

**Plan to Minimize Impacts on Adjacent Landowners
Floodplain Reconnection and Restoration La BARRANCA Unit, Sacramento River
National Wildlife Refuge, Tehama County California.**

Program Background

The Flood Protection Corridor Program was created by the Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act of March 2000 (Proposition 13). The Program is authorized to fund projects providing non-structural approaches to flood management, including the acquisition and restoration of wildlife habitat and agricultural land preservation. Proposition 13 requires the applicant, in conjunction with the Department of Water Resources, develop a plan to minimize the impacts on adjacent landowners prior to acquiring any interest in land.

The code states:

"79041. Prior to acquiring an easement or other interest in land pursuant to this article, the project shall include a plan to minimize the impacts on adjacent landowners. The plan shall include but not be limited to, an evaluation of the impact on floodwaters, the structural integrity of affected levees, diversion facilities, customary agricultural husbandry practices and timber extraction operations, and an evaluation with regard to the maintenance required for any facilities that are proposed to be constructed or altered."

Project Overview

The overall project goals are to reduce hazards to native fish, restore riparian habitat, and enhance the flood corridor. Specific objectives for this project include:

- Breach or remove the levee to reduce flood damage (non-structural floodwater retention) and reconnect the floodplain and river.
- Restore 200 acres (currently a walnut orchard) with native riparian plants creating a large contiguous block of new riparian habitat.
- Enhance existing riparian vegetation on the site through control of invasive plants on targeted areas of the existing riparian forest and former gravel mining areas.
- Reduce entrapment hazards to native fish (especially salmonids) from past gravel mining operations.

