigor.

4. Herbivore Control

Herbivores can have a large impact on young plants. A number of measures can help control or minimize their effects (Table 12). Cultural practices such as mowing or spraying can discourage most of these herbivores. One of the advantages of active restoration is that typically, more plants are planted than the herbivores can eat. Mortality of plants is expected to occur over time and is built into the planting design. Some damage by herbivores is tolerable and will not necessarily impact the success of the planting. Owl box installation could provide an outreach opportunity (local schools could build) and help to increase the local raptor population.

Unauthorized cattle grazing activity on the Schneider Property restoration site will require fencing to eliminate trespass and prevent impacts on the restoration effort. A 3 wire barbed wire fence, following wildlife-friendly fencing guidelines, should be sufficient to protect the restoration site as it grows. It isn't necessary to completely enclose the area to be protected. Deer in small numbers are present in the area, but are not expected to have a significant impact on the plantings. Field densities allow for some minor browsing damage.

Table 13. Summary of herbivore control methods.

Herbivore	Type of Damage	Comment on measure(s) or plant response
Voles (*Microtus californicus*)	Eat bark and cambium at the base of sapling, usually girdling the entire stem. Dig-up and eat recently planted acorns.	Saplings resprout, unless vole population is high. Voles live only in dense herbaceous (weed) cover and never stop moving when in the open to avoid predators. Remove dense weed cover through herbicides or mowing. Installation of raptor perches can encourage predation and keep vole populations under control.
Pocket Gophers (*Thomomys bottae)*	Eat root systems (probably killing more saplings than any other vertebrate pest).	Control of weed cover allows predators to hunt gophers. However, gophers can persist in an open, weed-free field. A variety of birds will prey on gophers if given the opportunity. Raptor perches and owl boxes may increase predation.
Ground Squirrels (*Otospermophilus beecheyi*)	Dig up and shred plants and protectors.	Flooding or disking can reduce populations.
Rabbits and Hares	Browse early spring growth.	Plant protectors will keep the browsing on new plants to a minimum. Plants should resprout with light browsing.
California Mule Deer (*Odocoileus hemionus*)	Browse new plant growth.	New plantings should resprout with light browsing. If excessive damage persists control measures will need to be addressed.

5. Long Term Maintenance

Long term maintenance refers to any maintenance that may occur after the restoration contract has expired. The design of this project took into consideration these future costs. Vegetation will be planted 10 feet from the edges of any roadways or existing informal access paths, and no sprawling or viney species will be planted in the rows nearest to these pathways. When similar designs were implemented on the San Joaquin River National Wildlife Refuge, maintenance of these roadways occurs only once a year. When considering the proposed roadways and existing informal access paths on Riverbottom Park total 2.8 km, it would take a crew of five approximately 12 hours to trim back the vegetation. Assuming a rate of $15 an hour (near the cost of regional conservation corps member) it would cost $900.00 a year to maintain vegetation near existing informal access paths and roadways. Using these same rates

for the 0.8 km of proposed access paths on the Schneider property, costs would be $252.00 to trim back vegetation yearly. Maintenance of roadways and access paths can also be accomplished through community outreach and volunteer events on the property, reducing the maintenance of these access paths to a simple time investment. The maintenance of these existing informal access paths and roadways will also maintain firebreaks across the property.

VI. MONITORING AND REPORTING

Monitoring is essential to demonstrate and improve Project success throughout the restoration cycle. It is important to respond to new information and changing conditions in order to "close the loop" between monitoring and Project implementation. Much of the information in the Plan can be viewed as testable hypotheses. For example, the planting design matches plant species to specific conditions and this information can be stored in a computer database. Using the monitoring information, we can evaluate the planting design and/or field management across each field. The sections below outline some of the monitoring information collected for the Project.

Annual quantitative plant monitoring takes place between June and August so that changes to field management or the planting palette can be made at the end of each growing season. More frequent observations allow improvements to management or responses to changes during the growing season.

Subtle ecological factors across the project area will affect each species differently, resulting in different growth rates and mortality rates. River Partners' horticultural goal for this project would be a minimum 70% survival rate at the end of the maintenance period.

A. Field Reports

Field managers will complete monthly reports to document project activities and qualitative observations. The reports will note planting and maintenance activities, weed pressure, plant growth, soil moisture, vandalism, rodent damage, irrigation system performance, and the effectiveness of field operations. These reports allow the review of performance and timing of events throughout the restoration process.

B. End of Season Monitoring

Monitoring is important to determine plant survivorship and assess the effectiveness of management practices. Our monitoring approach includes the following:

- Conduct a full census at the end of the first growing season. This allows the biologists and field managers to measure an exact survival rate and determine the initial success of the project. Survivorship patterns (e.g. survival of a single species in a certain soil type) can also be derived from this information and better direct management of the site.
- Monitor permanent plots in each plant community at the end of the growing season in years 2,3 and 4.
- Compare plant growth and coverage with several physical parameters such as topography, soils, and hydrology.

- Monitor herbaceous vegetation planted throughout the project by estimating vegetative cover in year 3 and 4.
- Analyze the data, review the findings, and adjust field design accordingly.
- Host an end of season meeting with staff to discuss the project and make adaptive management recommendations.

The data collected will provide information on any necessary replant activities and management responses for the following season.

C. Photo Points

Photographs can provide qualitative information in vegetation changes at a restoration site. Photographs taken over time can provide a compelling picture of a project's success with a minimum of time and expense. Permanent photo points are to be established on site (gps locations with descriptions of aspect, permanent reference points and site conditions), that can be revisited on a yearly basis, or to document project milestones (before and after planting, flood or fire events).

D. Wildlife Monitoring

River Partners encourages wildlife monitoring of restoration projects and will record wildlife sightings. Currently, there is no active wildlife monitoring protocol in place for the Riverbottom Park or the Schneider Property.

E. Annual Reports

The annual report documents the monitoring data, reviews the site activities, provides a budget analysis, and recommends future management actions. These are produced following the end of season meeting to help managers prioritize the project's needs.

F. Final Report

The final report summarizes the project, including information developed in the end of season memos. It should analyze implementation activities in terms of the Plan and provide long-term management suggestions.

VII. SAFETY ISSUES

A. Standard Field Procedures

We recommend that all employees have a safety binder that describes safe work practices. In case of injuries or illnesses while on the job, employees should have access to a phone to dial 911, and should have ready access to preferred medical providers.

B. Flood and Fire Contingencies

Flooding is likely to have minimal impact on restoration activities on the site. Regulated flows on the San Joaquin River have reduced the frequency of widespread flooding, although some out of bank flooding can occur during flood or spring releases from the dam. There is more than adequate time between upstream inflows from the dam and

tributaries, and flooding that may occur at the site to provide for the safe exit from the site of personnel, volunteers, and equipment.

During the implementation of the restoration, weed control activities will reduce the abundance of dry vegetative fuels, thus lowering the probability of wildfire. Access roads will be mapped for fire escape routes.

VIII. PROJECT IMPLEMENTATION TIMELINE

The project implementation timeline has been postponed due to the Governor's proclamation of a Drought State of Emergency on January 17, 2014. This proclamation directed state agencies to immediately implement water use reduction plans for all state facilities to reduce water usage by at least 20 percent. These water conservation actions include a moratorium on new, non-essential landscaping projects at state facilities and on state highways and roads.

The Wildlife Conservation Board staff finds that this directive applies to Conservancy habitat restoration projects that are not already installed, including the San Joaquin River Parkway, Riverbottom Park and Schneider Property Habitat Restoration Project. New irrigation for habitat restoration projects on state land may be postponed as necessary to comply with the directive, for as long as the state of emergency is in effect. So far no details have been provided regarding the Governor's order. The project implementation timeline has been adjusted reflecting this postponement. This timeline is considering the possible lift of the Drought State of Emergency occurring when fall or winter rains commence in 2014. We will ask for a project extension at that time to make up for time lost during this state of emergency.

Table 14. Timeline of tasks for Riverbottom Park and Schneider Property.

	2013				2014				2015				2016				2017			
	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F
Planning and permitting																				
Site preparation																				
Irrigation install																				
Planting																				
Maintenance																				
Monitoring																				
Management																				

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Appendix I-

Soil Analysis Riverbottom Park and Schneider Property

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4736

REPORT NUMBER: 13-205-023

CLIENT NO: 4747-M

SEND TO: RIVER PARTNERS
580 VALLOMBROSA AVE
CHICO, CA 95928

SUBMITTED BY: TREVOR MEADOWS

GROWER:

DATE OF REPORT: 07/26/13

SOIL ANALYSIS REPORT

SAMPLE ID	LAB NUMBER	Organic Matter		Phosphorus		Potassium	Magnesium	Calcium	Sodium	pH		Hydrogen	Cation Exchange Capacity	PERCENT CATION SATURATION (COMPUTED)				
		* % Rating	** ENR lbs/A	P1 (Weak Bray) **** * ppm	$NaHCO_3$-P (OlsenMethod) **** * ppm	K ***** * ppm	Mg *** * ppm	Ca *** * ppm	Na *** * ppm	Soil pH	Buffer Index	H meq/100g	C.E.C. meq/100g	K %	Mg %	Ca %	H %	Na %
1	54499	0.4L	37	55VH	25**	128H	118M	691L	71H	5.9	6.9	1.0	6.1	5.4	15.9	56.6	17.0	5.1
2	54500	1.8L	66	84VH	33H	407VH	107M	986M	21L	6.4	7.0	0.7	7.6	13.7	11.6	64.6	9.0	1.2
3	54501	1.2L	54	36H	12M	79M	85M	951VH	13VL	6.7		0.3	6.0	3.4	11.7	79.5	4.5	0.9
4	54502	1.6L	61	93VH	29H	415VH	89M	793M	9VL	6.5		0.5	6.3	16.9	11.7	63.2	7.5	0.6
5	54503	1.8L	67	94VH	28H	432VH	115M	981M	27L	6.4	7.0	0.7	7.8	14.2	12.2	63.1	9.0	1.5

** NaHCO3-P unreliable at this soil pH

SAMPLE NUMBER	Nitrogen NO_3-N ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Excess Lime Rating	Soluble Salts mmhos/cm	Chloride Cl ppm		PARTICLE SIZE ANALYSIS			
												SAND %	SILT %	CLAY %	SOIL TEXTURE
1		3VL						L	1.3M						
2		5L						L	0.5L						
3		3VL						L	0.2VL						
4		5L						L	0.3L						
5		6L						L	0.4L						

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), AND VERY HIGH (VH).
** ENR - ESTIMATED NITROGEN RELEASE
*** MULTIPLY THE RESULTS IN ppm BY 2 TO CONVERT TO LBS. PER ACRE OF THE ELEMENTAL FORM
**** MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS. PER ACRE P_2O_5
***** MULTIPLY THE RESULTS IN ppm BY 2.4 TO CONVERT TO LBS. PER ACRE K_2O
MOST SOILS WEIGH TWO (2) MILLION POUNDS (DRY WEIGHT) FOR AN ACRE OF SOIL 6-2/3 INCHES DEEP

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

Mike Buttress, CPAg
A & L WESTERN LABORATORIES, INC.

