State of California

The Natural Resources Agency
Department of Water Resources
Division of Flood Management
Flood Project Integrity & Inspection Branch

2009
SUPPLEMENTAL
EROSION SURVEY
OF THE
SAN JOAQUIN RIVER
FLOOD CONTROL SYSTEM

April 2010

Arnold Schwarzenegger	Lester A. Snow	Mark Cowin
Governor	Secretary for Natural Resources	Director
State of California	The Natural Resources Agency	Department of Water Resources

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
DIVISION OF FLOOD MANAGEMENT

Gary Bardini……..…….……Chief, Division of Flood Management
Jon Ericson.……..……Chief, Hydrology and Flood Operations
Jeremy Arrich……...…….Chief, Flood Project Integrity and Inspection Branch

This report was prepared by the Flood Project Integrity and
Inspection Branch under the direction of:

Jeremy Arrich…….……..Chief, Flood Project Integrity and Inspection Branch

With Assistance from

Amy Bindra……...……Senior Engineer, W.R.
Daniel Meyersohn……..Senior Engineer, W.R.
Pramod Amatya……Engineer, W.R.
M.D. Haque……..….Engineer, W.R.
Martin Janolo...…….Engineer, W.R.
Michal Koller……....Engineer, W.R.
Olivia Magana……...……Engineer, W.R.
Anthony McDonald…….……..Engineer, W.R.
John Paasch…….……..Engineer, W.R.
David Pesavento…….……...Engineer, W.R.
Herman Phillips…….……Water Resources Engineering Associate
Robert Duffey……..…….……Water Resources Technician II
Richard Willoughby...…...…..……..Water Resources Technician II

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1.0 INTRODUCTION

In April of 2006, the Department of Water Resources Flood Project Integrity and Inspection Branch (FPIIB) began developing an erosion survey program for San Joaquin River Flood Control (SJRFC) System to assist in the documentation and monitoring of erosion sites. A typical levee inspection occurs from the crown of the levee, but erosion on the slope and beyond is sometimes not visible from this vantage point. In addition, thick vegetation and wide berm can also obstruct an inspector's view of an erosion site. This program assists in documenting and monitoring of all visible waterside erosion sites in the SJRFC System. For the purpose of this report, an **erosion site** is defined as a site where ground loss associated with erosion has been observed and documented, and where the integrity of the levee is at risk of an erosion failure during floods and/or normal flow conditions.

1.1 Purpose

The specific purposes of the Waterside Erosion Surveys of the SJRFC System are to; a) inspect the waterside levee for erosion activity, b.) document and report new erosion sites, c.) document and report current condition of previously identified erosion sites, and d.) rank the severity of erosion sites based upon the findings from the field survey.

1.2 Scope of Work

In July of 2009, FPIIB conducted its annual review and inventory of erosion sites in the SJRFC System. The FPIIB scope of services included the following:

- Conduct field investigation by FPIIB personnel
- Evaluate current condition of previously identified erosion sites;
- Identify and record new erosion sites;
- Prepare a geodatabase for use in geo-referencing erosion sites and creating an Atlas;
- Prepare a ranking table using the data obtained from the field investigation and applying a set of modified DWR/Ayres ranking criteria;
- Prepare a summary sheet for each documented erosion site;
- Prepare a report summarizing the results and findings of the field survey.

2.0 FIELD INVESTIGATION AND PROCEDURES

Field investigations cover some of the major extents of SJRFC System, and include natural channels and manmade diversions. River Miles and Levee Miles used in this report are based on the estimates[1] performed by FPIIB staff, and may be slightly different from the U.S. Army Corps of Engineer (USACE) river mile alignment. Results of the field investigation are described in a subsequent section of this report. All results presented in this report are based upon the 2009 field survey and DO NOT reflect change of conditions past the field survey date.

[1] Estimated river mile and levee mile are based on the DWR Levee Stream Locator.

2.1 Coverage Area

Figures 1 and 2 show most of the project levees inspected during the 2009 field investigation.

Figure 1. Map of San Joaquin River and Tributaries - Northern Region

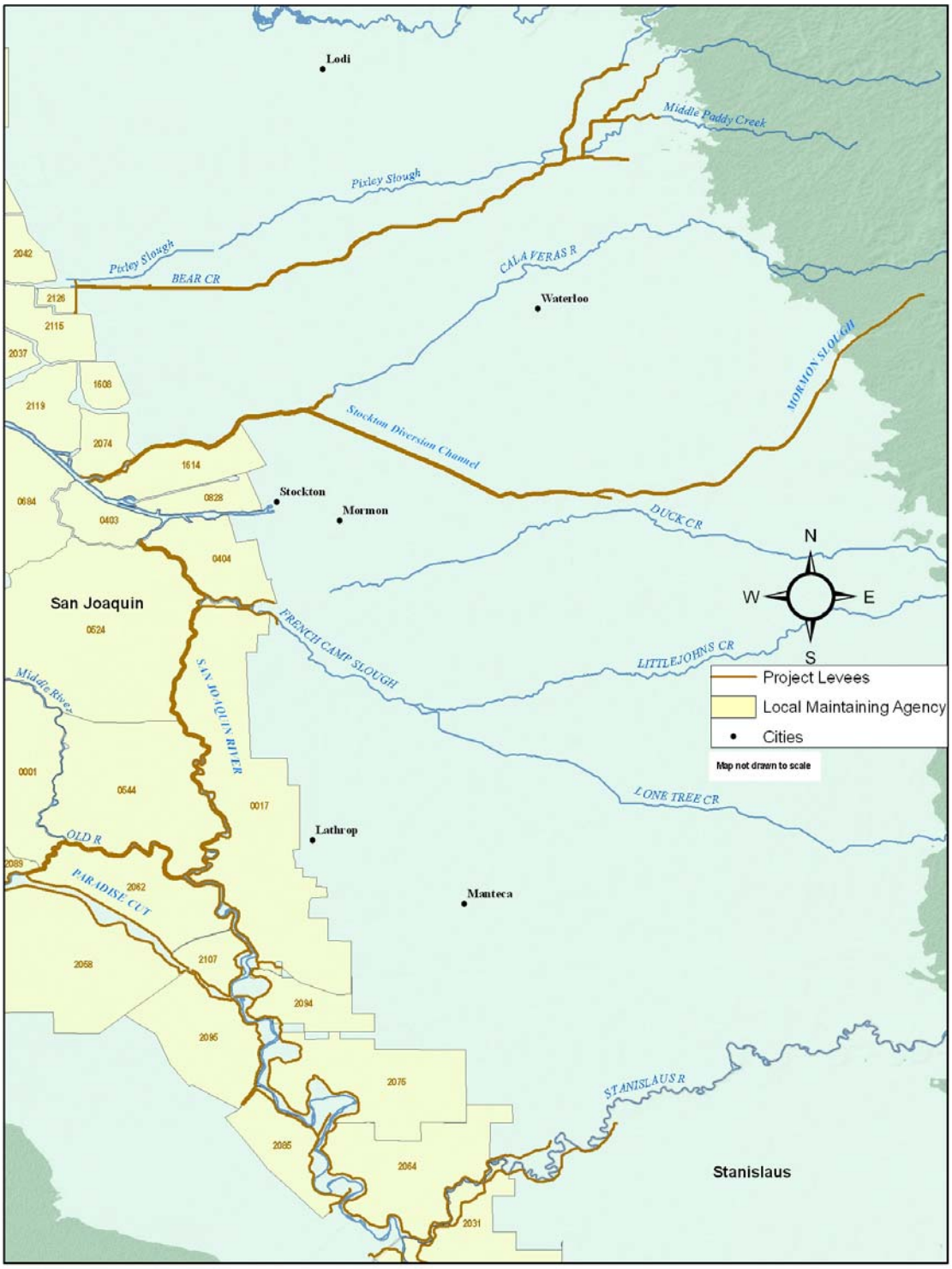
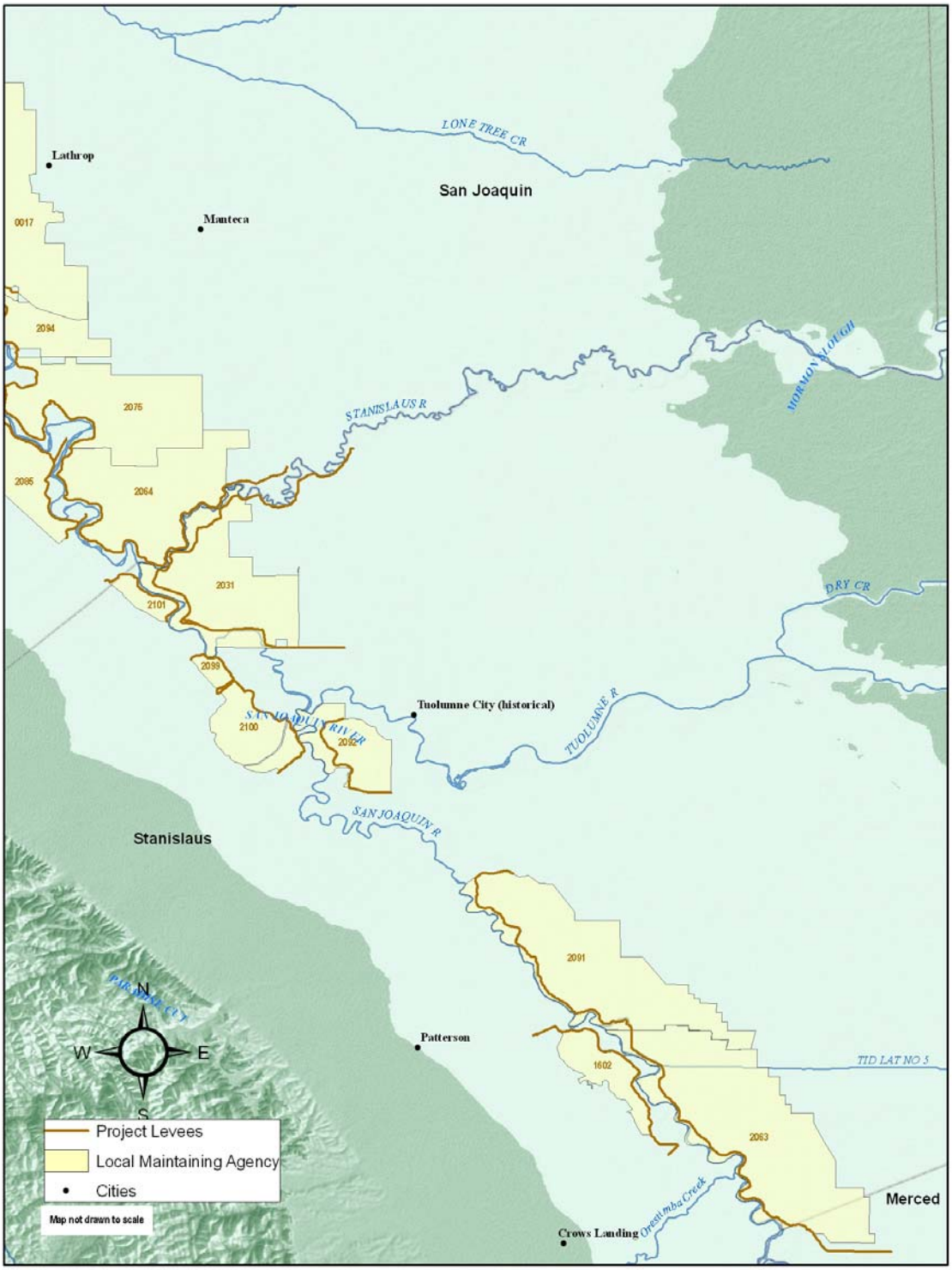