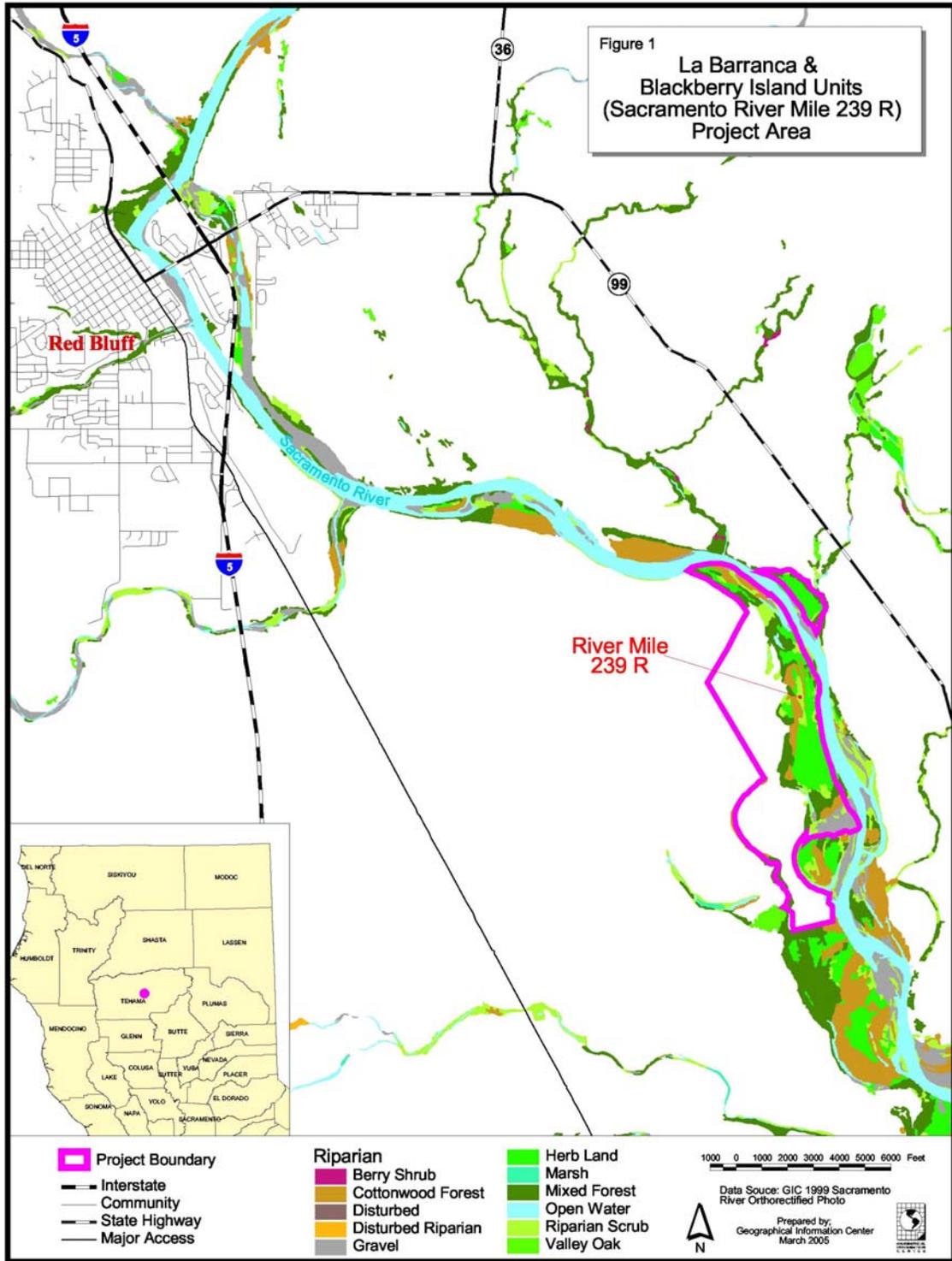
Project Information

- Location: Tehama County, approximately one mile east of Tyler Road and five miles southeast of the city of Red Bluff, California (Figure 1). It is located between Sacramento River Mile 237 to 240.
- Goals:
- Enhance flood corridor.
 - Improve habitat for threatened and endangered species and other species characteristic of riparian habitat.
- Objectives:
- Reduce potential fish entrapment hazards.
 - Provide transitory storage for floodwaters and increase sediment trapping.
 - Restore and enhance approximately 450 acres of riparian vegetation.
 - Remove or breach private levee to reconnect floodplain.
 - Provide benefits to adjacent orchards (filtering flood debris, reducing erosive flows, and improving water quality of agricultural discharge).
- Proponents:
- Department of Water Resources
 - U.S. Fish and Wildlife Service (USFWS)
 - River Partners
- Funding: Department of Water Resources, Flood Protection Corridor Program
\$1,220,000

Project Background

- Physical Setting
- A 900-foot long private levee was constructed to reduce the deposition of sediment and debris on the unlevelled orchard, but did not prevent flooding on the site. Now with the property in USFWS ownership, the levee no longer serves any purpose.
 - Several abandoned gravel pits poses possible fish entrapment.
- Geomorphic Setting
- This reach of the Sacramento River is a transition to a meandering river. Evidence of minor channel movement along the northern section includes a gravel bar that has formed adjacent to Blackberry Island (opposite the site), sediment deposited on the far northern edge of the site, and the river has moved westward just downstream of the new gravel bar. Along the southern end of the unit, there is evidence of a cutoff channel near River Mile 237.
- Hydrological Setting
- DWR data from flood events and modeling suggests that much of the project area is inundated every 2-4 years.
 - Numerous swales from the north are not able to reconnect with the floodplain. Floodwaters from swales connect and drain into the abandoned gravel pits.
 - Under existing conditions, the levee prevents flows accessing the swale and orchard area until outflanked by flows greater than the 20-year event. This occurs when an elevated road, near the upstream end of the project running perpendicular to the flow direction, is finally overtopped (GMA 2005)
 - Flooding behind the levee is due primarily from groundwater subbing or water backing into the area from downstream.
- Biological Setting
- As part of a 10-mile long riparian corridor protected under public ownership, the La BARRANCA Unit has excellent wildlife potential because of its proximity to the river and high diversity of vegetative structure. The project area provides a wildlife corridor close to the Sacramento River.
 - Avian monitoring documented high bird diversity and richness.
 - Within this reach of the Sacramento River, there is unsuitable spawning habitat for winter-run Chinook salmon, but suitable spawning habitat for fall-run Chinook salmon. The downstream end of the gravel bar at Blackberry Island at RM 239.5 offers one of the best spawning locations for fall-run

