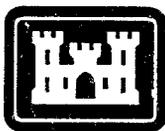


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**STANDARD
OPERATION AND MAINTENANCE
MANUAL**
for
Sacramento River Flood Control Project

**Sacramento Urban
Mitigation Area**

March 1996



Sacramento District
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

MANUAL CONTENTS

This manual consists of 3 components which have been included herein:

- * **Standard Operation and Maintenance Manual, Revised May 1955**
(The standard 1955 O&M manual does not address vegetation on mitigation areas.)
- * **Addendum to the Standard O&M Manual, April 1995**
(The addendum was prepared to specifically address general maintenance on mitigation areas as it applies to all sites and is organized to correspond to the standard 1955 manual.)
- * **Supplement to the Addendum, March 1996**
(The supplement addresses maintenance items which are specific to each site location identified herein. Only items that have not been addressed previously and which are unique to the mitigation site indicated herein are addressed in this supplement.)

ADDENDUM
TO THE

**STANDARD
OPERATION AND MAINTENANCE
MANUAL**

FOR THE
SACRAMENTO RIVER
FLOOD CONTROL PROJECT

APRIL 1995



SACRAMENTO DISTRICT
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

ADDENDUM

to the

STANDARD OPERATION AND MAINTENANCE MANUAL
Sacramento River Flood Control Project
(Revised May 1955)

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ADDENDUM FORMAT & CONTENT

The organization and format of this addendum is written to be consistent with the Standard Operations & Maintenance Manual for the Sacramento River Flood Control Project (Revised May 1955), and is intended to provide supplemental information that is not presently addressed.

SECTION I

INTRODUCTION

1-02 PURPOSE OF THE MANUAL: Vegetation on mitigation project sites has become an important ingredient in flood protection work. This addendum addresses vegetation on mitigation areas, including vegetation placed in rock revetment on berms, and does NOT address vegetation on levees. Maintenance practices found herein are intended to provide general guidance for local maintenance district personnel. These guidelines are intended to reflect a change in the value and acceptance of certain vegetation within the flood control channel and shall be used in place of the Standard Operation and Maintenance Manual (1955) when managing mitigation sites. The 1955 Standard Operation and Maintenance Manual will continue to provide primary guidance for all public safety issues and decisions.

A supplement to this addendum will be provided for each mitigation site on the Sacramento River Flood Control Project (SRFCP) to address individual site characteristics that will dictate peculiar vegetation maintenance requirements. Each supplement will address those items that vary from this addendum and that are unique to the locations covered by the supplement.

1-03 LOCATION AND DESCRIPTION: The majority of project mitigation areas are located along the banks of the Sacramento River. The nature of a mitigation site on this project typically is comprised of one of three types of areas. As-constructed drawings will show location and layout of each site in project supplements. The following describes the characteristics of each:

- (1) Waterside Berms: The waterside berm can be either an existing berm with sandy-loam soil or a newly constructed berm composed of sandy borrow material, or a combination of the two, held in place by a rock toe with rock revetment covering the waterside face of the berm. The rock revetment may or may not be planted as part of the mitigation requirement. Berm heights vary between 2 to 40 feet above normal summer flows, with frequent to occasional overtopping during winter months. See Exhibit K.
- (2) Natural Setback Berms: Natural setback berms are generally located in the upper reaches of the Sacramento River. These berms developed over time and have created their own natural levee setback from the main flow channel. The land between the setback "levees" and the river channel becomes a wide flood plain occasionally planted with orchards. The mitigation planting berm may be a narrow strip along the outer edge or be comprised of the entire area between the levee and channel.
- (3) Inland Mitigation Areas: Mitigation areas located on the dry-side of the levee are less typical and varied in nature. No Exhibit provided.

1-05 CONSTRUCTION HISTORY: Project supplements will address all pertinent information dealing with the construction of the mitigation site which might be unique. Two cross-sections shown in Exhibits K & L have been provided to show the most common berm types. These cross-sections will serve as examples of sites located on the waterside of levees. Each project shall provide a description of the mitigation site and its construction history.

SECTION II

LOCAL COOPERATION

2-01 FEDERAL REQUIREMENTS: Federal responsibility shall include the following:

- a. Prepare the appropriate environmental documentation (EA or EIS) in cooperation with the non-federal sponsor and coordinate with U.S. Fish & Wildlife Service, National Marine Fisheries Service, and Department of Fish and Game and determine mitigation requirements in consultation with these agencies using the Habitat Evaluation Procedure or other methodology.
- b. Prepare mitigation design, oversee project implementation, and ensure maintenance of plants has achieved root establishment and obtained other success criteria prior to turn-over to non-Federal sponsor.
- c. Prepare a final mitigation report documenting, both in text and photographically, existing conditions of site and plants at time of turn-over to non-Federal sponsor.
- d. Ensure that environmental commitments such as riparian mitigation measures and monitoring requirements are successfully accomplished in accordance with NEPA environmental documentation or through other laws (e.g. Endangered Species Act) in joint responsibility with non-Federal sponsor.
- e. Provide As-Constructed drawings showing location and layout of each mitigation site.
- f. Prepare project Operation and Maintenance Manual Supplements as it applies to each mitigation project.

2-02 NON-FEDERAL REQUIREMENTS: Non-Federal responsibility shall include the following:

- a. Protect and preserve all vegetation on site that has been turned over to the non-Federal sponsor, including vegetative growth as it "volunteers" throughout the life of the project. Allow vegetation to grow to maturity unimpeded within mitigation areas.

- b. Make regular inspections and submit annual reports (which shall include text and a photographic documentation of plant progress).
- c. Perform all maintenance requirements as stated herein.
- d. Over the life of the project, replant and replace all vegetation that has died as a direct result of vandalism, public use (accidental damage) and negligent maintenance practices, e.g., herbicide overspray, lack of beaver cage maintenance, and fire damage to plants. All 'Acts of God' damage shall be revisited by all concerned agencies and decisions, relative to replanting, made on a case by case basis.

SECTION III

GENERAL

3-05 ANNUAL REPORT: The non-federal sponsor shall prepare an annual report for the mitigation areas and submit to the District Engineer. The annual report shall compile information from the checklists that are prepared in coordination with the standard levee inspections during Spring and Fall. The annual report shall address all significant events that took place during the previous 12 months and shall include: the checklists, a photographic record of overall conditions, a photographic record of specific significant damage, service & maintenance records of all mechanical equipment, proposed corrective measures to deal with deficiencies, and a summary statement of general plant progress for the period of time from the preceding report.

3-09 PERIODIC SEMI-ANNUAL INSPECTIONS: Inspections of mitigation areas shall be initiated by the Superintendent and made with interested agencies at the times specified below to compare progress with the intent of mitigation plans as stated in the environmental documentation and other project documents. Provide the Corps, Operations Branch written notice 30 days prior to all inspections and invite the Corps to participate in the inspection.

- a. **Spring Inspection:** Inspection to occur during Spring. Spring is the season when the leaf emerges from the buds and a good time for visual plant identification, as well as, a good indicator of general plant health.
- b. **Fall Inspection:** Inspection to occur during Fall, typically when plant stress is most prevalent, and just prior to the rainy season. Note: Some plants might appear dead during this time of the year, but are actually alive and only exhibiting a physiological response to stress during prolonged drought conditions. Survival counts taken during the Spring inspection are generally more accurate.

3-10 CHECK LISTS: A suggested check list form for reporting results of inspections of the

mitigation areas is contained in this addendum as Exhibit H. As many copies of the form as are necessary to record all needed maintenance shall be used for reporting such inspections. Additional check lists may be contained in individual project supplements.

3-11 DRAWINGS: As-Constructed drawings showing plant species, location, and other features will be furnished to the Superintendent when each project is turned over for operation and maintenance.

SECTION IX

VEGETATION ON MITIGATION AREAS

9-01 DESCRIPTION: This section addresses maintenance requirements for vegetation and associated items on the above mentioned mitigation areas. The contents in this addendum are general in nature and apply to all mitigation project sites. Mitigation contracts will provide site specific supplements to this addendum addressing requirements unique to each site. The format of supplements shall conform to, and be consistent with, this addendum.

9-02 MAINTENANCE OF MITIGATION AREAS: The vegetation, once established and applicable success criteria achieved, will be transferred to the non-federal sponsor. "Establishment" shall be defined as "sustained self-sufficiency which is able to sustain growth without additional artificial watering, fertilizing, herbicide spraying, weeding, pruning, cultivation, or other general maintenance practices normally associated with ornamental vegetation.". When self-sufficiency is achieved there are external influences that impact the vegetation either positively or negatively. The following items address these impacts and are the responsibility of the non-federal local sponsor in maintaining acceptable site and plant conditions that will not impede vegetative growth.

- a. **General Plant Care:** The mitigation areas are not intended to be maintained to park-like conditions. Greater habitat value is afforded by those conditions that might be unsightly in a park situation, i.e., downed trees, broken branches, unmowed grass, etc. The habitat is enhanced by the natural diversity of the site. No removal of vegetation shall occur without prior written approval from the non-federal sponsor.
- b. **Tree Preservation:** Preserve ALL existing trees on mitigation areas. Only those trees that directly interfere with levee or revetment maintenance should be removed. Preservation of existing trees will help achieve the target goal of habitat replacement. Secondly, the indigenous scenic and ecological values of the site will be benefitted.
- c. **Volunteer Growth:** Preserve all native volunteer growth that is consistent with requirements and objectives of mitigation site plans and environmental documentation. The design concept on most sites has been set up to develop the upperstory, which

The design concept on most sites has been set up to develop the upperstory, which provides a seed source for most "successional growth" understory vegetation. The upperstory reduces the air and soil temperature which creates a micro-environment at the understory level that is more conducive to volunteer growth. This design concept encourages, and is dependent upon, volunteer growth to achieve the objectives of the environmental documentation. Volunteer growth will achieve the regeneration of "successional growth" desired in mitigation plans required of most projects. Mowing these areas will suppress this growth and is not recommended. Ensure that all maintenance practices of adjoining lands do not negatively impact site.

