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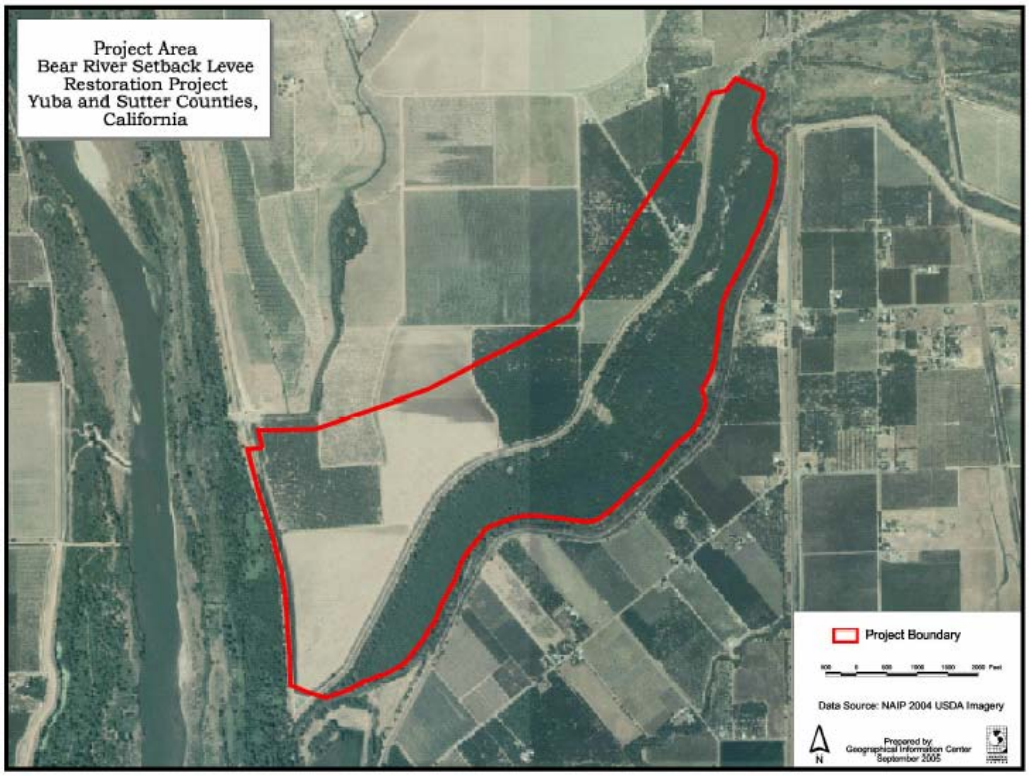
Operations and Maintenance Plan for Riparian and Upland Habitats and Mitigation Features of the Bear River Setback Levee Project

Bear River Miles 0-3.2, Feather River Mile 12 L
Yuba and Sutter Counties, California

August 1, 2006



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About the cover:

Aerial photograph of the Bear River Setback Levee Restoration Project site.

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OPERATIONS AND MAINTENANCE PLAN FOR RIPARIAN AND UPLAND HABITATS AND MITIGATION FEATURES OF THE BEAR RIVER SETBACK LEVEE PROJECT BEAR RIVER MILES 0-3.2 AND FEATHER RIVER MILE 12 L, YUBA AND SUTTER COUNTIES, CALIFORNIA

I. INTRODUCTION

A. Setting

The Bear River Setback Levee Project preserve (Preserve) addressed in this Operations and Maintenance Plan for Riparian and Upland Habitats and Mitigation Features of the Bear River Setback Levee Project (O&M Plan) consists of 639 acres of riparian and upland habitats and mitigation features approximately 13 miles south of Marysville, California, in Yuba and Sutter Counties at the confluence of the Feather and Bear Rivers. The Preserve is located in Township 13 North, Range 4 East, Sections 17,19, 20, 29 and 30 of the Nicolaus 7.5" USGS quadrangle (Figure 1).

The Preserve encompasses the expanded floodplain between the former Bear River Levee alignment and the setback levee (setback area) and land within the Bear River floodway between the Bear River and the former Bear River Levee alignment (Figure 2).

1. Project History

The Three Rivers Levee Improvement Authority (TRLIA) is a joint powers authority with the mission of advancing the flood safety of southwestern Yuba County, California. TRLIA's member agencies are Reclamation District (RD) 784 and the County of Yuba. TRLIA, or its successor agency, will be responsible for the management of the restoration and mitigation areas that are the subject of this O&M Plan.

TRLIA projects entail modifying the levee system on the Bear River, Feather River, Yuba River, and Western Pacific Interceptor Canal (WPIC) in southwestern Yuba County to address identified deficiencies in the system and to reduce river stages by increasing Bear River floodway capacity. Increasing the Bear River floodway capacity is being achieved through a levee setback on the lower Bear River at the confluence with the Feather River.

The objectives of the setback levee project are to:

- provide increased flood protection in the overall RD 784 area and meet 200-year standards where improvements are implemented;
- avoid increasing downstream flow and stage during peak-flow conditions; and
- enhance and restore fish, wildlife, and riparian habitat.

The setback levee project provides significant opportunities to enhance the ecological values of the project area through restoration of native habitats. The restoration component of this project is intended to promote the development of self-sustaining high-quality native habitat types and prevent the project site from becoming dominated

by invasive, non-native plants. The primary goals of the environmental enhancement work associated with the setback levee project are to:

- enhance and restore fish, wildlife, and riparian habitat in the project area;
- maximize a variety of riparian plant communities and other floodplain habitat types;
- meet hydraulic roughness value objectives in the expanded floodway;
- enhance connectivity between adjacent riparian habitats and river channels;
- minimize long-term O&M costs;
- provide mitigation for terrestrial resource impacts of the TRLIA flood control projects to the extent possible; and
- provide protection for a known archaeological site within the levee setback area.

2. Surrounding Land Uses

The Preserve is within an area bordered generally by the Lake of the Woods Management Unit of the Feather River State Wildlife Area, owned by the State of California and managed by California Department of Fish and Game (DFG), on the west; the south levee of the Bear River on the south; State Route 70 to the east; and Feather River boulevard to the north. The Plumas Lake Specific Plan area is north of the Preserve.

3. Regulatory Background

It is the intent of this O&M Plan to comply with the Clean Water Act Section 404 permits for TRLIA's Bear River and WPIC levee improvement projects and the environmental permits and authorizations that address avoidance or mitigation of effects of those projects on listed species, insofar as these permits and authorizations relate to on-site habitat features. The relevant permits and authorizations have been issued for the project by the following agencies for the resources indicated:

- U.S. Army Corps of Engineers (Corps) – general habitat restoration and specific mitigation features for affected jurisdictional waters of the United States,
- U.S. Fish and Wildlife Service (USFWS) – elderberry shrubs, the host plant of the federally protected valley elderberry longhorn beetle (VELB),
- National Marine Fisheries Service (NOAA Fisheries) – fish-protection features, and
- California Department of Fish and Game (DFG) – general habitat restoration partially financed through funding administered by DFG under the Costa Machado Water Act of 2000, Swainson's hawk mitigation, and specific fish-protection features.

Should there be any discrepancies between this O&M Plan and these permits and authorizations, the permits and authorizations override the O&M Plan stipulations unless otherwise approved by the issuing agencies consistent with their jurisdictions.

Figure 1. Location and Vicinity Map for Bear River Setback Levee Project Area, Yuba and Sutter Counties, California.