- Chinook with its riffles, good spawning substrate and adequate oxygen levels.
- Invasive plants, particularly giant reed (*Arundo donax*), Tree of Heaven (*Ailanthus altissima*), pepperweed (*Lepidium latifolium*), tamarisk (*Tamarix* spp.), yellow starthistle (*Centaurea solstitialis*) and Johnson grass (*Sorghum halepense*) currently dominate areas of existing riparian habitat and gravel pit areas.
- Surrounding Land Uses
- The La BARRANCA Unit is bordered by USFWS Refuge lands on all but the western edge, which is bordered by orchards. Converting the weed-dominated, abandoned agricultural fields in the project area to quality riparian and wetland habitat will reduce seed sources of invasive and noxious weeds.
- Regulatory Compliance
- Public Meetings: November 2003, April 2004
 - NEPA compliance: The Environmental Assessment (EA) notes a Finding of No Significant Impact (FONSI).
 - CEQA compliance: IS/mitigated NEG DEL ready for filing
 - Plan to minimize impact on adjacent landowners: satisfied by this document



Related Efforts

This project builds upon past efforts outlined below:

Land Acquisition

- In 1993, the Nature Conservancy purchased the 702.5-acre property from the Harriet D. Baldwin Living Trust and transferred it to the USFWS as a unit of the Sacramento River National Wildlife Refuge.

Phase I Feasibility Study

- In 2002, River Partners completed a feasibility study (Sacramento River Partners 2002) that evaluated the available data, identified management alternatives, data gaps, and recommended further actions on the eastern portion of the La BARRANCA Unit (305 acres). . This study was funded by the Anadromous Fish Restoration Program (AFRP) and Central Valley Project Improvement Act (CVPIA). The Feasibility Study identified alternatives to:
 - 1) Reconnect the floodplain and the river,
 - 2) Restore native riparian vegetation, and
 - 3) Reduce the potential of native fish entrapment (especially salmonids) associated with past gravel mining operations.
- Graham Matthews and Associates (GMA) completed a topographical survey and developed conceptual grading alternatives to eliminate entrapment of native fishes (GMA, 2001). Topographical information was critical in assessing the entrapment potential for the site.

Phase II Environmental Compliance

This project includes a number of planning documents including:

- California Environmental Quality Act (CEQA) documentation (an Initial Study and an anticipated Mitigated Negative Declaration),
- Draft and Final Restoration Plans,
- Plan to Minimize Impacts to Adjacent Landowners, and
- Floodplain Reconnection Plan.

Separate USFWS funding provided for National Environmental Policy Act (NEPA) compliance (North State Resources 2004). The Environmental Assessment (EA) determined a Finding of No Significant Impact (FONSI) for the project (North State Resources 2005). The EA provides detailed information to support any required permits and assist with the completion of documentation to comply with the California Environmental Quality Act (CEQA), Section 404 of the Clean Water Act, Section 7 of the Endangered Species Act, potential state (State Historic Preservation Office) and historic and archaeological sites.

Department of Water Resources' Interest in Providing Funds to Develop the La BARRANCA Restoration Project

The Flood Protection Corridor Program (FPCP) awarded River Partners \$1,220,000 to implement a comprehensive floodplain reconnection and restoration project on approximately 500 acres of the U.S. Fish and Wildlife Service's La BARRANCA Unit

(Figure 1). The site currently consists of a 450 acre walnut orchard (200 acres will be restored to natural riparian habitat under this project) and an existing riparian area (approximately 300 acres), portions of which have been impacted by past gravel mining operations. Restoration of riparian vegetation will improve wildlife habitat on the Refuge, provide transitory storage of floodwaters, and reduce fish entrapment hazards.