- d. **Weed Control:** General weed control on the mitigation sites is not desirable and could cause more destruction to the desirable vegetation than the benefits received by its eradication. Whenever weed control is permitted, care shall be taken to isolate the spray (or other method if used) so that only the targeted plant is affected. The maintenance districts will be allowed to control noxious weeds within the guidelines of the State of California, Department of Food and Agriculture, Division of Plant Industry. The maintenance district shall notify the Department of Water Resources, Flood Control Project Branch before taking any action. For guidance refer to, Pest Ratings of Noxious Weed Species and Noxious Weed Seed, Exhibit J.
- e. **Selective Clearing/Pruning:** The purpose of the mitigation sites is to establish vegetation that will serve as habitat for targeted wildlife species. Therefore, it would be inconsistent with this purpose to remove this vegetation for the sake of thinning it out. Pruning is not encouraged, only tree limbs overhanging fire breaks may require pruning. Downed woody debris will serve to enhance the habitat value of the site for certain species. Due to the different physical characteristics of mitigation sites, visual access of the levees should be maintained from the levee tops and for the revetments from the water. For general plant characteristics, see Exhibit I, Selected List of Woody Plants.
- f. **Human Impacts:** Next to natural disasters, human impacts pose the greatest potential for damage to vegetation. Unintentional damage occurs as often as intentional damage. Some sites are located near population centers and are impacted by both legitimate and non-legitimate uses. All damage as a result of these activities is the responsibility of the non-Federal sponsor. The following categorizes the greatest potential for damage from human impacts and should be policed by the local non-Federal sponsor:
 - (1) **Public Use:** The public's impact on a site will continue to be potentially disruptive to the vegetation. Ensure camping, partying, picnicking, fishing, and other recreational activities do not impact the plants. If public use becomes destructive, the non-Federal sponsor shall take corrective measures to replace plants and to ensure their survival.
 - (2) **Local Maintenance District Damage:** Within the area of human impacts, standard maintenance practices may pose a threat to the mitigation vegetation. Each district

should assess its present maintenance practices and determine if it can continue these practices or needs to adjust these methods to be less detrimental to the vegetation. Some traditional practices might not be appropriate for some sites and different methods should be implemented. Local maintenance personnel are the people most involved with the sites on a day to day basis and therefore stand the greatest risk of inadvertently damaging them. Current levee maintenance practices, such as burning, can quickly destroy years of mitigation work, if it gets out of control. The most common methods used to control vegetative growth on the levee structure (not the berm) are as follows:

1. **Mowing:** Mowing is by far the safest method used for avoiding potential damage, if controlled, and should be encouraged, where feasible.
 2. **Discing:** Discing is another preferred method, but is not as widely used due to its limited application to levee maintenance. Discing is most effective in maintaining a fire-break along the toe of the levee structure.
 3. **Spraying:** Chemical spraying is commonly used. Care shall be taken to prevent spray drift onto adjoining areas in accord with all applicable State and federal laws.
 4. **Burning:** Burning is the least preferred. The potential for damage is great.
- (3) **Vandalism:** Vandalism is always a potential threat but generally decreases over time. Most vandalism is caused by the theft of the planting stock while young (usually the first year after planting). As the plants root system develops, it becomes hard to remove, and is no longer a desirable target. Cutting of trees for firewood is another long-term threat. Vandalism damage to signs, fences, gates, and beaver barrier cages are long term problems and shall be repaired or replaced by the non-Federal sponsor in a timely fashion.
- (4) **Trash:** Trash is disruptive to plant growth and wildlife. Remove trash from the site and discard properly.
- g. **Wildlife Caused Damage:** Beaver, deer, rabbit, and gopher damage is an ongoing threat to the vegetation. Beaver damage is the most common of these. On some sites, beaver barrier cages have been installed to protect a percentage of the highly susceptible species and should be checked at each inspection. Repair of these items shall be made on a timely basis to ensure further damage does not continue. These cages provide additional protection from deer browse. Even though small trees are the beavers' preferred food, they will damage the larger trees as well. Cottonwood and willows are the beavers preferred species, but other riparian species have been known to be felled. The beaver barrier cages should not be removed at any time. Deer, rabbit, and gopher damage are prevalent while the vegetation is young but will have less of an impact over time. Wildlife

damage is considered as an 'Act of God' and shall be revisited by all concerned agencies and decisions, relative to replanting, made on a case by case basis.

- h. Natural Environmental Damage:** The greatest potential for damage will occur from some kind of natural event that will impact the site. These natural processes are inevitable and could occur at any time during the course of re-establishing the vegetation. However, over time the damage will likely be less, due to the maturity of the vegetation. Environmental damage caused by human impacts are events other than 'Acts of God' even though the results could be the same, i.e., a lightning fire versus a cigarette caused fire. Windthrow of trees may increase over time as trees mature. All 'Acts of God' damage shall be revisited by all concerned agencies and decisions, relative to replanting, made on a case by case basis.
- (1) Flood & Erosion: Flood damage to the mitigation sites is an ever present problem. Flood damage could be an annual occurrence and shall be documented in each annual report if impacts occur. Damage due to flooding will impact both vegetation and soil erosion.
- (2) Fire & Wind: Fire is a potential threat from both maintenance practices and public carelessness. Wind damage occasionally occurs but generally does not result in large scale damage.
- i. Fire-break maintenance:** Maintain a 15-foot-wide fire break at the toe of the levee on all berm sites with average widths of 30 feet or greater and around perimeter of site where possible and so designated. Occasionally firebreaks have been provided on berms of less width and will be designated as such in the as-builts. Most berm sites under 30 feet in width generally do not have a firebreak, due to lack of space. With the exception of narrow berm sites, provide a firebreak completely encircling all revegetation areas. These firebreaks shall be kept clear of vegetative growth at all times. Tree limbs shall be pruned so that the air space above firebreak is also kept clear. Coordinate and follow fire districts' recommendation for road maintenance and fire prevention.
- j. Woody Debris and Felled Trees:** Woody debris and felled trees provide sites for cavity nesting birds and cover for wildlife and increases the wildlife value of the site. Therefore, this organic matter shall be left undisturbed on all mitigation areas. On those sites where the debris becomes a fire hazard, remove and discard as a part of regular maintenance practices.
- k. Beaver Barrier Cage, Signage, Fencing, and Access Gate Maintenance:** Semi-annual inspections should check on the condition of the beaver barrier cages & fencing, protective fencing, signs, and barrier access gates and associated locks. All damage to these items should be repaired in a timely manner so that further damage does not occur.

- l. Public Health and Safety:** Vegetation will be managed to meet operation, maintenance, repair, replacement and rehabilitation (OMRRR) requirements of authorized flood control and other authorized project features. Vegetative management may include partial or complete removal of vegetation for OMRRR purposes. Local maintenance entities shall coordinate with the non-Federal sponsor and receive the non-Federal sponsor's approval prior to undertaking any action.

- m. Other Miscellaneous Items:** If applicable, ensure access roads are kept in good passable order. Ensure that all other items associated with individual projects are maintained as per mitigation plans. Maintenance records of these items shall be presented as applicable in each annual report.

9-03 MANAGEMENT AND OPERATION: The management and operation of each mitigation area shall be specified in each supplement to the addendum.

REFERENCES

1. Code of Federal Regulations, Title 33, Section 208.10, 9 August 1944
2. ER 1130-2-339, 29 October 1973, Inspection of Local Flood Protection Projects
3. ER 1130-2-335, 5 December 1968, Levee Maintenance Standards and Procedures
4. ER 1130-2-303, 15 December 1967, Maintenance Guide
5. ER 1130-2-400, 15 November 1985, Project Operation - Management of Natural Resources and Outdoor Recreation at Civil Works Water Resources Projects, USACE
6. ER 1130-2-438, 26 October 1987, Project Construction and Operation - Historic Preservation Program, USACE
7. ER 1105-2-100, 28 December 1990 - Section 7-39, Operation and Maintenance of Mitigation Features, non-Federal Responsibility
8. EM 1110-2-301, 31 March 1993 - Guidelines for Landscape Planting at Floodwalls, Levees, and Embankment Dams
9. EP 1165-2-1, 15 February 1989 - Chapter 11 - Operations, Maintenance, and Project Management.
10. EP 1165-2-501, 18 December 1988, Water Resources Policies and Authorities - Environmental Policies, Objectives, and Guidelines for the Civil Works Program of the Corps of Engineers, USACE
11. TR E-85-7, Aug. 1985, Final Report, Environmental Features for Streamside Levee Projects, pp. 26-31, Tree Preservation, WES, USACE
12. TR E-84-11, Nov. 1984, Final Report, Environmental Features for Streambank Protection Projects, WES, USACE
13. TR HL-90-19, November 1990, Final Report, pp. 20-38, A Study of Vegetation on Revetments, Sacramento River Bank Protection Project, Phase 1, Literature Review and Pilot Study, WES, USACE, PART II: LITERATURE REVIEW
14. TR E-79-2, August 1979 (Reprinted August 1991), Final Report, Flood Tolerance in Plants: A State-of-the-Art Review, WES, USACE

15. Sacramento River Bank Protection Project, Phase II Report, Study of Vegetation Allowances on Rock Revetment, Sept. 1992, Section 3 - Geomorphic and Environmental Aspects of the SRBPP Area, pp.19-22, and Section 4 - Issues and Concerns, pp.26-30
16. Effects of large woody debris removal on physical characteristics of a sand-bed river, Aquatic Conservation: Marine and Freshwater Ecosystems, Vol. 2, pp.145-163 (1992)
17. Interim Guide for Vegetation on Flood Control Levees, Under Reclamation Board Authority, adopted September 16, 1988
18. Arboriculture, Care of Trees, Shrubs, And Vines in the Landscape, Richard W. Harris, 1983, p. 46, Size of Root Systems
19. Riparian Planting Design Manual for the Sacramento River, Chico Landing to Collinsville, USACE, Sacramento District, May 1986

EXHIBIT H

CHECK LIST NO. 2

VEGETATION ON MITIGATION AREA
INSPECTION REPORT

Location of Area Inspected: _____ Date: _____
(including river mile) _____
Inspected by: _____

Report below the condition of the site and those items requiring maintenance work. Opposite each item listed, indicate the appropriate response, yes or no, in the area provided. Provide an attachment, if necessary, describing the negative significant conditions and any proposed/implemented maintenance work for each item. Note any changes, positive or negative, from the previous inspections.