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SAMPLE ID	LAB NUMBER	Organic Matter		Phosphorus		Potassium	Magnesium	Calcium	Sodium	pH		Hydrogen	Cation Exchange Capacity	PERCENT CATION SATURATION (COMPUTED)				
		* % Rating	** ENR lbs/A	P1 (Weak Bray) **** * ppm	$NaHCO_3$-P (OlsenMethod) **** * ppm	K ***** * ppm	Mg *** * ppm	Ca *** * ppm	Na *** * ppm	Soil pH	Buffer Index	H meq/100g	C.E.C. meq/100g	K %	Mg %	Ca %	H %	Na %
6	54504	0.9L	49	66VH	15M	224	78	595	7	6.4	7.0	0.4	4.6	12.4	13.8	64.1	9.0	0.7
7	54505	1.3L	55	45VH	20**	166H	88M	773M	12VL	5.8	6.9	1.2	6.2	6.8	11.5	61.8	19.0	0.8
8	54506	2.9M	89	54VH	34H	1070VH	114M	917L	14VL	6.4	6.9	0.8	9.1	30.0	10.3	50.1	9.0	0.7
9	54507	1.0L	50	56VH	25M	219	82	583	10	6.5		0.3	4.5	12.4	14.9	64.3	7.5	1.0
10	54508	1.1L	53	38H	17L	107	71	701	8	6.3	7.0	0.5	4.9	5.6	11.9	71.3	10.5	0.7

** NaHCO3-P unreliable at this soil pH

SAMPLE NUMBER	Nitrogen NO_3-N ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Excess Lime Rating	Soluble Salts mmhos/cm	Chloride Cl ppm		PARTICLE SIZE ANALYSIS			
												SAND %	SILT %	CLAY %	SOIL TEXTURE
6		4L						L	0.3L						
7		8L						L	0.4L						
8		19M						L	1.7M						
9		5L						L	0.3L						
10		6L						L	0.4L						

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), AND VERY HIGH (VH).
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SAMPLE ID	LAB NUMBER	Organic Matter		Phosphorus		Potassium	Magnesium	Calcium	Sodium	pH		Hydrogen	Cation Exchange Capacity	PERCENT CATION SATURATION (COMPUTED)				
		* % Rating	** ENR lbs/A	P1 (Weak Bray) **** * ppm	$NaHCO_3$-P (OlsenMethod) **** * ppm	K ***** * ppm	Mg *** * ppm	Ca *** * ppm	Na *** * ppm	Soil pH	Buffer Index	H meq/100g	C.E.C. meq/100g	K %	Mg %	Ca %	H %	Na %
11	54509	1.6L	61	33H	16M	110M	115M	871H	10VL	6.4	7.0	0.6	6.2	4.5	15.3	70.4	9.0	0.7
112	54510	1.0L	50	61VH	24VH	626VH	76M	594L	12VL	7.5		0.0	5.2	30.5	11.9	56.6	0.0	1.0

SAMPLE NUMBER	Nitrogen NO_3-N ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Excess Lime Rating	Soluble Salts mmhos/cm	Chloride Cl ppm		PARTICLE SIZE ANALYSIS			
												SAND %	SILT %	CLAY %	SOIL TEXTURE
11		4L						L	0.2VL						
112		7L						L	1.0M						

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), AND VERY HIGH (VH).
** ENR - ESTIMATED NITROGEN RELEASE
*** MULTIPLY THE RESULTS IN ppm BY 2 TO CONVERT TO LBS. PER ACRE OF THE ELEMENTAL FORM
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MOST SOILS WEIGH TWO (2) MILLION POUNDS (DRY WEIGHT) FOR AN ACRE OF SOIL 6-2/3 INCHES DEEP

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

Mike Buttress, CPAg
A & L WESTERN LABORATORIES, INC.

Appendix II-

Soil Pit Assessment of Riverbottom Park and Schneider Property

Pit #	Depth (inch)	Texture	Color	Notes	Vegetation
1	0-12"	Loam	10 YR 3/4	Moderate density of fine roots, no soil moisture	60-70% Vegetation - grazed annual grasses and forbs (Italian rye, vinegar weed, dove weed)
	12-60"	Loam	10 YR 3/4	Low density of fine roots, low soil moisture	
	60-108"	Loam	10 YR 3/4	No roots. Moderate soil moisture. Cobble starts at 79".	
2	NA	NA	NA	Surface rock only inches under thatch and organic layer. Too rocky to excavate soil pit.	50% Vegetation - grazed annual grasses and forbs (Italian rye, vinegar weed, dove weed)
3	0-1"	NA	NA	Organic surface layer.	60-70% Vegetation - grazed annual grasses and forbs (Italian rye, vinegar weed, dove weed)
	1-13"	Loam	7.5YR 2.5/1	High density fine roots, no moisture. Large peds and less friable soil.	
	13-60"	Clay loam	7.5YR 3/2	Low density of fine roots, low soil moisture.	
	60-108"	Sand	7.5YR 3/3	No roots, low soil moisture. Cobble mixed with sand.	
4	0-2"	NA	NA	Organic layer.	60-70% Vegetation - grazed annual grasses and forbs (Italian rye, vinegar weed, dove weed)
	2-84"	Sandy loam	2.5Y 3/3	Moderate density of fine roots, no soil moisture.	
	84-108"	Sandy loam	5Y 5/2	No roots, low soil moisture.	
	108-120"	Sandy loam	10YR 4/3	No roots, low soil moisture.	
5	0-3"	NA	NA	Organic layer.	80% Vegetation- large trees growing only 50ft from pit suggesting no limit to root growth (Western sycamore, eucalyptus) as well as annual forbs and grasses.
	3-15"	Loam	10YR 3/4	High density of fine roots, no soil moisture.	
	15-23'	Loam	2.5Y 5/2	Limestone with low density of fine roots and no soil moisture.	
	23-90"	Loam	2.5Y 5/2	Broken down limestone material with low density of medium sized roots and no soil moisture.	
	90-93"	Loam	2.5Y 5/2	Soil mixed with limestone chunks, evidence of repeated wetting and drying (oxidized iron). No plant roots and low soil moisture.	
	93-97"	Loam	2.5Y 5/2	No roots, low soil moisture.	

6	0-3"	NA	NA	Organic layer with high density of fine roots.	60-70% Vegetation - grazed annual grasses and forbs (Italian rye, vinegar weed, dove weed)
	3-20"	Clay loam	10YR 4/4	Moderate density of fine roots with no soil moisture. Stratification.	
	20-64"	Clay loam	2.5 YR 4/3	Low density of fine roots, no soil moisture.	
	64-66"	Clay loam	2.5 YR 4/3	Thin layer of limestone with penetrating fine roots and no soil moisture.	
	66-100"	Clay loam	2.5 YR 4/3	Low density of fine roots with no soil moisture.	
	100-108"	Limestone		Fine roots are able to penetrate limestone layer. No soil moisture.	
7	0-5"	NA	NA	Organic layer. High density of fine roots, no soil moisture.	80% Vegetation - annual grasses and sparse riparian trees including sandbar willow, buttonbush and mule fat
	5-18"	Sandy loam	2.5 Y 3/3	Moderate density of fine roots, no soil moisture.	
	18-53"	Loam	2.5 Y 3/3	Moderate density of fine roots, low soil moisture.	
	53-64"	Sand	2.5 Y 3/3	Moderate density of fine roots, moderate soil moisture.	
	64-78"	Loam	2.5 Y 3/3	Moderate density of fine roots, moderate soil moisture.	
	78-84"	Sand	2.5 Y 3/3	No roots, moderate soil moisture.	
	84+"	Silty clay loam	10 YR 3/1	No roots, high soil moisture. Gravel mixed in gley mottled soil, evidence of repeated wetting and drying (oxidized iron).	
8	0-18"	Cobble sand	2.5 Y 7/1	High density of fine roots, no soil moisture.	30% Vegetation - sandbar willow and buttonbush with sparse annual grasses
	18-32"	Sand	2.5 Y 7/1	Moderate density of fine roots, low soil moisture. Cobble mixed throughout soil layer.	
	32-60"	Cobble sand	2.5 Y 7/1	No roots to depth, high soil moisture.	
9	0-3"	NA	7.5 YR 3/2	Organic layer. High density of fine roots, no soil moisture.	60-70% Vegetation - bush lupine,

	3-14"	Clay loam	7.5 YR 3/2	High density of fine roots, no soil moisture.	elderberry, annual grasses and forbs (ripgut brome, Jimsonweed, vinegar weed, dove weed)
	14-115"	Clay loam	7.5 YR 3/2	Moderate density of fine roots, low soil moisture.	
	115-121"	Sand	NA	No roots, low soil moisture.	
	121-129"	Sand/gravel	NA	No roots, low soil moisture. Gravel and sand particles increased in size.	
10	0-7"	Clay loam	NA	Organic layer. High density of fine roots, no soil moisture.	60-70% Vegetation - Western sycamore, blue elderberry, annual grasses and forbs (ripgut brome, Jimsonweed)
	7-84"	Cobble sand	7.5 YR 3/1	Low density of fine roots and low soil moisture.	
	84-91"	Sandy loam	7.5 YR 3/2	No roots and moderate soil moisture.	
11	0-10"	NA	NA	Organic layer. High density of fine roots, no soil moisture.	60-70% Vegetation - Western sycamore, California rose, blue elderberry, annual grasses and forbs (ripgut brome, Jimsonweed)
	10-48"	Silt loam	7.5 YR 3/1	Moderate density of fine roots to 16" and low moisture in soils start at 24".	
	48-67"	Sand	NA	Friable sand. Depth is limited by the sand caving into pit.	
	67-99"	Silt loam	7.5 YR 3/1	No roots, low soil moisture.	

Appendix II-

Plant Association Tiles for Riverbottom Park and Schneider Property

Planting tile for riparian forest association

	Row				
Plant	1	2	3	4	5
1	MF	QB	RO	BW	SY
2	BW	EB	OK	BU	EB
3	BW	AS	AS	GC	QB
4	BU	SY	GC	OK	AW
5	CO	MF	SY	RO	BB
6	SW	RO	BB	BE	SW
7	BB	OK	BU	BL	QB
8	BE	AS	RO	QB	BL
9	CO	CB	OK	EB	GC
10	CB	BW	CB	MF	EB

Planting tile for flexible stem riparian forest association

	Row				
Plant	1	2	3	4	5
1	MF	BE	AS	BE	BU
2	CO	BB	BU	GC	MF
3	BB	SW	EW	BW	BU
4	BW	SW	RO	MF	AS
5	RO	RO	AW	BE	BB
6	OK	AS	BB	RW	BB
7	SW	BW	GC	SY	SW
8	SW	RO	CO	RO	SY
9	MF	BU	BB	GC	AW
10	AW	GC	RW	BW	GC

Planting tile for oak woodland association

Plant	Row 1	2	3	4	5
1	HM	RO	BB	RO	BL
2	MF	HM	RO	NB	CB
3	QB	GC	CB	OK	QB
4	SY	BB	QB	EB	BB
5	GC	MF	HM	BB	EB
6	EB	OK	RO	MF	GC
7	CB	EB	MF	OK	BB
8	BL	BL	EB	BL	RO
9	OK	QB	GC	CB	NB
10	NB	CB	SY	QB	OK

Planting tile for shadescale scrub association

Plant	Row 1	2	3	4	5
1	QB	MF	BL	GC	EB
2	NB	EB	BL	RO	NB
3	MF	BB	QB	NB	RO
4	BL	BB	GC	HM	RO
5	CB	HM	EB	BL	RO
6	EB	BL	CB	CB	MF
7	NB	MF	BB	QB	CB
8	NB	QB	EB	QB	BL
9	CB	CB	NB	QB	EB
10	QB	QB	MF	GC	BB

Species Key for Plant Association Tiles

AS	Oregon ash
AW	arroyo willow
BB	California blackberry
BE	box elder
BL	bush lupine
BU	buttonbush
BW	black willow
CB	coyote brush
CO	Fremont cottonwood
EB	blue elderberry
GC	golden currant
HM	honey mesquite
MF	mulefat
NB	naked buckwheat
OK	Valley oak
QB	quail bush
RO	California rose
RW	red willow
SW	sandbar willow
SY	Western sycamore

Appendix IV-

On Site Comprehensive Plant List of Riverbottom Park and Schneider Property

Riverbottom Park and Schneider Property Comprehensive Native Plant List	
Compiled 7/18/2013-7/19/2013	
Common Name	**Scientific Name**
Black Willow	*Salix nigra*
Box Elder	*Acer negundo*
Bulrush	*Scirpus spp.*
Bush Lupine	*Lupinus arboreus*
Buttonbush	*Cephalanthus occidentalis*
California Blackberry	*Rubus ursinus*
California Buckwheat	*Eriogonum fasciculatum*
California Dodder	*Cuscuta californica*
California Poppy	*Eschscholzia californica*
California Rose	*Rosa californica*
Coulter's Horseweed	*Laennecia coulteri*
Cudweed	*Gnaphalium californicum*
Dove Mullein	*Croton setigerus*
Elderberry	*Sambucus mexicana*
Evening Primrose	*Oenothera biennis*
Fiddleneck	*Amsinkia spp.*
Fremont Cottonwood	*Populus fremontii*
Giant Stinging Nettle	*Dendrocnide excelsa*
Heliotrope	*Heliotropium curvassicum*
Horsetail	*Equistetum arvense*
Jimsonweed	*Datura wrightii*
Kellogg's tarweed	*Deinandra kelloggii*
Leymus	*Leymus triticoides*
Marestail	*Conyza canadensis*
Missouri Gourd	*Cucurbita foetidissima*
Mule Fat	*Baccharis salicifolia*
Narrowleaf Milkweed	*Asclepias fascicularis*
Oregon Ash	*Fraxinus latifolia*
Red Willow	*Salix laevigata*
Rough Cockleburr	*Xanthium strumarium*
Saltgrass	*Distichlis spicata*
Sandbar Willow	*Salix exigua*
Spanish Lotus	*Lotus purshianus var. purshianus*
Spike weed	*Hemizonia pungens*
Sunflower	*Helianthus annuus*
Vinegar Weed	*Trichostema lanceolatum*