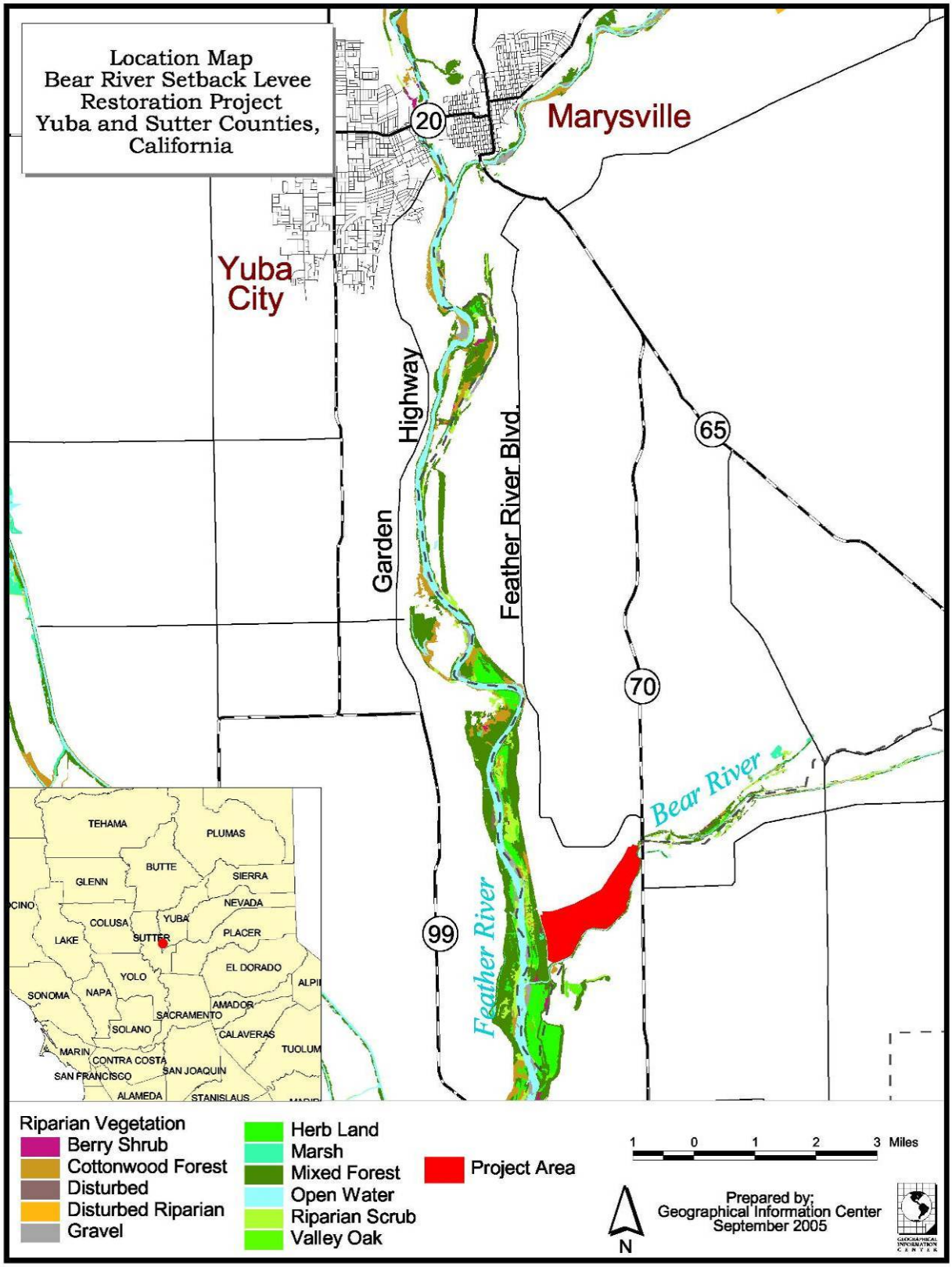
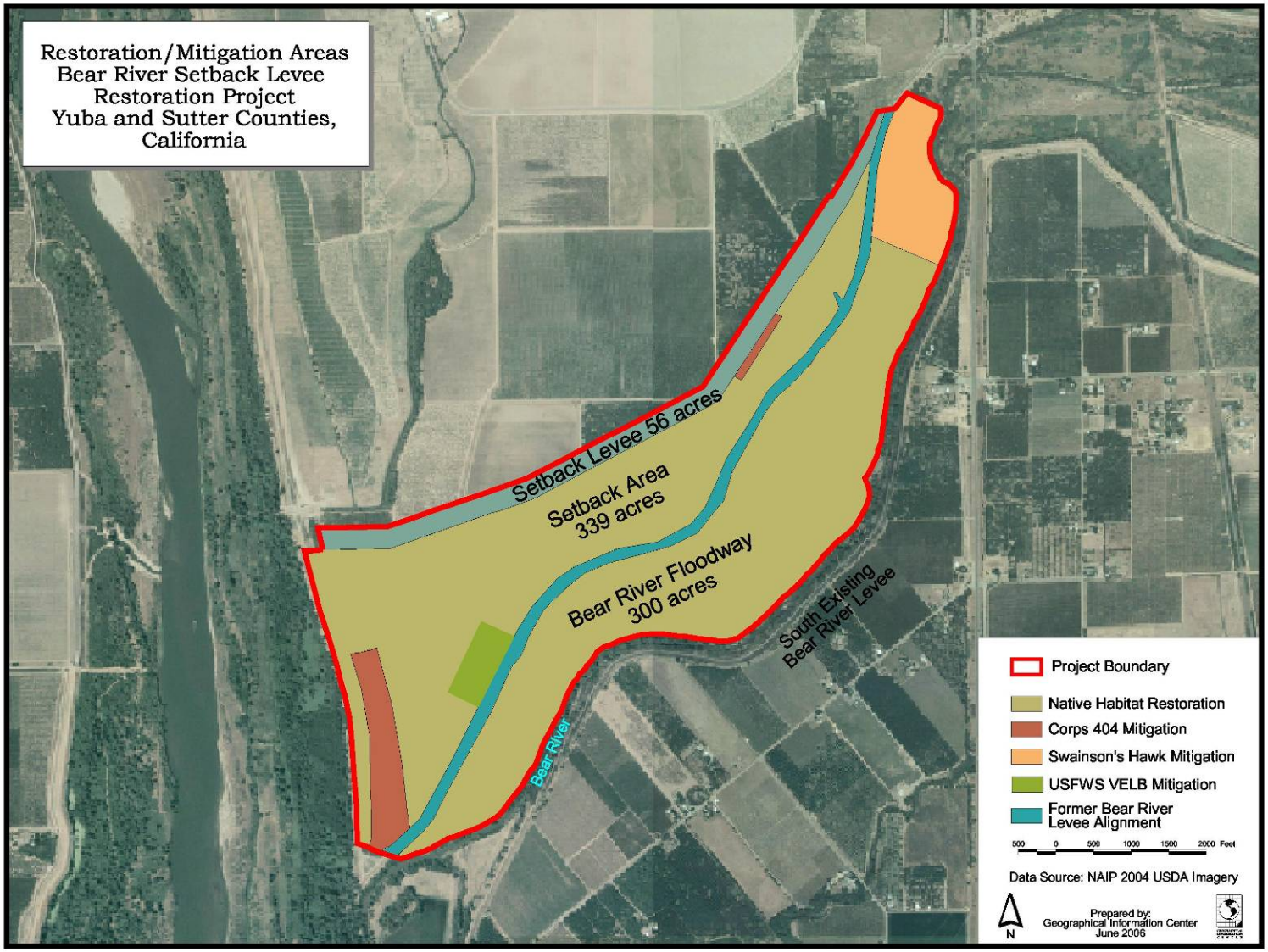


Figure 2. Environmental Enhancement Areas (Restoration and Mitigation) Within the Bear River Setback Levee Project Site.



Corps 404 mitigation within the Preserve includes the following land-cover types:

- emergent wetland,
- willow scrub,
- riparian scrub,
- riparian woodland,
- other waters of the United States,
- valley oak riparian forest, and
- valley oak forest.

USFWS mitigation consists of habitat for VELB.

Swainson's hawk mitigation consists of 39 acres of grassland/savanna.

The Preserve includes a floodplain swale intended to prevent the stranding of fish protected under the federal Endangered Species Act (under the authority of NOAA Fisheries) and the California Endangered Species Act (under DFG).

4. General Preserve Description

The Preserve encompasses 639 acres of native habitat types—including cottonwood/willow association, valley oak riparian forest, riparian scrub, and grassland/savanna. It includes enhancing shaded riverine aquatic (SRA) habitat within 68 acres along the secondary Bear River channel, which is south of the former Bear River Levee alignment. The Preserve does not include the 56-acre setback levee footprint and right-of-way.

B. Topography and Soils

Elevations throughout the Preserve range from approximately 30 feet above sea level (northwest corner of the Preserve near the Feather River levee) to 40 feet above sea level (northeast end of the Preserve adjacent to the Bear River levee).

Three soil types are identified within the Preserve: Columbia fine sandy loam, Shanghai silt loam, and Kilaga clay loam. The Feather and Bear Rivers are bordered by Columbia fine sandy loam. Most of the Preserve is made up of Shanghai silt loam, a very deep somewhat poorly drained soil that is characteristic of floodplains. Only a small section of the Preserve was found to contain Kilaga Clay Loam. This soil is limited by slow permeability and contains a deep hardpan.

C. Biological Resources

The habitat restoration of the Preserve site replaces orchards, row crops, and a few rural residential properties of relatively low habitat value with native habitat types anticipated to support a variety of wildlife species. Shaded riverine aquatic (SRA) habitat and valley oak riparian forest components of the Preserve will enhance habitat for fish species, including Central Valley salmon species and steelhead. Riparian forest

and adjacent grassland will provide nesting and foraging habitat for Swainson's hawk. Elderberry shrub clusters will provide habitat for the valley elderberry longhorn beetle (VELB). Dense clusters of a variety of shrub species are included to support a diversity of migratory songbirds. In addition, several mitigation requirements are embedded in the Preserve. These include several categories of waters of the United States as well as VELB and Swainson's hawk mitigation habitats.

D. Plan Goal

The purpose of this O&M Plan is to describe procedures and provide a schedule and preliminary budget estimate for the long-term maintenance of the riparian and upland habitats and mitigation features on the project site. The goal of this O&M Plan is to ensure that the preserved and created riparian and upland habitats and mitigation features on the project site will be protected in perpetuity without compromising floodwater conveyance capacity as the Bear River channel or floodplain change over time.

II. OWNERSHIP AND LAND MANAGEMENT

A. Ownership

Title to all land acquired by TRLIA will be conveyed to the State of California in the name of the Sacramento-San Joaquin Drainage District. TRLIA will maintain an easement over the properties in question for O&M purposes.

B. Land Management

TRLIA will contract with a qualified entity to conduct maintenance. In the event TRLIA is dissolved, the contract obligations will pass to the County of Yuba or RD 784.

RD 784 will maintain levees in coordination with the entity that is contracted to conduct restoration/enhancement and mitigation maintenance. In addition, RD 784 will be responsible for maintenance and wildfire management along the 50-foot-wide waterside toe access corridor of the setback levee, which will not be addressed in this plan.

III. LONG-TERM MANAGEMENT

A. Long-Term Management Goals

The goal of this O&M Plan is to ensure that the preserved and created riparian and upland habitats and mitigation features on the project site will be protected in perpetuity without compromising floodwater conveyance capacity as the Bear River channel or floodplain change over time. The restoration scheme is shown in Appendix I. Special design considerations are described below.

1. Habitat Design and Hydraulic Roughness Criteria

The restoration will consist mainly of a mosaic of trees, shrubs, and vines growing on the floodplain between the Bear River levees, with grassland/savanna at the northeast end of the Preserve. The primary restoration design considerations were based on the

results of the hydraulic analyses performed by MBK Engineers (MBK Engineers 2005), which established hydraulic roughness criteria for different parts of the project site. Future maintenance of the vegetation associations is necessary to ensure that appropriate roughness values are maintained in perpetuity.

Figure 3 represents the results of the hydraulic analysis performed by MBK Engineers to determine the vegetation roughness values allowed throughout the Preserve to maintain objective water level elevations at the WPIC (MBK Engineers 2005). The modeling demonstrated the following:

- Approximately 500 acres of the project area can be planted to a Manning's roughness value of 0.1, which corresponds to dense trees with branches above the flood stage and little understory (riparian forest).
- Approximately 100 acres at the upper end of the project area must be maintained to an average roughness value no greater than 0.06, which corresponds to maintained vegetation with light to medium brush and a light stand of trees (grassland-savanna). This area is the narrowest part of the floodplain and has a significant effect on the water surface elevations in the WPIC. Thus, long-term management includes monitoring and maintaining the designed roughness values within this designated low-hydraulic-roughness area.