Reference Manual No. _____

<u>Item No.</u>	<u>Description</u>	<u>Response</u>
1:	Mitigation area erosion free.....	_____
2:	Vegetation is free of fire damage.....	_____
3:	Vegetation is free of flood damage.....	_____
4:	Vegetation is free of wind damage.....	_____
5:	Vegetation is free of herbicide damage.....	_____
6:	Vegetation is free of wildlife damage.....	_____
7:	Vegetation & equipment is free of vandalism.....	_____
8:	Site is free of trash.....	_____
9:	Fire-break plowed and clear of growth.....	_____
10:	Access roads clear.....	_____
11:	Access gate barriers & locks in good working order.....	_____
12:	Beaver barrier cages or fencing in good condition.....	_____
13:	New volunteer growth (trees, shrubs) observed.....	_____
14:	Perimeter fencing in good working condition.....	_____
15:	Other items: _____	_____

COMMENTS: _____

EXHIBIT I

SELECTED LIST OF WOODY PLANTS, **with Maintenance Considerations**

The following categorizes plant types exhibiting similar growth characteristics that will be encountered. Exotic plants are listed only because of their presence along the river. Their inclusion in this list does not imply they are desirable. Ensure these plants do not encroach into the levee structure, rock revetment, or firebreaks, unless permitted in mitigation plans or as noted herein. Only native species have been planted and are desirable as mitigation vegetation.

- (A) Grasses and Forbs:** These herbaceous plants should be encouraged. They provide a root network immediately at the soil surface. These plants are permissible everywhere except on firebreaks. They provide some protection against surface erosion. Characterized by the following species:
1. *Artemisia douglasiana*/ Mugwort
 2. *Equisetum hyemale*/ Horsetail (exotic)
 3. *Cynodon dactylon*/ Bermuda Grass (exotic)
- (B) Vines:** These vines are low growing and form a dense thicket 2-4 feet high. Vines have good erosion control properties and provide good low-cover habitats. Vines have not been planted on water-side berm sites, yet, may volunteer during the life of the project. Characterized by the following:
1. *Rosa californica*/ California Wild Rose
 2. *Rubus vitifolius*/ California Blackberry
 3. *Vitis californica*/ Wild Grape
- (C) Small Shrubs:** These plants are low growing and generally under six feet in height. Allow these plants to mature on site. Characterized by the following species:
1. *Rhamnus californica*/ California Coffeeberry
 2. *Salvia mellifera*/ Black Sage
- (D) Large Shrubs & Small Trees:** These plants are generally characterized as having a multi-stem upright growth habit. They can appear "brushy" when young, but will develop into an "open" growth appearance over time. Most are deciduous and are "transparent" during winter inspections. Generally under 15 feet high, however, certain willow species can become tree-like on some reaches of the river. Plants may provide good slope stabilization. Characterized by the following species:
1. *Salix gooddingii*/ Black Willow
 2. *Salix hindsiana*/ Sandbar Willow
 3. *Salix lasiolepis*/ Arroyo Willow
 4. *Salix lasiandra*/ Yellow Willow
 5. *Salix laevigata*/ Red Willow

6. *Cephalanthus occidentalis*/ Button Brush
7. *Cornus occidentalis*/ Red Osier Dogwood
8. *Baccharis viminea*/ Mule Fat
9. *Heteromeles arbutifolia*/ Toyon

(E) Small Spreading Trees: Trees or large shrubs that have either a singular or multiple stems. Generally they are as wide as they are tall. Branches may droop to ground at "dripline" of tree. Mature growth may obtain 25-30 feet in height. Trunk diameter is small even with age, generally less than 18 inches. Characterized by the following species:

1. *Sambucus mexicanus*/ Blue Elderberry
2. *Aesculus californica*/ California Buckeye
3. *Ficus carica*/ Edible Fig (exotic)

(F) Medium Trees w/ shallow roots: Trees characterized as having a single leader with an upright growth habit. Height of tree may eventually reach 30-50 feet. Trunk diameters may achieve 3 feet with age, but generally are 18-24 inches. Root structure is generally shallow with 80% within top 36 inches of soil. Provides good erosion control. Characterized by the following species:

1. *Alnus rhombifolia*/ White Alder

(G) Medium Trees w/ deep roots: These trees are characterized as having a single leader with an upright growth habit. Height of tree may eventually be 30-60 feet. Trunk diameters may achieve 3 feet with age, but generally are 18-24 inches. Characterized by the following species:

1. *Acer negundo* spp. *californicum*/ Box Elder
2. *Robinia psuedoacacia*/ Black Locust (exotic)

(H) Large Trees: These trees are characterized as having a single leader with an upright growth habit. With age (and growing space) trees may eventually achieve heights of 60+ feet. Trunk may achieve large diameters with age, 4-6', but generally need space and time to achieve this. Generally classified as having deep roots, with the exception of the *Populus*. Good soil stabilizer of large areas. Characterized by the following species:

1. *Juglans hindsii*/ California Black Walnut
2. *Populus fremontii*/ Fremont Cottonwood
3. *Quercus lobata*/ Valley Oak
4. *Platanus racemosa*/ California Sycamore
5. *Fraxinus latifolia*/ Oregon Ash

EXHIBIT J

STATE OF CALIFORNIA
DEPARTMENT OF FOOD AND AGRICULTURE
DIVISION OF PLANT INDUSTRY

*PEST RATINGS OF NOXIOUS WEED SPECIES
AND NOXIOUS WEED SEED*

PURPOSE

To advise commissioners as to the Department's policy regarding any pest
action.

DEFINITIONS

- "A" An organism of known economic importance subject to state (or commissioner when acting as a state agent) enforced action involving: eradication, quarantine regulation, containment, rejection, or other holding action.
- "B" An organism of known economic importance subject to: eradication, containment, control or other holding action at the discretion of the individual county agricultural commissioner.
- or
- An organism of known economic importance subject to state endorsed holding action and eradication only when found in a nursery.
- "C" An organism subject to no state enforced action outside of nurseries except to retard spread. At the discretion of the commissioner.

GUIDANCE

The district will be allowed to control noxious weeds classified as "A" and identified by the Department of Food and Agriculture as "(an) organism of known economic importance to state (or commissioner when acting as a state agent) enforced action involving: eradication, quarantine regulation, containment, rejection, or other holding action."

The district will be allowed to control noxious weeds classified as "B" and identified by the Department of Food and Agriculture as (an) organism of known economic importance subject to: eradication, containment, control or other holding action at the discretion to the individual county agricultural commissioner.

Before the district eradicates any plant belonging to either class "A" or "B", the plant to be eradicated must be identified as a noxious weed in either class "A" or class "B" by a qualified biologist or a representative of the county agricultural commissioner's office. The district shall notify the Department of Water Resources, Flood Control Project Branch before taking action.

"A" SPECIES

*Eradication, containment, rejection or other holding action at the state-county level.
Quarantine interceptions to be rejected or treated at any point in the state.*

<u>Acaena anserinifolia</u>	bidly bidly
<u>Acaena novae-zelandiae</u> (- <u>A anserinifolia</u> in part as used previously and of British and Australian authors.)	bidly bidly
<u>Acaena pallida</u> (- <u>A anserinifolia</u> in part as used previously.)	bidly bidly
<u>Achnatherum brachychaetum</u> (- <u>Stipa brachychaeta</u>)	punagrass
<u>Albagi maurorum</u> (- <u>A pseudalhagi</u>)	camelthorn

Alternanthera philoxeroides

alligatorwood

"A" - *Pests Continued*

Arctotheca calendula

capeweed, as seed or fertile plants

Carduus acanthoides

plumeless thistle

Carduus nutans

musk thistle

Carthamus leucocaulos

whitestem, distaff thistle

Centaurea diffusa

diffuse knapweed

Centaurea iberica

Iberian starthistle

Centaurea maculosa

spotted knapweed

Centaurea squarrosa

squarrosa knapweed

Chondrilla juncea

skeletonweed

Cirsium ochrocentrum

yellowspine thistle

Cirsium undulatum

wavyleaf thistle

Crupina vulgaris

bearded creeper

Cucumia melo var. dudain

dudain melon

Cuscuta reflexa

giant dodder

Euphorbia esula

leafy spurge

Euphorbia serrata

serrate spurge

Halimodendron halodendron

Russian salttree

Halogeton glomeratus

halogeton

Helianthus ciliaris

blueweed

Heteropogon contortus

tanglehead

"A" - *Pests Continued*

<u>Hydrilla verticillata</u>	hydrilla
<u>Linaria gonistifolia</u> spp. <u>dalmatica</u> (- <u>L. dalmatica</u>)	Dalmatian, toadflax
<u>Onopordum</u> spp.	onopordum thistles
<u>Orobanche ludoviciana</u> var. <u>cooperi</u> (- <u>O cooperi</u> (Gray) Heller, as used in Munz', A Flora of Southern California.) (- <u>O multiflora</u> Nutt., as used in Correll and Johnston's Manual of the Vascular Plants of Texas.)	Cooper's broomrape desert broomrape
<u>Orobanche ramosa</u>	branched, broomrape
<u>Peganum harmala</u>	harmel
<u>Physalis virginians</u> var. <u>sonorae</u> (- <u>p subglabrata</u> as used previously.)	smooth groundcherry
<u>Prosopis strombulifera</u>	creeping mesquite
<u>Salsola vermiculata</u>	wormleaf salsola
<u>Salvia virgata</u> (- <u>S pratensis</u> as used previously.)	meadow sage
<u>Scolymus hispanicus</u>	golden thistle
<u>Solanum cardiophyllum</u> nightshade	heartleaf
<u>Solanum dimidiatum</u>	Torrey's nightshade
<u>Sonchus arvensis</u>	perennial sowthistle
<u>Sphaerophysa salsula</u>	Austrian peaweed

"A" - Pests Continued

<u>Striga lutea</u> (- <u>S asiatica</u>)	witchweed
<u>Tagetes minuta</u>	wild marigold
<u>Zygophyllum fabago</u>	Syrian beancaper

"B" SPECIES

Eradication, containment, control or other holding action at the discretion of the commissioner.