The proposed levee breach or removal and grading activities will enhance floodplain connectivity and improve drainage out of the gravel pits. The grading effort is relatively modest and any levee modifications should be implemented after restoration has begun to minimize any potential for erosion and help capture debris and sediment. The project will be designed to ensure that there are no negative impacts to neighboring landowners resulting from the construction of the project.

Outreach Efforts

The La Barranca Project will be designed to minimize flooding impacts and maximize floodplain benefits. The Refuge owns the land that will be inundated. Since 2000, River Partners has hosted numerous meetings with local interests and public meetings (April 2004) to inform the public and adjacent landowners and gather input for the project. DWR facilitated a public meeting in November 2003 for the Flood Protection Corridor Program. Concerns discussed at these public meeting included:

- Potential on-site geomorphological effects (including the erosion of adjacent or opposite banks, and the deposition and translocation of sandbars), and
- Potential hydraulic impacts
 - Increased flood water velocity in the adjacent orchards due to riparian trees,
 - Flow constriction causing floodwaters to affect adjacent orchard,
 - Inadequate topographical information for hydraulic analysis,
 - Impacts to river and the east bank after restoration,
 - Re-evaluation of hydraulic effects after removal of levee,
 - Changes in FEMA Flood Insurance Rate Maps (FIRM) if project changes the delineation of the FEMA 100-year floodplain, and
 - Risks to fish.

Input from these meetings has influenced the project design and timing, and the scope of additional analyses. These concerns are addressed in supporting studies and in other sections of this document. Some of these concerns are summarized below.

Supporting studies consisted of additional hydraulic modeling (GMA 2005, MBK 2005) and a river meander study (Larsen 2005) focused on the concerns of erosion and deposition, the impacts of floodwater associated with the project and to adjacent properties, including the eastern bank of the Sacramento River, and hydraulic effects after levee removal. The hydraulic analyses indicated no significant negative impacts to adjacent landowners and a few benefits (reduced velocities) on flood hydraulics associated with the project.

To address the inadequate topographical information for hydraulic analysis, GMA added nine additional cross sections between RM 233.60 and 235.96 (existing DWR HEC-RAS cross sections). These data (plus the data collected previously) were adequate for

the hydraulic analyses. No additional topography on the eastern bank was needed for the analysis.

Based on the hydraulic analysis, there was no indication of negative impacts to adjacent landowners associated with the project or potential changes in the FEMA Flood Insurance Rate maps for the 100-year event.

To increase drainage and reduce threats to fish, gravel pits will be filled with levee material and graded to existing topography.

Evaluation of Impact of Development of Project on Floodwaters

MBK Engineers (MBK 2005) and Graham Matthews Associates (GMA 2005) evaluated the effects of the proposed restoration and floodplain reconnection on floodwaters. Based on the available information, both analyses concluded that the project would not likely result in negative impacts and may have a few benefits to river hydraulics. Some details are provided below.

GMA built a 1-D (one dimensional) hydraulic model using topographic data collected as part of the project (Appendix A) to evaluate the hydraulic effects of three project alternatives:

- No Action-existing conditions,
- Levee Removal with Restoration, and
- Levee Breach with Restoration)