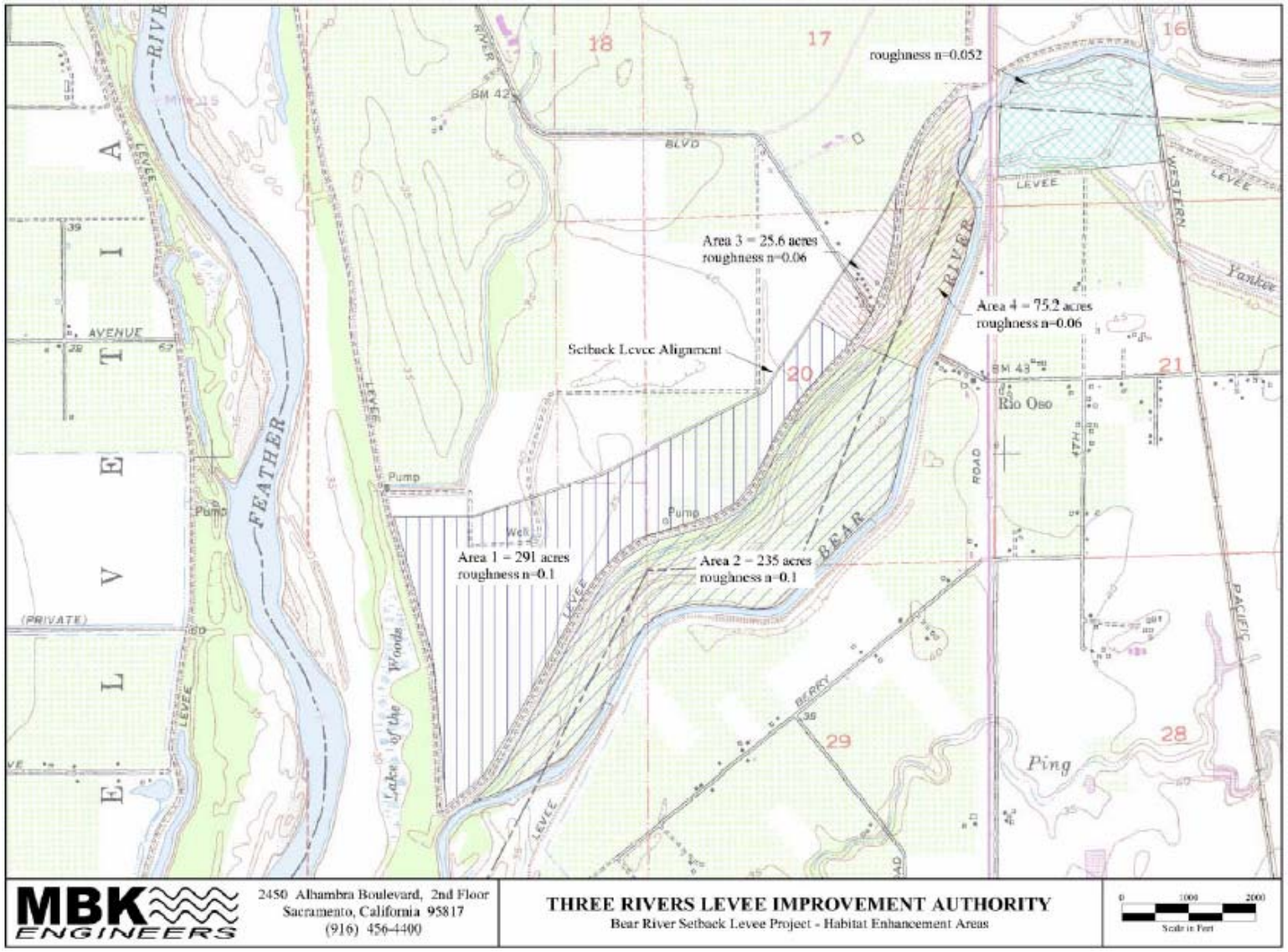
2. Mitigation Features

Goals associated with the mitigation features in the Preserve are to ensure long-term viability of created habitat and to maintain the constructed floodplain swale in perpetuity to serve as a fish passage during flood events. To protect the integrity of the mitigation areas and avoid unanticipated future impacts, no roads, utility lines, trails, benches, equipment or fuel storage, grading, firebreaks, mowing, grazing, planting, disking, pesticide use, burning, or other structures or activities shall be constructed or occur within the on-site mitigation, preservation, and avoidance areas without specific, advance written approval from the Corps, except for maintenance activities identified in this O&M Plan.

3. Flood Conveyance

Because the project site is at the confluence of the Bear and Feather Rivers, the project area is subject to a significant backwater effect from the Feather River during high flows. The design for the project accounts for flood surface elevation associated with these Feather River backwater flows and the effects of dense riparian vegetation on flow velocity in the levee setback area.

Figure 3. Target Roughness Values for Potential Restoration Areas, Bear River Setback Levee Project.



B. Management Units

Monitoring and maintenance activities are defined for the following management units within the Preserve (Figure 4) to ensure the proper hydraulic functioning of the setback area; maintain high-quality habitat values consistent with regulatory and resource agency agreements; and meet requirements for protecting mitigation features:

1) Riparian Restoration Areas
2) Mitigation Areas
3) Floodplain Swale and Adjacent Floodplain
4) Low Hydraulic Roughness Areas

Routine long-term maintenance activities for these areas are described in the following subsections and summarized in Table 1 at the end of this section.

1. Riparian Restoration Areas

Floodplain soils are very rich, allowing plants to survive well and achieve their maximum height and spread in a short period. Unless controlled, invasive weeds, such as annual grasses, giant reed-grass (*Arundo donax)*, salt-cedar (*Tamarix aphylla)*, and Himalayan blackberry (*Rubus procerus)*, may rapidly establish on the floodplain and replace or displace desired native vegetation. Weed communities generally do not provide quality habitat for most wildlife. Maintenance will include the removal of any non-native invasive weed species each spring through focused chemical control. Spot-spraying with herbicide to kill invasive weed species is recommended.

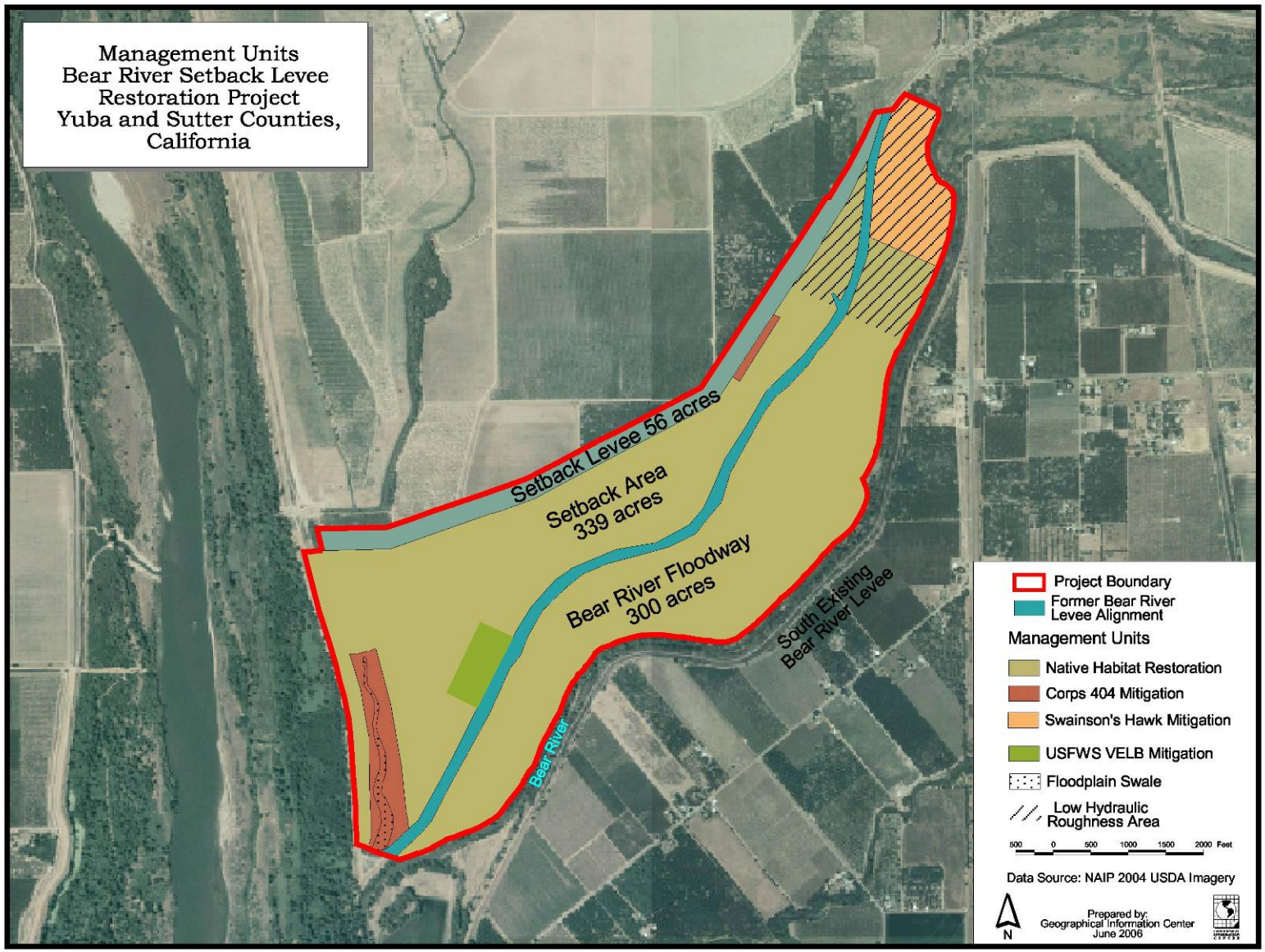
2. Mitigation Areas

To promote the development of contiguous, high-quality habitat and effective management of the on-site preserve, which will be subject to periodic flooding, the Preserve and specific mitigation plantings within the Preserve will not be fenced. However, all roads accessing the setback levee and the Preserve will have locked gates to limit motor vehicle access to the levee and Preserve area to maintenance activities. Appropriate signage also will be installed in accordance with Corps and USFWS requirements indicating the presence of the Preserve and mitigation areas and requirements for their protection. The coordinates of the specific mitigation areas within the on-site preserve will be established and identified on a geo-referenced map or aerial photograph for future identification and differentiation from other Preserve areas. Long-term maintenance of the mitigation areas includes annual monitoring for vandalism and disposal of trash and other debris in the area.