<u>Acacia paradoxa</u> (- <u>A armata</u>)	kangaroothorn
<u>Acronilon repens</u> (- <u>Centaurea repens</u>)	Russian knapweed
<u>Aegilops cylindrica</u>	jointed goatgrass
<u>Aegilops ovata</u> (- <u>A geniculata</u> and <u>A neglecta</u> in part)	ovate goatgrass
<u>Aegilops triuncialis</u>	barb goatgrass
<u>Aeschynomene rudis</u>	rough jointvetch
<u>Agropyron repens</u>	(see <u>Elytrigia repens</u>)
<u>Allium paniculatum</u>	panicked onion
<u>Allium vineals</u>	wild garlic
<u>Ambrosia trifida</u>	giant ragweed
<u>Araujia sericofera</u>	bladderflower
<u>Cardaria chalepensis</u>	lens-podded hoarycress

"B" - Pests continued

<u>Cardaria drabs</u>	heart-podded hoary cress
<u>Cardaria pubescens</u>	globe-podded hoary cress
<u>Carthamus baeticus</u>	smooth distaff thistle
<u>Carthamus lanatus</u>	woolly distaff thistle
<u>Centaurea calcitrapa</u>	Purple star thistle
<u>Centaurea repens</u>	(See <u>Acroptilon repens</u>)
<u>Centaurea sulphurea</u>	Sicilian thistle
<u>Chorispora tenella</u>	purple mustard
<u>Cirsium arvense</u>	Canada thistle
<u>Coronopus squamatus</u>	swine cress
<u>Cucumis myriocarpus</u>	paddy melon
<u>Cynara cardunculus</u>	artichoke thistle
<u>Cyperus esculentus</u>	yellow nutsedge
<u>Cyperus rotundus</u>	purple nutsedge
<u>Elytrigia repens</u> (- <u>Agropyron repens</u>)	quackgrass
<u>Euphorbia oblongata</u>	oblong spurge
<u>Gaura coccinea</u>	scarlet gaura
<u>Gaura drummondii</u> (- <u>G odorata</u>)	scented gaura
<u>Gaura sinuata</u>	wayleaf gaura

"B" - Pests continued

<u>Gypsophila paniculata</u>	baby's breath
<u>Imperata breyifolia</u>	satintail
<u>Isatis tinctoria</u>	dyer's woad
<u>Lepidium latifolium</u>	perennial peppergrass
<u>Lythrum salicaria</u>	purple loosestrife
<u>Muhlenbergia schreberi</u>	nimblewill
<u>Nothoscordum inodorum</u>	false garlic
<u>Nymphaea mexicana</u>	banana waterlily
<u>Oryza rufipogon</u>	red rice
<u>Panicum antidotale</u>	blue panicgrass
<u>Physalis viscosa</u>	grape groundcherry
<u>Polygonum cuspidatum</u>	Japanese
<u>Polygonum polystachyum</u>	Himalayan knotweed
<u>Polygonum sachalinonae</u>	giant knotweed
<u>Rorippa austriaca</u>	Austrian fieldcress
<u>Salvia aethiopis</u>	Mediterranean sage
<u>Senecio Jacobaea</u>	tansy ragwort
<u>Senecio squalidus</u>	Oxford ragwort
<u>Setaria faberi</u>	giant foxtail
<u>Solanum carolinense</u>	Carolina horsenettle, knotweed

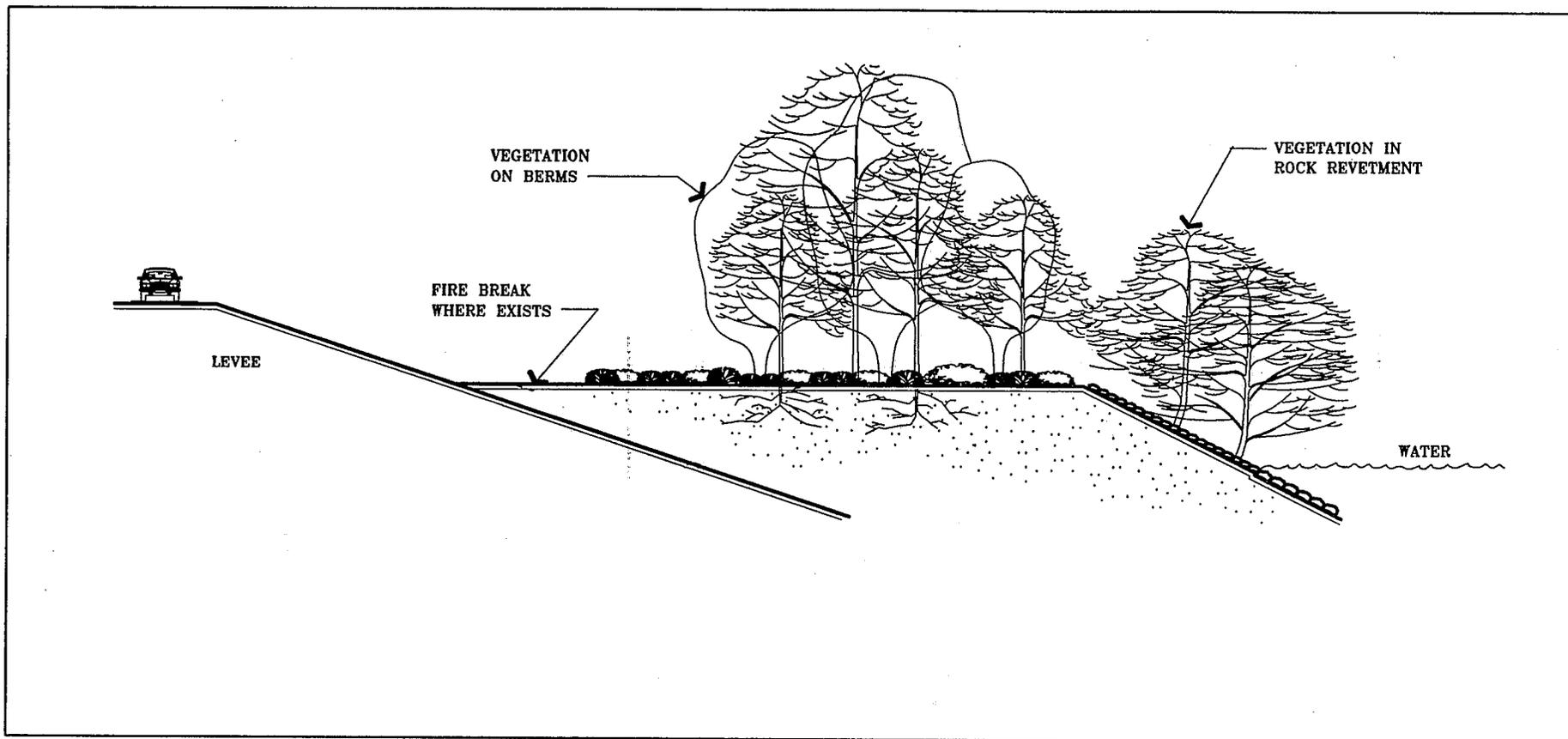
"B" - Pests continued

<u>Solanum elaeagnifolium</u>	white horsenettle
<u>Solanum lanceolatum</u>	lanceleaf nightshade
<u>Solanum marginatum</u>	white-margined nightshade
<u>Symphytum asperum</u>	rough comfrey
<u>Ulex europaeus</u>	gorse
<u>Viscum album</u>	European mistletoe

"C" SPECIES

State endorsed holding action and eradication only when found in a nursery: action to retard spread outside of nurseries at the discretion of the commissioner: reject only when found in a cropseed for planting or at the discretion of the commissioner.

<u>Carduus pycnocephalus</u>	Italian thistle
<u>Carduus tenuiflorus</u>	Italian thistle
<u>Cenchrus echinatus</u>	Southern sandbur
<u>Cenchrus incertus</u>	coast sandbur
<u>Cenchrus longispinus</u> (- <u>C pauciflorus</u> as used previously)	mat sandbur
<u>Centaurea solstitialis</u>	yellow starthistle



