Lower Colorado River Multi-Species Conservation Program

Balancing Resource Needs

Palo Verde Ecological Reserve Restoration Development Plan: Overview

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

December 2006

Lower Colorado River Multi-Species Conservation Program
Implementation Steering Committee Members

Federal Participant Group

Bureau of Reclamation
Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
City of Somerton
City of Yuma
Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
Town of Fredonia
Town of Thatcher
Town of Wickenburg
Salt River Project Agricultural Improvement and Power District
Unit "B" Irrigation and Drainage District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users' Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState County Government Coalition
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Game
City of Needles
Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
San Diego County Water Authority
Southern California Edison Company
Southern California Public Power Authority
The Metropolitan Water District of Southern California

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Nevada Participant Group

Colorado River Commission of Nevada
Nevada Department of Wildlife
Southern Nevada Water Authority
Colorado River Commission Power Users
Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
The Cocopah Indian Tribe

Conservation Participant Group

Ducks Unlimited
Lower Colorado River RC&D Area, Inc.

Lower Colorado River
Multi-Species Conservation Program

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Lower Colorado River
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Lower Colorado Region
Boulder City, Nevada
http://www.lcrmscp.gov

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Acronyms and Abbreviations

CDFG	California Department of Fish and Game
CESA	California Endangered Species Act
CW	Cottonwood-Willow Land Cover Type
ESA	Endangered Species Act
GBBO	Great Basin Bird Observatory
HCP	Habitat Conservation Plan
LCR	Lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
MMRP	Mitigation Monitoring Reporting Program
Permit	CESA Incidental Take Permit No. 2081-2005-008-06
PVER	Palo Verde Ecological Reserve
PVID	Palo Verde Irrigation District
Reclamation	Bureau of Reclamation
RPP	Restoration Phase Plan
SWFL	Southwestern willow flycatcher
YBCU	Yellow-billed cuckoo

Background

Palo Verde Ecological Reserve (PVER) encompasses 1,352 acres of Colorado River historic floodplain near Blythe, California. Formerly, the property was known as the Riverview Ranch and was owned by the Travis family. The ranch was acquired by the Trust for Public Lands in the beginning of 2004. On September 3, 2004, the property was conveyed to the State of California. California has identified up to approximately 1,100 acres of active agricultural lands on this property for habitat restoration for the Lower Colorado River Multi-Species Conservation Program (LCR MSCP).

As part of the LCR MSCP, the California Department of Fish and Game (CDFG) and the Bureau of Reclamation (Reclamation) are jointly planning the conversion of portions of PVER from agricultural crops to a mix of native plant species. After planting is complete, the created habitats are then managed for species covered under the LCR MSCP throughout the 50-year life of the program.

For large habitat restoration sites which are developed over a number of years, such as PVER, the restoration activities are divided into phases. This document, the *Draft Palo Verde Ecological Reserve Restoration Development Plan: Overview*, provides a synopsis of the restoration potential of the site as well as the projected phasing of development. To document the development of habitat on the property, a phase-specific restoration plan is prepared each fiscal year which documents the planning, design, planting, and monitoring requirements of that phase.

An annual report will be prepared each year summarizing restoration and monitoring activities conducted during the previous year. Specific information on the contents of these annual reports can be found in Section 5.

Through the adaptive management process, a plan for each Phase will be prepared annually and submitted to CDFG for approval. This plan will incorporate the monitoring results from the previous year, and include the planting design and techniques, grading plan, and demonstration or research plan for the acreage that will be converted. The monitoring results will help guide management of the site and any modifications to previously restored habitats.

A final report will be prepared and submitted to CDFG no later than 180 days after the completion of all mitigation measures.

1.0 Introduction

The LCR MSCP is a partnership of Federal and non-Federal stakeholders responding to the need to balance the use of lower Colorado River (LCR) water resources and the conservation of native species and their habitats in compliance with the Endangered Species Act. This is a long-term (50-year) plan to conserve at least 26 species along the LCR from Lake Mead to the Southerly International Boundary with Mexico through the implementation of a Habitat Conservation Plan (HCP). Most covered species are State and/or Federally listed special status species. The Bureau of Reclamation (Reclamation) is the entity responsible for implementing the LCR MSCP over the 50-year term of the program. A Steering Committee currently consisting of 56 entities has been formed, as described in the *LCR MSCP Funding and Management Agreement*, to provide input and oversight functions to support LCR MSCP implementation.

Development of PVER will be undertaken by Reclamation as part of the LCR MSCP HCP and the California Parties' California Endangered Species Act (CESA) Incidental Take Permit No. 2081-2005-008-06 (Permit) by converting agricultural crops to native riparian habitat. The overall goal for PVER is to develop and maintain as much riparian habitat as practical that will contribute to the habitat objectives for endangered and threatened species outlined in the LCR MSCP HCP and CESA Permit.

Purpose

This document serves as the initial guide for the creation and maintenance of PVER habitat, which will continue to evolve through an adaptive management program described in this plan. Subsequent documents will provide detailed information for each proposed phase and identify the annual development of land cover types on the property.