Western Sycamore	*Platanus racemosa*
White Alder	*Alnus rhombifolia*
Gumplant	*Grindelia camporum*
Riverbottom Park and Schneider Property Comprehensive Non-Native Plant List	
Compiled 7/18/2013-7/19/2013	
Common Name	**Scientific Name**
Tree of Heaven	*Ailanthus altissima*
Red Gum Eucalyptus	*Eucalyptus camaldulensis*
Horehound	*Marrubium vulgare*
Silk Tree	*Albizia julibrissin*
Storksbill	*Erodium botrys*
Red Sesbiana	*Sesbania punicea*
Ripgut Brome	*Bromus diandrus*
Yellow Star Thistle	*Centaurea solstitialis*
Italian Rye	*Festuca perennis*
Red-root Pigweed	*Amaranthus retroflexus*
Black Mustard	*Brassica nigra*
Bermuda Grass	*Cynodon dactylon*
Chicory	*Cichorium intybus*
Tree Tobacco	*Nicotiana glauca*
Curly Dock	*Rumex crispus*
Prickly Wild Lettuce	*Lactuca serriola*
Himilayan Blackberry	*Rubus armeniacus*
Jersey Cudweed	*Pseudognaphalium luteoalbum*
False Nutsedge	*Cyperus strigosus*
Wild oat	*Avena fatua*
Sow Thistle	*Sonchus oleraceus*

Appendix V-

On Site Comprehensive Wildlife List of Riverbottom Park and Schneider Property

Riverbottom Comprehensive Species List		
Compiled 7/18/2013-7/19/2013		
WILDLIFE		
Type	**Common Name**	**Scientific Name**
BIRDS	Swainson's Hawk	*Buteo swainsoni*
	Green Heron	*Butorides virescens*
	Red Shouldered Hawk	*Buteo lineatus*
	Western Scrub Jay	*Aphelocoma californica*
	Mockingbird	*Mimus polyglottos*
	Great Horned Owl	*Bubo virginianus*
	Cattle Egret	*Bubulcus ibis*
	Killdeer	*Charadrius vociferus*
	American Goldfinch	*spinus tristis*
	Black Phoebe	*Sayornis nigricans*
	Western Kingbird	*Tyrannus verticalis*
	American Kestrel	*Falco sparverius*
	Spotted Towhee	*Pipilo maculatus*
	Black-Crowned Night Heron	*Nycticorax nycticorax*
	Ash-throated Flycatcher	*Myiarchus cinerascens*
	Turkey Vulture	*Cathartes aura*
	Barn Swallow	Hirundo rustica
	Red Tail Hawk	*Buteo jamaicensis*
	Anna's Hummingbird	*Calypte anna*
	Mourning Dove	*Zenaida macroura*
	House Finch	*Carpodacus mexicanus*
	Nuttall's Woodpecker	Picoides nuttallii
	Double-crested Cormorant	*Phalacrocorax auritus*
	Red-winged Blackbird	*Agelaius phoeniceus*
MAMMALS	California Ground Squirrel	*Otospermophilus beecheyi*
	Red Fox	*Vulpes vulpes*
	Botta's Pocket Gopher	*Thomomys bottae*
MISC.	Bullfrog	*Rana catesbeiana*
	Honeybee	*Apis spp.*
	Western Fence Lizard	*Sceloporus occidentalis*
	Spotted Bass	*Micropterus punctulatus*
	Western Tiger Swallowtail Butterfly	*Papilio rutulus*
	Cabbage Butterfly	*Pieris rapae*

Attachment B, Exhibit B, USACE Letter

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Flood Protection and Navigation Section (18995)

DEC 16 2014

Ms. Leslie M. Gallagher, Acting Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Ms. Gallagher:

We have reviewed a permit application by River Partners/City of Fresno (application number 18995). This project includes clearing debris and weeds, planting 24 acres of riparian forest, and installing a drip irrigation system at the Riverbottom Park property along the left and right bank of the San Joaquin River. The project is located where Riverbottom Park abuts the southern edge of the San Joaquin River to the east of the railroad crossing in Fresno, at 36.850998°N 119.899361°W NAD83, Fresno County, California.

The District Engineer has no comments or recommendations regarding flood control because the proposed work does not affect a federally constructed project.

Based upon the information provided, no Section 10 or Section 404 permit is needed.

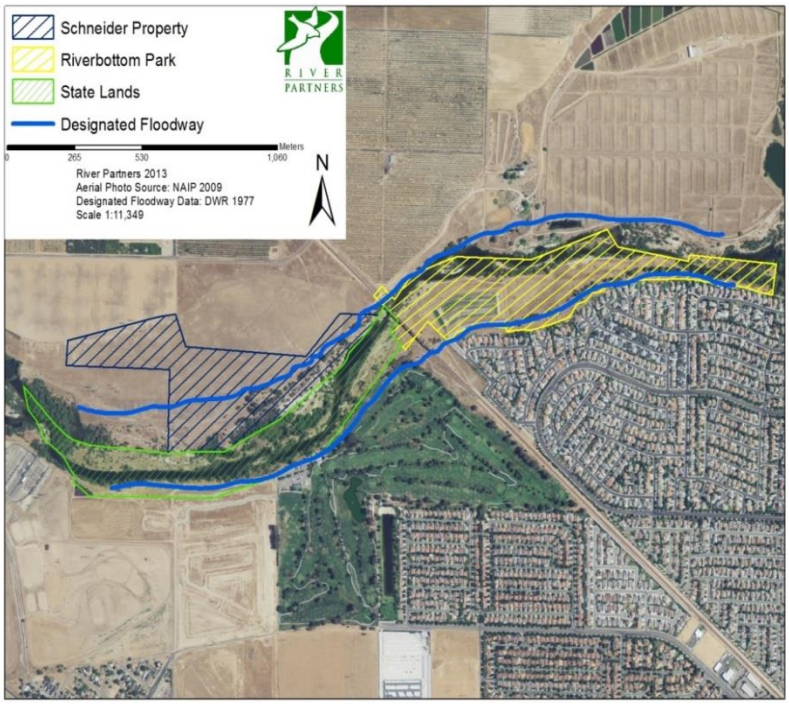
A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite 200, Sacramento, CA 95821.

Sincerely,

Ryan Larson, P.E.
Chief, Flood Protection and Navigation Section

Riverbottom Park and Schneider Property
Vegetation Management Plan

This Vegetation Management Plan describes each of the desirable outcomes for native plant vegetation structure on the floodplain and in the channel of the San Joaquin River at RM242-244 in Fresno. This plan provides guidance for City and San Joaquin River Conservancy staff members who are responsible for maintaining the properties.

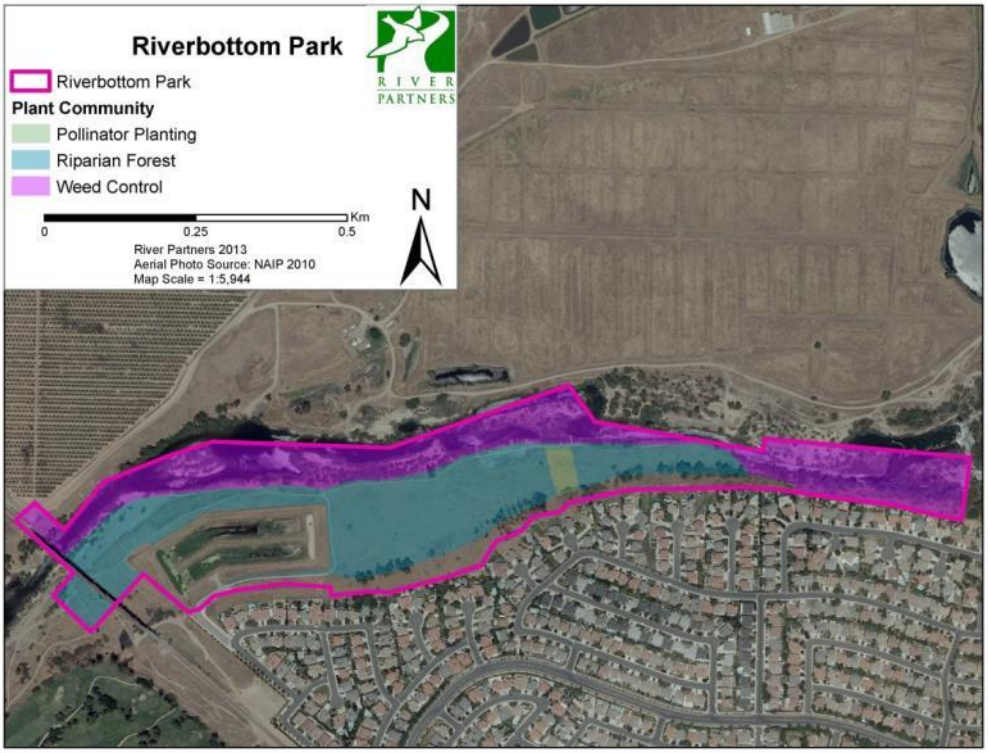


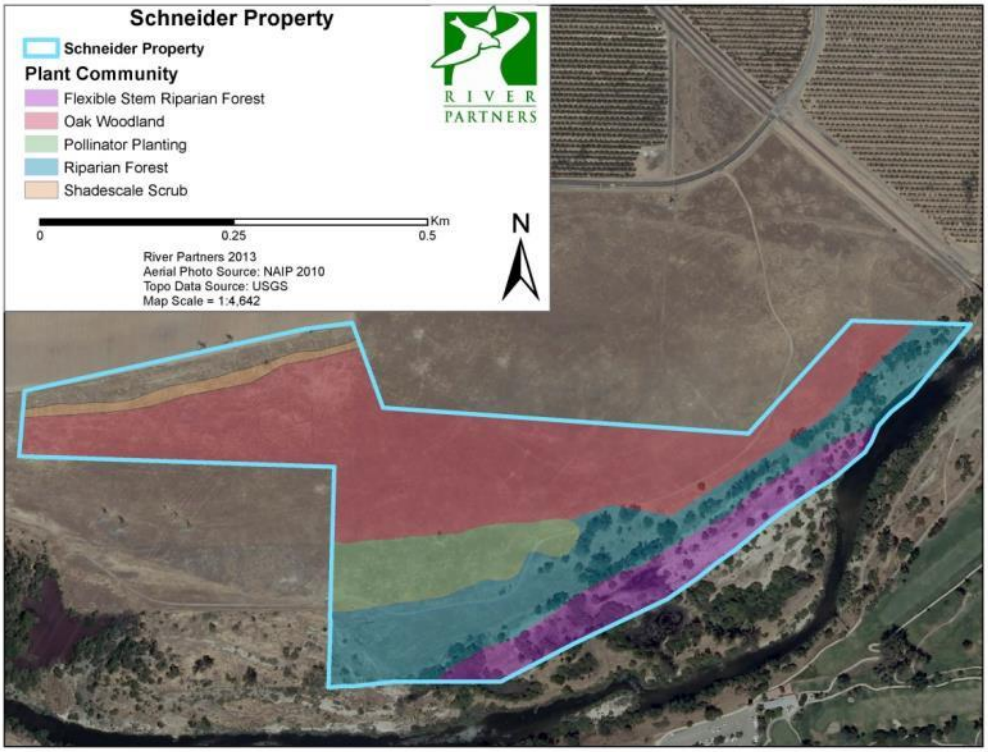
Property Owner Responsible
The properties encompassing the floodway at RM 242-244 are owned and maintained by the City of Fresno PARCS Department (left bank – Riverbottom Park) and the San Joaquin River Conservancy (right bank – Schneider Property). There is no agency with responsibility for channel vegetation maintenance in this portion of the floodway. There is no maintenance required on sovereign state lands.

Funding
Long term management of the properties is funded through the existing budgets of the landowners, and is expected to be reduced from current conditions by the restoration project. The desired outcome of the restoration project is a vegetation community that does not require continued maintenance. Herbicide application, grazing, and vegetation trimming may be performed if required to provide for public safety (i.e. visibility and access).

Maintenance Components
The desired outcome of the restoration project is a vegetation community that is self-sustaining, and has no impact on flood conveyance. Post-project hydraulic conditions have been modelled to verify this outcome. The restoration actions proposed throughout the project area are similar within each of 6 vegetation zones. These zones have consistent maintenance requirements as well. Locations of these zones are provided in the figures below. Maintenance actions for these zones are described below.

Vegetation Zones:
Zone 1. Flexible Stem Riparian Forest
Zone 2. Riparian Forest
Zone 3. Pollinator Planting
Zone 4. Weed Control
Zone 5. Oak Woodland
Zone 6. Shadescale Scrub


Riverbottom Park
Riverbottom Park
Plant Community
Pollinator Planting
Riparian Forest
Weed Control
0
0.25
0.5
Km
N
River Partners 2013
Aerial Photo Source: NAIP 2010
Map Scale = 1:5,944
RIVER
PARTNERS


Schneider Property
Schneider Property
Plant Community
Flexible Stem Riparian Forest
Oak Woodland
Pollinator Planting
Riparian Forest
Shadescale Scrub
0
0.25
0.5
Km
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River Partners 2013
Aerial Photo Source: NAIP 2010
Topo Data Source: USGS
Map Scale = 1:4,642
RIVER
PARTNERS

Zone 1. Flexible Stem Riparian Forest

Location: floodplain, adjacent to the main channel

Vegetation Structure: Matrix of flexible-stemmed shrubs with occasional trees

Long-term Maintenance:

- Post establishment, this vegetation zone requires very little maintenance as shrubs and groundcover provide protection against infestation by weeds.
- Planting density is expected to decrease over time, and replanting after natural attrition is not required.
- Volunteer trees may need to be removed if growing in areas that block maintenance access.
- Spot treat weeds as needed.