Typical Waterside Berm

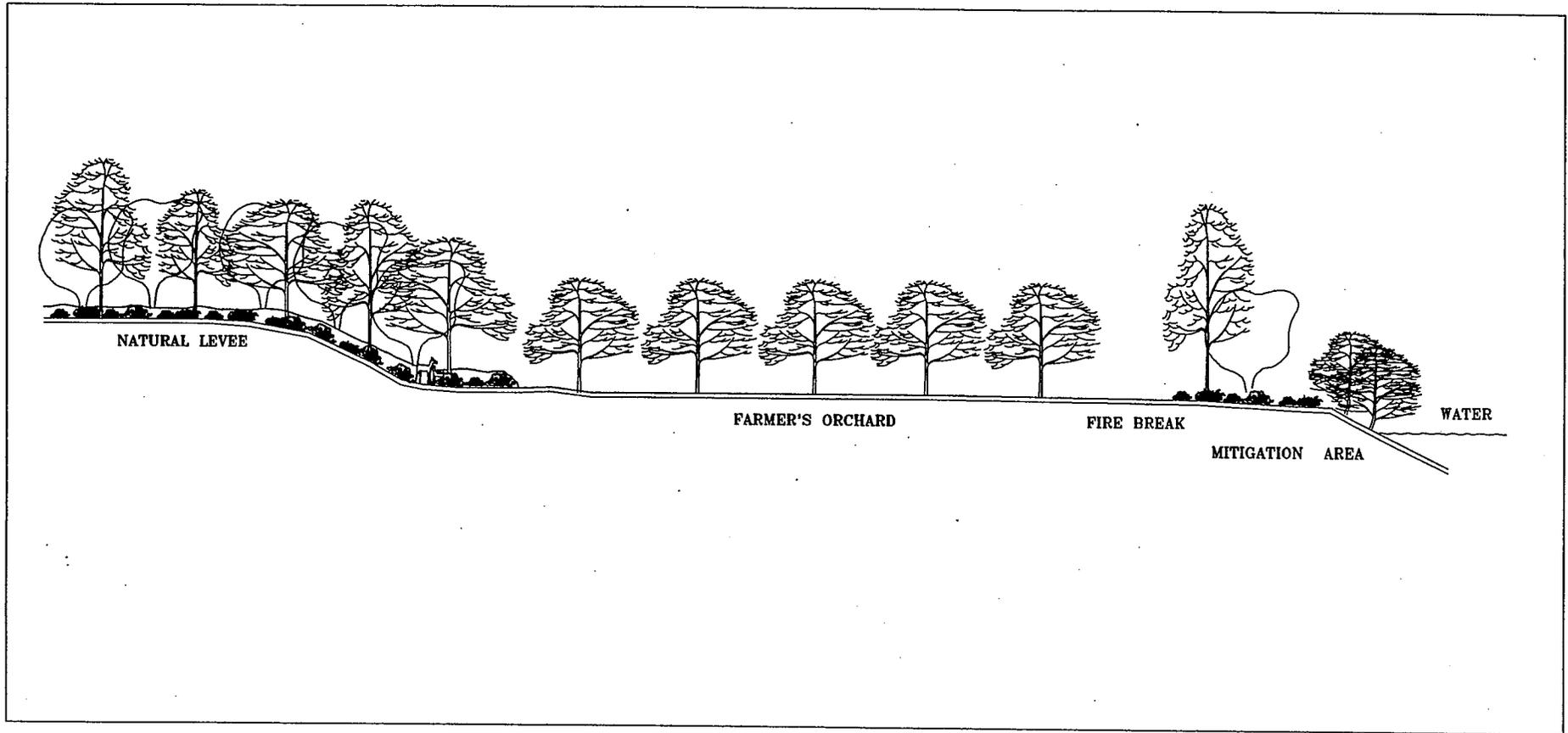
NOT TO SCALE

Sacramento River Flood Control Project

Exhibit K

U.S. Army Corps
Of Engineers
Sacramento District
EXHIBIT K





Natural Setback Berm

NOT TO SCALE

Sacramento River Flood Control Project

Exhibit L

U.S. Army Corps
Of Engineers
Sacramento District
EXHIBIT L



SUPPLEMENT
TO THE
ADDENDUM
OF THE
STANDARD
OPERATION AND MAINTENANCE
MANUAL

for
Sacramento River Flood Control Project,

Sacramento Urban
Mitigation Area

"VEGETATION ON MITIGATION AREAS"

March 1996



SACRAMENTO DISTRICT
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA



SUPPLEMENT to the ADDENDUM
for the
Sacramento Urban Mitigation Area
STANDARD OPERATION AND MAINTENANCE MANUAL
Sacramento River Flood Control Project

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SUPPLEMENT FORMAT & CONTENT

The organization and format of this supplement is written to be consistent with the Standard Operations & Maintenance Manual and the supporting addendum for the Sacramento River Flood Control Project (Revised May 1955), and is intended to provide supplemental information that is not specifically addressed.

SECTION I

INTRODUCTION

1-02 PURPOSE OF THIS SUPPLEMENT: This is a supplement to the Addendum titled "Vegetation on Mitigation Areas" of the Standard Operation and Maintenance manual for the Sacramento River Flood Control Project. Addendum requirements are only referenced to herein, but are still applicable. All Operations & Maintenance requirements stated in the Addendum, except as differing herein, shall apply. This supplement is intended to provide information and guidance to maintenance personnel to the mitigation area described herein.

1-03 LOCATION AND DESCRIPTION: This mitigation area is a 123 acre site. It consists of 3 unique habitats as follows: 79 acres riparian/upland, 22 acres emergent marsh, and 22 acres open water. The site is located at Sacramento River mile 68.5 RT, roughly 1/2 mile west of the river. The site is surrounded on three sides by farming interests and on the fourth by another mitigation site. See Exhibits B,C & D for Location Maps.

1-05 CONSTRUCTION HISTORY: The mitigation area is off-site mitigation for the construction of 32 miles of levee works in the Sacramento vicinity. The goal was to consolidate the mitigation requirements into a single functioning ecosystem.

- a. **Design Concept:** The design concept was to create an oxbow that would re-create natural landforms that have historically existed, and continues to occur, along this reach of the Sacramento River. The objective was to make the habitats as varied and diverse as possible, while providing a mosaic of uses. The design utilizes the constructed water's edges (3.5 miles) to maximize environmental diversity and interfaces between habitats.
- b. **Excavation:** The oxbow was excavated to take advantage of ground water and natural runoff that forms in naturally occurring closed oxbows. The grading design objective was to balance and utilize all soil removed during construction, while creating the historic oxbow lake formation. The contouring created elevations above the ground water level that are more conducive for a variety of riparian and upland species. The depth of the oxbow is the determining factor that controls the separation of open water and the emergent marsh area.
- c. **Water Source:** A well and pump were constructed to provide a constant lake level throughout the year to maintain an open water requirement. The well was drilled to 300 feet below the surface and produces 1,500 gpm. The pump is controlled by a float set to turn the pump on when the water drops below 14 feet elevation (above sea level) and turns off when it reaches 14 feet elevation. There is also a controller that can be set to control the timing automatically.

- d. **Water Operating Level:** The water level has been designed to be maintained at elevation 14, above sea level. A visual indicator is the debris rack overflows located at both concrete weirs. The water level is at the design level, when the water is at the debris rack outflow or slightly flowing into it. This is set roughly 6 inches below the crown of the concrete weirs.
- e. **Overflow Weirs:** Two concrete weirs have been constructed at the back side of the oxbow to allow the additional accumulation of winter rain water to overflow into an existing irrigation drainage ditch. This process also enables the lake to "flush out" on an annual basis. Excess water will flow into the debris rack until the volume becomes great enough so that it cannot handle it. When the debris rack cannot handle the volume of water, it will flow over the two concrete weirs.
- f. **Vegetation:** Only native terrestrial and aquatic vegetation was used, and was pre-grown from seed collected near the site. The 17,000 plus plants were planted from seedlings, pole cuttings, and as direct seed. Temporary irrigation for three years was used to establish plants.

SECTION II

LOCAL COOPERATION

2-01 FEDERAL REQUIREMENTS: For Federal responsibility see Addendum, dated April 1995.

2-02 NON-FEDERAL REQUIREMENTS: Non-Federal responsibility shall specifically include the items indicated herein. This is in addition to the items listed in the Addendum, dated April 1995.

SECTION III

GENERAL

3-05 ANNUAL REPORT: Specific items must be addressed in the annual report and shall include: service & maintenance records of the water well and pump equipment, the debris rack assembly, the access road condition and maintenance, status of the water level, the water level sensor mechanism and the condition of the terrestrial and aquatic vegetation. These items are in addition to the requirements stated in the Addendum, The report shall propose corrective measures to deal with deficiencies, and a summary statement of general plant progress for the period of time from the preceding report.

specifically

3-09 PERIODIC SEMI-ANNUAL INSPECTIONS: For inspection requirements see Addendum, dated April 1995.

3-10 CHECK LISTS: A specific check list form for reporting results of inspections of this mitigation area is contained in this supplement as Supplemental Exhibit A. These check lists shall be completed during each semi-annual inspection.

3-11 DRAWINGS: As-built drawings are provided as Exhibit F.

SECTION IX

VEGETATION ON MITIGATION AREAS

9-01 DESCRIPTION: This section addresses specific maintenance requirements for vegetation and associated items on the above mentioned mitigation area.

9-02 MAINTENANCE OF THE MITIGATION AREA: The site has proven well suited for the riparian/upland and emergent marsh species that have been re-introduced. At the completion of the maintenance period, plant survival was at 90% of that which was originally installed. The plants have established themselves and will continue to live without any artificial support by maintenance personnel. "Establishment" is defined herein as *"sustained self-sufficiency where the plant is able to sustain growth without additional artificial watering, fertilizing, herbicide spraying, weeding, pruning, cultivation, or other general maintenance practices normally associated with sustaining ornamental vegetation"*. The following items address impacts that shall be addressed so by and are the responsibility of the non-Federal local sponsor in maintaining acceptable site and plant conditions so that vegetative growth will not be impeded.

- a. **General Plant Care:** In addition to requirements in Addendum, blue elderberry plants shall be maintained in accordance with the General Compensation Guidelines for the Valley Elderberry Longhorn Beetle, Exhibit E.
- b. **Tree Preservation:** See Addendum.
- c. **Volunteer Growth:** See Addendum.
- d. **Weed Control:** In addition to requirements in Addendum, ensure weed growth is controlled on the graveled and perimeter dirt access roads within the mitigation area. In early Spring and after seasonal winter rains decrease, initiate road maintenance to ensure all access roads are passable. All vegetative growth shall be removed and regraded for all gravelled access roads. On the perimeter access road with a dirt surface; remove vegetation, disk (if appropriate), apply an herbicide spray, regrade and compact to make road accessible during the months where seasonal rains do not deter access. Perform

another series of maintenance activities during the Fall season. It is anticipated that this semi-annual maintenance will be sufficient to ensure access. It may become necessary to perform maintenance as described herein if the condition of the access roads and/or the growth of unwanted vegetation impedes access or becomes a fire hazard. These roads also serve as a fire break so they shall be maintained as such during the fire hazard season.