The intent is to create as much riparian habitat as practical that will be managed for the southwestern willow flycatcher (*Empidonax traillii extimus)* (SWFL), yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (YBCU), and other species covered under the LCR MSCP HCP. The creation of habitat includes both the establishment of native plants and the management of the vegetation and its structural type to meet performance standards, such as seral stages of vegetation, moist soil, standing water, and open areas for mosaics of riparian vegetation.

This plan provides management options for habitats for Covered Species in Reach 4, described in the LCR MCSP HCP habitat objectives and the CDFG CESA Permit. The plan provides habitat restoration design and management methods, including construction (planning and design), monitoring, research and reporting incorporated within an adaptive management plan. Through the adaptive

management process, data from monitoring and research results will be integrated into the plan and implemented to provide for future successful habitat restoration and objectives.

Location/Description

PVER lies within the historic floodplain of the Colorado River in southeastern Riverside County as shown in the *USGS-Blythe NE Quadrangle Map* at the intersection of Ranges 23 and 24 East and Townships 5 and 6 South (Figure 1). PVER is one of the northern-most parcels of agricultural land within the Palo Verde Valley and is accessed via eastern Second Ave., 5 miles north of the town of Blythe and 87 miles south of Needles.

Existing infrastructure consists primarily of an irrigation system comprised of 9.2 miles of lined and unlined irrigation ditches and associated slide gates, a 100-horsepower electric pump, and approximately 14 miles of access roads. All the acreage has been in agricultural crops of grain, small melons and alfalfa since the late 1930s. Currently, the land is leased and farmed with crops such as alfalfa and grain.

Landownership

PVER is owned by CDFG who leases approximately 1,100 acres to a local farmer who grows alfalfa and small grains. CDFG intends to continue the agricultural lease until the property comes under development by Reclamation. The proposed development schedule by phases is shown in Figure 2.

Water

The Palo Verde Irrigation District (PVID) has an entitlement to Colorado River water for use on up to 104,500 acres of land within the PVID pursuant to a contract between the United States and PVID dated February 7, 1933. CDFG, as a landowner within the PVID, has the right to order Colorado River water from PVID for pumping through the PVID canal system to its fields. CDFG will make Colorado River water available for irrigation of the native plants.

Agreement

An "*Agreement for Restoration Activities Consistent with the LCR MSCP*" is being developed that recognizes Reclamation's and CDFG's commitment to work together and assures the land and water resources will be available for the 50-year term of the LCR MSCP.