3. Floodplain Swale and Adjacent Floodplain

The constructed swale is at the lowest portion of the floodplain (excluding the channels) and is designed to ensure complete drainage of the portion of the Preserve north of the former Bear River Levee alignment (levee setback area) and prevent fish stranding when floodwater recedes. The design of the swale is shown in Appendix II. If the duration of high flows is sufficient, beavers could construct dams in the swale and impede drainage. Additionally, the swale may develop dense stands of cottonwood and willow seedlings following flooding in the spring. These areas may trap sediments that may eventually alter the drainage of the swale. Ponding of water due to sediment deposition and/or beaver dams may lead to problems such as fish stranding following

Figure 4. Management Units of the Bear River Setback Levee Project Site.



floods and mosquito breeding in the spring. Therefore, some routine annual maintenance of the swale may be necessary. Routine maintenance will be restricted to minor activities to remove debris and fish-passage barriers, such as beaver dams and sediment-trapping vegetation, from the swale. As in the riparian restoration area, spot-spraying with herbicide to kill invasive weed species is recommended if needed. (See Section IV of this O&M Plan for information on long-term monitoring of potential changes in swale function that could lead to fish stranding.)

4. Low Hydraulic Roughness Area

The east section of the Preserve represents a hydraulically sensitive location on the floodplain. This encompasses the area that will be managed as open grassland with very few trees and shrubs to ensure that water surface elevations remain sufficiently low within the WPIC upstream. Keeping this area free of woody species, however, will likely be a challenge. Undesired woody species within this grassland will require removal. Exposure to periodic flooding may facilitate the transport and deposition of sediments and debris within the grassland area. This deposited material could hinder native grass growth and lead to woody species invasion.

Native perennial grasses planted over the entire low hydraulic roughness area are intended to form a dense layer over the soil surface and help to discourage the establishment of woody species. Mowing during the spring and early summer will discourage small trees and shrub species and allow the native grasses to dominate.

Once the native perennial grasses are established (2-3 years after planting), they will form a dense “sod” that will reduce establishment by weeds and woody plants. Nevertheless, maintenance actions must be implemented annually to prevent woody species from establishing.

Properly-timed mowing that prevents the weeds from forming seeds can be an effective method of controlling weeds. Spring weeds such as wild radish (*Raphanus sativus*), black mustard (*Brassica nigra*), and annual grasses should not be very abundant because the native perennial grass will cover virtually the entire soil surface. In addition, the perennial grasses will be actively growing during the winter and spring, forming a very competitive environment for any weed seedling to become established. Thus, mowing during the early and mid-spring should not be necessary. The most problematic weeds will be the species that grow from late spring into early summer, for example, star thistle, Johnson grass, and pepperweed. Mowing will be timed to allow the weeds to begin flowering, but not to develop any seed. For the summer weeds, the schedule will be: the first mowing in early to mid May, with the second mowing 3-4 weeks later in June, and the third mowing in late June or early July. The height of the mower should be 3-4 inches for the first two mowings, and then as low as 1 inch for the final mowing of the year.

Table 1. Schedule for Routine Maintenance of the Management Units of the Bear River Setback Levee Project Area.

Management Unit	Date	Trigger	Common Non-Native Species	Action
Restoration Areas	Spring	New growth of invasive non-native species	Arundo, salt cedar, Himalayan blackberry	**Arundo:** Remove stalks with sicklebar mower and take off-site. Apply glyphosate to new growth. **Salt cedar:** Cut stump and paint with Garlon. **Himalayan blackberry:** Cut and spray with glyphosate on new growth.
Mitigation Areas	Spring/ Summer	-	-	Monitor for vandalism and remove trash.
Floodplain Swale and Adjacent Floodplain	Spring	New growth of invasive non-native species	Arundo, salt cedar, Himalayan blackberry	**Arundo:** Remove stalks with sicklebar mower and take off-site. Apply glyphosate to new growth. **Salt cedar:** Cut stump and paint with Garlon. **Himalayan blackberry:** Cut and spray with glyphosate on new growth.
	Spring	Ponding of water resulting from debris accumulation, sediment-trapping vegetation or beaver dams	-	Remove debris, vegetation or beaver dams.
	Late Spring	Dense stand of cottonwood and willow seedlings within the swale	-	Mow or spray herbicide on new seedlings.
Low Hydraulic Roughness Area	Spring	New growth of invasive non-native species	Arundo, salt cedar, Himalayan blackberry	**Arundo:** Remove stalks with sicklebar mower and take off-site. Apply glyphosate to new growth. **Salt cedar:** Cut stump and paint with Garlon. **Himalayan blackberry:** Cut and spray with glyphosate on new growth.
	Early to mid-May	Weed germination; soil moisture is appropriate for field activities	Johnson grass, yellow starthistle, pepperweed	Mowing should be timed to allow the weeds to begin flowering, but not to develop any seed. Adjust mower to a height of 3-4 inches.
	June	-	-	Adjust mower to a height of 3-4 inches.
	Late June to early July	-	-	Final mowing of the season. Adjust mower to a height of 1 inch.

Annual maintenance will be required to keep the area open.

- Mowing the entire area during the spring and early summer for a total of three times per year should be sufficient to allow native grasses to dominate.
- Spot-spraying with herbicide may be needed to kill individuals of woody plants that survive the mowing.
- Removal of sediments and large woody debris may be required if the hydraulic roughness will be compromised.

IV. MONITORING AND INSPECTIONS-REPORTING REQUIREMENTS

This section of the O&M Plan addresses monitoring and reporting requirements for mitigation areas and is based on the Habitat Mitigation and Monitoring Plan (HMMP) (Jones & Stokes 2006) and the restoration plan (River Partners 2005) for the Preserve. In the HMMP, the monitoring and inspection protocol is two-tiered, with a 10-year monitoring and maintenance effort that is followed by a less intense maintenance program.

A. Monitoring of Corps 404 Mitigation

1. Monitoring Requirements

Following construction and mitigation implementation, a 10-year monitoring program will be conducted in the Corps Section 404 mitigation areas to determine the mitigation sites' progress toward meeting the established success criteria for habitat function and value. The monitoring will include both quantitative surveys to check survival and percent cover, and qualitative surveys for overall condition and success of mitigation efforts (Table 2). The performance criteria that will be used to determine mitigation area success are shown in Table 3. Additionally, continued success of the mitigation wetlands, without human intervention, must be demonstrated for 3 consecutive years, once the success criteria have been met.

During this 10-year monitoring period:

- Annual general maintenance inspections will be conducted that include the assessment/remedy of any weed, vandalism, or erosion problems and trash removal.
- A monitoring biologist will conduct annual qualitative (reconnaissance and photo documentation) inspections.
- A monitoring biologist will conduct annual quantitative inspections (census or permanent plot sampling) to evaluate progression towards meeting the annual performance criteria.

2. Biological Inspections

A qualified biologist will conduct annual inspections during the 10-year monitoring period to help ensure the long-term integrity of the mitigation areas. The monitoring biologist will conduct qualitative and quantitative biological inspections of the mitigation areas during the year to monitor wetland function, thatch accumulation, newly introduced exotic species, and overall habitat function. The goal of these surveys is to ensure that the various habitat types become successfully established and can be maintained in perpetuity.

a) Quantitative Monitoring

(1) Census

During the monitoring period, the monitoring biologist will conduct quantitative project monitoring. A census will be conducted during the first growing season to note survivorship. During implementation, changes in the planting design are possible and will be noted. Deviations in planting will be recorded during the census.

(2) Permanent Plot Sampling

Utilizing permanent plots, monitors will collect data on overall survivorship, height, and cover in subsequent years. All samples will be based on 20 m x 50 m (1,000 m^2) plots (quadrats) placed with the long axis oriented in a north-south direction. The grid cell method (overlaying each area with a 20 m x 50 m grid) will be used to select sampled plots. Locations that are not characteristic of that particular area will be excluded. In general, there will be a plot every 5-20 acres. The plots serve as areas to collect information on woody and herbaceous species.

Each location will be marked with a wooden stake or a flexible survey stake in sites that tend to flood frequently. A description of the location of the northwest corner of each plot and Global Positioning System (GPS) coordinates will be recorded.

Plant status, cover, and height of all shrubs and trees inside the 20 m x 50 m plot will be measured. Because restoration activities often create conditions that favor the survivorship and natural recruitment of native plants, newly recruited native riparian woody species will be noted. The estimate of aerial cover of both trees and shrubs will be based on the longest diameter through the horizontal plane of the plant's drip line, a thin line at which a drop of water would fall from the outwardmost-oriented leaf. Tree heights may be measured with either a clinometer or laser hypsometer. Data analysis will calculate absolute cover, relative cover by wetland indicator species, and relative cover by native species.

b) Qualitative Monitoring

In addition to these quantitative assessments, qualitative assessments will include general plant health, excessive weed competition, target hydraulic conditions, signs of herbivory, use by wildlife, and vandalism. These assessments will be documented through fixed photo points.

The use of select photo points will provide consistent views and orientations for a comprehensive assessment of the progress of mitigation efforts over the monitoring period. The photographic record of the site will be maintained from the time of the initial planting through the end of the monitoring activities. Photographs will include a description of the location number and date of photograph. Field notes associated with photographs will be copied and archived along with monitoring data each year. Color prints will be submitted with the annual monitoring report to the Corps.

3. Remedial Plantings

If performance criteria are not being met during annual monitoring surveys, identified remedial actions such as remedial plantings will be implemented as needed. Adaptive management will be used for remedial plantings to identify those plants best suited to the site based on an evaluation of the site monitoring results. To the extent feasible, plant materials will be collected locally as appropriate or purchased from a nursery specializing in native plant species in this region.

Remedial measures will be undertaken within 1 year if it is determined that performance criteria are not met. Remedial measures may include replanting, weed control, or other

measures to increase the number of surviving plants. A restoration ecologist will determine the specifics with respect to replanting activities.

4. Reporting Requirements

Monitoring reports will be submitted to the Corps annually for years one through four and bi-annually for years six, eight, and ten of the monitoring period and for each additional year if remediation is required by October 1 of each year.

An additional monitoring report will be submitted to the Corps at the end of the 3-year period demonstrating continued success of the mitigation program without human intervention. The only exception to this last requirement will be if the 3-year period occurs wholly within the 10-year monitoring period, in which case the 10-year report may be used to meet this requirement.

Table 2. Corps 404 Mitigation Monitoring and Reporting, Bear River Setback Levee Project.