- e. **Selective Clearing/Pruning:** See Addendum.
- f. **Human Impacts:** See Addendum.
- g. **Wildlife Caused Damage:** See Addendum.
- h. **Natural Environmental Damage:** See Addendum.
- i. **Fire-break maintenance:** In addition to requirements in Addendum, maintain the access roads as a 15-foot-wide fire break. Presently a dirt perimeter road exists on three sides of the five-sided site. The access road and the other two sides of the lake have gravel roads. Both the dirt and gravel roads shall be kept clear of vegetative growth at all times. Tree limbs shall be pruned so that the air space above the firebreak is also kept clear to a height required by the local fire district. Coordinate and follow fire district's recommendation for road maintenance and fire prevention. The firebreaks shall be kept in a condition to prevent fires from spreading across them.
- j. **Woody Debris and Felled Trees:** See Addendum.
- k. **Beaver Barrier Cage, Signage, Fencing, and Access Gate Maintenance:** No beaver barrier cages or fencing have been provided on this mitigation area, however, signs and access gates shall be maintained in a readable and operable condition, respectively. See Addendum. Signs shall be annually checked. Any sign found to be damaged or unreadable shall be replaced or repaired to its original condition.
- l. **Public Health and Safety:** See Addendum.
- m. **Other Miscellaneous Items:** Ensure the following items are maintained in good condition and kept operable.
 - 1) **Access Road Maintenance:** Ensure the gravel access roads and the perimeter dirt roads are maintained in good operable condition. Ensure they are kept clear of vegetative growth.
 - 2) **Water Well & Pump Maintenance:** Ensure the water well, pump and associated water level sensor are maintained in an operable condition and serviced as per manufacturer's recommendations.

3) Concrete Weir Maintenance: Ensure the two concrete weirs are maintained so they can function as designed. Ensure the debris rack is operable and kept clear of any debris that is hindering it from functioning properly. Clear all woody growth that impedes flows.

4) Electrical Service to Pump: Ensure that electrical service is maintained to the pump. Ensure that an account with the local electrical company is kept current.

9-03 MANAGEMENT AND OPERATION OF MITIGATION AREA: The purpose and function of the mitigation area is to provide habitat for wildlife. The management and operation of the area shall be in accordance with this goal. Any use other than this (i.e. general public access, recreation, hunting, etc...) shall be coordinated with, and approved by, the Corps of Engineers prior to such activity. The following shall be a part of the management and operation of the mitigation area components:

1) Control of Emergent Marsh Vegetation and Open Water Interface: Emergent marsh is a necessary component of this project. Requirements indicate that 22 acres must be maintained. The site has proved thus far to easily achieve this requirement and, depending on associated environmental conditions, tends to increase beyond. In so doing, the open water area decreases. This necessitates that the interface between the two must be managed through time. Guidance for maintaining an acceptable emergent Marsh to Open Water ratio shall be as follows:

a) The design goal of the pond area (emergent marsh to open water interface) is 50% for each, 22 acres emergent marsh and 22 acres open water.

b) When the emergent marsh vegetation has increased to 60% (26.5 acres) cover of the total pond area, it shall be harvested until it is reduced to 40% cover. Factors which may cause a condition where the vegetation will increase above the acceptable ratio includes: environmental weather conditions, seasonal climatic cycles, and the improper management of the ponds water level. It is anticipated that the necessity for harvesting will occur every two to three years.

c) The pond shall be monitored and annually assessed to determine its status. Provide this information in the annual report.

2) Emergent Marsh Eradication Time-Table: Ensure that when it has been determined that vegetative harvesting is necessary, it is performed during a time which will cause least damage to wildlife use and the surrounding vegetation. The best time to perform emergent marsh eradication (harvesting) is August/September because most of the birds have completed nesting for the year. The second best window is October/November, but is subject to seasonal rains impeding the work.

3) Emergent Marsh Eradication Method: Recommended method for controlling emergent marsh vegetation shall be consistent with project requirements and must be

careful not to negate the wildlife benefits gained elsewhere on the site. The emergent marsh vegetation shall be sprayed with an approved aquatic herbicide, such as "Rodeo" by Monsanto, and then manually removed. Ensure the spray is limited to the pond area and does not drift and cause damage to the terrestrial vegetation on adjacent areas. Aerial spraying will not be permitted. Other methods are acceptable as long as they are effective and approved by the U.S. Fish & Wildlife Service and the California Department of Fish and Game and work within the overall goal of the mitigation site and are not detrimental to the wildlife.

REFERENCES

1. Office Report, Sacramento Urban Area Levee Reconstruction Project, Mitigation Area Repairs, June 1994.

SUPPLEMENTAL EXHIBIT A
SACRAMENTO URBAN MITIGATION AREA

VEGETATION ON MITIGATION AREA
INSPECTION REPORT

Reference Manual No. _____

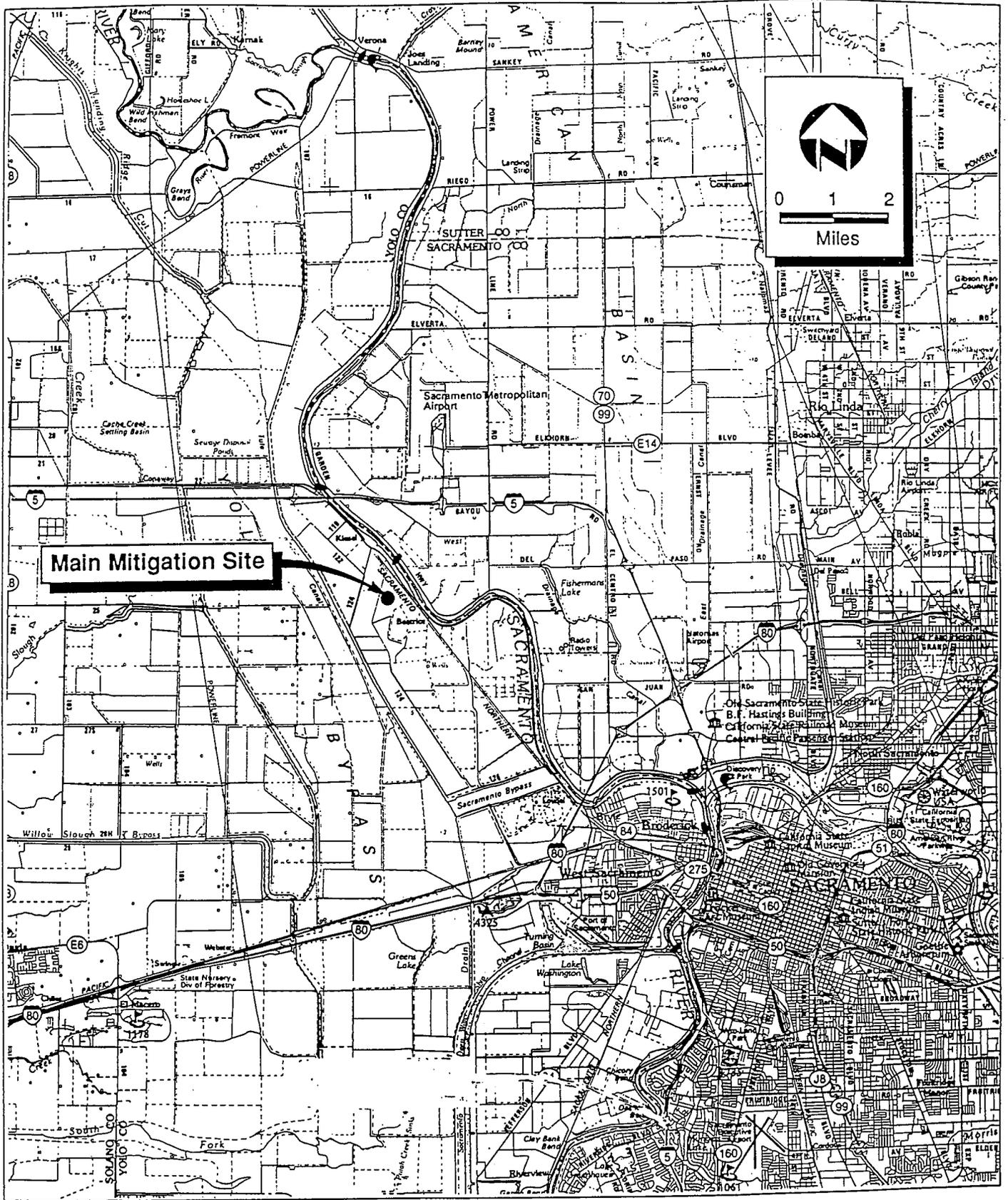
Location of Area Inspected: _____
 Inspected by: _____

Date: _____

Report below the condition of the site and those items requiring maintenance work. Opposite each item listed, indicate the appropriate response, yes or no, in the area provided. Provide an attachment, if necessary, describing the significant negative conditions and any proposed/implemented maintenance work for each item. Note any changes, positive or negative, from the previous inspections.