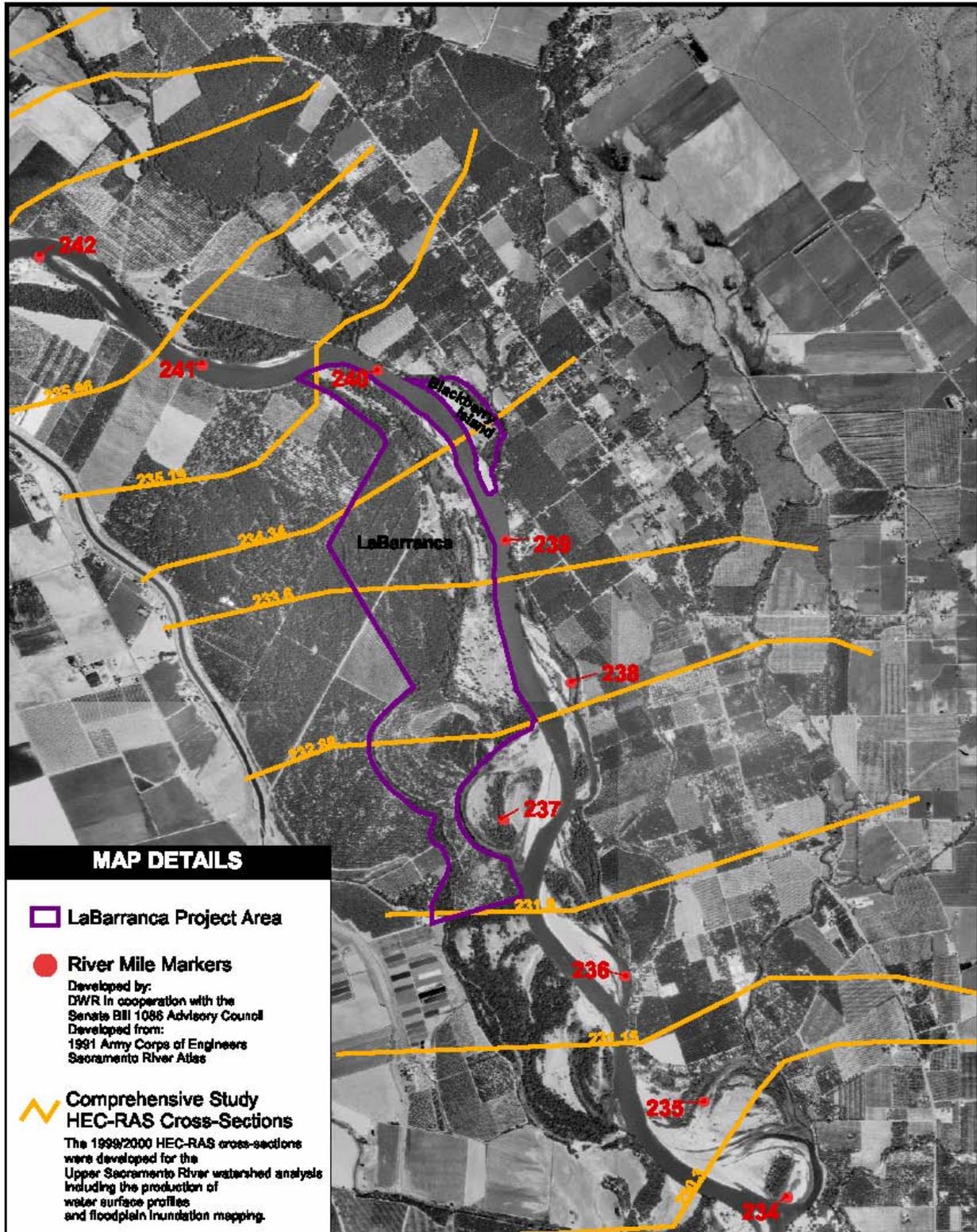
These modeled alternatives differed by the elevation and vegetation roughness values (Manning's n) selected. GMA (2005) utilized data from various sources to build the model and conduct an analysis of project alternatives on hydraulic effects between RM 230 and RM 240 (the river miles refer to DWR river stations and cross-sectional data)¹. Each alternative was modeled under a range of flow conditions: the 2, 10, 20, 50 and 100-year flood events (Q_2 , Q_{10} , Q_{20} , Q_{50} , and Q_{100}). MBK Engineers (MBK) completed further hydraulic analysis (Appendix B) using the same model and evaluated the overall effects of the project on floodwaters.