Figure 1: Location of Palo Verde Ecological Reserve

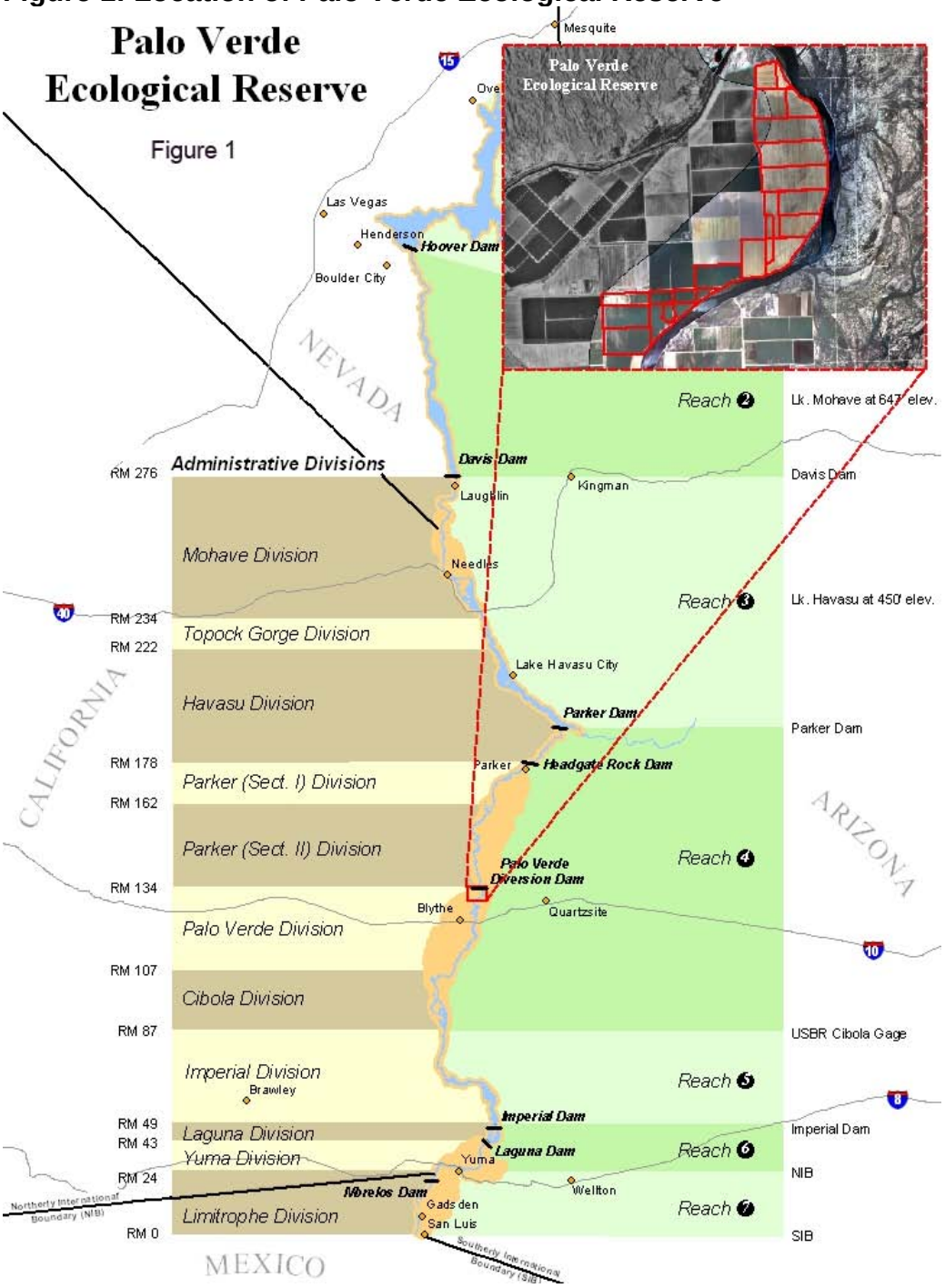
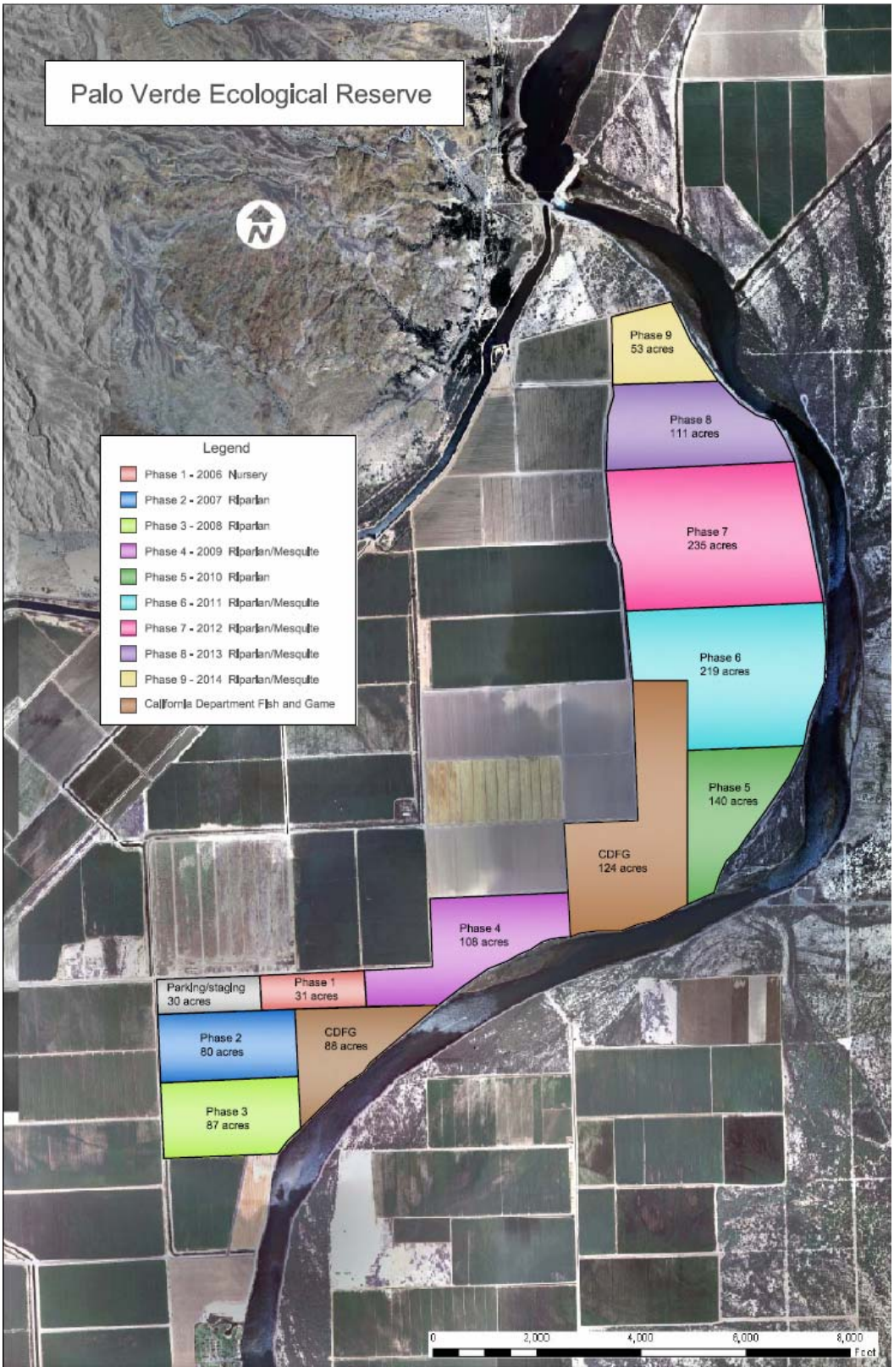


Figure 2: Proposed Phasing Map



2.0 Restoration Development Plan

The LCR MSCP HCP goals include creation, development, and maintenance of riparian habitat conditions for 5,940 acres of cottonwood-willow (CW). This restoration plan is intended to partially fulfill those commitments.