Figure 2. Map of San Joaquin River and Tributaries -- Southern Region



2.2 Procedure

Prior to the field investigations, a master list of the current inventory of erosion sites was reviewed. This list was used to locate previously identified erosion sites. The most current Levee Inspection report was also reviewed for previously identified erosion sites. Erosion sites reported to have been repaired were noted and inspected for verification.
Land-based survey was conducted with FPIIB staff inspecting the waterside levee and berm on a 4x4 vehicle. In waterways where view of the waterside levee was obstructed by wider berm or by thick vegetation, a jet-driven boat was used to conduct the survey. In both instances, observation and measurements were taken with the use of a portable Trimble GeoXT GPS handheld receiver.

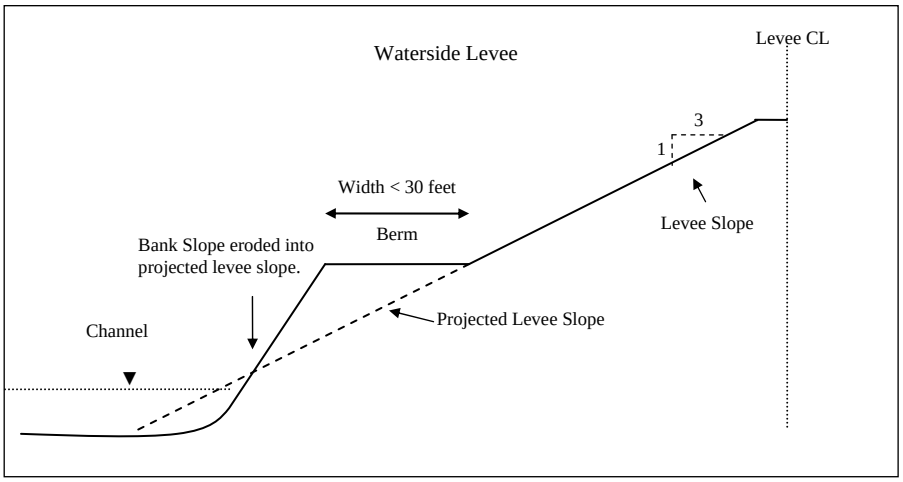
Data collected at each site includes, but are not limited to:

a.) GPS coordinates of the levee crown at the midpoint of the erosion site
b.) Estimated length of erosion, in ft.
c.) Estimated height of erosion, in ft.
d.) Location of erosion relative to the levee slope (e.g. lower ½ slope, upper ½ slope)
e.) Estimated waterside berm width, in ft.
f.) Estimated levee slope (H:V)
g.) Animal burrow hole activity
h.) Existing vegetation
i.) Soil type at the eroded face
j.) Condition of surrounding trees
k.) Digital photographs of the site

Inclusion of a bank erosion site into the inventory takes into account the severity of the erosion and the threat to the levee integrity. Figure 3 shows a typical cross section of a levee on the waterside. The following criteria is used to consider a site as being susceptible to erosion:

a.) Bank erosion into the projection of the levee slope.
b.) Berm width of less than 30 feet.

Figure 3. Typical Cross Section of Waterside of a Levee



2.3 Ranking Methodology

In the past, FPIIB ranked and rated each site based on a limited number of factors contributing to an erosion failure. This ranking system was inconsistent with field findings, and the scoring was partially subjective. Subsequently, in 2009 FPIIB staff made modifications to the criteria. These modifications are based on both quantitative and qualitative analysis resulting from field and office studies. The intent of the modifications was to develop a more consistent and comprehensive guideline that increases emphasis on physical factors contributing to an erosion failure. Following are the modifications made:

- Soil Type was added as a criterion because it is a physical factor that determines the rate of erosion.
- Levee Slope was added as a criterion because it is a physical factor contributing to an erosion failure. Steeper slopes are more prone to erosion-induced failures than flatter slopes.
- Burrow Holes was added as a criterion because it is a physical factor that accelerates erosion-induced failure. A burrow hole can weaken the structural integrity of a levee by creating seepage path through the levee. These holes act as pores on the levee, allowing for the penetration of water into the levee. Any burrowing activity along the levee slope is indicative of future bank instability.
- Seepage Potential was removed because it was not a physical factor for determining severity.
- Erosion located on the waterside berm and is less than 30 feet from the levee toe will be included in the ranking. The point rating for Location of Erosion was modified to accommodate the change.
- Point rating for Vegetation Cover was partially modified to account for actual field conditions.

Erosion sites were ranked using criteria partly based upon the Ayres Associates "2007 – Field Reconnaissance Report of Bank Erosion Sites and Site Priority Ranking" dated December 18, 2007, and the draft URS "Erosion Screening Process (ESP) Report" dated April 2009. The criteria have been partially modified to suit the type of data collected for the SJRFC System erosion survey. Following are definitions of the factors used to rank erosion sites:

1. **Berm width**: Berm width is the horizontal segment of the bank that extends from the waterside levee toe to the top of the riverbank
2. **Vegetation Cover**: Remaining vegetation on site and its role in providing erosion protection.
3. **Burrow Holes**: Presence of burrow holes on the waterside levee slope and embankment.
4. **Levee Slope (H:V)**: Horizontal to vertical ratio of the eroding levee slope. Slope is estimated since actual cross sections were not available at the time of this report.
5. **Soil Type**: Soil that is immediately exposed at the eroded face. Classification is based on the findings of the Erosion Screening Process (ESP) Report and on the Unified Soil Classification System.
6. **Site Relative to Bend**: Where within a meander bend an erosion site is located.

7. **Radius of Curvature (Rc/W)**: Radius of the meander bend divided by the top width of the channel flowing full.
8. **Length of Erosion**: Full length along the river over which the erosion occurs.
9. **Scarp Height**: Height of the eroded face along the levee slope or berm. Scarp height can be characterized as one that is sloping or parallel to the levee slope, or another that is near-vertical.
10. **Location of Erosion**: Position in the vertical direction along the berm or the levee slope where the erosion occurs.

The 2009 SJRFC System Ranking Criteria can be found in Appendix A. The criteria reflects quantitative and qualitative analysis used to determine the severity of an erosion site. The criteria is separated into three categories – physical levee characteristics, erosion characteristics, and hydraulics. These are further subdivided into factors related to erosion failure and are used to calculate a final normalized score. Each factor has a potential score of 0, 1, 2, 3, 4, or 5 and is multiplied by a weighted multiplier ranging from 1 to 5. The weighted multiplier reflects qualitative assumptions relating each factor to erosion failure. The total score for an erosion site is collected by summing all the weighted points. The total score is then normalized to a 100 point scale and is determined by dividing the total score by the maximum possible score of 91. Once all the erosion sites have been assigned a normalized score, they are ranked from highest to lowest. A high score is associated with a high erosion potential, and a low score is associated with a low erosion potential.