Both analyses concluded that the project would not likely result in negative impacts to adjacent landowners or the flood control system. MBK suggested that the proposed project may benefit river hydraulics because of the decrease in water velocities associated with increased flood plain storage. Though the reductions in flow velocity were small, it could help diminish the potential for erosion. Other significant findings include:

- The proposed project reduces water velocities and provided a small increase in water surface elevation associated with an increase in flood storage capacity.

¹ **Technical note:** GMA used a variety of data sources to build the model, including a GMA field survey for additional topographical cross sections, USGS DEM, DWR channel bathymetry, and DWA DTM data (GMA 2005). Typically these data are identified by River Mile, providing discrepancies between river miles as the river position moves from year to year. For example, Figure 2 shows river mile markers (from the 1991 Army Corps of Engineers river alignment) and cross sections (from the 1999-2000 Army Corps of Engineers river alignment). For GMA's analysis all data sources were rectified onto a base map for modeling purposes. In other words, the actual position of the cross section on the landscape was used.

Figure 2. Project Area with River Miles and Cross-Section Stations.



- The effects of the project decreased as the events grew in magnitude.
- Flood velocities were lower under the levee breach or removal and restoration alternatives.
- In general, the calculated water surface elevation changes were small (a modeled increase of less than 0.2'). Two cross sections stations, 234.05 and 233.97, indicated a stage increase at every event modeled except the 2-year event. The 100-year event showed an increase of 0.44' for the levee breach and 0.48' for the levee removal alternative. However, these scenarios (levee breaching or removal) result in expanded flood plain storage and decreased velocities (MBK Engineers 2005). This is a function of how stages are calculated in the model (as stages increase, velocities decrease). The decrease in flood velocities and increase in flood plain storage are benefits of the project.
- The restoration appeared to have little influence on flood stage and will likely protect the agricultural uses to the west by capturing debris and sediment.

Evaluation of Impacts on Geomorphologic Processes

A river meander migration study and geomorphic modeling (Appendix C) were conducted to address concerns with potential impacts to geomorphic processes, specifically erosion of adjacent or opposite banks, and the deposition and translocation of sandbars. The study indicated that the project will not cause negative geomorphological changes to the project site or to lands adjacent to the project (Larsen 2005). Some details are provided below.

Historically, river meander migration at the site has been limited since at least 1920. The channel in the vicinity of the La Barranta site has not experienced major movement. Movement is limited because of the restraint caused by the erosion-resistant Modesto formation on the eastern bank of the river.

Channel migration was simulated using a channel migration model that consists of physics-based mathematical algorithms for flow and sediment transport, which are the main physical processes responsible for channel migration (Larsen and Greco 2002). Modeling demonstrated that the site is likely to be highly stable (Larsen and Girvetz 2005). Based on the study of aerial photo records that show historic portions of this site, and geomorphic modeling of the anticipated future channel migration at this site, the restoration as planned will not affect the river migration or bank erosion dynamics significantly at the site and will not threaten any of the surrounding properties through bank migration or other river dynamics. In particular, restoration activities would not significantly alter the channel migration and bank erosion characteristics on the east side of the channel (Larsen 2005).

The large gravel bar, which has been growing along the eastern bank of the Sacramento River, would not be significantly affected in terms of hydraulic or geomorphic changes related to the proposed restoration activities. In summary, no geomorphic or hydraulic issues are associated with the proposed project that would negatively impact surrounding neighbors. The proposed action will not cause any

detrimental geomorphological changes to the project site or to lands adjacent to the project (Larsen 2005).

Evaluation of Impact on Structural Integrity of Affected Levees

No levees of the Sacramento River Flood Control project are located near the project area. Part of the proposed project will remove or breach a 900 foot long unpermitted levee and connect existing drainages on the landside of the levee to the river. The unpermitted levee was intended to reduce the deposition of sediment and debris on the unleveled orchard. However, the levee does not prevent flooding on the site. Flooding behind the levee occurs frequently but is primarily due to groundwater subbing or water backing into the area from downstream.