Activity	Approximate Date or Frequency	Details
Qualitative Monitoring	Annually	• Assess general plant health, excessive weed competition, appropriate hydrological conditions, signs of herbivory, use by wildlife, and vandalism. • Documented through fixed photo points.
Quantitative Monitoring	Annually	• Conduct a census during the first growing season to note survivorship. During implementation, changes in the planting design are possible and should be noted. Deviations in planting shall be recorded during the census. • Collect data on overall survivorship, height, and cover in subsequent years utilizing permanent plots. Plant status, cover, and height of all shrubs and trees inside the 20 m x 50 m plot will be measured. Because restoration activities often create conditions that favor the survivorship and natural recruitment of native plants, newly recruited native riparian woody species will be noted. Data analysis will calculate absolute cover, relative cover by wetland indicator species, and relative cover by native species. • If performance criteria are not being met during annual monitoring surveys, identified remedial actions such as remedial plantings will be implemented as needed. Remedial measures may include replanting, weed control, or other measures to increase the number of surviving plants.
Reporting	Years 1-4, 6, 8, and 10 by October 1.	• Submit monitoring reports to Corps. • Submit an additional monitoring report to the Corps at the end of the 3-year period demonstrating continued success of the mitigation program without human intervention. The only exception to this last requirement shall be if the 3-year period occurs wholly within the 10-year monitoring period. In which case, the 10-year report may be used to meet this requirement.

Table 3. Performance Criteria to Measure Emergent Wetlands Mitigation Success, Corps 404 Mitigation Area, Bear River Setback Levee Project.

Year	Survival of Trees and Shrubs (%)	Total Cover (%) of Wetland Indicator Species
1	85	5
2	75	10
3	65	15
4	55	20
5	50	25
6	50	25
7	50	25
8	50	25
9	50	25
10	50	25

Additional monitoring of the floodplain swale portion of the Corps 404 mitigation as it relates to fish passage is provided below in Section C.

B. Monitoring of VELB Mitigation Area

A biologist will monitor elderberry transplants and associated native plants within the VELB mitigation area. The population of VELB, the general condition of the mitigation area, and the condition of the elderberry and associated native plantings in the conservation area will be monitored over 10 consecutive years following the survey and monitoring procedures listed in the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS 1999). The monitoring and reporting requirements are summarized in Table 4 at the end of this section.

1. Annual Surveys

Each year during the 10-year monitoring period, a minimum of two site visits between February 14 and June 30 will be made by a qualified biologist. According to the guidelines, the surveys must include the following:

- A population census of the adult beetles, including the number of beetles observed, their condition, behavior, and their precise locations. Visual counts must be used; mark-recapture or other methods involving handling or harassment must not be used.
- A census of beetle exit holes in elderberry stems, noting their precise locations and estimated ages.
- An evaluation of the elderberry plants and associated native plants on the site, and on the conservation area, if disjunct, including the number of plants, their size and condition.
- An evaluation of the adequacy of the signs and weed control efforts in the avoidance and conservation areas.
- A general assessment of the habitat, including any real or potential threats to the beetle and its host plants, such as erosion, fire, excessive grazing, off-road vehicle use, vandalism, excessive growth, etc.

A minimum survival rate of at least 60 percent of the elderberry plants and 60 percent of the associated native plants must be maintained throughout the monitoring period.

Within 1 year of discovery that survival has dropped below 60 percent, failed plantings will be replaced to bring survivorship above the success criteria.

2. Reporting Requirements

Monitoring reports will be submitted annually by December 31 to USFWS and DFG. Copies of the report should be sent to:

- Chief of Endangered Species, Sacramento Fish and Wildlife Office, 2800 Cottage Way, W-2605, Sacramento, CA 95825
- Supervisor, Environmental Services, Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814
- Staff Zoologist, California Natural Diversity Data Base, Department of Fish and Game, 1220 S Street, Sacramento, CA 95814.

Table 4. VELB Mitigation Monitoring and Reporting, Bear River Setback Levee Project.

Activity	Approximate Date or Frequency	Details
Qualitative Monitoring	Annually	• Evaluate the adequacy of the signs and weed control in the avoidance and mitigation areas. • Assess the habitat, including any real or potential threats to the beetle and its host plants, such as erosion, fire, excessive grazing, off-road vehicle use, vandalism, excessive growth, etc.
Quantitative Monitoring	Annually, minimum two surveys between February 14 and June 30.	• A population census of the adult beetles, including the number of beetles observed, their condition, behavior, and their locations. Visual counts must be used; mark-recapture or other methods involving handling or harassment must not be used. • A census of beetle exit holes in elderberry stems, noting their locations and estimated ages. • An evaluation of the elderberry plants and associated native plants in the mitigation area, including the number of plants, their size and condition.
Reporting	December 31	• Submit monitoring reports annually to USFWS and DFG.

C. Monitoring of Swale and Adjacent Floodplain

The following monitoring will be conducted to evaluate the effectiveness of the floodplain swale in preventing fish stranding in the northern portion of the Preserve and the potential for the development of substantial barriers to fish passage in the Preserve. The swale also serves as Corps Section 404 mitigation; therefore, the swale-monitoring activities described in this section are in addition to the monitoring and reporting requirements for Section 404 mitigation described in Section A above. The monitoring and reporting requirements described below are summarized in Table 5 at the end of this section.

1. Monitoring Requirements

Monitoring of the swale and adjacent floodplain will be conducted for at least 10 years after the swale is fully constructed and until the setback area has been inundated by at least three flood events from the upper end by overtopping of the Bear River bank. The monitoring will be conducted to assess whether hindrances to drainage and fish

passage have developed. The length, frequency, and scope of any additional monitoring will be determined in coordination with NMFS and DFG and will depend on results of the monitoring conducted during the 10-year period following swale construction and levee degradation, including the extent of floodplain habitat development and its effect on monitoring feasibility. The following specific monitoring actions will be conducted.

- A baseline visual assessment of the levee setback area (the northern portion of the Preserve, above the former Bear River Levee alignment) will be conducted by a qualified biologist after the swale is fully constructed and levee degradation has occurred, and before the high-flow season begins on November 1. The survey will document features of the setback area, including physical and biological components of the site, such as vegetation and expected fish passage routes. Specific stations will be established to conduct photo documentation of the levee setback area during subsequent surveys.

- For the first 10 years following the completion of construction, a visual survey will be conducted by a qualified biologist once per year in years in which the swale and adjacent floodplain are inundated. A survey will also be conducted after each event that inundates the setback area from the upstream eastern end by overtopping the bank of the Bear River during this 10-year period, or following the first three such events, whichever is longer. The purpose of these surveys will be to identify the extent of any ponded areas that cannot drain to the floodplain swale. Photo documentation will be conducted from the stations established during the baseline visual survey and from other points, as necessary, to document the condition of the swale and adjacent floodplain.

2. Reporting Requirements

Following each year when monitoring is conducted, a letter report summarizing the overall condition of the floodplain habitat and any changes that have occurred since the previous report shall be submitted to NMFS and DFG by August 1. The focus of the report will be an assessment of potential for fish passage and stranding. The report will recommend remediation measures, if needed, along with a schedule specifying when the remediation activities will occur. Based on project design and hydraulic and sediment deposition analyses, potential remediation is anticipated to be restricted to minor maintenance activities to remove debris, dense vegetation and fish passage barriers, such as beaver dams, from the swale. The ultimate goal is that the swale and restoration area function naturally and as planned with minimal human intervention and maintenance.

Table 5. Floodplain Swale Monitoring and Reporting, Bear River Setback Levee Project.

Activity	Approximate Date or Frequency	Details
Conduct baseline visual assessment of the swale area after the swale is fully constructed, restoration is complete, levee degradation has occurred and before the high-flow season.	By November 1 of year of construction	• Document features of the restoration area, including physical and biological components of the site, such as vegetation and expected fish passage routes. • Establish permanent stations to conduct photo documentation of the setback area during subsequent surveys.
Perform visual survey after flood events.	After each event that inundates the swale during the first 10 years	• Document the condition of the swale and adjacent floodplain.
	After each event that inundates the setback area from the upstream end by overtopping the bank of the Bear River during the first 10 years, or following the first 3 such events, whichever is longer.	• Document the condition of the swale and adjacent floodplain. • Identify the extent of any ponded areas that cannot drain to the floodplain swale after a flood event stemming from the Bear River.
Submit to NMFS and DFG a letter report summarizing the overall condition of the floodplain habitat and any changes that have occurred since the previous report.	August 1 of each monitoring year	• The focus of the report will be an assessment on potential for fish passage and stranding. The report will recommend remediation measures, if needed, along with a schedule specifying when the remediation activities will occur.

D. Swainson's Hawk Mitigation Area

1. Monitoring Requirements

Monitoring of the 39-acre Swainson's hawk mitigation site will be conducted to assess the establishment of woody plants in the identified low roughness area and the viability of the habitat management actions that focus on maintaining the native grassland habitat lands for Swainson's hawk use.

During the 3-year establishment period, a biologist will conduct an annual survey (in May) of the native grasses. Cover will be estimated through visual estimates of 1-m-square plots randomly selected along a permanent transect. Ocular estimates of cover by native herbaceous understory species, general weeds, weeds of concern, and bare ground/litter will be recorded.

2. Reporting Requirements

There are no reporting requirements for the Swainson's Hawk mitigation area.

V. PROHIBITED ACTIVITIES

This section outlines the restrictions on activities that can take place in the Preserve. The following activities are prohibited, except as needed to accomplish the above-mentioned management and maintenance activities or as described below. Additionally, if any of these activities must be undertaken because of special circumstances, they may need to be reviewed and approved by the Corps, USFWS, and DFG on a case-by-case basis.

A. Access to Preserve

The intent of the Preserve is to maintain the created and preserved habitats in perpetuity. Limited access to the Preserve furthers this goal. Off-trail pedestrian access to the Preserve will be discouraged through gates and signs.

B. Vegetation Removal

No removal or alteration of any existing native vegetation will be allowed in the Preserve except as described in this O&M Plan and except for other maintenance activities as required to maintain the design conveyance capacity (i.e., the design roughness values) and the general flood conveyance patterns across the project site. Such activities would include removal of vegetative material, living and dead that interferes with the successful execution, functioning maintenance, or operation of the adopted plan of flood control.

No native trees with a trunk diameter at breast height (DBH) in excess of 4 inches will be removed or damaged within the Preserve without prior consultation with and approval of a DFG representative and the Corps or approval of USFWS in the VELB mitigation area.