Zone 2. Riparian Forest

Location: floodplain

Vegetation Structure: Matrix of flexible-stemmed trees and shrubs with dense groundcover provided by native species.

Long-term Maintenance:

- Post establishment, this vegetation zone requires very little maintenance as shrubs and groundcover provide protection against infestation by weeds.
- Planting density is expected to decrease over time, and replanting after natural attrition is not required.
- Spot-treat weeds as needed.

Zone 3. Pollinator Planting

Location: floodplain

Vegetation Structure: Dense mix of annual and perennial native herbs and grasses

Long-term Maintenance:

- Mowing or weed-eating once per year in the fall is recommended but not required to cut back dead plant matter and create good conditions for spring and summer growth.
- Spot-treat weeds as needed.

Zone 4. Weed Control

Location: main channel

Vegetation Structure: herbaceous and flexible-stemmed shrubs where naturally recruited, open sand bars and open water in the channel

Long-term Maintenance:

- River flows will scour vegetation and maintain a vegetation mosaic in this zone, no maintenance is required.
- Spot-treat weeds as needed.

Zone 5. Oak Woodland

Location: uplands

Vegetation Structure: Mix of oak and sycamore trees spaced across the site with dense native understory herbs – target tree density is savanna (<70 trees per acres), with trees spaced >20' on center

Long-term Maintenance:

- Post establishment, this vegetation zone requires very little maintenance as trees shade out weed growth and groundcover provides protection against infestation by weeds.
- Planting density is expected to decrease over time, and replanting after natural attrition is not required.
- Grazing and/or mowing and weed-eating in the fall is recommended but not required to clear annual herbaceous growth and create good conditions for spring and summer herbaceous growth.
- Spot-treat weeds as needed.

Zone 6. Shadescale Scrub

Location: uplands

Vegetation Structure: low density shrubs and herbs

Long-term Maintenance:

- Spot-treat weeds as needed.

MBK ENGINEERS

Water Resources • Flood Control • Water Rights

T E C H N I C A L M E M O R A N D U M

DATE: August 1, 2014

TO: River Partners c/o Julie Rentner

FROM: Don Trieu, P.E.

REVIEWED BY: Mike Archer, P.E.

SUBJECT: Riverbottom Park and Scheinder Property Habitat Restoration Project – Hydraulic Impact Analysis

Background

River Partners proposes to perform habitat restoration and enhancement along the San Joaquin River in Fresno and Madera County. The project is located along the river channel and upland area on the San Joaquin River at approximately USGS river mile 242 (Figure 1). The primary goal of the project is to increase and improve riparian, upland and wetland habitat to benefit multi-species. Plantings of native vegetation are proposed to achieve the goals. MBK Engineers has performed a hydraulic analysis of the proposed project in support of the California Central Valley Flood Protection Board (CVFPB) Encroachment Permit Application. This memorandum documents the hydraulic analysis performed.

Project Description

The project consists of enhancing approximately 147 acres of riparian and upland habitat on the San Joaquin River: Riverbottom Park (63 acres), Schneider Property (62 acres), and adjacent State lands (22 acres). The properties span approximately two miles of the San Joaquin River from river mile 242 to 244. The San Joaquin River runs between two bluffs through the project site with the federal project levees beginning approximately 22 miles downstream. Riverbottom Park is located within San Joaquin River floodplain and CVFPB Designated Floodway. About 50% of the Schneider Property is located within the Designated Floodway. (Figure 2)

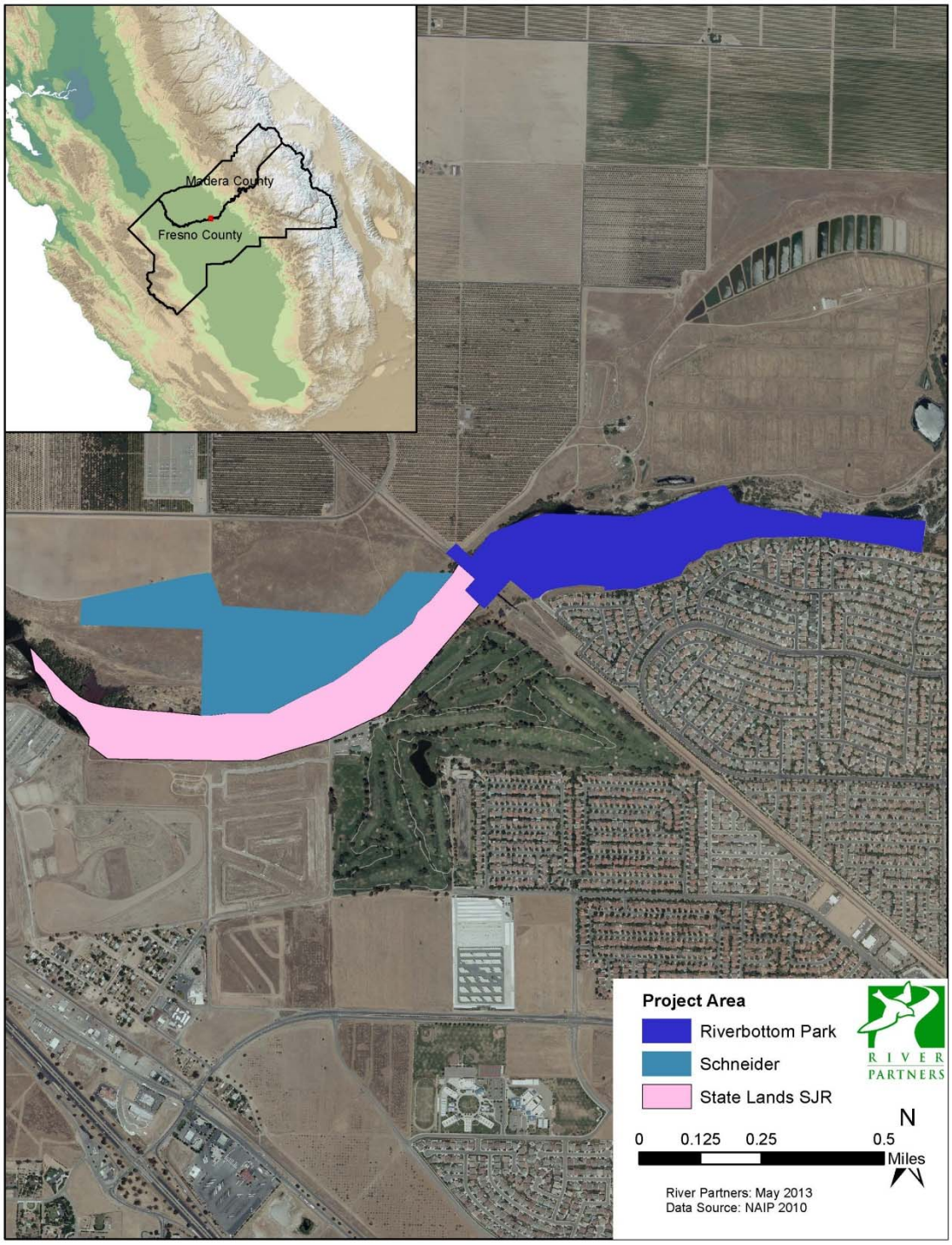

Madera County
Fresno County
Project Area
Riverbottom Park
Schneider
State Lands SJR
RIVER PARTNERS
N
0 0.125 0.25 0.5
Miles
River Partners: May 2013
Data Source: NAIP 2010

Figure 1

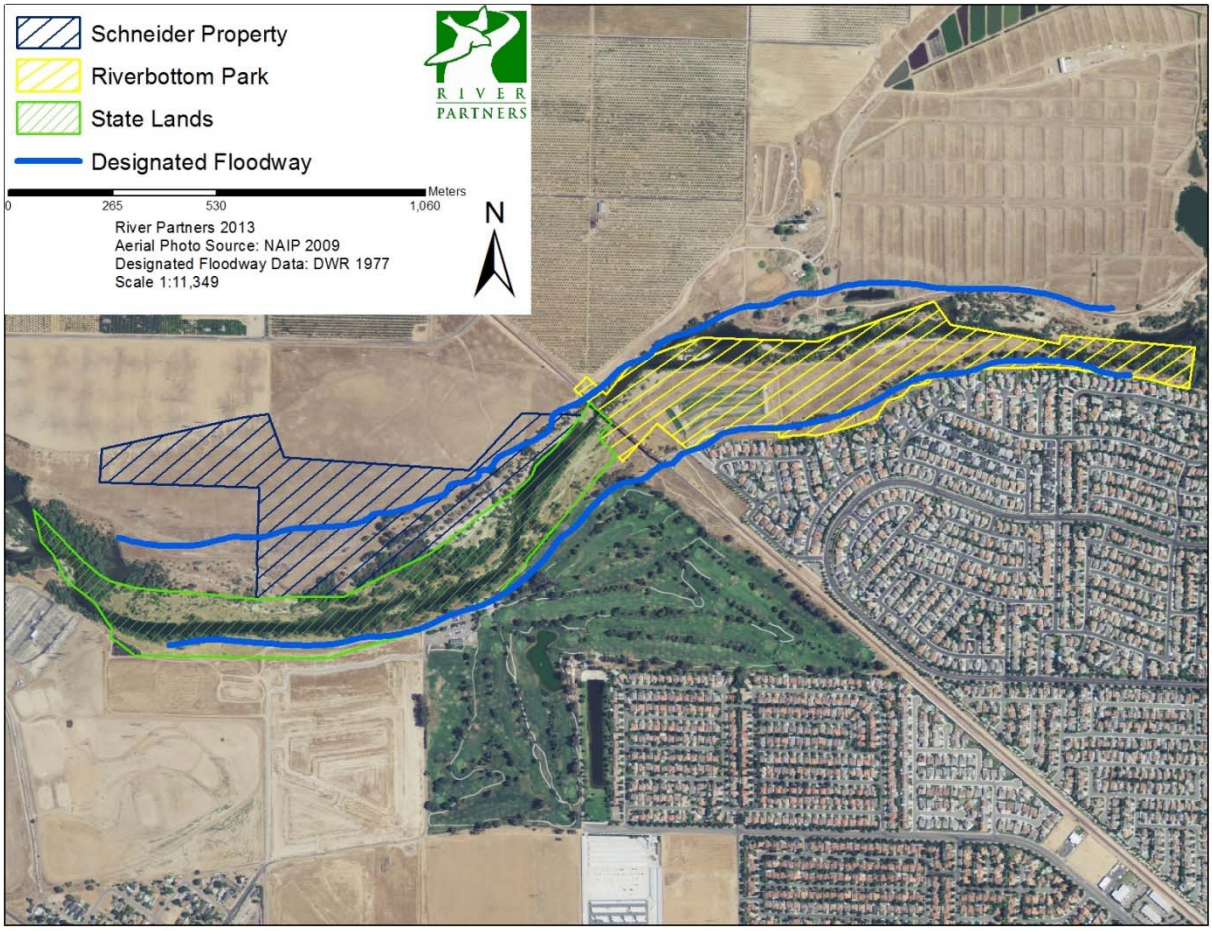


Figure 2

Currently, both project sites are dominated by a mixture of invasive weeds on the floodplains and upland areas. The invasive weeds compete for both water and light and are not an ideal habitat for the targeted species. River Partners proposes to plant five different plant associations at the two project sites; Schneider Property and Riverbottom Park. There will be no plantings proposed on State lands. Following is a description and list of native plants in each plant association:

1. *Riparian Forest*

   The riparian forest association will be planted on the flat open floodplains on both properties. A total of 24 acres on the Riverbottom Park and 14.2 acres on the Schneider property will be planted with the plants from this association. Seventeen different types of wood species will be planted, a majority of which are flexible stem and will bend with the river's velocity during flood flows. Rows of plants will be planted parallel to the flood flows with a row spacing of 16 feet and 10 feet between plants. Table 1 shows the plants and density for the Riparian Forest.

Table 1: Riparian Forest Plants

Common name	Species composition (%)	Density (plant/acre)	Total Number
Sandbar willow	4	11	420
Black willow	8	22	840
Arroyo willow	2	6	229
Oregon ash	6	16	611
California blackberry	6	16	611
Fremont cottonwood	4	11	420
Golden currant	6	16	611
California rose	8	22	840
Valley oak	8	22	840
Box elder	4	11	420
Buttonbush	6	16	611
Western sycamore	6	16	611
Mule fat	6	16	611
Coyote brush	6	16	611
Blue elderberry	8	22	840
Quail bush	8	22	840
Bush lupine	4	11	420
TOTAL	**100**	**272**	**10,390**

2. *Pollinator Planting*

Pollinating plants will be planted on approximately 6.59 acres of the project site. The area will be seeded and planted with plants shown in Table 2. There are no woody plants in this plant community.