It is possible that one benefit of removing the levee will be to reduce flood inundation water surface levels (and the expanse of inundation) at downstream locations. In summary, the proposed removal of the interior levee does not change the river dynamics in ways that threaten adjacent properties or significantly increase flooding. Due to the additional onsite storage of floodwaters, there might be a small tendency for flood attenuation downstream (Larsen 2005). With the property in USFWS ownership, the levee no longer serves any purpose.

Evaluation of Impacts on Diversion Facilities

The project is approximately 5 miles downstream of the Red Bluff Diversion Dam. Preliminary hydraulic modeling developed for the EA indicate no upstream impacts associated with the project. Therefore, given the distance and these results, the project is unlikely to have any impact on the Red Bluff Diversion Dam.

Evaluation of Impacts on Customary Agricultural Husbandry Practices

According to the Farmland Mapping and Monitoring Program (FMMP), much of the land on the La Barranca Unit is high quality and falls under special farmland categories (North State Resources 2005). About 45-50 acres of this site, for example, are Columbia fine sandy loam which is a prime soil when irrigated. The soils on the remainder of the site are a mix of riverwash and Columbia complex channeled, both of which are non-prime soil types.

The site was purchased by the US Fish and Wildlife Service in 1991. Two hundred acres of the site were a walnut orchard that was removed in 2005. The remaining 250 acres are a low value riparian habitat. Because the site has a high water table and floods frequently, the orchard's production was impaired and the prior owner suffered damages from inundation and sedimentation that contributed to his willingness to sell the land to the Fish and Wildlife Service.

Evaluation under the California Land Evaluation-Site Assessment (LESA) Model was not deemed appropriate since this project concerns protected resource lands and not "Land Committed to Nonagricultural Use" by virtue of urban development. Such a determination is consistent with CEQA Statutes Section 21095, which makes use of LESA an "optional methodology." Under the LESA model the proposed project would not qualify as "Land Committed to Nonagricultural Use" as such land is designated as having received discretionary *development* approvals such as a tentative subdivision map, tentative or final parcel map, or recorded development agreement. (Department of Conservation California Agricultural LESA

Model 1997 Instruction Manual (Manual) at page 26). In contrast, the proposed project falls within the California LESA model definition of “protected resource lands.” The model defines protected resource lands as “those lands with long term use restrictions that are compatible with or supportive of agricultural uses of land. Included among them are the following: publicly owned lands maintained as park, forest, or watershed resources; and lands with agricultural, wildlife habitat, open space, or other natural resource easements that restrict the conversion of such land to urban or industrial uses” (Manual at page 28).

The proposed project would restore some agricultural acreage to native riparian habitat, effectively removing it from agricultural production; however, the proposed project would not cause serious degradation or elimination of the physical or natural conditions that provide the site’s values for farming nor be irreversible. The project would re-establish long-term processes and functions present in riparian habitat communities, including the natural formation of soils that gave these sites their original agricultural value. Because the agricultural value of the soil is tied directly to the natural conditions and processes that existed before commercial agricultural development of the land, habitat restoration efforts would in effect be preserving (and possibly improving over time) the values that make the soil useful for agriculture (Cannon 2004, Tilman et al. 1996 and 2002). Returning the land to cultivation would require only removing the native vegetation and implementing some soil preparation, which is similar to the requirements of the original clearing of habitat necessary to create farmed land decades ago. This contrasts to farmland converted to urban uses, where construction of infrastructure and buildings and the compaction and paving of soils makes the conversion irreversible.

Finally, the proposed project would not stop or hinder the agricultural practices that occur on neighboring properties. SRNWR endeavors to be good neighbors in their property management. SRNWR policies include those addressing maintenance of fire breaks and vegetation buffers that are carried into project design to minimize incompatibilities with active agricultural operations on adjacent properties.

For these reasons, this impact is considered less than significant

Evaluation of Impacts on Timber Extraction Operations

This project will not impact any timber extraction operations.