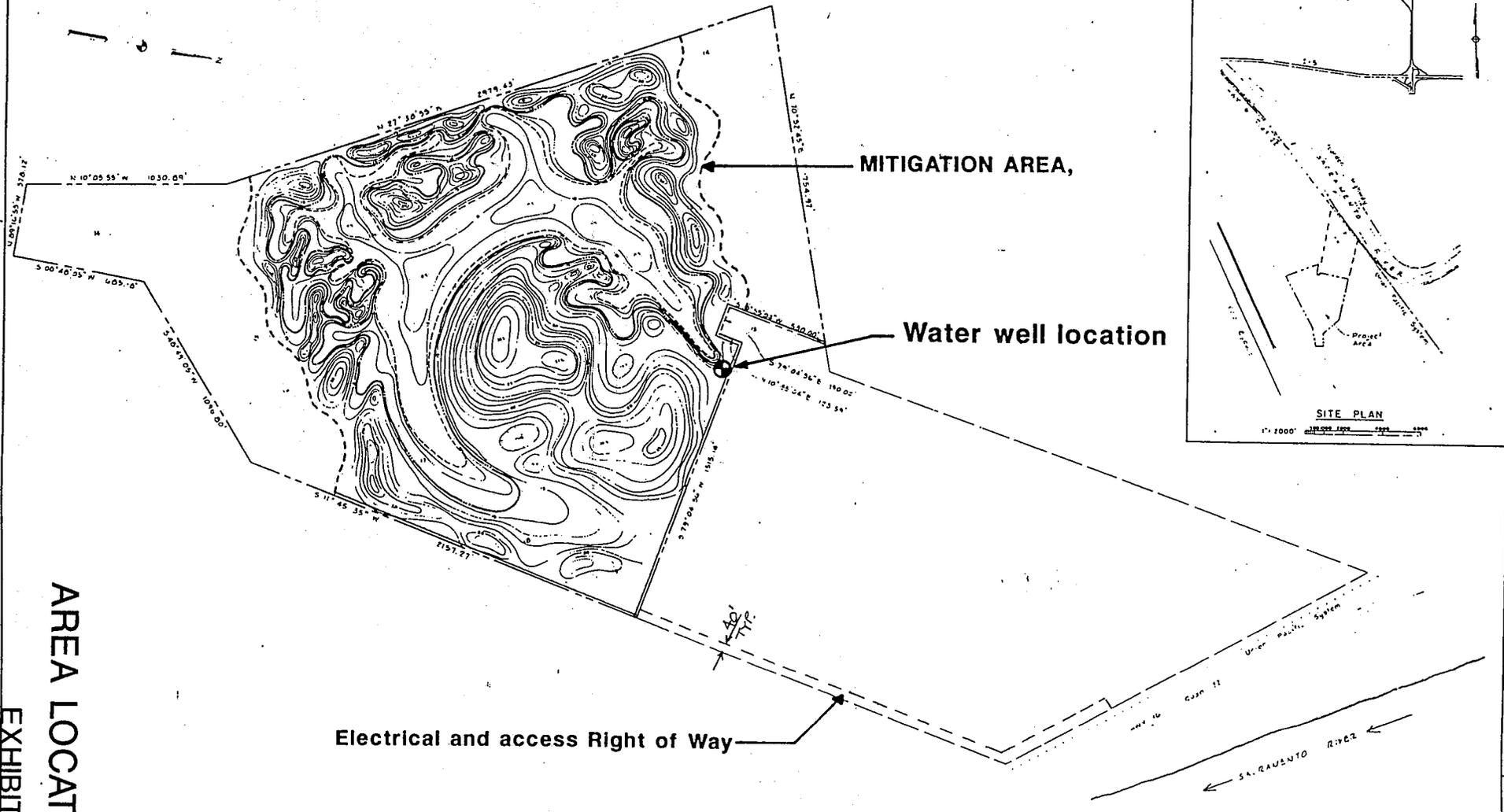
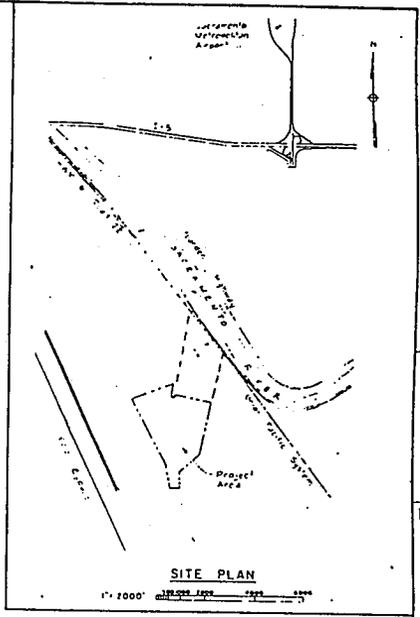
<u>Item No.</u>	<u>Description</u>	<u>Response</u>
1:	Mitigation area erosion free.....	_____
2:	Vegetation is free of fire damage.....	_____
3:	Vegetation is free of flood damage.....	_____
4:	Vegetation is free of wind damage.....	_____
5:	Vegetation is free of herbicide damage.....	_____
6:	Vegetation is free of wildlife damage.....	_____
7:	Vegetation & equipment is free of vandalism.....	_____
8:	Site is free of trash.....	_____
9:	Access road and Fire-break is clear of vegetative growth and passible.....	_____
10:	Access gate barriers & locks in good working order.....	_____
11:	Signs in good condition.....	_____
12:	New volunteer growth (trees, shrubs) observed.....	_____
13:	Water Well & Pump system operating properly.....	_____
14:	Water level at design elevation (at debris rack inlet).....	_____
15:	Concrete Weirs in good condition.....	_____
16:	Electrical wire & poles in good condition and functioning properly.....	_____
17:	Em. marsh vegetation is less than 60% of pond area (total pond area is 44 acres).....	_____
18:	Emergent marsh vegetation harvesting is required.....	_____
19:	Other items: _____	_____

COMMENTS: _____



PROJECT LOCATION MAP

EXHIBIT B



AREA LOCATION MAP
EXHIBIT C

DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
DRAWN BY S. JONES	CHECKED BY M. ALLEN
MITIGATION AREA LOCATION PLAN	
DATE 10/1/88	SHEET NO. 1 OF 1

GRAPHIC SCALE

FUNCTION ANALYSIS - VE PAYS

WEIR

LAKE

ACCESS ROAD / FIREBREAK

PUMP WELL

- LEGEND**
- - - Existing contours
 - New contours
 - 15 Elevation of mean sea level - 1929
 - Property line
 - Top of slope - 14.0 elev.
 - Open water line - 11.0 elev.

BOUNDARY LINE

GRADING LIMITS

GRADING LIMITS

Top of slope 14.0 elev.

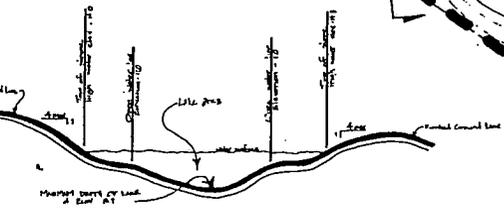
Open water line 11.0 elev.

Top of slope 14.0 elev.

Open water line 11.0 elev.

SITE LOCATION MAP

EXHIBIT D



NOTE

1. See Sheet 35 for Staking Plan

GRAPHIC SCALE

DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
SACRAMENTO URBAN AREA LEVEE RECONSTRUCTION PROJECT, CALIFORNIA WEST SACRAMENTO / MITIGATION AREA SITE PREPARATION MITIGATION AREA GRADING PLAN	
DESIGNED BY S. JONES	DATE 11/11/87
DRAWN BY J. RAGSDALE	SCALE 1" = 100'
CHECKED BY M. BLIX	PROJECT NO. 50-4-5822
APPROVED: <i>James H. ...</i> <i>slc</i> DATE: 11/11/87	

EXHIBIT E

May 31, 1994

General Compensation Guidelines for the Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) was listed as a threatened species in 1980 (45 Federal Register 52807). This animal is fully protected under the Endangered Species Act of 1973, as amended (Act). The larvae of the beetle feed and mature within elderberry (*Sambucus* sp.) shrubs. Use of the plants by the early stages of this insect, a wood borer, is very rarely apparent. Frequently, the only exterior evidence of use of the shrub is the exit hole created by the larvae prior to the pupal stage. The beetle has been found in elderberry plants with stems possessing a diameter of one inch or greater. The range of the animal extends from Redding south to Bakersfield and from the western foothills of the Sierra Nevada to the eastern foothills of the coast range (Barr 1991; U.S. Fish and Wildlife Service 1984).

An adequate survey should be completed by a qualified biologist for the valley elderberry longhorn beetle and its elderberry foodplant if the proposed project site is located within the range of the animal. The report should include the precise location of all elderberry shrubs, their height and diameter, the presence of adult exit holes and the general condition of the plants. A map should also be included with the report indicating the major vegetational communities present on site. The completed study should be sent to the U.S. Fish and Wildlife Service (Service) for review.

Take incidental to an otherwise lawful activity may be authorized by one of two procedures. If a Federal agency is involved with the permitting, funding, or carrying out of the project, then initiation of formal consultation between that agency and the Service pursuant to section 7 of the Act is required if it is determined that the proposed project may affect a federally listed species. Such consultation would result in a biological opinion that addresses the anticipated effects of the project to the listed species and may authorize a limited level of incidental take. If a Federal agency is not involved with the project, and federally listed species may be taken as part of the project, then an incidental take permit pursuant to section 10(a) of the Act would need to be obtained. The Service may issue such a permit upon completion of a satisfactory conservation plan for the listed species that would be affected by the project.

The following mitigations should be undertaken for the valley elderberry longhorn beetle:

Avoid Habitat Whenever Possible

1. Fence and flag each elderberry shrub or group of these plants so that the construction crew can avoid them. There should be a setback of at least twenty feet from the dripline of each elderberry shrub. The area must be designated to prevent isolation of the beetle population from other

populations located in adjacent areas. The area should be designated as habitat for the valley elderberry longhorn beetle in perpetuity.

Brief contractors on the requirements to avoid damaging the elderberry plants and the possible penalties for not complying with these provisions. These areas should be adequately signed with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines and imprisonment." The signs should be clearly readable from a distance of at least twenty feet.

Work crews should be informed about the status of the threatened valley elderberry longhorn beetle and the need to protect its elderberry host plant. All on-site personnel should receive instruction regarding the presence of the federally protected animal.

Transplant Elderberry Shrubs

Elderberry shrubs should be transplanted if they can not be avoided by the proposed project. All elderberry plants with a stem diameter of 1.0 inch or greater in size at ground level should be transplanted to a mitigation area. In some cases, a shrub that would be extremely difficult to remove because of access problems or one that is in such poor condition that it is unlikely to survive being transplanted may be exempted from this requirement at the Service's discretion.

A qualified biologist (monitor) should be on-site for the duration of the transplanting of the elderberry shrubs to insure that no unnecessary take of the valley elderberry longhorn beetle occurs. The biologist utilized should have the authority to stop all activities until appropriate corrective measures have been completed. The biologist should also be required to report violations immediately to the Service and the California Department of Fish and Game.

1. Timing.--Elderberry shrubs with stems equal to or greater than 1.0 inches in diameter in ground level should be transplanted when the plant is dormant (approximately November through the first two weeks in February) after they have lost their leaves and, thus, the plants essentially are not transpiring or actively growing. Planting during the non-growing season will reduce the shock to the plant and increase transplantation success.