The area will be managed for SWFL, YBCU and other LCR MSCP covered species. The plan generally will be used as a guide to create and manage 50 percent of CW in seral stage I. The other 50 percent will be created and managed for seral stages III and IV. The area will be designed and planted to create the presently known preferred conditions necessary for the target covered species. Areas of contouring for moist soil and standing water, along with mosaics of vegetation, comprise the basis for the creation of habitat. As more specific information regarding habitat conditions for the covered species become known, that information will be incorporated into the design and management plans.

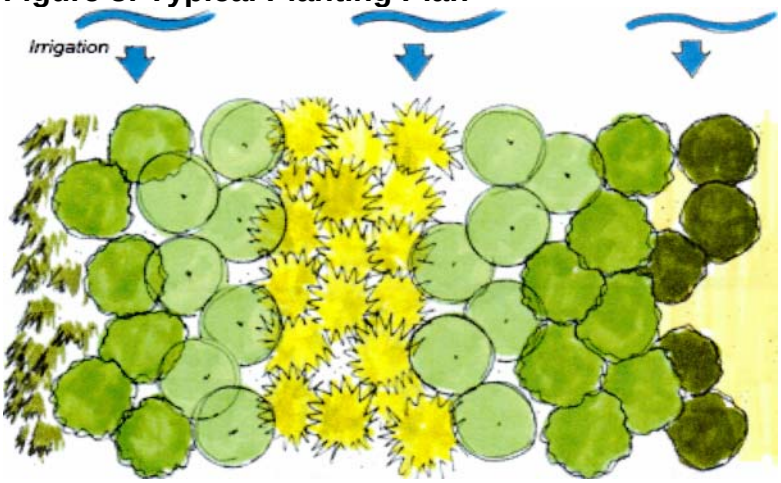
Planting Plan

The Planting Plan incorporates native riparian species along the LCR into a mosaic of created habitats with areas of CW and honey mesquite cover types. Patch sizes of created habitats are designed and managed to provide habitat for more than one species as based on information in the LCR MSCP HCP and CESA Permit for each species. Depending on site conditions, CW and honey mesquite will be created in proximity to each other to re-create an integrated mosaic of habitats that approximate terrestrial communities historically present in the LCR floodplain (LCR MCSP HCP). When feasible, areas of standing water or moist soil and open areas (areas with ground cover and low shrubs) will be incorporated into the design. We anticipate high plant diversity for habitats created at PVER, based on our integrated mosaic approach for planting. By employing this approach, a high quality habitat is anticipated.

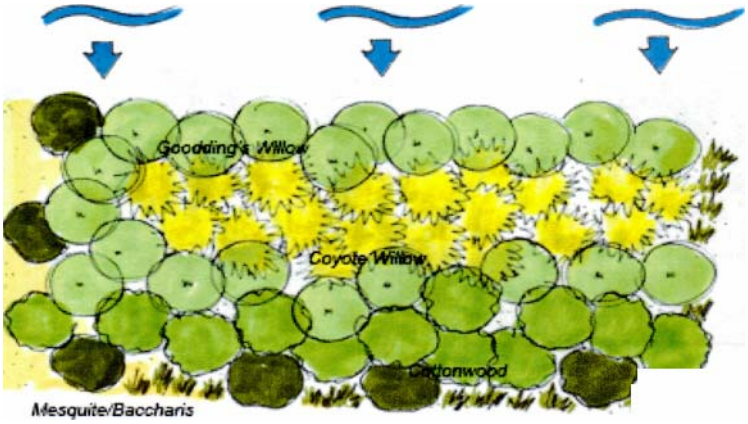
The planting design will place vegetation species with high water needs close to irrigation gates, and the species that require less water will be planted further from the gates (Figure 3).

The design utilizes the slope of the field for irrigation purposes. Canals, depressions and ponds will be designed to ensure the flow of water will start at the gate end and continue to the opposite side of fields (Figure 4). These areas would be irrigated more frequently from April through September (breeding season of the SWFL) so multiple areas would have the moist soils or standing water that are favored by the SWFL.

Figure 3: Typical Planting Plan



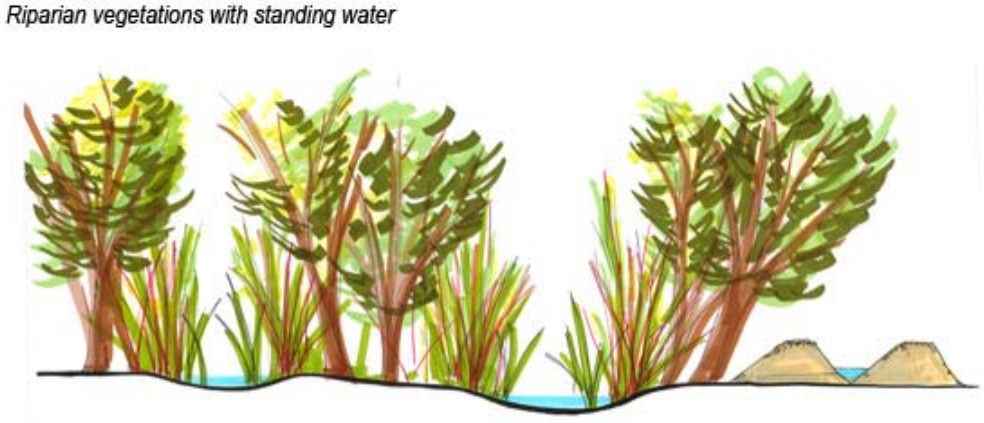
Plan #1
This mosaic of habitat includes the following elements: drought tolerant vegetation, riparian vegetation and moist/saturated soils. The design takes into consideration observed natural riparian vegetation configuration. Drought tolerant vegetation is on the edges progressing to riparian in the middle. The design creates a buffer zone around the Goodding willow-coyote willow area, potential habitat for the southwestern willow flycatcher. Water is delivered to each species according to water requirements through gates.