Evaluation of Impacts on Maintenance of Any Facilities Proposed to be Altered or Constructed Within the Project Area

This project does not involve the alteration or construction of facilities. The grading and restoration activities are designed to require very little maintenance. However, the project area is owned by USFWS as part of the Sacramento River National Wildlife Refuge. Refuge staff will annually assess the performance and maintenance requirements of each of their units and will address maintenance issues that may arise in the future, such as weed control.

Evaluation of Project Benefits

The restoration of native vegetation and reconnection of the Sacramento River to its floodplain provide numerous benefits:

- Filtering of flood debris,
- Reduction of erosive flows,

- Improved water quality of agricultural discharge,
- Improved fish and wildlife habitat,
- Reduced seed sources of invasive weeds, and
- Enhanced wildlife viewing and fishing.

Project Considerations

The project builds in a number of measures that improve field implementation. The identified measures include:

- All installation and maintenance work will avoid damaging existing native riparian vegetation to the extent possible.
- No ground disturbing work will occur within the active channel of the Sacramento River. Any construction work on the floodplain will include best management practices (BMP) to control erosion.
- Surface disturbance of soil and vegetation will be kept to a minimum and typical of the agricultural practices currently on site.
- Existing access and maintenance roads will be used wherever feasible.
- Any earthmoving will occur in the summer (low precipitation) months to reduce the likelihood of soil erosion or sediment discharge.
- Any levee removal or breaching will occur after restoration has commenced so that established vegetation can capture debris and sediment.
- Grading and scraping operations will be suspended when winds exceed 20 mph.
- Any stockpiled soil would be placed, sloped and seeded so that it will not be subject to accelerated erosion.
- The restoration will be planted in rows (20 feet apart) and oriented to generally follow the existing drainage patterns and to enhance floodwater conveyance.
- River Partners will comply with all applicable statutory herbicide application and notification regulations.
- If archeological resources are uncovered during a ground preparation activity, staff members will stop all activity within the immediate vicinity of the discovery, unless safety concerns are an issue. Staff will make an effort to protect resources or remains by flagging off the area. After activity has stopped, staff will immediately contact someone at the River Partners office and the US Fish and Wildlife Service (USFWS) via telephone. Written confirmation will also be turned in to USFWS. Activities resulting in the inadvertent discovery may resume after we receive a notice from USFWS.

Conclusion

In summary, the project and its subsequent maintenance will not have significant adverse impacts to existing adjoining property owners, land use practices, or flood control facilities. In addition to providing habitat for a variety of wildlife species including threatened and endangered species, the proposed project provides incremental flood benefits by increasing floodplain storage and attenuating flood effects downstream of the project area (GMA 2005, Larsen 2005).

References

- GMA. 2001. La BARRANCA Gravel Pit Restoration Project, 2001 Conceptual Grading Alternatives. Graham Matthews and Associates. Weaverville, California.
- GMA 2005. Hydraulic Analysis of La BARRANCA Project Alternatives. Prepared for North State Resources, Inc. May 2005. Weaverville, California.
- Larsen, E.W., and S.E. Greco. 2002. Modeling channel management impact on river migration: a case study of Woodson Bridge State Recreation Area, Sacramento River, California, USA. *Environmental Management* **30**:209-224.
- Larsen, E.W., and E. Girvetz. 2005. Future Meaner Bend Migration and Floodplain Development Patterns near River Miles 241 to 235, Sacramento River. University of California, Davis.
- Larsen, E.W. Evaluation of Geomorphological Processes at the La BARRANCA Unit. June 28, 2005. Located at River Partners, Chico, California.
- MBK Engineers. Hydraulic Impact of La BARRANCA Project Alternatives. (DATE). Located at River Partners, Chico, California.
- North State Resources. 2005. Draft Environmental Assessment for Proposed Activities on the Sacramento River National Wildlife Refuge La BARRANCA and Blackberry Island Units.
- Sacramento River Partners. 2002. Floodplain Restoration Feasibility Study, La BARRANCA Unit, Sacramento River National Wildlife Refuge, Tehama County, California. June 13, 2002. Dan Efseaff, editor. Chico, California.

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