2.4 Overall Rating

Overall rating was assigned to each site based on their normalized score. First, an average was found by adding all the scores and dividing them by the number of non-repaired erosion sites in the inventory. The average score is established to be the group threshold and determines the overall rating as described by the following: if the normalized score of a site falls at or below the average, the site is given a rating of M. If it is greater than the average, the site is given a rating of U. Table 1 summarizes the definition of ratings.

Table 1. Definition of Ratings

Minimally Acceptable (M)	Unacceptable (U)
If normalized score ≤ Average, Then Overall Rating = M	If normalized score > Average, Then Overall Rating = U
A site that receives a normalized score equal to or less than the average is rated as M, or Minimally Acceptable. This site should be monitored closely and annually, as it may become a serious deficiency in the near future.	A site that receives a normalized score greater than the average is rated as U, or Unacceptable. This site may require immediate attention and corrective action, as it may be a serious deficiency that can fail during normal flow or in the next high water event.

3.0 SUMMARY AND RECOMMENDATION

Based upon the 2009 field investigations, a total of nine sites have been or soon will be repaired, most of them by DWR. Five other sites were removed from the inventory by combining them to nearby sites, while four sites were removed from the inventory after further review and consideration. In addition, 18 new sites were identified and added to the inventory. The total number of erosion sites documented, ranked, and rated in the SJRFC System remains at 52. A summary of the 2009 findings is presented in Table 2.

Table 2. Summary of Erosion Sites by Local Maintaining Agency

Local Maintaining Agency	2008 Erosion Sites	2009 New Sites	2009 Removed Sites	2009 Repaired Sites	2009 Erosion Sites**
Boat Survey					
RD 1	1	0	0	1	0
RD 17	1	3	0	0	4
RD 404	11	0	3	6	2
RD 524	2	3	0	1	4
RD 544	1	0	0	0	1
RD 2031	2	0	1	0	1
Land Survey					
RD 2058	1	1	0	0	2
RD 2062	9	2	3	0	8
RD 2063*	1	0	0	0	1
RD 2075	2	0	1	0	1
RD 2089	6	0	0	0	6
RD 2092	1	0	0	0	1
RD 2095	4	1	0	1	4
RD 2101*	1	0	0	0	1
Lower San Joaquin Levee District*	1	-	1	-	0
San Joaquin County Flood Control District	2	8	0	0	10
Madera County FCWA*	2	-	-	-	2
Merced County Stream Group*	4	-	-	-	4
Total	**52**	**18**	**9**	**9**	**52**

* These areas were not part of the 2009 field investigation.
** "2009 Erosion Sites" = "2008 Erosion Sites" + "2009 New Sites" – "2009 Removed Sites" – "2009 Repaired Sites"

A total of 33 sites received a rating of M, while 19 received a rating of U. Ratings for some sites were carried over from the previous year because these sites were not visited in 2009.

Table 3 shows 19 erosion sites that received a rating of U. It is recommended that these sites be addressed by the appropriate districts so that corrective action may be taken.

Table 3. Erosion Sites with Overall Rating of U.

Site ID	Normalized Score	Overall Rating
RD0524U1RM41.79	74	U
RD0524U1RM41.15	71	U
RD0404U2RM1.56	70	U
RD2062U3RM30.19	69	U
RD0544U1RM47.12	68	U
RD2101U1RM73.92	67	U
RD2089U1RM29.95	67	U
RD0524U1RM42.20	66	U
NA0017U15RM1.58	63	U
RD2089U1RM29.61	63	U
NA0017U15RM0.86	62	U
RD0017U2RM53.54	62	U
RD2095U2RM60.62	62	U
RD2062U3RM30.43	60	U
RD2089U2RM28.35	59	U
RD2095U1RM6.88	59	U
NA0013U3RM1.00	58	U
RD0404U1RM40.86	57	U
RD2075U1RM64.34	57	U

The 2009 inventory is limited to the findings from the Levee Inspection program, previous and current erosion surveys, and to what is visible above the waterline. Despite the lack of significant flow events during the 2008-2009 water year, 18 new erosion sites were added to the inventory. These sites could have been overlooked during the field survey from the previous year. They can also be an indication that the system continues to deteriorate even in the dry season.

As part of an ongoing effort to improve the efficiency, quality, and consistency of documenting and reporting erosion sites, FPIIB will continue to improve its practices in the following ways:

- FPIIB created an inventory database allowing efficient documentation and reporting of site conditions. The database allows for rapid retrieval of information, and can be a valuable tool during high water conditions and emergency events.
- FPIIB will continue to refine the Erosion Survey criteria as needed.
- FPIIB will continue to implement changes to the Erosion Survey program as existing policies are clarified over time, as new policies are developed, and as other levee management issues arise.

APPENDIX A – SJRFC SYSTEM RANKING CRITERIA

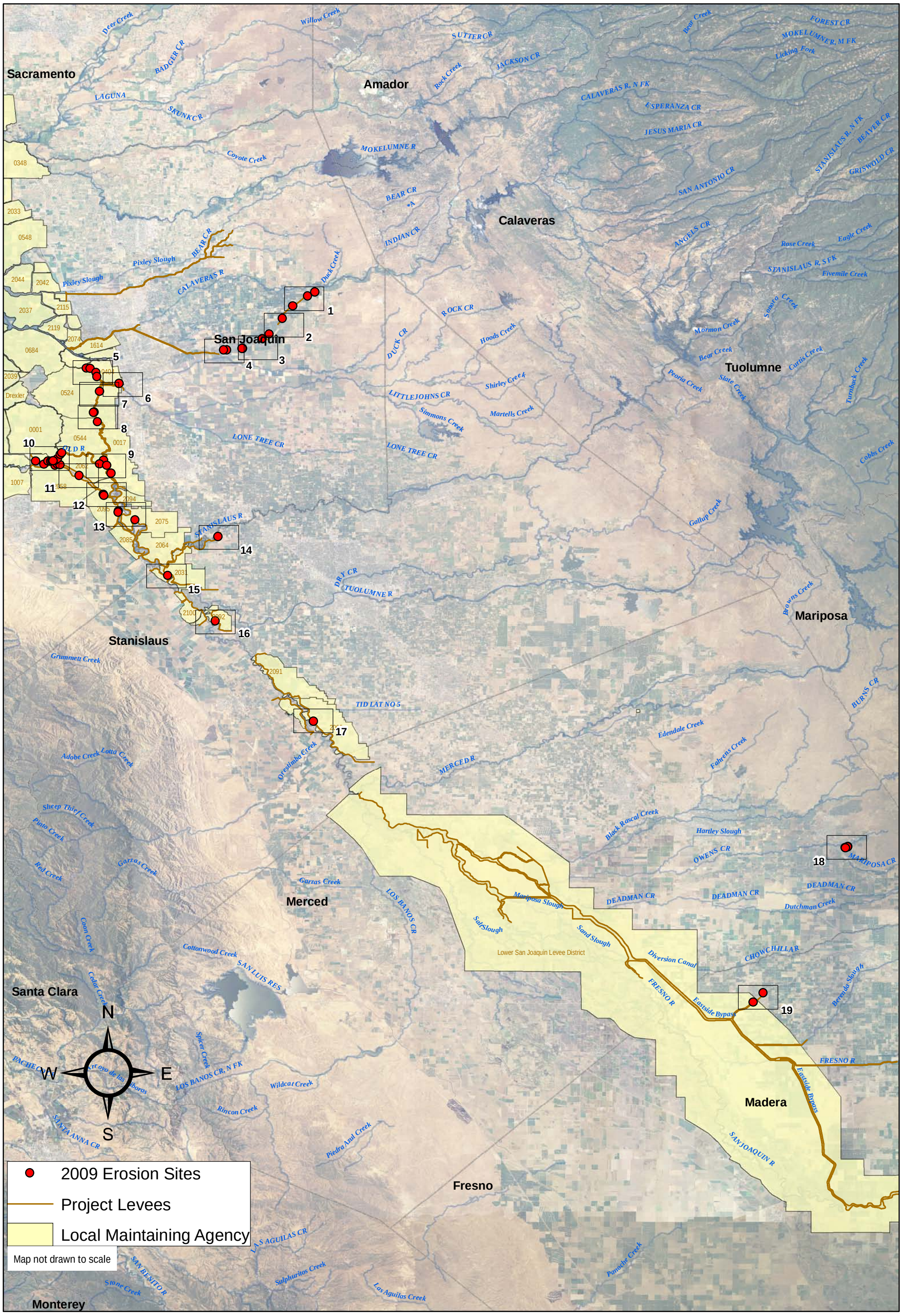
Department of Water Resources
Flood Project Integrity Inspection Branch