2. Procedure to plant elderberry shrubs.

a. Cut tree back to 3 to 6 feet from the ground or to 50 percent of its height (whichever is greater) by removing branches and stems above this height. The trunk and all stems greater than 1.0 inches in diameter measured at ground level should be replanted.

b. Excavate a hole 3 to 4 feet deep to receive the planting;

c. Dig plant up using Vemeer spade, backhoe, front end loader, or other suitable equipment, taking as much of the root ball as possible, and replant immediately at the compensation site. Move plant only by the root ball. If the plant is to be moved and transplanted off site, wrap the root ball in burlap and secure with wire. Dampen burlap with water, as necessary, to keep root ball wet;

d. The elderberry shrub should be planted in a water retention basin 40 feet by 40 feet in size (1600 square feet). The root ball should be planted so it is level with the existing ground. Compact the soil sufficiently so that settlement does not occur. A basin 40 feet by 40 feet should be provided for every five seedling elderberry plants and associated native vegetation (see number 4 below);

e. Saturate soil with water. Do not use fertilizers or other supplements or paint the tips of stems with pruning substance as the effects of these compounds on the beetle are unknown;

f. Monitor to ascertain if additional watering is necessary:

1. if sandy, well-drained soil, plants may need to be watered weekly or possibly twice monthly;
2. if clay, poorly-drained soil, it may not be necessary to water after the initial saturation.

A drip watering system and timer would be ideal. However, in situations where this is not possible, a water truck or other apparatus may be used.

Sixteen hundred (1600) square feet should be provided for each avoided elderberry shrub; each transplanted elderberry shrubs; and every five seedling elderberry plants and associated native plants. The mitigation area should be designated as habitat for the valley elderberry longhorn beetle in perpetuity. The mitigation area should be designated to prevent isolation of the beetle population from other populations located in adjacent areas. A conservation easement or fee title for the mitigation area should be given to a resource agency or appropriate private organization. The fee title or conservation easement should include adequate funding that ensures management of the mitigation area in perpetuity. The Service should be provided with a map and written details specifically identifying the mitigation area prior to the initiation of the mitigation program.

3. Procedure to plant additional stems.--Each stem 1.0 inches or greater in diameter at ground level that is moved or destroyed will be replaced with seedling elderberry plants in the mitigation area using a ratio from 2:1 to 5:1. This replacement requirement applies even if the elderberry shrub is transplanted. Replacement stock should be obtained from local sources. The approval of the Service should be obtained prior to initiating the compensation program. The ratio is determined as follows:

Ratio of 2:1 Elderberry shrubs with stem diameters 1.0 inch or greater at ground level and there are no adult emergence holes.

Ratio of 3:1 Elderberry shrubs with stem diameters 1.0 inch or greater at ground level. Beetles are present as evidenced by emergence holes, but occur in 50 percent or less of the shrubs.

Ratio of 5:1 Elderberry shrubs with stem diameters 1.0 inch or greater in size at ground level. Beetles are present as evidenced by emergence holes, and occur in 51 percent or greater of the shrubs.

4. Plant associated native plants: Recent studies have found that beetles are more abundant in more dense native plant communities with a mature overstory and mixed understory versus a young overstory and low understory. Therefore, a mix of native plants associated with the elderberry shrubs at the

project site should be planted at a ratio of at least two specimens of all native tree and shrub species for every five elderberry stems equal to or greater than 1 inch in diameter at ground level. These plantings also must be monitored with the same survival criteria utilized for the elderberry plants. The saplings and seedlings, as appropriate, should be from native populations at the project site or from the immediate project vicinity. The approval by the Service of the native plant donor sites must be obtained prior to initiation of any of the revegetation work.

Example 1

Total number of elderberry shrubs on project site: 20
Associated native plants: interior live oak (*Quercus wislizenii*),
foothill pine (*Pinus sabiniana*), and California
buckeye (*Aesculus californica*)
Number of elderberry shrubs with evidence of the
the valley elderberry longhorn beetle: 12
Number of stems equal or greater than 1 inch: 100
Compensation: Transplant the 20 elderberry shrubs that will
be impacted, plant 500 elderberry seedlings (ratio of 5:1),
plant 40 interior live oaks, 40 foothill pines,
40 California buckeyes
Total area required: 4.41 acres

Example 2

Total number of elderberry shrubs: 10
Associated native plants: interior live oak (*Quercus wislizenii*)
Number of elderberry shrubs with evidence of the valley
elderberry longhorn beetle: 0
Number of stems greater or equal to 1.0 inch: 0
Compensation required - None

Example 3

Total number of elderberry shrubs: 5
Associated native plants: cottonwood (*Populus fremontii*)
Number of elderberry shrubs with evidence of the
valley elderberry longhorn beetle: 0
Number of stems equal or greater than 1.0 inch: 15
Compensation required: Transplant the 5 elderberry shrubs,
plant 30 elderberry seedlings (ratio 2:1), plant 6 cottonwoods
Total area required: .40 acre

Example 4

Total number of elderberry shrubs: 25
Associated native plants: none
Number of elderberry shrubs with evidence of the
the valley elderberry longhorn beetle: 7
Number of stems equal or greater than 1.0 inch: 150
Compensation required: Transplant the 25 elderberry shrubs, plant 450
stems (ratio 3:1)
Total area required: 4.22 acres

Provide Habitat for the Beetle in Perpetuity

Weeds and other plants that are not native to the mitigation area should be removed at least once a year or at the discretion of the Service or the California Department of Fish and Game. Mechanical means should be used; herbicides should be prohibited.

Measures should be taken to insure that no pesticides, herbicides, or other chemical agents enters the mitigation area. No spraying of these agents should be conducted within one hundred (100) feet of the area or if they have the potential to drift, flow or be washed into the area in the opinion of biologists or law enforcement personnel from the California Department of Fish and Game or the Service. The Service should be provided with written documentation that this condition will be carried out in perpetuity.

No dumping of trash or other material should occur within the mitigation area. Any trash or other material should be removed within ten (10) working days of discovery. The Service should be provided with written documentation that this condition will be carried out in perpetuity.

Biologists and law enforcement personnel from the California Department of Fish and Game and the Service should be given complete access to the project site to monitor transplanting activities. Personnel from both these agencies should be given complete access to the project and the mitigation area to monitor the valley elderberry longhorn beetle and its elderberry shrub habitat in perpetuity.

If appropriate, permanent fencing should be placed completely around the mitigation area to prevent unauthorized entry by off-road vehicles, equestrians, or other parties that may damage or destroy the habitat of the beetle. The applicant should receive approval from the Service that the fencing is acceptable prior to initiation of the mitigation program.

If appropriate, a minimum of two prominent signs should be placed and maintained in perpetuity at the mitigation area noting that the site is habitat of the federally threatened valley elderberry longhorn beetle and including information on the beetle's biology and ecology. The signs should be approved by the Service. They should be replaced or repaired within ten (10) working days if they are found to be damaged or destroyed.

Monitoring Program

The population of the adults of the threatened valley elderberry longhorn beetle, the general condition of the mitigation area, and the elderberry plants and associated native plants located at the mitigation area should be monitored by a qualified biologist annually for a period of ten years beginning with the date the mitigation program is initiated. Two visits between February 14 and June 30 of each year should be made beginning the year the mitigation is begun. The study should include a population census of the adult beetles, including the actual number of animals observed, their condition, behavior, and precise location at the site; a census of the elderberry shrubs and associated native plants, including the number of plants observed, their size, and condition; and a general assessment of the habitat, including any real or potential threats to the beetle, and its food plants,

such as erosion, excessive grazing by livestock, off-road vehicle use, etc. Random-walk counts should be used; mark-recapture or other methods that involve handling or harassment shall not be utilized. The materials and methods that will be utilized for this study should be reviewed and approved by the Service. All appropriate Federal and State permits should be obtained prior to initiating the field studies.

A written report analyzing the data from the monitoring of the threatened valley elderberry longhorn beetle at the mitigation area and the elderberry shrubs and associated native plants located at the project site should be conveyed to the Service and the Department of Fish and Game (Supervisor, Environmental Service, Department of Fish and Game, 1416 Ninth Street, Sacramento, California 95814, and Staff Zoologist, California Natural Diversity Data Base, Department of Fish and Game, 1220 S Street, Sacramento, California 95814) by December 31 of each year for a ten year period beginning with the date the program is initiated. The report should include, but not be limited to, the raw data collected during the field surveys and a basic analysis of the population dynamics of the valley elderberry longhorn beetle at the compensation sites. The population size (qualitative) should be estimated for the beetle. Maps showing where the individual adult beetles and exit holes were observed should be included. For the elderberry shrubs and associated native plants the following should be analyzed: the survival rate, condition, and size of the plants. Real and likely future threats should be addressed along with suggested mitigations (e.g. fencing access to off-road vehicles, more frequent removal of exotic vegetation, etc.). The original field notes, photographs, correspondence, and all other pertinent material, as well as a copy of the report should be deposited and accessioned into the Entomology Department, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118 by December 31 of each year for a ten year period beginning with the date the mitigation program is initiated. The Sacramento Field Office should be provided with the accession numbers given to this material by the California Academy of Sciences.

Success Criteria

A survival rate of 80% of the elderberry shrubs and associated native plants should be obtained at the end of the ten year monitoring program. The Service will make the determination as to the compensator's replacement responsibilities arising from circumstances beyond its control such as plants damaged or killed as the result of severe flooding or vandalism.

Future Revisions

Revegetating with elderberries and the responses of the beetle to such revegetation efforts is a relatively new procedure. As data become available on which to evaluate this technique, revisions to these guidelines are anticipated.

Service Contact

These guidelines were prepared by Chris Nagano, Sacramento Field Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, Room E-1823, Sacramento, California 95825. Please refer any questions on these guidelines to him at the above address or call 916/978-4866 extension 358.

Literature Cited

- Barr, C.B. 1991. The distribution, habitat, and status of the valley elderberry longhorn beetle *Desmocerus californicus dimorphus*. Sacramento Field Office, U.S. Fish and Wildlife Service, Sacramento, California
- U.S. Fish and Wildlife Service. 1984. Recovery plan for the valley elderberry longhorn beetle. Endangered Species Program. Portland, OR.