C. Burning and Dumping

No burning or dumping of rubbish, garbage, or any other wastes or fill materials will be allowed in the Preserve.

D. Disking

Disking will not occur within the Preserve.

E. Equipment or Fuel Storage

There will be no storage of equipment or fuel within the Preserve.

F. Topography

Disturbance of the topography within the Preserve is not allowed except for sediment removal activities required to reestablish the design topography and design conveyance capacity of the floodway. Such activities would include the clearing of sediment areas and removal of sediment that interferes with the successful execution, functioning, maintenance, or operation of the adopted plan of flood control. No exploration, development, or extraction of oil, gas, or minerals will be allowed in the Preserve.

G. Pesticides and Chemical Agents

Except as needed for management of the habitat as outlined in this O&M Plan, there will be no use of any pesticides, fungicides, insecticides or any other chemical agents used to kill or suppress plants, animals, or fungi in the Preserve.

Other chemical pollutants introduced into the Preserve in relation to O&M activities, including raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to aquatic life, will be prevented from contaminating the soil and/or entering the waters of the state. If any of these materials are placed within or where they may enter a stream or lake, they will be removed immediately. DFG, the Corps, and USFWS (if the activity affects the VELB mitigation area) will be notified immediately by the Operator of any spills and shall be consulted regarding cleanup procedures.

H. Motor Vehicle Use

No motorized vehicles will be permitted on any portion of the Preserve with the exception of the motorized access required for activities described in this plan; for Preserve maintenance purposes such as authorized mosquito abatement; and for emergency or law enforcement situations requiring access by medical, fire or law enforcement vehicles.

The speed limit on roads in the Preserve will not exceed 20 mph.

Movement of heavy equipment is restricted to established roadways.

I. Non-native Plants

No non-native plants shall be planted in the Preserve.

VI. FUNDING AND BUDGET NEEDS

The preliminary estimated annual costs of carrying out the required maintenance and monitoring for the Preserve are presented in Table 6. These costs have been estimated using 2005 prices and labor charges and do not reflect inflation. They also do not reflect the discontinuation of some of the monitoring and reporting requirements over time or the assumption that some activities will not occur in every year. A Property Analysis Record (PAR) will provide a more accurate representation of the costs of long-term management of the subject Preserve based on analysis of the specific characteristics of the property, management requirements and administrative costs.

Table 6. Estimated Long-Term O&M Costs for Riparian and Upland Habitats and Mitigation Features of the Bear River Setback Levee Project.

AREA/FEATURE	MAINTENANCE NEED	ACTION	FREQUENCY	ANNUAL COST
Riparian Restoration and Mitigation Areas	Exotic plant removal	Spot-spray with herbicide	Annual	$3,200
	Vandalism, trash and debris removal	General site survey	Annual	$600
Floodplain Swale	Ponding of water by beaver dams, debris, or sediment-trapping vegetation	Visual survey	Annual	$5,100
		Remove barriers (dams, debris, and/or vegetation)	Annual	$2,100
	Exotic plant removal	Spot-spray with herbicide	Annual	$1,000
Low Hydraulic Roughness Area	Prevent establishment of woody plants	Maintain dense stand of native grasses	Annual, mow up to three times in spring and early summer	$5,600
	Exotic plant removal	Spot-spray with herbicide	Annual	$1,000
	Large woody debris	Removal if it compromises hydraulic integrity	Annual	$1,200
		Estimated costs		**$19,800**

Notes:
1. This table does not include maintenance, irrigation, and monitoring required as part of the 3-year restoration and mitigation establishment period.

VII. REFERENCES

River Partners. 2005. Riparian Restoration Plan for Bear River Setback Levee Project, Yuba County, California. Issued for Approval. Chico, California.

MBK Engineers. 2005. Hydraulic and Hydrologic Analysis of the Three Rivers Levee Improvement Authority's Phase 3 Project Basis of Design for Bear River Setback Levee Project (Revision 1). Sacramento, California.

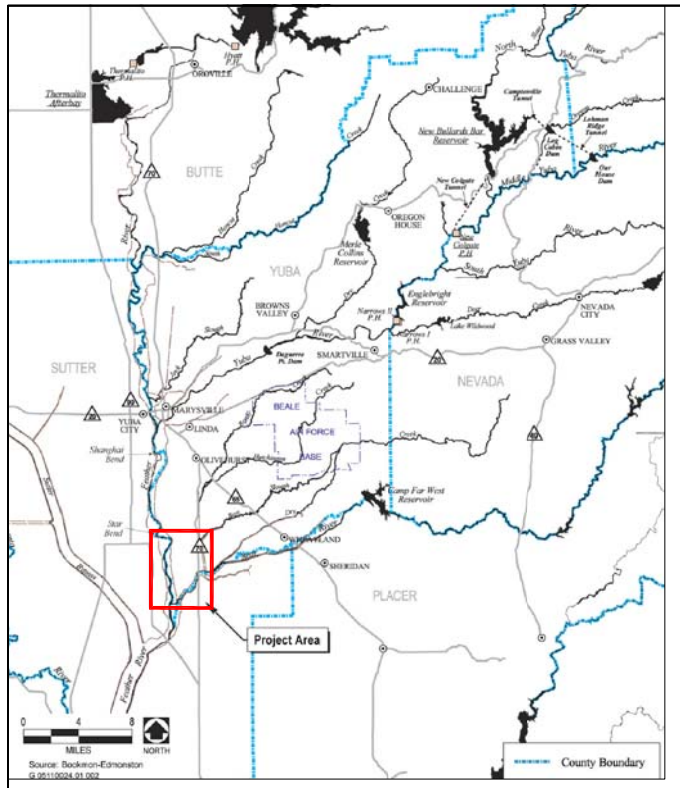
Jones and Stokes. 2006. Habitat Mitigation and Monitoring Plan for the Feather-Bear-WPIC Levee Improvements Project. Prepared for Three Rivers Levee Improvement Authority. Sacramento, California.

PWA 2005. The Bear River Levee Setback Design: Assessment of Potential Geomorphic Effects. Prepared for BE/GEI and the Three Rivers Levee Improvement Authority. San Francisco, California.

USFWS. 1999. Conservation guidelines for the Valley Elderberry Longhorn Beetle. http://sacramento.fws.gov/es/documents/velb_conservation.htm Accessed on July 7, 2004.

Appendix I: Restoration Master Plan for the Bear River Setback Levee Project, including Habitat Mitigation Plan

Restoration Master Plan for the Bear River Setback Levee Project, including Habitat Mitigation Plan



Location Map

PUMP STATION NO. 6

NORTH DETENTION BASIN

SETBACK LEVEE

Road 512

LEVEE TO BE REMOVED

LEVEE ACCESS RAMPS (BOTH SIDES)

GATE

RELIEF WELL DRAINAGE DITCH

TOE ACCESS CORRIDORS

Valley Oak Forest and Riparian Woodland area. See Sheets 2 and 5 for addtional information

CLARK SLOUGH

SOUTH DETENTION BASIN

Match Line See Sheet 2
Match Line See Sheet 3

EXISTING PUMP STATION NO. 2

FEATHER RIVER LEVEE

RELIEF WELL DITCH OUTFALL

LEVEE TO BE REMOVED

EXISTING LEFT BANK FEATHER RIVER LEVEE

EXISTING GATE

NOTCH IN EXISTING LEVEE

BEAR RIVER

EXISTING RIGHT BANK BEAR RIVER LEVEE

SHALLOW CONTOURING AREA FLOODPLAIN SWALE

NOTES:

1. See sheet 2 and 3 for planting areas.

2. See sheet 4, 5, and 6 for plant species and quantities.

0 1250 2500 feet

Overall Site Plan

Sheet 1

Sheet 1 of 6

December 28, 2005

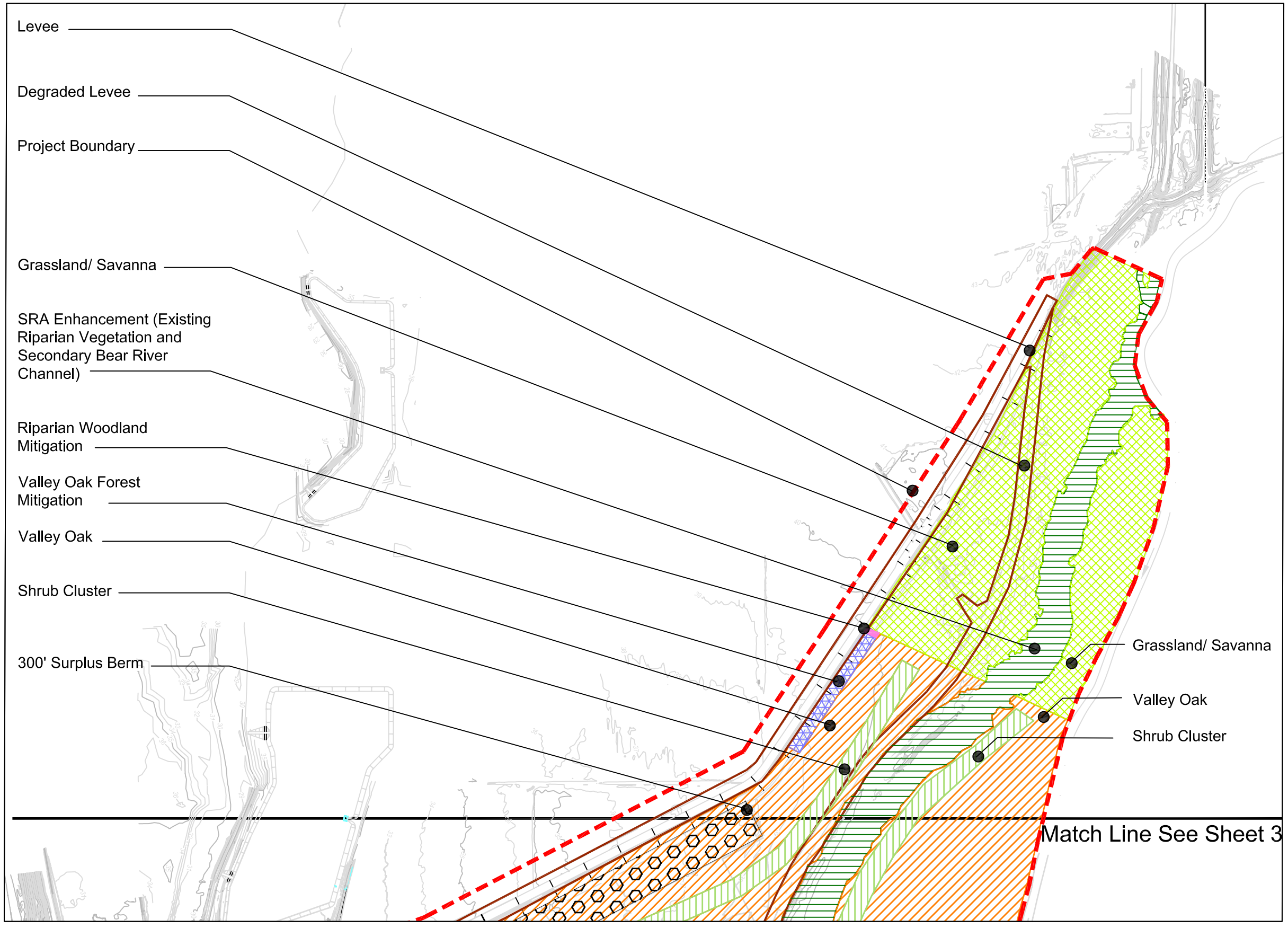
"These plans communicate the planting design program for the restoration area. These plans include sufficient information to allow for general understanding of the required planting construction for this project; however, these plans do not include comprehensive details and specifications and, therefore, can not to be interpreted as complete documents for use during actual construction."