2009 SJRFC SYSTEM RANKING CRITERIA

CRITERIA	SCORE DEFINITION		WEIGHT	WEIGHTED SCORE
PHYSICAL LEVEE CHARACTERISTICS (waterside)				
Berm Width	0 - Greater than 30 ft 1 - 20 to 30 ft 2 - 15 to 20 ft	3 - 10 to 15 ft 4 - 5 to 10 ft 5 - Less than 5 ft	1	5
Vegetation Cover	0 - Ground surrounding site fully covered 1 - 2/3 of ground covered	2 - 1/3 of ground covered 3 - No vegetation	2	6
Burrow Holes	0 - No signs of activity	5 - Signs of activity	1	5
Levee Slope (H:V)	0 - 3:1 or greater 1 - 2.5:1 2 - 2:1	3 - 1.5:1 4 - 1:1 or less 5 - Near vertical	3	15
Soil Type	1 - Cobbles 2 - Gravel (GP-GW) 3 - Clay (CL, CH, SC, GC)	4 - Sand (SP, SM and mixtures) 5 - Silt (ML)	4	20
HYDRAULICS CHARACTERISTICS				
Site relative to bend	0 - Inside of bend 1 - Straight reach 2 - Immediately downstream of bend	3 - Outside of bend > 90 degrees 4 - Outside of bend @ 90 degree turn 5 - Outside of bend < 90 degrees	1	5
Radius of Curvature (Rc/W)	0 - Greater than 5 or no curve 1 - 4 to 5 2 - 3 to 4	3 - 2 to 3 4 - 1 to 2 5 - Less than 1	1	5
EROSION CHARACTERISTICS				
Length	1 - Less than 50 ft 2 - 50 to 100 ft 3 - 100 to 200 ft	4 - 200 to 300 ft 5 - Greater than 300 ft	2	10
Scarp Height	1 - Less than 2 ft 2 - 2 to 5 ft 3 - 2 to 5 ft & near-vertical	4 - Greater than 5 ft 5 - Greater than 5 ft & near-vertical	3	15
Location	1 - Erosion on berm	5 - Erosion affecting levee slope	1	5
			Total Weighted Score	91

APPENDIX B – INDEX OF THE SAN JOAQUIN ATLAS

Index of San Joaquin Erosion Surveys Atlas



APPENDIX C – SUMMARY SHEETS FOR THE 2009 INVENTORY

- **NA 011 – Madera County Flood Control and Water District**
- **NA 0013 – Merced County Stream Group**
- **NA 0017 – San Joaquin County Flood Control and Water Conservation District**
- **RD 0017 – Mossdale**
- **RD 0404 – Boggs**
- **RD 0524 – Middle Roberts Island**
- **RD 0544 – Upper Roberts Island**
- **RD 2031 – Elliot**
- **RD 2058 – Pescadero**
- **RD 2062 – Stewart**
- **RD 2063 – Crows Landing**
- **RD 2075 – McMullin**
- **RD 2089 – Stark**
- **RD 2092 – Dos Rios**
- **RD 2095 – Paradise Cut**
- **RD 2101 – Blewett**

NA 11 **Unit: 1** **Ash Slough**

Madera County Flood Control and Water District

Site ID **NA0011U1RM2.57**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.055596	-120.412647	2.57	1.15	M

Site Feature

Length (ft):	460
Scarp Height (ft):	3
Location Relative to Levee:	Levee toe
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Sand (SP,SM and mixture)
Condition of surrounding tree(s)	Tree(s) within affected area and with visible roots and leaning
Crown Width (ft):	
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	8.9

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	4	x4	16
Site Relative to Bend	3	x1	3
Radius of Curvature:	0	x1	0

Total Score (out of 91): **50**

Normalized Score (out of 100%): **55**

Comments:

Most Recent:	2009: Site recommended as local maintenance issue, per Critical Levee Repair Office, Critical Erosion Sites Evaluation 2008 Report; previously rated "M"
Previous Comments:	2007: undercutting of the toe; several trees along the slope, with roots exposed;

Date of Survey: 9/6/2007

NA 11 **Unit: 1** **Ash Slough**

Madera County Flood Control and Water District

Site ID **NA0011U1RM3.8**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.068570	-120.398620	3.80	2.38	M

Site Feature

Length (ft):	100
Scarp Height (ft):	5
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	10
Vegetation cover:	Ground surrounding site is fully covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Sand (SP,SM and mixture)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Immediately downstream of bend
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	2	x2	4
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	4	x1	4
Vegetation Cover:	0	x2	0
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	4	x4	16
Site Relative to Bend	2	x1	2
Radius of Curvature:	5	x1	5

Total Score (out of 91): **42**

Normalized Score (out of 100%): **46**

Comments:

Most Recent:	2009: Site recommended as local maintenance issue, per CLRO CES Evaluation 2008 Report; previously rated "M"
Previous Comments:	2008: undulating waterside slope surface; vehicular damage along the waterside slope caused by farming equipment; sandy material; small area of concrete rubble found on waterside crown hinge; vehicular damage extends from levee toe to crown surface

Date of Survey: 8/26/2008

NA 13 **Unit: 3** **Owens Creek Diversion**

Merced County Stream Group

Site ID **NA0013U3RM1**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.270800	-120.284180	1.00	1.00	U

Site Feature

Length (ft):	10
Scarp Height (ft):	7
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	0
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	11.6

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	4	x3	12
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	3	x1	3
Radius of Curvature:	0	x1	0

Total Score (out of 91): **53**

Normalized Score (out of 100%): **58**

Comments:

Most Recent:	2009: Site recommended as local maintenance issue, per CLRO CES Evaluation 2008 Report; previously rated "U"
Previous Comments:	2008: terracetting; frequent livestock traversing slopes; 2007: GPS extended from opposite bank using Google Earth

Date of Survey: 8/26/2008

NA 13 **Unit: 3** **Owens Creek Diversion**

Merced County Stream Group

Site ID **NA0013U3RM1.25**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.272630	-120.280390	1.25	1.25	M

Site Feature

Length (ft):	10
Scarp Height (ft):	3
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	2
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	3.8

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	2	x1	2

Total Score (out of 91): **46**

Normalized Score (out of 100%): **51**

Comments:

Most Recent:	2009: bank erosion scour that is immediately downstream of Mission Ave. bridge; noticeable terracetting damage from livestock traversing the slope; site is recommended as local maintenance issue, per CLRO CES Evaluation 2008 Report; previously rated "M"
Previous Comments:	2008: Terracetting damage from livestock; there is now a pocket developing on the levee toe; site is 100' downstream of Mission Avenue bridge

Date of Survey: 8/26/2008

NA 13 **Unit: 4** **Owens Creek Diversion**

Merced County Stream Group

Site ID **NA0013U4RM0.21**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.272283	-120.280869	0.21	0.21	M

Site Feature

Length (ft):	700
Scarp Height (ft):	4
Location Relative to Levee:	On berm
Remaining Berm Width(ft):	20
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	2	x3	6
Location of Erosion:	1	x1	1
Berm Width:	2	x1	2
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **44**

Normalized Score (out of 100%): **48**

Comments:

Most Recent:	2009: Site recommended as local maintenance issue, per CLRO CES Evaluation 2008 Report; previously rated "U"
Previous Comments:	2007: GPS extended from opposite bank using Google Earth; signs of vehicular damage on levee

Date of Survey: 9/10/2007

NA 13 **Unit: 4** **Owens Creek Diversion**

Merced County Stream Group

Site ID **NA0013U4RM0.42**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.270630	-120.283970	0.42	0.42	M

Site Feature

Length (ft):	50
Scarp Height (ft):	4
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	0
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	26.5

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **44**

Normalized Score (out of 100%): **48**

Comments:

Most Recent:	2009: Site recommended as local maintenance issue, per CLRO CES Evaluation 2008 Report; terracetting damage from livestock traversing; there is a wooden platform installed on site; landside ground is same heights as levee crown; previously rated "M"
Previous Comments:	2007: GPS extended from opposite bank using Google Earth, GPS on file is correct

Date of Survey: 9/10/2007

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM0.86**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
38.045818	-121.023955	0.86	0.86	U

Site Feature

Length (ft):	4800
Scarp Height (ft):	12
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	11
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	Tree(s) within affected area and visible roots
Crown Width (ft):	12
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	5	x3	15
Location of Erosion:	5	x1	5
Berm Width:	3	x1	3
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	1	x3	3
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **56**

Normalized Score (out of 100%): **62**

Comments:

Most Recent:	2009: Near-vertical bank erosion; degrading channel is incising the banks; recommend annual assessment and monitoring of critical erosion site, per CLRO CES Evaluation 2008 Report; LMA is monitoring site for changes in condition; previously rated "U"
Previous Comments:	2007: Visited site 2/6/07; possible critical site

Date of Survey: 8/12/2009

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM1.58**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
38.040170	-121.033800	1.58	1.58	U

Site Feature

Length (ft):	350
Scarp Height (ft):	5
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	1.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	12
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	15.1

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	3	x3	9
Soil Type:	3	x4	12
Site Relative to Bend	3	x1	3
Radius of Curvature:	0	x1	0