Table 2: Pollinator Planting Plants

Species	Annual or Perennial	Seeding Rates (PLS/Acre)	Plug Rates (Plugs/Acre)	Planting Rates (Plants Per Acre)
California poppy (*Eschscholzia californica*)	A	0.5	-	-
Tansy phacelia (*Phacelia tanacetifolia*)	A	0.25	-	-
Common tidytips (*Layia platyglossa)*	A	0.25	-	-
Vinegarweed (*trichostema lanceolatum*)	A	0.25	-	-
Fiddleneck (*Amsinckia intermedia*)	A	0.25	-	-
Gumplant (*Grindelia camporum)*	P	0.5	-	-
Mugwort *(Artemesia douglasiana)*	P	0.25	-	-
Spikeweed (*Hemizonia pungens*)	P	0.25	-	-
Milkweed (*Asclepias fascicularis*)	P	0.5	-	-

Species	Annual or Perennial	Seeding Rates (PLS/Acre)	Plug Rates (Plugs/Acre)	Planting Rates (Plants Per Acre)
Telegraph Weed (*Heterotheca grandiflora*)	P	0.25	-	-
Small Fescue (*Festuca microstachys*)	P	0.25	-	-
Yarrow (*Achillea millefolium*)	P	0.5	-	-
Purple Needle grass (Stipa pulchra)	P	0.25	-	-
Creeping wildrye (*Elymus triticoides)*	P	-	500	-
Basket sedge (*Carex barbarae*)	P	-	500	-
Naked Buckwheat (*Eriogonum nudum*)	P	-	-	25
Bush lupine (*Lupinus albifrons*)	P	-	-	25

3. Oak Woodland

The oak woodland plant community will be planted on the upland areas of the Schneider Property. All of the plants in this plant community is outside of the Designated Floodway. A total of 29.78 acres will be planted. Valley oak and sycamore trees will be the dominant tree species with a diverse herbaceous understory. Plants will be planted at row spacing of 16 feet and plant spacing of 12 feet. Plant species associated with this habitat type are shown in Table 3.

Table 3: Oak Woodland Plants

Common name	**Species composition (%)**	**Density (plant/acre)**	**Total Number**
California blackberry	10%	23	685
Golden currant	8%	18	536
California rose	10%	23	685
Valley oak	10%	23	685
Western sycamore	4%	9	268
Mulefat	8%	18	536
Coyote brush	10%	23	685
Blue elderberry	10%	23	685
Quail Bush	10%	23	685
Bush lupine	8%	18	536
Honey mesquite	6%	13	387
Naked buckwheat	6%	13	387
TOTAL	**100**	**227**	**6,760**

4. Shadescale Scrub

The slopes of the Schneider Property will be planted with drought tolerant plants. Plants typically used to stabilize slopes and on levee restoration projects are proposed.

A total of 1.5 acres will be planted. A row and plant spacing of 16 feet will be utilized for this area. Table 4 shows the various different plant species.

Table 4: Shadscale Scrub Plants

Common name	Species composition (%)	Density (plant/acre)	Total Number
California blackberry	8%	16	24
Golden currant	6%	12	18
California Rose	8%	16	24
Mulefat	10%	20	31
Coyote brush	12%	23	35
Blue Elderberry	12%	23	35
Quail bush	16%	31	47
Bush Lupine	12%	23	35
Honey mesquite	4%	8	12
Naked buckwheat	12%	23	35
TOTAL	**100**	**195**	**296**

5. *Flexible Stem Riparian Forest*

Flood tolerant species will be planted at lower elevations along the river on the Schneider Property. Plants will be planted parallel to flood flows with row spacing of 16 feet and a plant spacing of 12 feet. A total of 6.92 acres on the Schneider Property will be planted. Table 5 list the plants associated with the flexible stem riparian forest. Most of the plants are flexible stem and recent research by the California Department of Water Resources has shown that these plants have the potential to reduce the roughness coefficient as flood depth increases.

Table 5: Flexible Stem Riparian Forest Plants

Common name	Species composition (%)	Density (plant/acre)	Total Number
Sandbar willow	10	23	159
Black willow	8	17	118
Arroyo willow	6	14	97
Oregon ash	6	14	97
California blackberry	12	27	187
Fremont Cottonwood	4	9	62
Golden currant	10	23	159
California Rose	10	23	159
Valley Oak	2	5	34
Box elder	6	14	97
Buttonbush	8	18	125
Western sycamore	4	9	62
Red willow	6	14	97
Mule Fat	8	17	118
TOTAL	**100**	**227**	**1,571**

Methodology

The methodology used to determine the hydraulic impacts associated with the proposed project was to develop an existing condition model and compare the results with those from a project condition model. The existing condition assumes the existing channel condition within the San Joaquin River. This model was then modified to reflect the proposed project. Computed maximum water surface elevations from the model simulations were compared to determine if there are any hydraulic impacts due to the project.

A 1-dimensional HEC-RAS model was used to simulate the existing and project conditions. The hydraulic model used was the California Department of Water Resources Central Valley Hydrology Study (CVHS) HEC-RAS model of the San Joaquin River Flood Control Project (SRFCP). The model development is documented in *"Interim Work product for the Central Valley Hydrology Study: Development of regulated CVHS Sacramento River and San Joaquin Basin HEC-RAS models"*, February 9, 2011, David Ford Consulting Engineers. The CVHS model was modified to only include the reach of the San Joaquin River between Comp Study river miles 227 and 264, extending 20 miles upstream and 15 miles downstream from the project site. To simulate the project condition, the HEC-RAS model geometry was modified to reflect the proposed project on at the Riverbottom and Schneider properties. To represent the proposed vegetation, the Manning's roughness coefficients in the model were modified to reflect the long term vegetation at the two sites. Figure 3 shows the cross sections through the project site along with the proposed plant associations. For each of the plant associations the Manning's roughness coefficient was adjusted in the respective cross sections. Appendix A shows each of the cross sections modified along with the existing and project condition Manning's roughness coefficient. The Manning's roughness coefficient used for each plant association is tabulated in Table 6.

Table 6: Manning's Roughness Coefficient

Plant Association	Manning's Roughness Coefficient
Riparian Forest	0.085 to 0.1
Pollinator Plantings	Higher of 0.04 or existing condition roughness.
Oak Woodland	0.06
Shadescale Scrub	Higher of 0.05 or existing condition roughness
Flexible Stem Riparian Forest	0.07

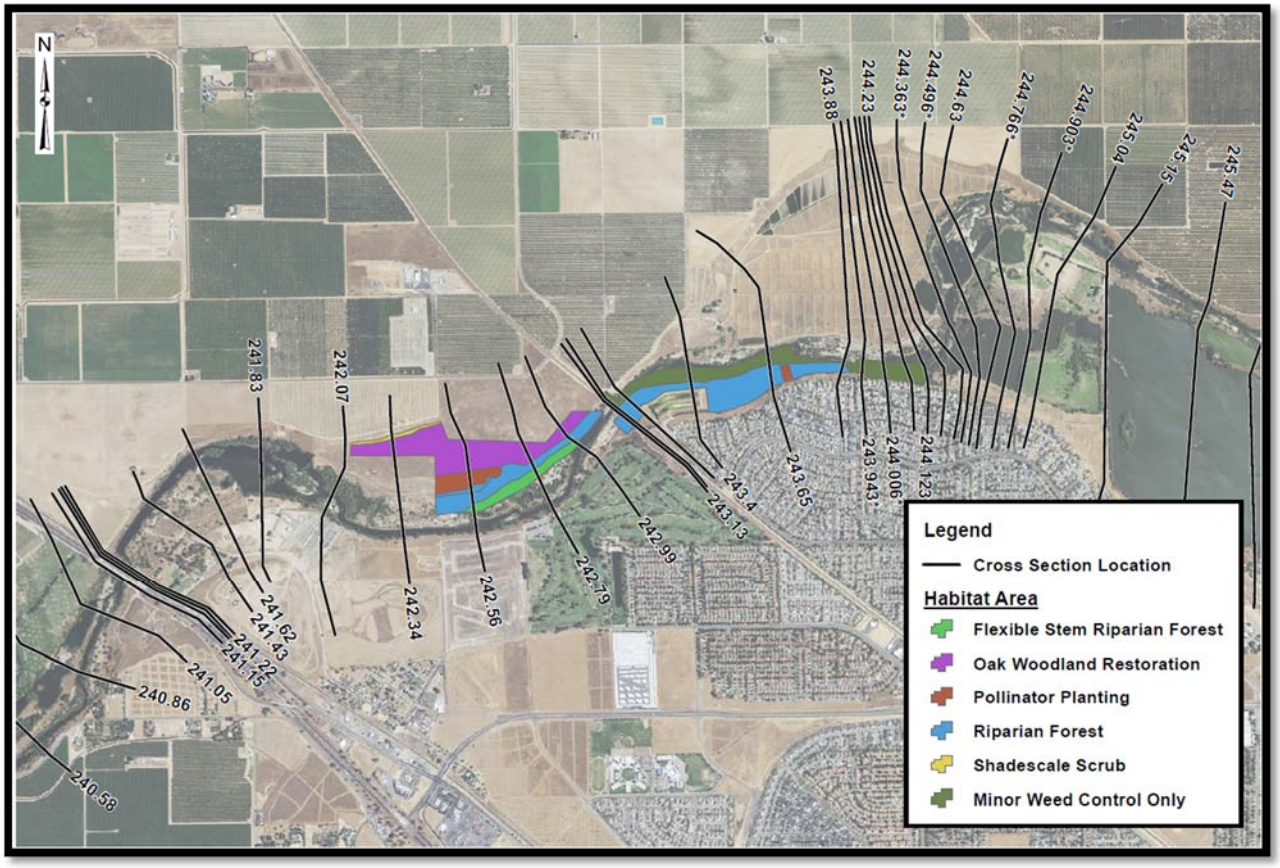


Figure 3

The existing and project condition models were simulated in steady-state condition using the CVFPB Designated Floodway design flow, 100 year and 200 year flood event. The 100 and 200 year flood events were developed by the U.S. Army Corps of Engineers (USACE) for the Sacramento and San Joaquin Basins Comprehensive Study (Comp Study). The flows used in this analysis are tabulated in Table 7

Table 7: Hydrologic Inputs

Event	Peak Flow (cubic feet per second)
CVFPB Designated Floodway Flow	20,000
100 year	71,000
200 year	110,000

Results

The computed water surface elevations and the differences in water surface elevations for the existing condition and project condition are tabulated in Table 8. Profile plots of the computed flood stage changes due to the Project Condition are provided in Figure 4.

The maximum increase in water surface occurs within the boundaries of the project. The maximum increase is 0.14 feet for the CVFPB Designated Floodway design flow, 0.37 for the 100 year flood and 0.47 feet for the 200 year flood.

Table 8: Water Surface Elevations and Differences

River Mile	Existing Condition WSE (ft-NAVD88)			Project Condition WSE (ft-NAVD88)			Difference (feet)		
	20,000 cfs	100 yr	200 yr	20,000 cfs	100 yr	200 yr	20,000 cfs	100 yr	200 yr
251.77	265.2	272.05	275.6	265.2	272.05	275.6	0	0	0
251.677	265.03	272.54	275.56	265.03	272.54	275.56	0	0	0
251.585	264.96	272.54	275.53	264.96	272.54	275.53	0	0	0
251.492	264.98	272.53	275.5	264.98	272.53	275.51	0	0	0.01
251.4	264.85	271.98	274.86	264.85	271.98	274.87	0	0	0.01
250.93	264.59	271.43	274.24	264.59	271.43	274.25	0	0	0.01
250.56	264.11	270.85	273.59	264.11	270.85	273.59	0	0	0
250.16	263.83	270.05	272.57	263.83	270.05	272.58	0	0	0.01
249.91	263.17	269.52	272.02	263.17	269.52	272.03	0	0	0.01
249.4	261.26	267.77	270.16	261.26	267.77	270.18	0	0	0.02
249.02	260.35	266.57	268.79	260.35	266.58	268.81	0	0.01	0.02
248.75	259.57	265.94	268.08	259.57	265.94	268.11	0	0	0.03
248.5	258.28	265.31	267.42	258.28	265.31	267.47	0	0	0.05
248.11	256.98	263.29	265.77	256.98	263.3	265.87	0	0.01	0.1
247.89	256.31	262.36	265.19	256.31	262.37	265.32	0	0.01	0.13
247.71	254.52	261.64	264.82	254.52	261.66	264.98	0	0.02	0.16
247.34	253.3	260.42	264.13	253.3	260.46	264.33	0	0.04	0.2
246.93	252.13	259.55	263.53	252.14	259.61	263.76	0.01	0.06	0.23
246.52	251.07	258.98	263.17	251.08	259.06	263.43	0.01	0.08	0.26
246.2	249.83	257.7	262.65	249.84	257.86	262.95	0.01	0.16	0.3
246.03	249.47	257.49	262.47	249.48	257.66	262.77	0.01	0.17	0.3
245.88	248.46	257	262.2	248.49	257.19	262.53	0.03	0.19	0.33
245.66	247.36	256.48	261.93	247.4	256.71	262.28	0.04	0.23	0.35
245.47	245.75	256.11	261.73	245.81	256.37	262.1	0.06	0.26	0.37
245.15	244.34	255.62	261.47	244.42	255.93	261.86	0.08	0.31	0.39
245.04	243.77	255.45	261.35	243.87	255.77	261.74	0.1	0.32	0.39
244.903	243.75	255.46	261.34	243.86	255.77	261.73	0.11	0.31	0.39
244.766	243.74	255.44	261.33	243.84	255.76	261.72	0.1	0.32	0.39
244.63	243.56	255.37	261.28	243.67	255.69	261.67	0.11	0.32	0.39
244.496	243.61	255.38	261.28	243.72	255.7	261.67	0.11	0.32	0.39
244.363	243.58	255.35	261.25	243.69	255.67	261.65	0.11	0.32	0.4
244.23	243.3	255.24	261.18	243.42	255.57	261.58	0.12	0.33	0.4