Plan #2
The same elements are included as in Plan #1, but arranged in a different configuration. Coyote willow-Goodding willow relationship remains the same in this planting plan. Water is controlled for moist/saturated soils and the required needs of the willows. Vegetation is planted according to water requirements of each species. Vegetation with highest water requirements (willows) are located closest to the irrigation gate followed by cottonwood, and then an edge of mesquite.

Figure 4: Flood Irrigation/Shallow Pools

Shallow pools, lined or formed with soil amendments are set in the soil with top at grade. These pools areas will create places where water collects, during a normal irrigation cycle. Water flows across field filling the pool areas and continues across the field. Water will evaporate from pools, but will be refreshed each time the field is irrigated. As time goes on the pools will fill with soil and debris, but still have the ability to hold water or moist soils.



As trees and ground covers increase in density and height, evaporation rates decrease due to soil conditioning from organic debris. Pools will hold water longer. Vegetative species that prefer moist or wet soil will begin to grow around the pool areas, and conditions needed by the covered species will eventually develop.

Table 1 lists the potential species that may be used in the development of habitat at PVER. Each phase plan will include the specific plant species and estimated quantities that will be planted.

Table 1: Potential Native Plant Species List

Scientific Name	Common Name
Populus fremontii	Fremont Cottonwood
Salix gooddingii	Goodding Willow
Salix exigua	Coyote Willow
Prosopis glandulosa v. torreyanna	Honey Mesquite
Atriplex lentiformis	Quailbush
Atriplex canescens	4-wing Saltbush
Atriplex polycarpa	Cattle Saltbush
Baccharis sarothroides	Desertbroom
Baccharis salicifolia	Mulefat
Distichlis spicata	Inland Salt Grass
Encelia farinose	Brittlebush

Grading and Contouring

Initial ground preparation includes laser leveling existing fields to ensure complete and even coverage of irrigation water, and cost-efficient water use. Generally, berms are used to control irrigation to areas requiring more water and deliver water efficiently. To the extent necessary, these berms or borders may also be used for water collection areas to create moist soils. Contouring may be used on the site to create wet swales or ponding areas; however, a specific grading design will be included for each phase plan for approval prior to implementation. Over time, wind erosion, water erosion, build-up of debris, etc., will likely cause change in topography mimicking natural grading changes. As necessary, the specific grading and contouring plans will be included in each individual phase plan prior to implementation.

Planting Material/Planting Techniques

Plant material for the project would be collected from the PVER nursery, other established MSCP nurseries along the LCR, and from areas that are ecologically similar. Planting techniques that have been proven successful include:

- Automated mass transplanting
- Dormant pole cutting/planting
- Hydro seeding
- Planting poles, potted plants, or slips with a conventional tree planter
- Seeding
- Perimeter planting of poles, potted plants, or slips

Planting techniques may include a combination of the above or any planting techniques that have been researched or demonstrated to be successful and/or cost effective. The specific planting technique will be included in each individual phase plan prior to implementation.

Herbicide/Fertilizer/Pesticide Application

To maintain healthy stands of native riparian species, the application of herbicides, fertilizer, or pesticides may be required. All herbicide, fertilizer or pesticide application would be applied or supervised by a current Certfied Pesticide Applicator for the chemical being applied and in compliance with the rules, regulations, and laws set by the State of California and Riverside County.

All records and associated chemical application documents will be stored by the land manager and will include:

- Training records of all employees handling pesticides and herbicides
- Material Safety Data Sheets for all pesticides, herbicides and fertilizers
- Location map of herbicide and pesticide storage site
- Use of California and Riverside County approved herbicide, pesticide and fertilizers
- Record of herbicide, pesticide or fertilizer use

3.0 Management Overview

Land Manager

Reclamation will be responsible for ensuring the long-term operation and maintenance of PVER throughout the 50-year term of the LCR MSCP. The details of operations and maintenance of PVER will be agreed upon between Reclamation and CDFG to include species monitoring, soil, water, vegetation structure, law enforcement, public use, wildfire management, research, and monitoring. Each specific area will be addressed in the adaptive management plan.