Total Score (out of 91): **57**

Normalized Score (out of 100%): **63**

Comments:

Most Recent:	2009: No change observed; erosion is upstream and downstream of drop structure; bank erosion associated with high velocities; recommend annual assessment and monitoring of critical erosion site, per CLRO CES Evaluation 2008 Report; previously rated "U"
Previous Comments:	2007: Visited site 2/6/2007

Date of Survey: 8/12/2009

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM3.14**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
38.026257	-121.054829	3.14	3.14	M

Site Feature

Length (ft):	30
Scarp Height (ft):	6
Location Relative to Levee:	On berm
Remaining Berm Width(ft):	15
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	5	x3	15
Location of Erosion:	1	x1	1
Berm Width:	3	x1	3
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **43**

Normalized Score (out of 100%): **47**

Comments:

Most Recent:	2009: downward creep of the soil, possibly caused during pipe installation; erosion is 2-3 ft cut into the bank; vertical pump inlet is located adjacent to erosion; District personnel were made aware of this during the site survey
Previous Comments:	

Date of Survey: 8/12/2009

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM7.23**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.980625	-121.097194	7.23	7.23	M

Site Feature

Length (ft):	25
Scarp Height (ft):	4
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	1.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	12
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	3	x3	9
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	3	x3	9
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **50**

Normalized Score (out of 100%): **55**

Comments:

Most Recent:	2009: near-vertical scarp on the bank; levee is on high ground
Previous Comments:	

Date of Survey: 8/12/2009

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM9.11**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.967200	-121.124840	9.11	9.11	M

Site Feature

Length (ft):	100
Scarp Height (ft):	5
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Inside of bend
Radius of Curvature:	17.6

Criterion:	Score:		Weighted Score:
Length:	2	x2	4
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	2	x2	4
Burrow Holes:	5	x1	5
Levee Slope(H:V):	2	x3	6
Soil Type:	3	x4	12
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **47**

Normalized Score (out of 100%): **52**

Comments:

Most Recent:	2009: Erosion is incising into the levee; a pipe outlet is located at the levee toe; there are traces of concrete lining originally placed over the slope; levee is on high ground; inspect for potential pipe leak
Previous Comments:	

Date of Survey: 8/12/2009

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM9.16**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.966943	-121.125468	9.16	9.16	M

Site Feature

Length (ft):	100
Scarp Height (ft):	5
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	1.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	21.0

Criterion:	Score:		Weighted Score:
Length:	2	x2	4
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	3	x3	9
Soil Type:	3	x4	12
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **48**

Normalized Score (out of 100%): **53**

Photo Not Available

Photo Not Available

Comments:

Most Recent:	2009: cut of 1-2 ft into the levee along lower 1/2 slope; cut is near-vertical; levee is on high ground
Previous Comments:	

Date of Survey: 8/11/2009

Photo Not Available

Photo Not Available

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM10.37**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.965057	-121.146595	10.37	10.37	M

Site Feature

Length (ft):	20
Scarp Height (ft):	3
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	1.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	3	x3	9
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **47**

Normalized Score (out of 100%): **52**

Comments:

Most Recent:	2009: localized erosion; sloughing at the lower slope; small pocket erosion developing
Previous Comments:	

Date of Survey: 8/12/2009

NA 17 **Unit: 15** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U15RM10.62**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.964940	-121.151127	10.62	10.62	M

Site Feature

Length (ft):	300
Scarp Height (ft):	5
Location Relative to Levee:	Upper 1/2 slope
Remaining Berm Width(ft):	10
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	4	x2	8
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	4	x1	4
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	2	x3	6
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **49**

Normalized Score (out of 100%): **54**

Comments:

Most Recent:	2009: scarp with varying height of 1' - 5'; levee is on high ground; erosion occurs just downstream of rip rap placement; at the time of the survey, there were burn piles at various location along the waterside levee slope
Previous Comments:	

Date of Survey: 8/12/2009

NA 17 **Unit: 16** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U16RM4.57**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
38.009201	-121.069224	4.57	4.57	M

Site Feature

Length (ft):	80
Scarp Height (ft):	1
Location Relative to Levee:	Upper 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	2	x2	4
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **42**

Normalized Score (out of 100%): **46**

Comments:

Most Recent:	2009: Differential settlement of 1-2'; appears to be a shallow slide caused by undercutting; settlement has carved into the crown; adjacent area was recently repaired for burrow den on the lower slope; recently placed rocks on adjacent repair site
Previous Comments:	

Date of Survey: 8/12/2009

NA 17 **Unit: 16** **Mormon Slough**

San Joaquin County Flood Control and Water Conservation District

Site ID **NA0017U16RM6.47**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.986959	-121.087544	6.47	6.47	M

Site Feature

Length (ft):	30
Scarp Height (ft):	4
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **43**

Normalized Score (out of 100%): **47**

Comments:

Most Recent:	2009: site is adjacent to abutment on Milton Road Bridge; pocket erosion has developed and will continue to expose the bridge foundation; this erosion appears to be critical as it may affect the bridge foundation
Previous Comments:	

Date of Survey: 8/11/2009

RD 17 **Unit: 2** **San Joaquin River**

Mossdale

Site ID **RD0017U2RM43.95**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.907119	-121.324224	43.95	0.68	M

Site Feature

Length (ft):	50
Scarp Height (ft):	2
Location Relative to Levee:	Levee toe
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Immediately downstream of bend
Radius of Curvature:	2.0

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	2	x1	2
Radius of Curvature:	4	x1	4

Total Score (out of 91): **46**

Normalized Score (out of 100%): **51**

Comments:

Most Recent:	2009: Undercutting of the toe just above the existing rip rap; note there is a housing development on the landside of the levee (refer to Aerial Atlas)
Previous Comments:	

Date of Survey: 9/29/2009

RD 17 **Unit: 2** **San Joaquin River**

Mossdale

Site ID **RD0017U2RM46.13**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.878234	-121.331693	46.13	2.89	M

Site Feature

Length (ft):	15
Scarp Height (ft):	3
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	5.0

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	3	x1	3
Radius of Curvature:	1	x1	1

Total Score (out of 91): **49**

Normalized Score (out of 100%): **54**

Comments:

Most Recent:	2009: pocket erosion just below and across the abutment of Howard Road Bridge; existing toe rip rap and concrete slabs in place; erosion may develop into a larger pocket erosion if no corrective action is taken
Previous Comments:	

Date of Survey: 9/29/2009

Photo Not Available

Photo Not Available

RD 17 **Unit: 2** **San Joaquin River**

Mossdale

Site ID **RD0017U2RM52.8**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.811165	-121.318605	52.80	9.99	M

Site Feature

Length (ft):	50
Scarp Height (ft):	3
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	10
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	4	x1	4
Vegetation Cover:	2	x2	4
Burrow Holes:	5	x1	5
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **47**

Normalized Score (out of 100%): **52**

Comments:

Most Recent:	2009: A 50-ft section of the lower slope has slumped just above the existing rip rap; there is also rip rap protection along the levee toe
Previous Comments:	

Date of Survey: 9/28/2009

RD 17 **Unit: 2** **San Joaquin River**

Mossdale

Site ID **RD0017U2RM53.54**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.805740	-121.324240	53.54	10.66	U

Site Feature

Length (ft):	225
Scarp Height (ft):	7
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	6.0

Criterion:	Score:		Weighted Score:
Length:	4	x2	8
Height:	4	x3	12
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **56**

Normalized Score (out of 100%): **62**

Comments:

Most Recent:	2009: No major change observed; erosion site is immediately upstream of rehabilitation site ; recommend annual monitoring of site per Critical Erosion Sites Evaluation 2008 Report; note site # is the same as RM53.7, LM10.59; previously rated "U"
Previous Comments:	2008: Observed to be caused by wave-wash erosion; 2007: Visited site 6/7/07; site could be combined with Site 32

Date of Survey: 9/29/2009

RD 404 **Unit: 1** **San Joaquin River**

Boggs

Site ID **RD0404U1RM40.86**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.939480	-121.342730	40.86	0.23	U

Site Feature

Length (ft):	200
Scarp Height (ft):	2
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	2.1

Criterion:	Score:		Weighted Score:
Length:	3	x2	6
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	3	x1	3

Total Score (out of 91): **52**

Normalized Score (out of 100%): **57**

Comments:

Most Recent:	2009: No major change observed; this site was combined with other existing sites at RMs 40.93, 40.98, and 41.14 as one site; several pocket erosion just above non-uniform toe rip rap; previously rated "U"; bare spots along the upper slope
Previous Comments:	2008: wave wash erosion; several pocket erosions along the lower slope; site is inside of a bend; 2006: visited site 9/12/06

Date of Survey: 9/30/2009

RD 404 **Unit: 2** **French Camp Slough**

Boggs

Site ID **RD0404U2RM1.56**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.918440	-121.297040	1.56	1.45	U

Site Feature

Length (ft):	1350
Scarp Height (ft):	6
Location Relative to Levee:	Upper 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	8.9

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	4	x3	12
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	3	x1	3
Radius of Curvature:	0	x1	0

Total Score (out of 91): **64**

Normalized Score (out of 100%): **70**

Comments:

Most Recent:	2009: Erosion appears to be maintenance-related, and not cause by riverflow; recommend annual assessment and monitoring of erosion site, per Critical Erosion Sites Evaluation 2008 Report; previously rated "U"
Previous Comments:	2006: Headward erosion along the levee bank; erosion has created "notches" estimated to be about 12 ft in height; erosion appears to be maintenance related; DWR Inspector for the area says that the erosion has ben present for years

Date of Survey: 9/12/2006

RD 524 **Unit: 1** **San Joaquin River**

Middle Roberts Island

Site ID **RD0524U1RM41.15**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.938895	-121.337602	41.15	0.56	U

Site Feature

Length (ft):	360
Scarp Height (ft):	6
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	0
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	1.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	6.3

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	4	x3	12
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	3	x3	9
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **65**

Normalized Score (out of 100%): **71**

Comments:

Most Recent:	2009: erosion site extends from RM 41.11 to 41.18; existing revetment is no longer adequately protecting the oversteepened slope
Previous Comments:	2008: Existing concrete slabs placed as temporary fix; sliding of revetment; 6' pocket erosion with near-vertical scarp; note a sewage treatment plant is located on landside of the levee

Date of Survey: 9/29/2009

RD 524 **Unit: 1** **San Joaquin River**

Middle Roberts Island

Site ID **RD0524U1RM41.79**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.933470	-121.329110	41.79	1.20	U

Site Feature

Length (ft):	400
Scarp Height (ft):	5
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	0
Vegetation cover:	No ground coverage
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	1.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	3	x2	6
Burrow Holes:	5	x1	5
Levee Slope(H:V):	3	x3	9
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **67**

Normalized Score (out of 100%): **74**

Comments:

Most Recent:	2009: Site consists of an approximately 400 ft. eroding bank with minimal protection; the existing rip rap is sloughing; note there is an exposed section of a pipe
Previous Comments:	2006: There is extensive loss of rip rap on some sections; sewage disposal pond on land side; there is an exposed "hanging" pipe outlet from the upper slope

Date of Survey: 9/29/2009

RD 524 **Unit: 1** **San Joaquin River**

Middle Roberts Island

Site ID **RD0524U1RM42.2**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.927770	-121.327870	42.20	1.61	U

Site Feature

Length (ft):	300
Scarp Height (ft):	4
Location Relative to Levee:	Upper 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area and with visible roots and leaning
Crown Width (ft):	
Site Relative to Bend:	Outside of bend < 90 deg
Radius of Curvature:	2.2

Criterion:	Score:		Weighted Score:
Length:	4	x2	8
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	5	x1	5
Radius of Curvature:	3	x1	3

Total Score (out of 91): **60**

Normalized Score (out of 100%): **66**

Comments:

Most Recent:	2009: The lower slope is lined with some erosion pockets; some tree roots are exposed; there is visible undermining of the levee toe; site is immediately upstream of the Higway 4 Bridge; the bridge is possibly causing a scour to occur, eroding the bank
Previous Comments:	

Date of Survey: 9/29/2009

RD 524 **Unit: 1** **San Joaquin River**

Middle Roberts Island

Site ID **RD0524U1RM46.12**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.877880	-121.332550	46.12	5.65	M

Site Feature

Length (ft):	30
Scarp Height (ft):	3
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	5.0

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	1	x1	1

Total Score (out of 91): **46**

Normalized Score (out of 100%): **51**

Comments:

Most Recent:	2009: no major change observed; upper portion of the existing revetment has slipped, exposing the degraded bank; note the site # is same as RM 46.3, LM5.69 found in the CLRO CES Evaluation 2008 Report; ste was previously rated "M"
Previous Comments:	2008: Previously repaired using rock revetment; upper portion of the revetment is sliding, causing deformation on levee slope; upstream of Howards Road Bridge

Date of Survey: 9/30/2009

RD 544 **Unit: 1** **San Joaquin River**

Upper Roberts Island

Site ID **RD0544U1RM47.12**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.864820	-121.327200	47.12	0.43	U

Site Feature

Length (ft):	200
Scarp Height (ft):	4
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area and visible roots
Crown Width (ft):	
Site Relative to Bend:	Outside of bend < 90 deg
Radius of Curvature:	3.1

Criterion:	Score:		Weighted Score:
Length:	3	x2	6
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	5	x1	5
Radius of Curvature:	2	x1	2

Total Score (out of 91): **62**

Normalized Score (out of 100%): **68**

Comments:

Most Recent:	2009: No major change observed; despite dense vegetation, the bank is eroding and sloughing; the levee toe is being undermined; note the tree on site; the site was previously rated "U"
Previous Comments:	2008: undermining of the toe; rodent holes in several location; trees with roots partially exposed; sloughing on slope

Date of Survey: 9/30/2009

RD 2031 **Unit: 1** **Stanislaus River**

Elliot

Site ID **RD2031U1RM0.48**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.704740	-121.159140	0.48	0.48	M

Site Feature

Length (ft):	150
Scarp Height (ft):	5
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	10
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	Tree(s) within affected area and with visible roots and leaning
Crown Width (ft):	12
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	5.9

Criterion:	Score:		Weighted Score:
Length:	3	x2	6
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	4	x1	4
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	3	x4	12
Site Relative to Bend	3	x1	3
Radius of Curvature:	0	x1	0

Total Score (out of 91): **43**

Normalized Score (out of 100%): **47**

Comments:

Most Recent:	2009: No major changes observed; 1" fissure cracks developing on the slope; rip rap is showing signs of sloughing; recommend as local maintenance issue, per CLRO CES Evaluation 2008 Report; site was previously rated "U"
Previous Comments:	2008: No change from previous year; irrgation outlet located on site; rock rip rap placed on river bank 2007:

Date of Survey: 8/20/2009

RD 2058 **Unit: 1** **Paradise Cut**

Pescadero

Site ID **RD2058U1RM1.78**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.803769	-121.386341	1.78	2.15	M

Site Feature

Length (ft):	20
Scarp Height (ft):	5
Location Relative to Levee:	Upper 1/2 slope
Remaining Berm Width(ft):	25
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	1	x1	1
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **44**

Normalized Score (out of 100%): **48**

Comments:

Most Recent:	2009: A possible leak or spill from a siphon breaker is eroding the slope and developing into a headward erosion; a portion of the buried pipe is exposed; the lower slope seems to be lined with chunks of concrete debris or other rock material
Previous Comments:	

Date of Survey: 7/23/2009

RD 2058 **Unit: 1** **Paradise Cut**

Pescadero

Site ID **RD2058U1RM3.97**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.789810	-121.352490	3.97	4.51	M

Site Feature

Length (ft):	200
Scarp Height (ft):	5
Location Relative to Levee:	On berm
Remaining Berm Width(ft):	20
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area and visible roots
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	5.2

Criterion:	Score:		Weighted Score:
Length:	3	x2	6
Height:	2	x3	6
Location of Erosion:	1	x1	1
Berm Width:	2	x1	2
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **42**

Normalized Score (out of 100%): **46**

Comments:

Most Recent:	2009: No major change observed; site is a 200 ft long near-vertical berm erosion; recommend annual assessment and monitoring of erosion site, per CLRO CES Evaluation 2008 Report; site # is same as RM4.0,LM4.51; previously rated "U"
Previous Comments:	2008: Two large trees (2-3' DBH) with partial roots exposed 2007: visisted site 3/13/07

Date of Survey: 7/23/2009

RD 2062 **Unit: 1** **San Joaquin River**

Stewart

Site ID **RD2062U1RM54.14**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.804080	-121.314060	54.14	0.91	M

Site Feature

Length (ft):	15
Scarp Height (ft):	4
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	2.1

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	3	x1	3

Total Score (out of 91): **46**

Normalized Score (out of 100%): **51**

Comments:

Most Recent:	2009: landside ground surface has been raised to the height of the levee crown; sloughing of the existing rip rap revetment on the lower slope, creating a pocket; site # is the same as RM54.34,LM1.08; previously rated "M"
Previous Comments:	2006: Previously marked with stake

Date of Survey: 9/14/2006

Photo Not Available

Photo Not Available

RD 2062 **Unit: 1** **San Joaquin River**

Stewart

Site ID **RD2062U1RM55.57**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.793120	-121.308110	55.57	2.25	M

Site Feature

Length (ft):	100
Scarp Height (ft):	3
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	25
Vegetation cover:	Ground surrounding site is fully covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	1.9

Criterion:	Score:		Weighted Score:
Length:	2	x2	4
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	1	x1	1
Vegetation Cover:	0	x2	0
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	4	x1	4

Total Score (out of 91): **43**

Normalized Score (out of 100%): **47**

Comments:

Most Recent:	2009: Portion of the rip rap has slipped, leaving an exposed section; there is dense vegetation surrounding site; landside ground surface has been raised to height of levee crown; site # same as RM55.75,LM2.25; previously rated "U"
Previous Comments:	2006: pocket erosion approximately .3-.4 miles downstream from SPRR bridge