River Mile	Existing Condition WSE (ft-NAVD88)			Project Condition WSE (ft-NAVD88)			Difference (feet)		
	20,000 cfs	100 yr	200 yr	20,000 cfs	100 yr	200 yr	20,000 cfs	100 yr	200 yr
244.176	243.34	255.24	261.18	243.46	255.57	261.58	0.12	0.33	0.4
244.123	243.24	255.18	261.14	243.36	255.52	261.54	0.12	0.34	0.4
244.07	243.16	255.13	261.08	243.28	255.46	261.48	0.12	0.33	0.4
244.006	243.03	255.06	261.06	243.15	255.41	261.47	0.12	0.35	0.41
243.943	242.9	254.98	261.01	243.03	255.34	261.42	0.13	0.36	0.41
243.88	242.76	254.87	260.9	242.89	255.22	261.31	0.13	0.35	0.41
243.65	242.2	254.62	260.63	242.33	254.95	261	0.13	0.33	0.37
243.4	241.97	254.19	260.11	242.11	254.5	260.45	0.14	0.31	0.34
243.19	241.4	253.62	259.41	241.52	253.99	259.88	0.12	0.37	0.47
243.16	241.32	253.53	259.32	241.4	253.56	259.29	0.08	0.03	-0.03
243.13	241.28	253.47	259.23	241.35	253.48	259.15	0.07	0.01	-0.08
242.99	241.17	253.25	258.95	241.24	253.32	258.96	0.07	0.07	0.01
242.79	240.76	252.95	258.65	240.8	252.99	258.65	0.04	0.04	0
242.56	240.12	252.38	258.12	240.11	252.37	258.05	-0.01	-0.01	-0.07
242.34	239.79	252.04	257.76	239.79	252.04	257.78	0	0	0.02
242.07	239.51	251.59	257.25	239.51	251.59	257.25	0	0	0
241.83	239.32	251.4	257.02	239.32	251.4	257.02	0	0	0
241.62	239.19	251.2	256.75	239.19	251.2	256.75	0	0	0

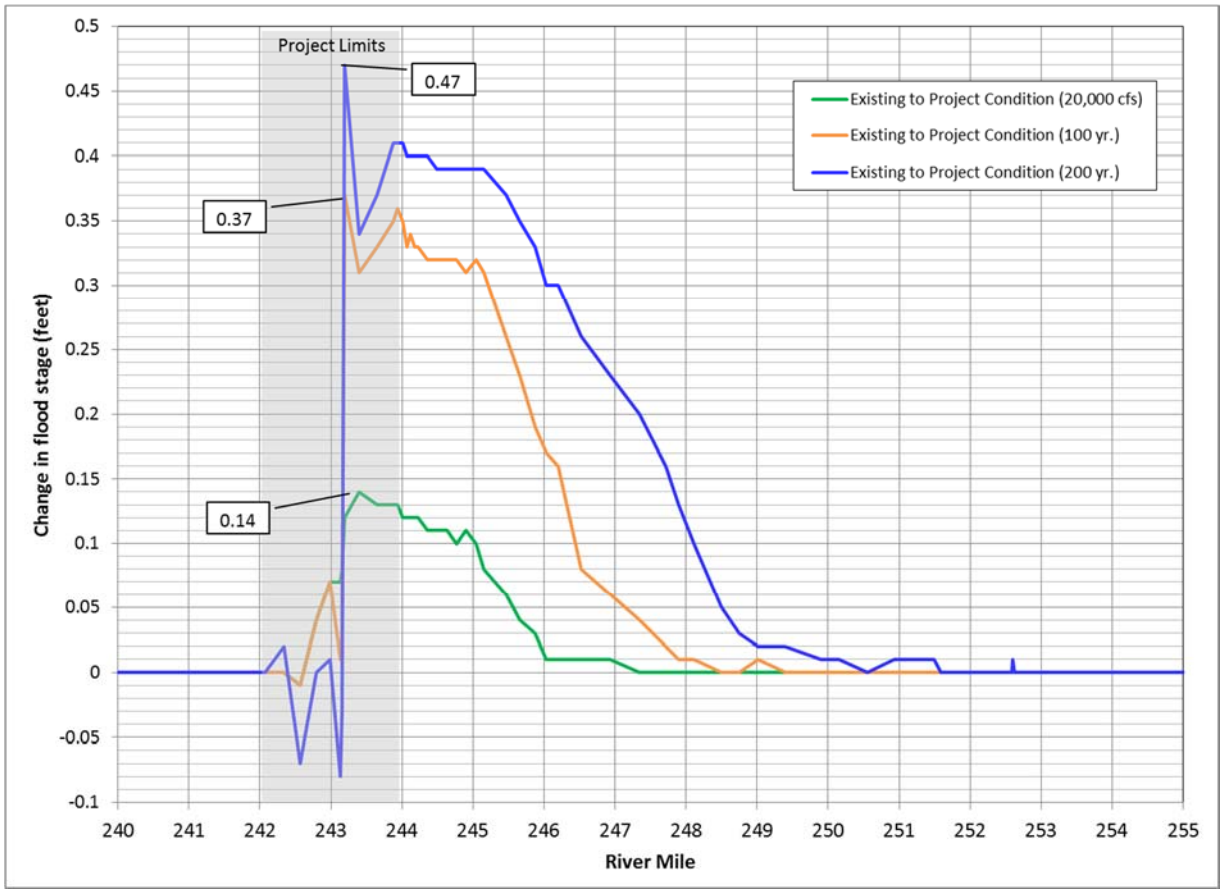


Figure 4

Conclusion

The proposed project is located along the San Joaquin River reach where the river runs between two bluffs. There is no Federal, State or local levees along this reach of the river until approximately river mile 220, 22 miles downstream of the project site. Under existing conditions, the water surface along the project reach is typically a minimum of 55 feet below the top of the bluff for the CVFPB design flow, 45 feet for the 100 year flood and is 40 feet for the 200 year event. Figure 5 shows a typical cross section.

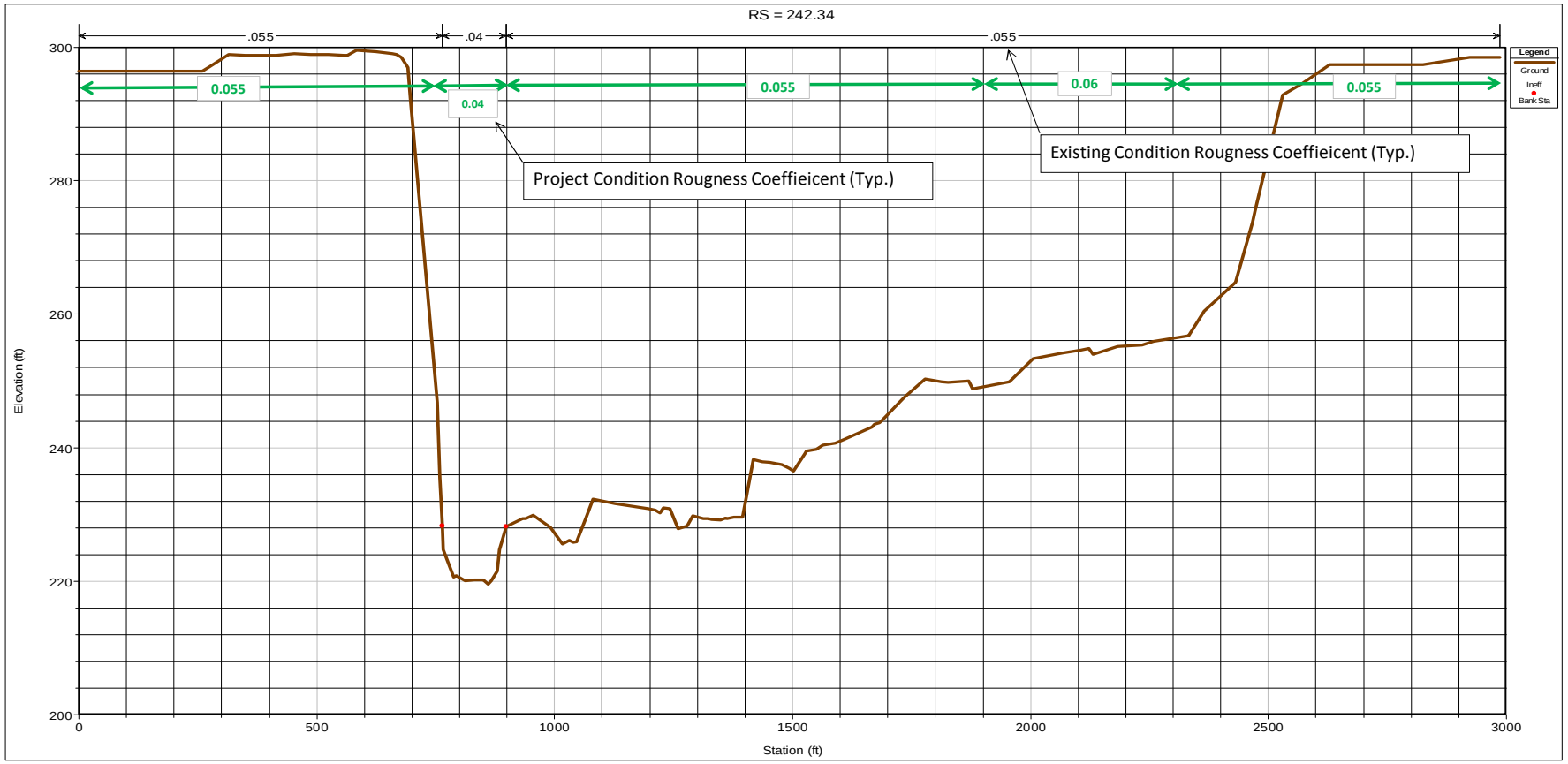
Figure 5

The proposed project would increase water surface elevations by as much as 0.14, 0.37 and 0.47 feet for the CVFPB DF design flow, 100 year, and 200 year flood event, respectively. There would still remain a significant amount of freeboard to the top of the bluff for all flood events simulated. Based on the analysis results and review of the project plans and existing topography, the increase in water surface elevation would not significantly reduce the ability of the San Joaquin River through the project reach to pass the flood events simulated, nor would it increase flood risk.