RIVER PARTNERS

EDAW

P:\2005\05110024.01 Bear River Levee\CAD\plantingplan12_05.dwg

Restoration Master Plan for the Bear River Setback Levee Project, including Habitat Mitigation Plan



NOTE:

1. See sheet 4, 5, and 6 for plant species and quantities.

2. SRA enhancement will consist of removing Himalayan blackberry throughout portions of the existing riparian vegetation and replacing it with cottonwoods, white alder and willows. No restoration plantings will take place in the secondary Bear River channel.

0 800 1600 feet

Planting Plan

Sheet 2

Sheet 2 of 6

December 28, 2005

"These plans communicate the planting design program for the restoration area. These plans include sufficient information to allow for general understanding of the required planting construction for this project; however, these plans do not include comprehensive details and specifications and, therefore, can not to be interpreted as complete documents for use during actual construction."

RIVER PARTNERS

EDAW

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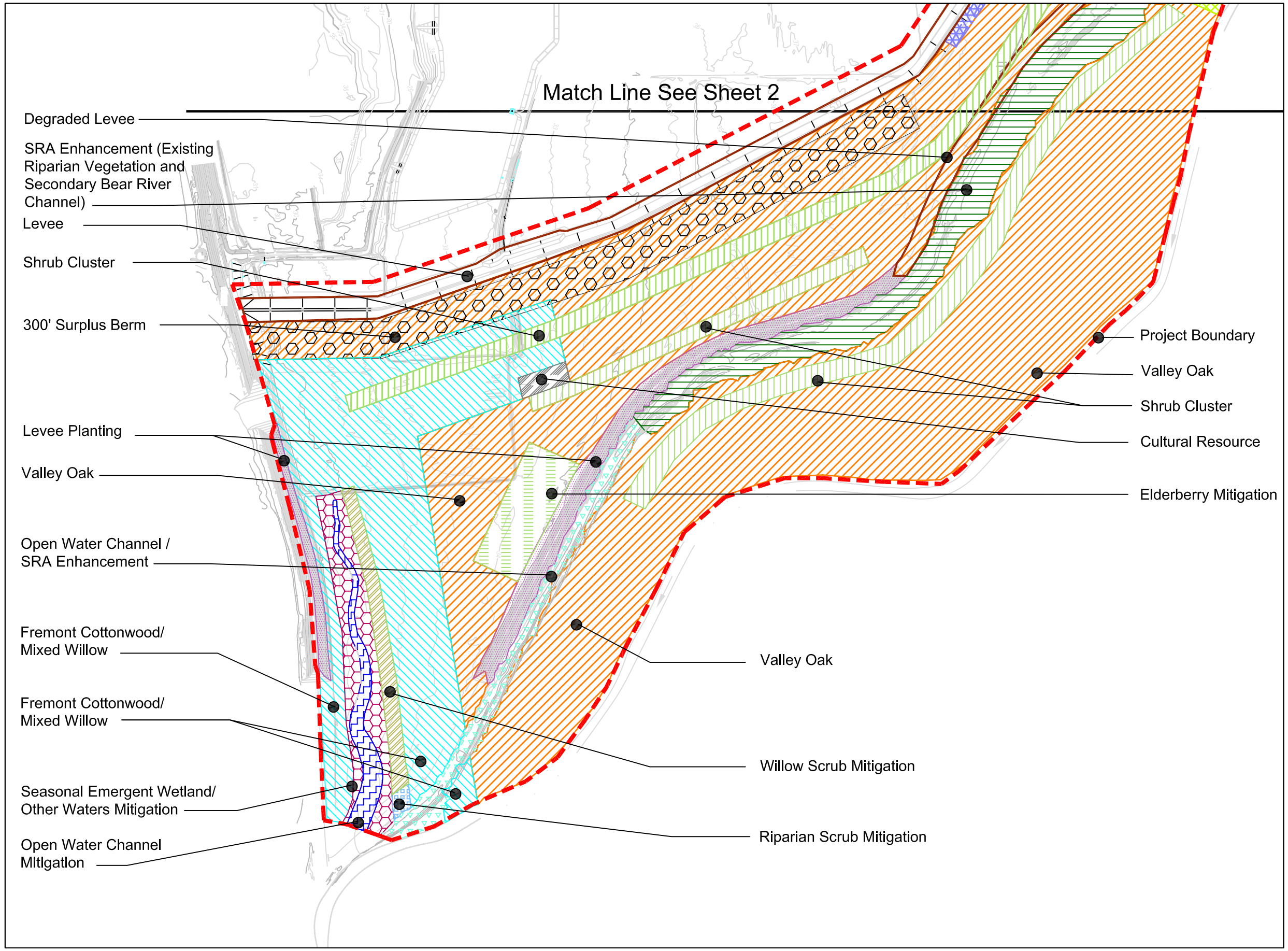
Restoration Master Plan for the Bear River Setback Levee Project, including Habitat Mitigation Plan



NOTE:

1. See sheet 4, 5, and 6 for plant species and quantities.

2. SRA enhancement will consist of removing Himalayan blackberry throughout portions of the existing riparian vegetation and replacing it with cottonwoods, white alder and willows. No restoration plantings will take place in the secondary Bear River channel.

0 800 1600 feet

Planting Plan

Sheet 3

December 28, 2005

"These plans communicate the planting design program for the restoration area. These plans include sufficient information to allow for general understanding of the required planting construction for this project; however, these plans do not include comprehensive details and specifications and, therefore, can not to be interpreted as complete documents for use during actual construction."

RIVER PARTNERS

EDAW

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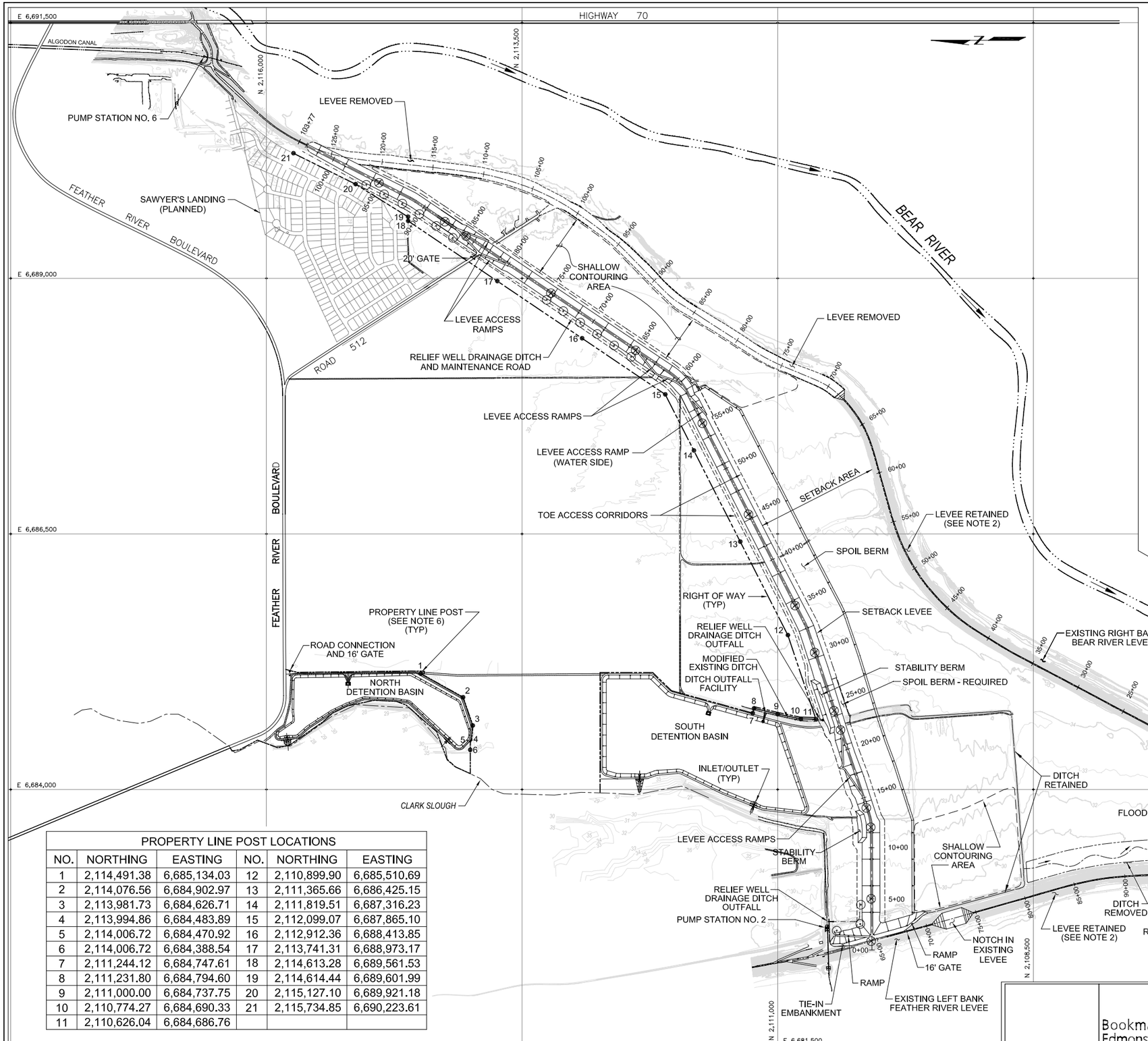
Appendix II: Engineering drawing C-92 Floodplain swale with elevations.