Date of Survey: 9/14/2006

RD 2062 **Unit: 2** **Paradise Cut**

Stewart

Site ID **RD2062U2RM1.94**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.805422	-121.383173	1.94	3.48	M

Site Feature

Length (ft):	500
Scarp Height (ft):	1
Location Relative to Levee:	Levee toe
Remaining Berm Width(ft):	30
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	1	x1	1
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **46**

Normalized Score (out of 100%): **51**

Comments:

Most Recent:	2009: 1-2 ft. of vertical scarp on levee toe; damage was most likely caused by farming equipment during clearing operation;
Previous Comments:	

Date of Survey: 7/27/2009

RD 2062 **Unit: 2** **Paradise Cut**

Stewart

Site ID **RD2062U2RM2.14**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.804604	-121.379454	2.14	3.27	M

Site Feature

Length (ft):	50
Scarp Height (ft):	2
Location Relative to Levee:	Levee toe
Remaining Berm Width(ft):	30
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	1	x1	1
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **38**

Normalized Score (out of 100%): **42**

Comments:

Most Recent:	2009: 1-2 ft of vertical scarp on the levee toe; damage was most likely caused by agricultural equipment during clearing operation; maintenance issue
Previous Comments:	

Date of Survey: 7/27/2009

RD 2062 **Unit: 3** **Old River**

Stewart

Site ID **RD2062U3RM30.19**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.810609	-121.385879	30.19	0.27	U

Site Feature

Length (ft):	475
Scarp Height (ft):	4
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	3	x3	9
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **63**

Normalized Score (out of 100%): **69**

Comments:

Most Recent:	2009: No major change observed; pocket erosion & vertical scarp;site was combined with RM 30.13 and 30.02 with total erosion length of 465 ft; recommend annual assessment & monitoring of site, per CLRO CES Evaluation 2008 Report; previously rated "M"
Previous Comments:	2008: Top of vertical scarp has rip rap that appears to be sliding; rodent holes; existing toe rip rap

Date of Survey: 9/29/2009

RD 2062 **Unit: 3** **Old River**

Stewart

Site ID **RD2062U3RM30.43**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.813070	-121.383100	30.43	0.56	U

Site Feature

Length (ft):	30
Scarp Height (ft):	4
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	1.9

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	4	x1	4

Total Score (out of 91): **55**

Normalized Score (out of 100%): **60**

Comments:

Most Recent:	2009; no major change observed; section of the rip rap has slipped, exposing a levee section that has eroded; recommend as local maintenance issue, per CLRO CES Evaluation 2008 Report; site # same as RM30.43,LM0.63; previously rated "U"
Previous Comments:	2008: site is located inside of bend; scarp looks to be into the levee prism; piles of concrete chunks placed on the slope

Date of Survey: 9/29/2009

RD 2062 **Unit: 3** **Old River**

Stewart

Site ID **RD2062U3RM31.12**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.819290	-121.378880	31.12	1.20	M

Site Feature

Length (ft):	30
Scarp Height (ft):	2
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	Ground surrounding site is fully covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Outside of bend < 90 deg
Radius of Curvature:	1.8

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	0	x2	0
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	5	x1	5
Radius of Curvature:	4	x1	4

Total Score (out of 91): **47**

Normalized Score (out of 100%): **52**

Comments:

Most Recent:	2009: No major change observed; section of rip rap has slipped, creating a terraced effect; dense vegetation growth recommend as a local maintenance issue, per CLRO CES Evaluation 2008 Report; site # same as RM31.12,LM1.25; previously rated U
Previous Comments:	2006: 1-2' into prism

Date of Survey: 9/28/2009

RD 2062 **Unit: 3** **Old River**

Stewart

Site ID **RD2062U3RM31.28**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.821380	-121.376900	31.28	1.42	M

Site Feature

Length (ft):	30
Scarp Height (ft):	2
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area and visible roots
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	2.7

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	3	x1	3

Total Score (out of 91): **43**

Normalized Score (out of 100%): **47**

Comments:

Most Recent:	2009: No major change; sliding of the rip rap at the base; there is visible man-made trail leading from crown to toe; recommend as a local maintenance issue, per CLRO CES Evaluation 2008 Report; site # same as RM31.3,LM1.45; previously rated "M'
Previous Comments:	2006: portion of rip rap along the slope has collapsed; exposed levee section is starting to erode, also exposing tree roots

Date of Survey: 9/29/2009

RD 2063 **Unit: 1** **San Joaquin River**

Crows Landing

Site ID **RD2063U1RM105.5**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.447450	-121.026090	105.50	2.72	M

Site Feature

Length (ft):	7
Scarp Height (ft):	2
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	20
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	2	x1	2
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **32**

Normalized Score (out of 100%): **35**

Comments:

Most Recent:	2009: Note this site has not been reported to be repaired
Previous Comments:	2007: sinkhole approximately 7'x7'x'2'; rated "M"

Date of Survey: 8/7/2007

RD 2075 **Unit: 1** **San Joaquin River**

McMullin

Site ID **RD2075U1RM64.34**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.727933	-121.274491	64.34	5.34	U

Site Feature

Length (ft):	75
Scarp Height (ft):	10
Location Relative to Levee:	Toe & slope
Remaining Berm Width(ft):	10
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Sand (SP,SM and mixture)
Condition of surrounding tree(s)	Tree(s) within affected area and with visible roots and leaning
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	2	x2	4
Height:	4	x3	12
Location of Erosion:	5	x1	5
Berm Width:	4	x1	4
Vegetation Cover:	2	x2	4
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	4	x4	16
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **52**

Normalized Score (out of 100%): **57**

Comments:

Most Recent:	2009: No major change; located in an oxbow; slope surface consist of very sandy material; exposed tree roots; recommend as a local maintenance issue, per CLRO CES Evaluation 2008 Report; Eddy Cordoza of RD 2075 is aware of the site; previously rated "U"
Previous Comments:	2007: Site is close to irrigation pump inlet

Date of Survey: 8/20/2009

RD 2089 **Unit: 1** **Old River**

Stark

Site ID **RD2089U1RM29.11**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.805530	-121.401700	29.11	1.18	M

Site Feature

Length (ft):	10
Scarp Height (ft):	5
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	3
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	18.9

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **43**

Normalized Score (out of 100%): **47**

Comments:

Most Recent:	2009: existing revetment just above the toe is sloughing; recommend as a local maintenance issue, per CLRO CES Evaluation 2008 Report; site # is same as RM29.1,LM1.10; previously rated "M"
Previous Comments:	2006: Toe slough; existing revetment

Date of Survey: 10/20/2006

RD 2089 **Unit: 1** **Old River**

Stark

Site ID **RD2089U1RM29.61**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.809780	-121.396230	29.61	0.66	U

Site Feature

Length (ft):	20
Scarp Height (ft):	5
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	2.2

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	3	x1	3
Radius of Curvature:	3	x1	3

Total Score (out of 91): **57**

Normalized Score (out of 100%): **63**

Comments:

Most Recent:	2009: No major change observed; 5-ft vertical scarp is immediately downstream of where berm has tapered; recommend as local maintenance issue, per CLRO CES Evaluation 2008 Report; site is same as RM29.6,LM0.60; previously rated "U"
Previous Comments:	2008: No change observed; rodent holes on lower slope; wide levee crown

Date of Survey: 9/28/2009

RD 2089 **Unit: 1** **Old River**

Stark

Site ID **RD2089U1RM29.83**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.809530	-121.392160	29.83	0.41	M

Site Feature

Length (ft):	5
Scarp Height (ft):	2
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	Ground surrounding site is fully covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	0	x2	0
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **42**

Normalized Score (out of 100%): **46**

Comments:

Most Recent:	2009: rock protection placed on upper slope; images need to be updated; recommend annual assessment and monitoring of erosion site, per CLRO CES Evaluation 2008 Report; site # same as RM29.84,LM0.30; previously rated "M"
Previous Comments:	2008: Two sites combined as one; steep slope; downstream of a pump. 2006: Visited site 10/20/06

Date of Survey: 9/28/2009

RD 2089 **Unit: 1** **Old River**

Stark

Site ID **RD2089U1RM29.95**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.810050	-121.390260	29.95	0.30	U

Site Feature

Length (ft):	50
Scarp Height (ft):	7
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	5	x3	15
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	5	x1	5
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **61**

Normalized Score (out of 100%): **67**

Comments:

Most Recent:	2009: Rock revetment placed on the upper slope; however, vertical scarp is still present; recommend annual assessment and monitoring of erosion site, per CLRO CES Evaluation 2008 Report; site same as RM29.95,LM0.22; previously rated "M"
Previous Comments:	2008: pocket erosion with vertical scarp; loss of rip rap; mild vegetation growth since last survey

Date of Survey: 9/28/2009

RD 2089 **Unit: 1** **Old River**

Stark

Site ID **RD2089U1RM30.02**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.810460	-121.388870	30.02	0.22	M

Site Feature

Length (ft):	5
Scarp Height (ft):	3
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	8
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	2	x3	6
Location of Erosion:	5	x1	5
Berm Width:	4	x1	4
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **46**

Normalized Score (out of 100%): **51**

Photo Not Available

Photo Not Available

Comments:

Most Recent:	2009: localized sloughing near the toe; rock protection has been added along the upper slope and along the toe; recommend annual assessment and monitoring of erosion site, per CLRO CES Evaluation 2008 Report; previously rated "M"
Previous Comments:	2008: Minor toe erosion

Date of Survey: 9/28/2009

Photo Not Available

Photo Not Available

RD 2089 **Unit: 2** **Old River**

Stark

Site ID **RD2089U2RM28.35**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.809960	-121.413200	28.35	0.42	U

Site Feature

Length (ft):	60
Scarp Height (ft):	6
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	Ground surrounding site is fully covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area and visible roots
Crown Width (ft):	
Site Relative to Bend:	Inside of bend
Radius of Curvature:	7.0

Criterion:	Score:		Weighted Score:
Length:	2	x2	4
Height:	4	x3	12
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	0	x2	0
Burrow Holes:	5	x1	5
Levee Slope(H:V):	1	x3	3
Soil Type:	5	x4	20
Site Relative to Bend	0	x1	0
Radius of Curvature:	0	x1	0

Total Score (out of 91): **54**

Normalized Score (out of 100%): **59**

Comments:

Most Recent:	2009: Pocket erosion on lower slope just above the toe rip rap; protruding rip rap upstream is creating an eddy, scouring the levee slope; site # is same as RM28.4,LM0.30; previously rated "U"; images are courtesy of the Levee Repair Office.
Previous Comments:	2008: Cut into levee profile; riprap slide; rodent holes; pictures do not match GPS and current condition

Date of Survey: 9/28/2009

RD 2092 **Unit: 1** **San Joaquin River**

Dos Rios

Site ID **RD2092U1RM84.6**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.587130	-121.162830	84.60	1.62	M

Site Feature

Length (ft):	750
Scarp Height (ft):	2
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	1000
Vegetation cover:	No ground coverage
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2.5:1
Soil Type:	Clay (CL,CH,SC,GC)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	1	x3	3
Location of Erosion:	5	x1	5
Berm Width:	1	x1	1
Vegetation Cover:	3	x2	6
Burrow Holes:	0	x1	0
Levee Slope(H:V):	1	x3	3
Soil Type:	3	x4	12
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **41**

Normalized Score (out of 100%): **45**

Comments:

Most Recent:	2009: No major change; sloughing at the lower slope that's created a terraced effect; damage could be caused by wave action during an extended flooding; site recommended as local maintenance issue, per CLRO CES Evaluation 2008 Report; previously rated "M"
Previous Comments:	2007: Not as serious - use lower rating

Date of Survey: 8/25/2009

RD 2095 **Unit: 1** **Paradise Cut**

Paradise Cut

Site ID **RD2095U1RM6.74**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.763630	-121.319000	6.74	0.73	M

Site Feature

Length (ft):	50
Scarp Height (ft):	8
Location Relative to Levee:	On berm
Remaining Berm Width(ft):	15
Vegetation cover:	Ground surrounding site is fully covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	4	x3	12
Location of Erosion:	1	x1	1
Berm Width:	3	x1	3
Vegetation Cover:	0	x2	0
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **45**

Normalized Score (out of 100%): **49**

Comments:

Most Recent:	2009:No major chang,e noticeable vegetation growth; erosion is on berm, but if left untreated, it will eventually erode into levee prism; recommend annual assessment/monitoring of site, per CES 2008 Report;site # same as RM6.8,LM0.73; previously rated "U"
Previous Comments:	2008: Downstream of WPRR near siphon pipe & pump; sandy levee; visited by Jeff Van Gilder and LRO in 2008 for repair assessment; scouring downstream of RR crossing, possibly caused by eddy effects

Date of Survey: 7/29/2009

RD 2095 **Unit: 1** **Paradise Cut**

Paradise Cut

Site ID **RD2095U1RM6.88**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.761960	-121.318140	6.88	0.86	U

Site Feature

Length (ft):	25
Scarp Height (ft):	7
Location Relative to Levee:	Lower 1/2 slope
Remaining Berm Width(ft):	0
Vegetation cover:	Ground surrounding site is fully covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	1.5:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	Tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Straight reach
Radius of Curvature:	

Criterion:	Score:		Weighted Score:
Length:	1	x2	2
Height:	4	x3	12
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	0	x2	0
Burrow Holes:	0	x1	0
Levee Slope(H:V):	3	x3	9
Soil Type:	5	x4	20
Site Relative to Bend	1	x1	1
Radius of Curvature:	0	x1	0

Total Score (out of 91): **54**

Normalized Score (out of 100%): **59**

Comments:

Most Recent:	2009: No major change observed; near-vertical slope that has rip rap sloughing; recommend as a local maintenance issue, per CLRO CES Evaluation 2008 Report; site# same as RM6.9,LM0.86; previously rated "U"
Previous Comments:	2008: previous erosion site that is partially protected with concrete rubble; erosion scarp is adjacent to the sloughing rip rap

Date of Survey: 7/29/2009

RD 2095 **Unit: 2** **San Joaquin River**

Paradise Cut

Site ID **RD2095U2RM60.62**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.740196	-121.297662	60.62	1.78	U

Site Feature

Length (ft):	150
Scarp Height (ft):	10
Location Relative to Levee:	On berm
Remaining Berm Width(ft):	20
Vegetation cover:	1/3 of ground covered
Burrow Holes (WS):	Signs of Activity
Levee Slope (H:V):	3:1 or greater
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	16
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	5.7

Criterion:	Score:		Weighted Score:
Length:	3	x2	6
Height:	5	x3	15
Location of Erosion:	1	x1	1
Berm Width:	2	x1	2
Vegetation Cover:	2	x2	4
Burrow Holes:	5	x1	5
Levee Slope(H:V):	0	x3	0
Soil Type:	5	x4	20
Site Relative to Bend	3	x1	3
Radius of Curvature:	0	x1	0

Total Score (out of 91): **56**

Normalized Score (out of 100%): **62**

Comments:

Most Recent:	2009: Site immediately downstream of existing rip rap; there is a 20-ft berm remaining; however, berm wil continue to erode, eventually erode into the levee profile; site # same as RM62.6,LM1.87; recommend annual assessment, per CES Evaluation 2008 Report
Previous Comments:	2006: Visited site 10/20/06

Date of Survey: 9/29/2009

RD 2095 **Unit: 2** **San Joaquin River**

Paradise Cut

Site ID **RD2095U2RM60.69**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.738880	-121.298260	60.69	1.87	M

Site Feature

Length (ft):	200
Scarp Height (ft):	5
Location Relative to Levee:	On berm
Remaining Berm Width(ft):	20
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Silt (ML)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Outside of bend > 90 deg
Radius of Curvature:	5.7

Criterion:	Score:		Weighted Score:
Length:	3	x2	6
Height:	2	x3	6
Location of Erosion:	1	x1	1
Berm Width:	2	x1	2
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	5	x4	20
Site Relative to Bend	3	x1	3
Radius of Curvature:	0	x1	0

Total Score (out of 91): **46**

Normalized Score (out of 100%): **51**

Comments:

Most Recent:	2009: No major change observed; sloughing of the rip rap above toe; erosion begins immediately downstrea mof existing rip rap; roughly15-ft berm remains; however, it will continue to erode and eventually intrude into the levee profile if left untreated
Previous Comments:	2006: Just upstream of where berm starts to widen

Date of Survey: 9/29/2009

Photo Not Available

Photo Not Available

RD 2101 **Unit: 1** **San Joaquin River**

Blewett

Site ID **RD2101U1RM73.92**

Latitude:	Longitude:	River Mile:	Levee Mile:	Overall Rating:
37.650259	-121.228961	73.92	1.95	U

Site Feature

Length (ft):	500
Scarp Height (ft):	10
Location Relative to Levee:	Toe & beyond
Remaining Berm Width(ft):	0
Vegetation cover:	2/3 of ground covered
Burrow Holes (WS):	No Activity
Levee Slope (H:V):	2:1
Soil Type:	Sand (SP,SM and mixture)
Condition of surrounding tree(s)	No tree(s) within affected area
Crown Width (ft):	
Site Relative to Bend:	Immediately downstream of bend
Radius of Curvature:	7.9

Criterion:	Score:		Weighted Score:
Length:	5	x2	10
Height:	5	x3	15
Location of Erosion:	5	x1	5
Berm Width:	5	x1	5
Vegetation Cover:	1	x2	2
Burrow Holes:	0	x1	0
Levee Slope(H:V):	2	x3	6
Soil Type:	4	x4	16
Site Relative to Bend	2	x1	2
Radius of Curvature:	0	x1	0

Total Score (out of 91): **61**

Normalized Score (out of 100%): **67**

Comments:

Most Recent:	2009: recommend annual assessment and monitoring of critical erosion site, per CLRO CES Evaluation 2008 Report; an eddy has formed, eroding bank and intruding into the levee prism; site # same as RM76.3,LM1.89; previously rated "U"
Previous Comments:	2007: Recommended for short list of immediate repair sites; silty sand levee material

Date of Survey: 8/30/2007

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