Soil Management

Since PVER is located within the Colorado River floodplain, sands and silts have been deposited over time by numerous flood events. Several soil series and associations are found on the property, primarily Rositas fine sand and Gilman sandy loam. There are small areas (less than 4 percent) of Gadsen clay. Sand and sandy loam soils have a low water retention capacity and drain easily. Since

some riparian habitats have areas of standing water or moist soils, soil management would include increasing water-holding capacity where appropriate. Adding organic material to soil would likely increase water-holding capacity and add nutrients to the soil for plant growth. Planting cover crops can decrease wind erosion and help protect topsoil. Following is a list of methods that may be used to manage soil water-holding capacity, nutrients, and to prevent salinity build-up:

- Leaves, vegetative debris and branches will be left on site to decay
- Demonstration techniques may include the use of various mulches such as wood chips, straw (certified weed-free), etc.
- Planting ground cover (native and non-native)
- Appropriate irrigation schedules to flush salts from the soil
- Fertilizer

Soil management may include a combination of the above, or any other techniques that have been researched or demonstrated to be successful and cost effective.

Water Management

Irrigation System

The primary water management at PVER will be an efficient flood irrigation system and schedule. Currently, PVER has an irrigation system that is comprised of 9.2 miles of lined and unlined delivery ditches and associated slide gates. A 100-horsepower electric pump delivers water to the irrigation system from the Colorado River.

It is anticipated that a farmer would be contracted to inspect ditches, canals and gates, and the results reported to Reclamation. In addition, visual inspections will be performed by the irrigator each time the fields are irrigated. Reclamation will be responsible for the cost of repairs and/or replacement of the main irrigation supply system which are proportional to the acreage that has been developed by Reclamation. Reclamation will be responsible for the cost of repairs and/or replacement of irrigation supply ditches exclusively used by Reclamation.

The pump will be inspected and serviced according to the manufacturer's recommendations or yearly, whichever is more frequent.

The costs associated with the delivery of water will be paid for by Reclamation based on the percentage of acreage that has been converted from agricultural land to habitat.

Irrigation Practices

It is anticipated that all CW land cover will be flood-irrigated on a regular basis. Irrigation will be increased during breeding and nesting season of the SWFL (April through September) to create moist soil conditions in small depressions throughout the site. Creating conditions of moist soils, standing or ponding water is considered to be beneficial for the species, and encourages insect diversity and an increase to the relative humidity within the vegetation canopy. A demonstration for moist soil techniques is anticipated and may be conducted in the future.

Irrigation management may include a combination of the above techniques, or any techniques that have been researched or demonstrated to be successful and/or cost effective. The specific irrigation schedules will be included in the individual restoration phase plans prior to implementation. These schedules may be modified as needed.

Structural Management

Selective harvesting within the CW habitat may be used to mimic successional stages to create the targeted structurally diverse habitat. The intent is to mimic the seral stages preferred by the SWFL.

Woody Riparian Habitats

Created habitats would be managed to support CW types I, III and IV for SWFL, and CW types I and III for YBCU. The following methods for structural management will be implemented to achieve the desired cover type classifications. The structural types are based on Anderson and Ohmart (1984) proportional distribution of the vegetation. The PVER property will be assessed annually at the end of each growing season to identify structural types. The following methods may be modified and new methods may be added depending on research and demonstration of techniques, through the adaptive management plan:

- Planting appropriate riparian vegetation that matures to recommended heights
- Manually maintaining the three distinct heights or layers of vegetation
- Planting designed so canopy trees do not shade out mid and bottom foliage and integrates open areas (areas planted with only ground covers)
- Selective removal of intermediate vegetation (pruning and thinning)
- Creating open areas with shrubs and grasses

Structural management may include a combination of the above or any techniques that have been researched or demonstrated to be successful and/or cost effective.

Law Enforcement

CDFG is responsible for law enforcement at PVER. Reclamation will work with CDFG to ensure these activities do not conflict with the LCR MSCP HCP.

Public Use

CDFG has the authority to regulate hunting and recreation uses pursuant to CDFG statutes, regulations and policies. In cooperation with Reclamation, CDFG will coordinate its public use and related activities so they are consistent with and do not adversely affect restoration activities at PVER.

Wildfire Management

As guided by commitments in the HCP (LCR MSCP 2004), wildfire management practices on PVER would:

- Reduce the risk of the loss of created habitat to wildfire by providing resources to suppress wildfires, e.g., contributing to and integrating with local, State, and Federal agency fire management plans, and
- Implement land management and habitat creation measures to support the reestablishment of native vegetation that is lost to wildfire.

PVER wildfire management may include the rapid response of irrigating the affected field and the fields immediately adjacent to the wildfire.

4.0 Monitoring

This section contains the overall strategy for monitoring the PVER restoration project. Subsequent documents (Restoration Phase Plans) provide specific monitoring requirements for each phase and would be typically created on an annual basis.

Monitoring is critical to the adaptive management program. This process allows LCR MSCP partners to analyze implementation activities, address the uncertainty inherent in a 50-year program, and respond appropriately. Scientifically designed monitoring studies will be conducted to evaluate whether the restoration parameters established for each covered species habitat are being achieved, the restoration area develops as covered species habitat, and the habitat is being utilized by the covered species. Results reported on how the created habitat develops, relative to the restoration and management techniques employed, will be used to refine and/or develop future techniques to ensure that the most cost-

effective and efficient approaches will be applied in future phases at PVER, and other restoration sites.

Initial conservation area monitoring plans are based on elements described in the HCP (LCR MSCP 2004). The *Draft Final Science Strategy* describes the science and adaptive management plan strategies for the LCR MSCP. The monitoring plan elements for PVER may be revised after those strategies have been adopted.