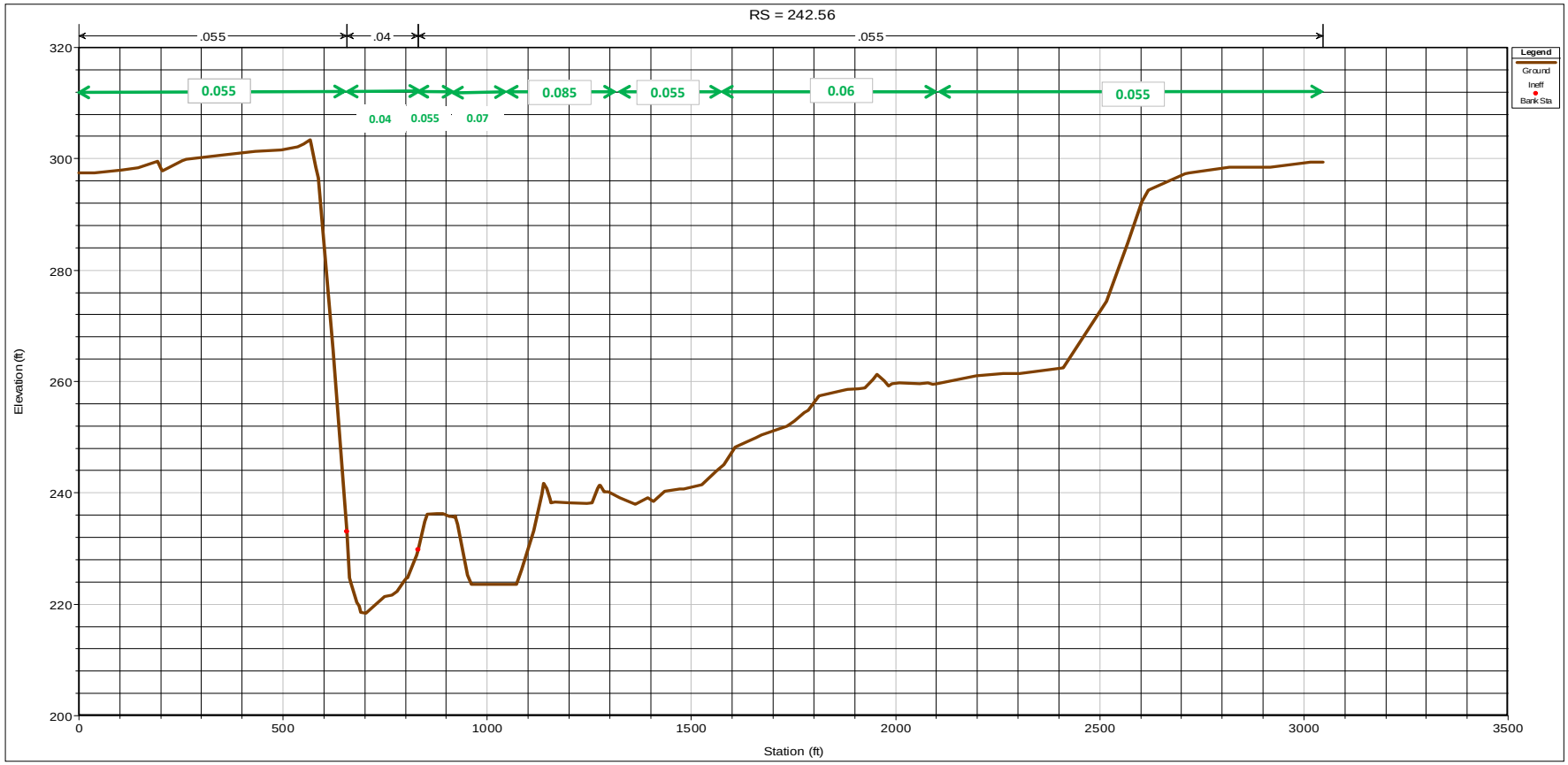
Don Trieu, P.E.

Appendix A

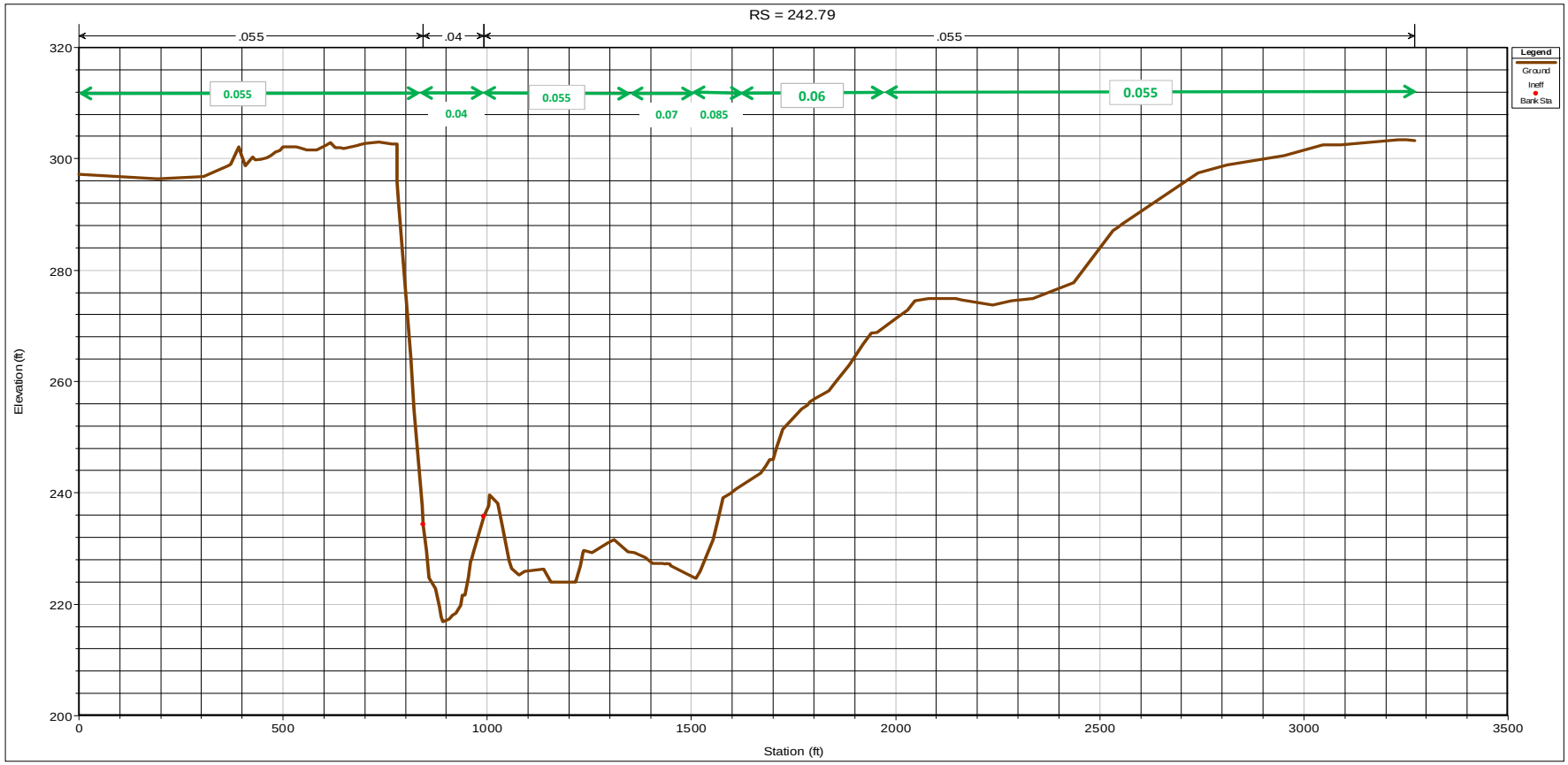
Attachment_B_Exhibit D_Hydraulic Analysis



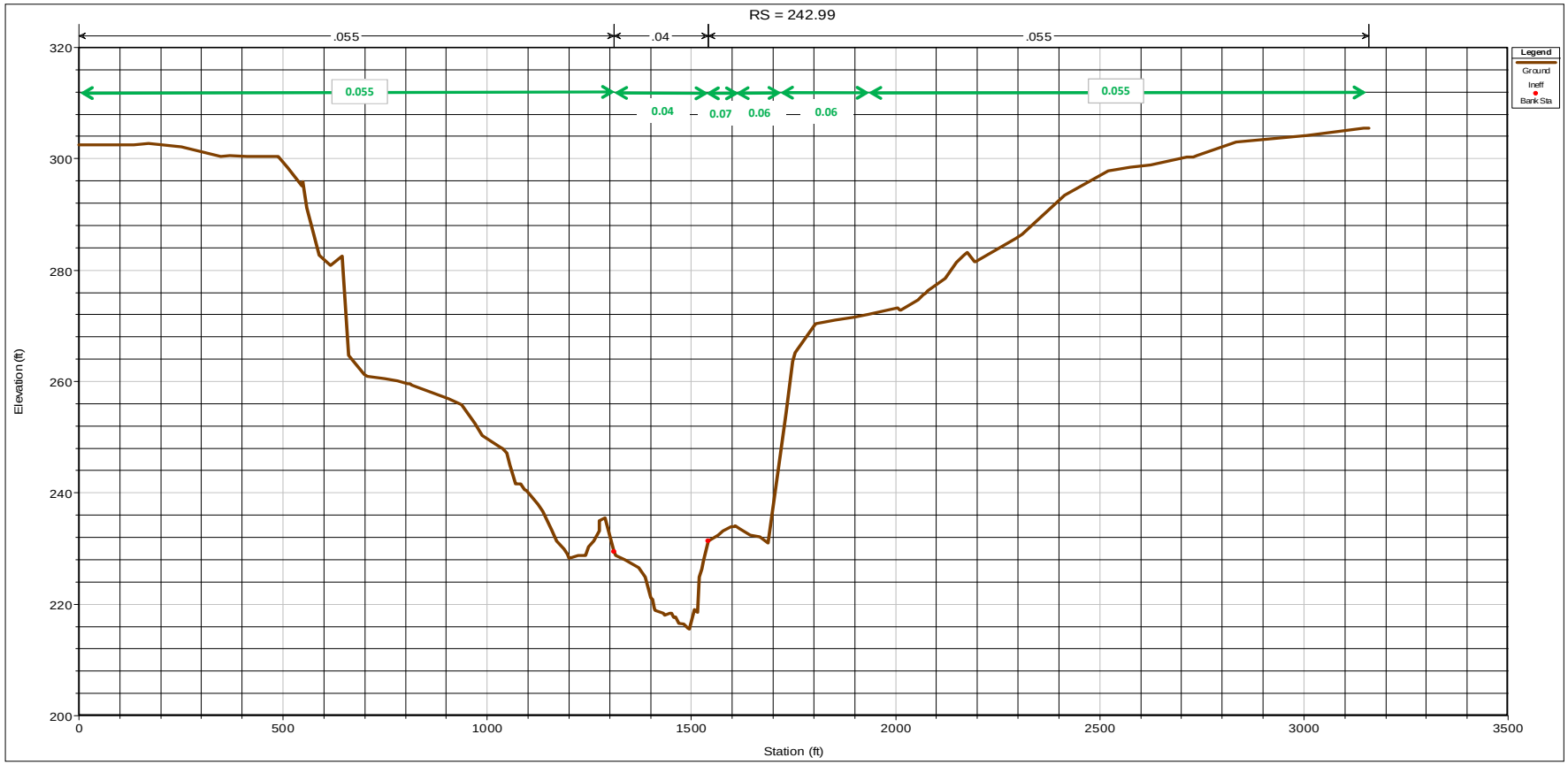
Attachment_B_Exhibit D_Hydraulic Analysis



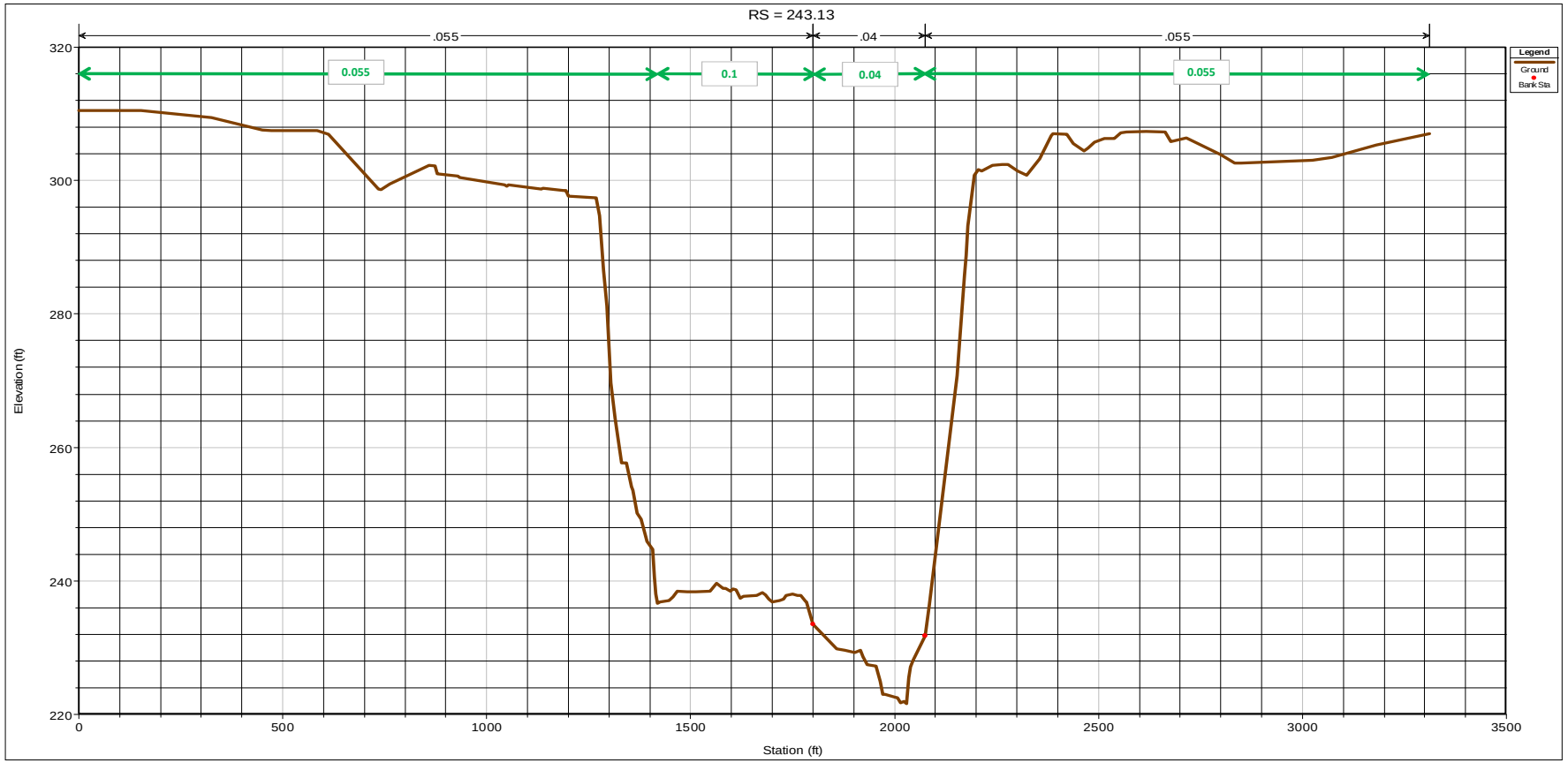
Attachment_B_Exhibit D_Hydraulic Analysis