PROPERTY LINE POST LOCATIONS					
NO.	NORTHING	EASTING	NO.	NORTHING	EASTING
1	2,114,491.38	6,685,134.03	12	2,110,899.90	6,685,510.69
2	2,114,076.56	6,684,902.97	13	2,111,365.66	6,686,425.15
3	2,113,981.73	6,684,626.71	14	2,111,819.51	6,687,316.23
4	2,113,994.86	6,684,483.89	15	2,112,099.07	6,687,865.10
5	2,114,006.72	6,684,470.92	16	2,112,912.36	6,688,413.85
6	2,114,006.72	6,684,388.54	17	2,113,741.31	6,688,973.17
7	2,111,244.12	6,684,747.61	18	2,114,613.28	6,689,561.53
8	2,111,231.80	6,684,794.60	19	2,114,614.44	6,689,601.99
9	2,111,000.00	6,684,737.75	20	2,115,127.10	6,689,921.18
10	2,110,774.27	6,684,690.33	21	2,115,734.85	6,690,223.61
11	2,110,626.04	6,684,686.76			

NOTES

1. TOPOGRAPHY WAS PROVIDED BY MHM INC. BASED ON MARCH 2005 AERIAL SURVEY BY RADMAN AERIAL SURVEYS. VERTICAL DATUM IS U.S. ARMY CORPS OF ENGINEERS GROUND CONTROL BASED ON 1929 NGVD. HORIZONTAL DATUM IS CALIFORNIA COORDINATE SYSTEM, ZONE 2 (NAD 1983).
2. THE LENGTHS OF LEVEE REMOVAL SHOWN ARE BASED ON HYDRAULIC (FLOOD CONTROL) REQUIREMENTS. THE LENGTHS OF THE REACHES OF LEVEE SHOWN AS BEING RETAINED ARE MAXIMUM LENGTHS. THESE REACHES OF LEVEE MAY BE SHORTENED (DEGRADED FURTHER) IF MORE BORROW MATERIAL IS NEEDED FOR PROJECT CONSTRUCTION.
3. WELLS AND POWER LINES IN THE SETBACK AREA AND WALNUT ORCHARD INSIDE THE EXISTING FLOODWAY ARE TO REMAIN FOR ENVIRONMENTAL RESTORATION IRRIGATION.
4. LOCATIONS OF EXISTING FEATURES ARE APPROXIMATE.
5. SEE DWG. G-6 FOR UTILITIES.
6. FURNISH AND INSTALL PROPERTY LINE POSTS AT LOCATIONS SHOWN. PROPERTY LINE POSTS SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH CALTRANS STANDARD SPECIFICATION SECTION 82 AND CALTRANS STANDARD PLAN A73C, CLASS 2 METAL POST (WITH RETROREFLECTIVE SHEETING).

LEGEND

- GATE
- RELIEF WELL
- SETTLEMENT MONUMENT
- 10 PROPERTY LINE POSTS
- RIGHT-OF-WAY (PROPERTY OR PERMANENT EASEMENT BOUNDARY)

0 500 1,000
SCALE, FEET

NO.	DATE	ISSUE/REVISION	DES	DRN	CH	APP
0	03-10-06	ISSUED FOR CONSTRUCTION	KT	PYM	FG	AP

Bookman-Edmonston
A Division of GEI Consultants

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
Government Center
915 Eighth Street, Suite 115
Marysville, CA 95901-5273

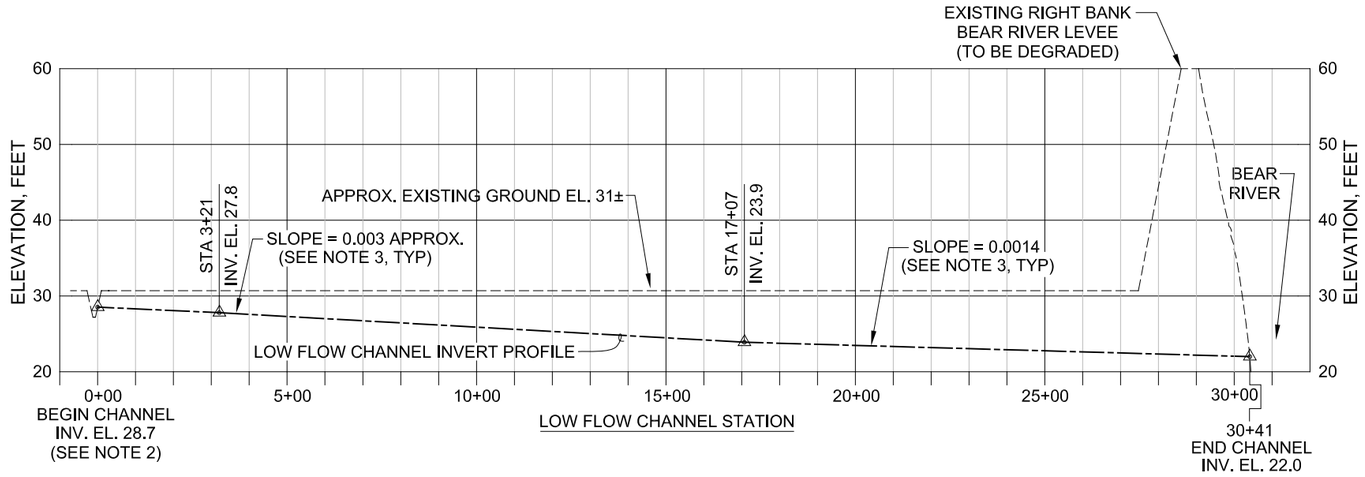
GEI Project 050110

BEAR RIVER SETBACK LEVEE
Reclamation District No. 784
Yuba County, California

SITE PLAN

DWG. NO. G-13

G-13 01-09-06 PYM



LOW FLOW CHANNEL PROFILE

0 10 20 (VERTICAL) SCALE, FEET

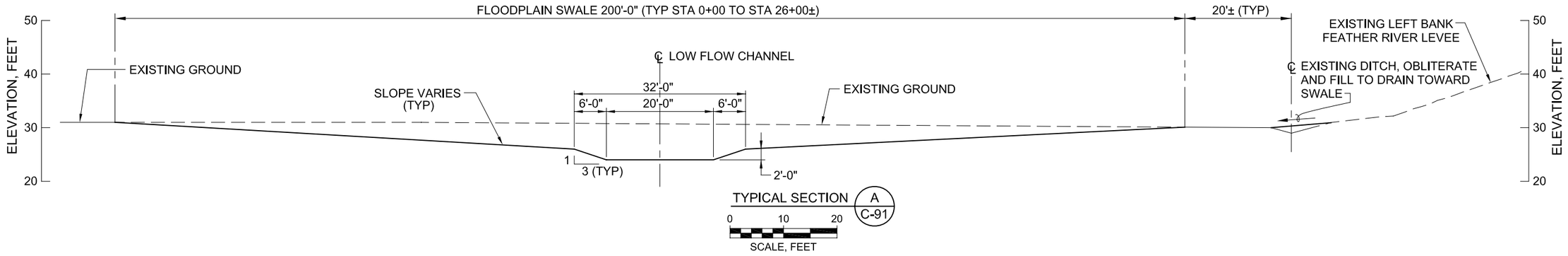
0 200 400 (HORIZONTAL) SCALE, FEET

NOTES

1. SEE DWG. C-90, NOTE 2.
2. DO NOT MATCH INVERT ELEVATION OF LOW FLOW CHANNEL WITH INVERT ELEVATION OF EXISTING DITCH.
3. SLOPE OF LOW FLOW CHANNEL INVERT IS APPROXIMATE. LOW FLOW CHANNEL INVERT SLOPE SHALL BE CONSTANT BETWEEN INVERT GRADE CONTROL POINTS SHOWN ON PROFILE.

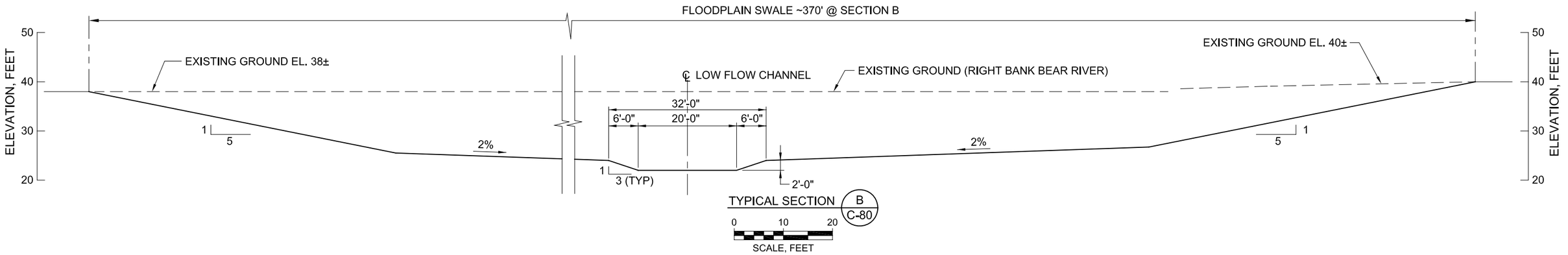
LEGEND

△ INVERT GRADE CONTROL POINT



TYPICAL SECTION A C-91

0 10 20 SCALE, FEET



TYPICAL SECTION B C-80

0 10 20 SCALE, FEET

NO.	DATE	ISSUE/REVISION	DES	DRN	CH	APP
0	03-10-06	ISSUED FOR CONSTRUCTION	AP	PYM	FG	AP

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A Division of GEI Consultants

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
Government Center
915 Eighth Street, Suite 115
Marysville, CA 95901-5273

GEI Project 050110

BEAR RIVER SETBACK LEVEE
Reclamation District No. 784
Yuba County, California

FLOODPLAIN SWALE PROFILE AND SECTIONS

DWG. NO. C-92

C-92 03-08-06 PYM