Monitoring at PVER will be structured into four categories:

- Predevelopment Monitoring
- Implementation Monitoring
- Habitat/Species Monitoring
- Vegetation Classification

The goals for monitoring may be revised depending on the Adaptive Management Program results, covered species requirements, and/or other management decisions in the future. All monitoring will be designed specifically for each phase and habitat type within that phase. Thus, not every species will be monitored at all times. Covered species monitoring will be organized in the following guilds: marshbirds, neotropical birds, cavity nesting birds, small mammals, bats, and reptiles and amphibians. SWFL, YBCU, and MacNeill's sootywing skipper will be monitored using species specific protocols.

Purpose

The purpose of the PVER monitoring plan is to determine if restoration parameters established for each covered species habitat are being achieved; when each phase of PVER develops as covered species habitat; and if the habitat is being utilized by the covered species. The Avoidance and Minimization Measures, Conservation Area Management Measures, Monitoring and Research Measures, and General and Species-Specific Conservation Measures from the LCR MSCP HCP document dictate the range of data collected, analyzed, and incorporated into the adaptive management plan. Results reported on how the created habitat develops, relative to the restoration and management techniques employed, would be used to refine and/or develop techniques for future phases. This would ensure that the most effective and efficient approaches are used.

Monitoring Design

Sampling design is based on a quasi-experimental design using the Before-After Control-Impact (BACI) design (Stewart-Oaten and Osenberg 1992, Bernstein and Zalenski 1983, Green 1979). The BACI approach prescribes the collection of data prior to an activity and comparison to data collected after the activity (Smith 2002). The quasi-experimental design will use pre-restoration phases as controls. The designs will utilize randomization where possible. Sub-samples of each phase will be taken at the same or similar randomized points both pre- and post-restoration. To the greatest extent practicable, pre-restoration monitoring will be conducted for a minimum of one year prior to the implementation of each phase.

Predevelopment Monitoring

Predevelopment monitoring is designed to establish what types of restoration activities may be conducted, establish baseline data for evaluating post development, and identify whether or not covered species currently inhabit PVER. To establish baseline conditions, an understanding of the current and historical conditions at PVER are necessary.

Predevelopment monitoring is divided into abiotic (soil features) and biotic (vegetation and covered species) factors.

- Abiotic Monitoring
    - Soil
        - Samples are taken from each phase after removal of agricultural crops and before the planting of trees.
        - Samples in each phase are analyzed for moisture, salinity, textural classification, depth to ground water, and nutrients, including nitrate, ortho-phosphate, and ammonia.

- Biotic Monitoring
    - Vegetation Monitoring
        - Currently, PVER is all farm fields and no riparian or marsh habitat is present, therefore only *Atriplex* spp. will be surveyed and mapped.

    - Avian Monitoring
        - Marshbirds will not be monitored, as marsh habitat is not present.
        - Neotropical birds will be monitored utilizing a standardized point count protocol (GBBO 2003). Because PVER is currently in homogeneous agricultural crops, only three

point count transects will be established along the existing roads.
    - Cavity nesting birds will not be monitored, as riparian or mesquite habitat is not present. However, point count surveys will record any avian species present during the predevelopment monitoring phase.
    - Species-specific SWFL and YBCU surveys will not be conducted, as riparian habitat is not present. However, point count surveys will record any avian species present during the predevelopment monitoring phase.

- Small mammal presence/absence surveys will be conducted utilizing a standardized protocol. Trapping will occur prior to the implementation of each phase between late September-November and late February-May. Trapping will be conducted overnight. Traps will be placed in parallel, linear transects of approximately 150 meters in length. A trap station will be located every 10 meters along each transect. Transects will be located 10 to 15 meters apart, with the actual distance apart determined by the size of the area being surveyed. Trapping will be conducted for a minimum of 500 trap nights.

- Bat presence/absence surveys will be conducted utilizing active/passive AnaBat surveys at least two days per season (spring, summer, winter, and fall), prior to the implementation of each phase. All AnaBat system locations will be chosen based on suitable habitat for the covered bat species and ability to maximize data collected.

- Amphibian and reptile monitoring will not be conducted because PVER is outside of the known range of the covered amphibian species and does not currently meet covered reptile species habitat requirements.

- MacNeill's sootywing skipper presence/absence surveys will be conducted if *Atriplex* spp. is located at PVER. Visual surveys will be conducted when the skipper flies between April-October (Pollard 1977). A minimum of three surveys will be conducted.

Implementation Monitoring

Implementation monitoring will be conducted to assess whether land cover type creation and management actions have been implemented as designed for each phase. This type of monitoring quantifies changes immediately after treatments and evaluates whether actions were implemented as prescribed (Block et al.

2001). For example, this type of monitoring would be used to determine whether the planting techniques employed were effective and vegetation was planted according to the phase design specifications. This monitoring is focused on the habitat (biotic) and conditions therein (abiotic).