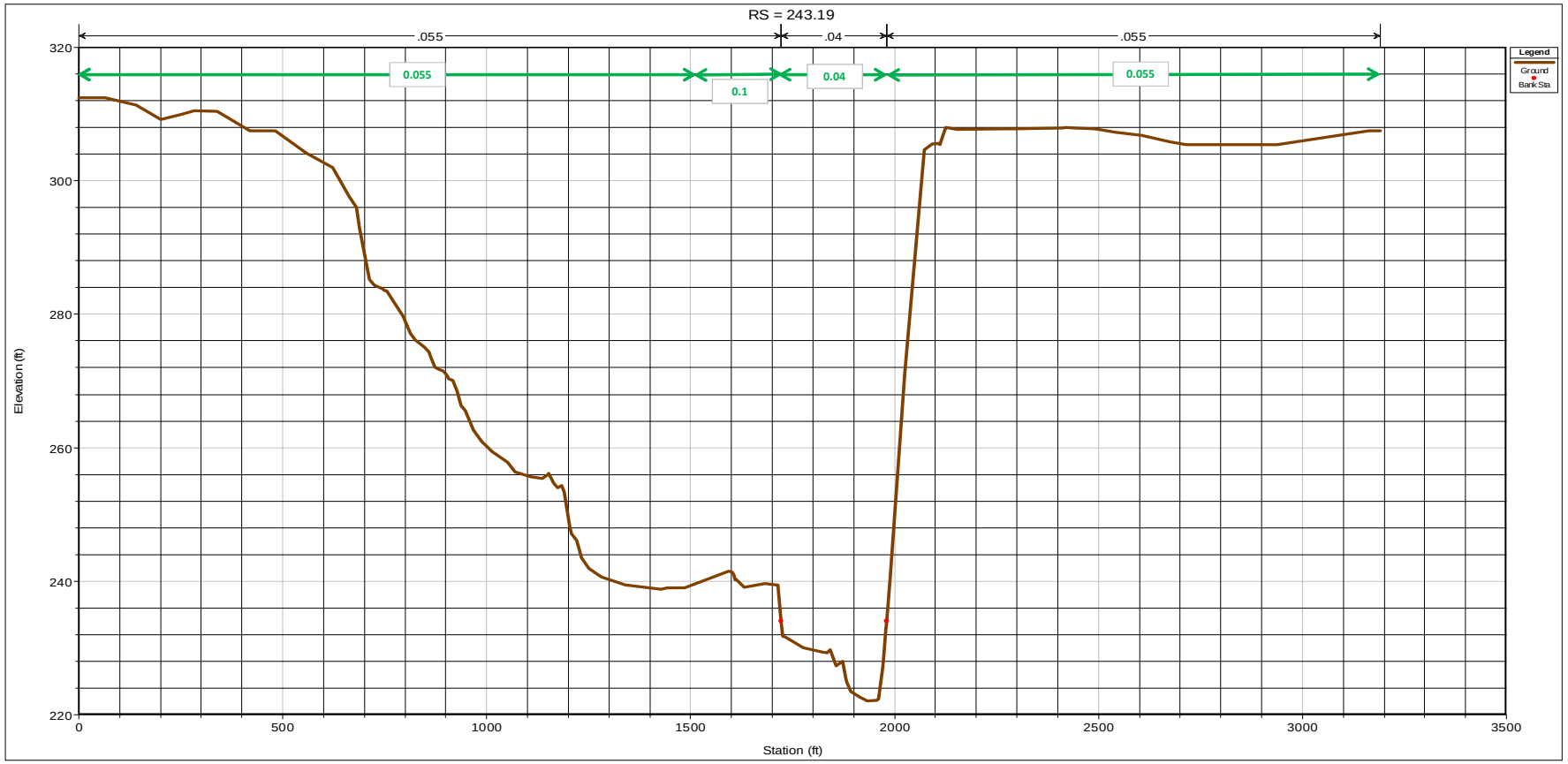
Attachment_B_Exhibit D_Hydraulic Analysis



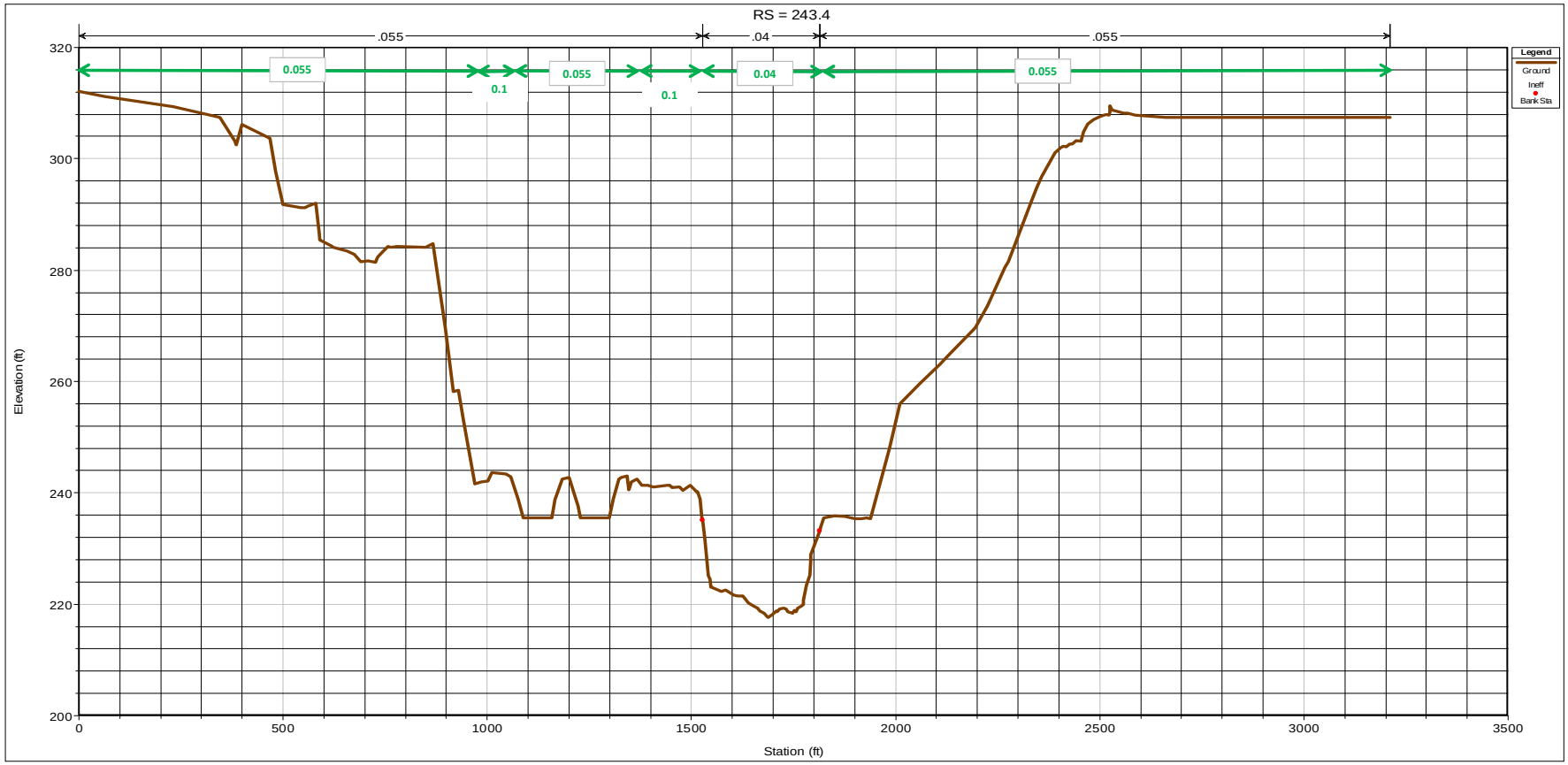
Attachment_B_Exhibit D_Hydraulic Analysis



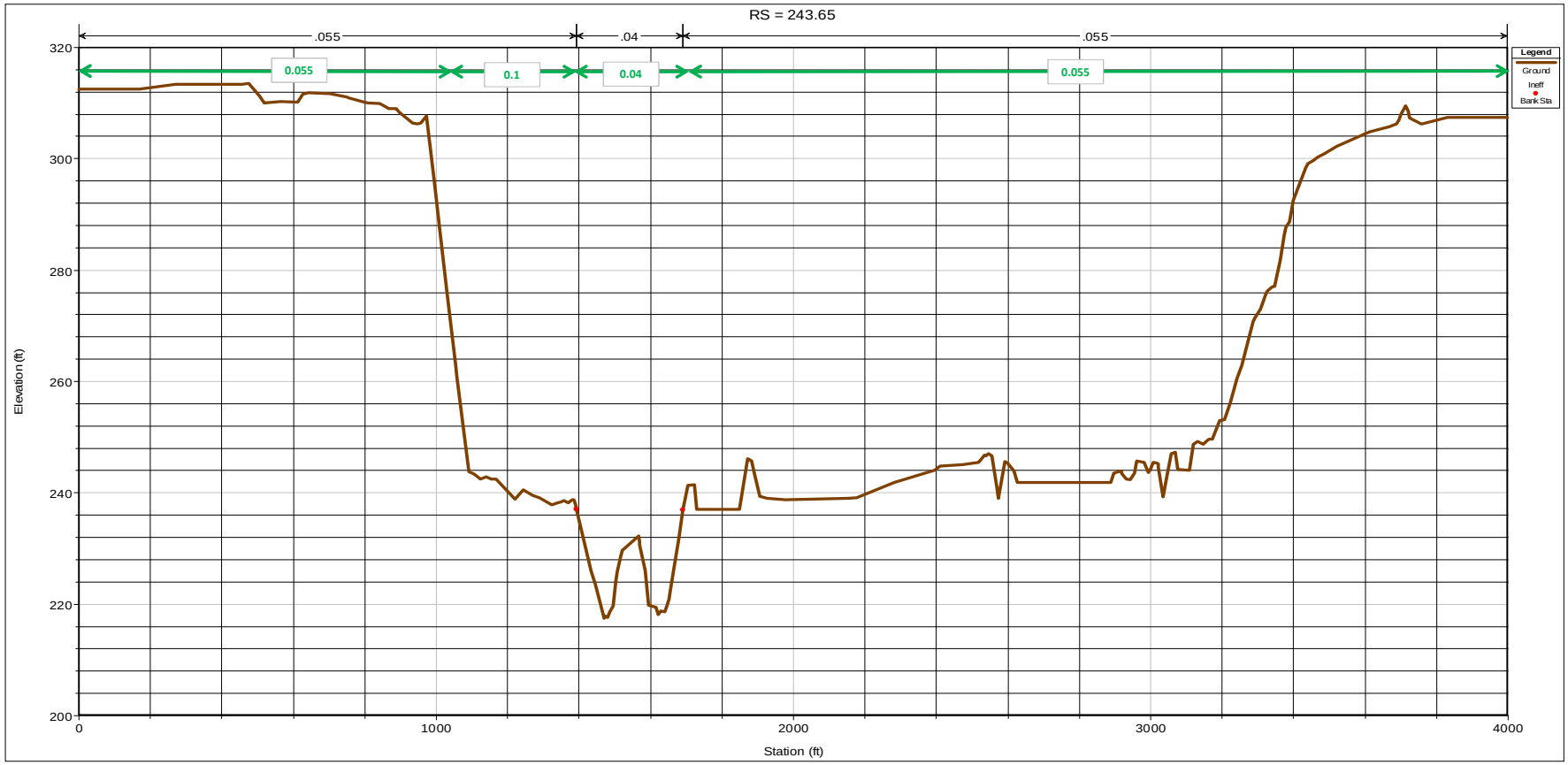
Attachment_B_Exhibit D_Hydraulic Analysis



Attachment_B_Exhibit D_Hydraulic Analysis



Attachment_B_Exhibit D_Hydraulic Analysis



Attachment_B_Exhibit D_Hydraulic Analysis