- Abiotic Monitoring
  - Soil
    - Samples in each phase will be analyzed for moisture, salinity, textural classification, depth to ground water, and nutrients, including nitrate, ortho-phosphate, and ammonia.
    - Samples will be collected annually until the nutrient and salinity measurements are stable.
  - Water
    - Deliveries will be recorded.
- Biotic Monitoring
  - Vegetation
    - Four to six weeks after planting (or after dormancy break), a sample of the trees will be counted and an index of condition (Table 2) will be recorded to determine initial survivorship. These data will be used to guide initial management activities, such as water use and re-planting.
    - After the first two growing seasons, growth and survivorship will be determined, utilizing transects through each phase during the dormancy period (October-January). Sample transects would be randomly determined on an annual basis. The number of sample transects would be determined for each phase and will be based on several factors including patch size, restoration technique, vegetation species, and variation within each stand. Within each sample transect, every tree will be counted and recorded by species. Diameter at breast-height and tree condition (Table 2) will be recorded for every hundredth tree sampled. Percent cover will be measured at random one-meter square plots in each transect to evaluate herbaceous and shrub plant components.

Table 2: Index of Tree Condition

Condition	Definition
Live	Trees appear in apparently good condition – leaves green, no symptoms of wilting, die-back, or chlorotic appearance of leaves
Stressed	Trees appear to be in generally poor condition – chlorotic leaves and leaf drop
Tip die-back	The main stem is in good condition; the most apical portions are in very poor condition exhibiting wilting and die-back symptoms
Basal sprouts	Main stem dead; new growth is initiated from stem base or root stock
Not found	Seedling not found during particular sampling period. If seedling not found in two consecutive periods, it is considered dead.
Apparently dead	General appearance of stem is dry and brittle; no live wood observed and no observable green foliage growth; re-sprouting still possible
Dead	Previously listed as apparently dead; tree in such poor condition that survival by re-sprouting is unlikely.

Habitat/Species Monitoring

Effectiveness monitoring is designed to determine whether each phase is providing the habitat requirements needed for the targeted covered species, if any covered species is utilizing the habitat, and if there are differences in wildlife use of the habitat depending on planting design, composition, and watering regimes. All monitoring will be designed specifically for each phase and habitat type within that phase. The monitoring is divided into habitat and covered species, and will be analyzed incorporating the two.

- Habitat Monitoring
    - Abiotic Conditions
        - Soil
            - Samples would continue to be analyzed for moisture, salinity, textural classification, depth to ground water, and the nutrients nitrate, ortho-phosphate, and ammonia until the conditions are stable. When conditions reach the reference points, samples will be analyzed every three to five years. If conditions change, samples will be analyzed annually until conditions reach the reference point again.
            - Soil moisture probes will be utilized 10 times during the breeding season for SWFL, in SWFL habitat, beginning the year SWFL surveys are conducted.

- Samples will be conducted minimally at the same site as the predevelopment monitoring.

- Water
  - Deliveries to each phase will be recorded and analyzed to determine if the necessary amounts were delivered to grow the requisite habitat.

- Microclimate
  - Random and strategically located data loggers (to record temperature and relative humidity) will be placed within the habitat. The number of data loggers for each phase will be based on acreage of restored habitat. Data loggers will be downloaded approximately every four months. If a SWFL and/or YBCU nest is located, a data logger will be placed within 2 meters of the nest.

- Biotic Conditions
  - Vegetation
    - Beginning at the end of the third growing season, habitat condition will be monitored using a standardized protocol based on a nested sample plot design. Initially, habitat monitoring will occur on an annual basis (years 3 through 6). Monitoring will occur every other year between year 6 and year 10. After year 10, each site will be sampled every five years to monitor successional change through the LCR MSCP period. If a catastrophic disturbance (fire, flood, etc.) occurs to the stand, post disturbance monitoring will mimic the post-restoration monitoring regime.
    - Vegetation monitored would include overstory trees, sapling, shrub, understory, herbaceous layer, vertical foliage density, and crown closure.

- Covered Species Monitoring
  - Marshbirds
    - Monitoring will not be conducted because no marshbird habitat will be restored.

  - Neotropical Birds
    - A standardized point count protocol (GBBO 2003) will be used. Point counts will be conducted annually during the breeding season (May-July) once each month beginning the first May after the planting of each phase. Separate

transects for each phase will be conducted based on habitat type and acreage.
    - Standardized breeding and winter season banding/mistnetting (DeSante 2005) may be conducted, if conditions warrant.
    - Standardized area searches (Ambrose 1989) may be conducted, if conditions warrant (areas less than 20 acres).
    - If covered species are observed, targeted species-specific surveys, nest searches, and banding/mistnetting may be conducted.

- Cavity Nesting Birds
    - Elf owl surveys would be conducted after four to six years, depending on when the land cover type structure and density indicate the habitat has achieved the reference conditions. Installed nest boxes would be monitored during the breeding season (April-July) for Elf owls. If an Elf owl is detected during the breeding season, nest searches, and/or targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.
    - Gilded flicker and Gila woodpecker will be surveyed as part of the Neotropical bird monitoring mentioned above. Installed snags will be monitored during the breeding season (May-July). If gilded flicker and/or Gila woodpecker is detected during the breeding season, nest searches, and/or targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.

- Southwestern Willow Flycatcher
    - Standardized presence/absence surveys (Sogge et al. 1997, USFWS 2000) will be conducted after three growing seasons, depending on when the land cover type structure and density indicates the habitat has achieved the reference conditions. A minimum of five surveys will be conducted beginning in May and ending in July. If a SWFL is detected after June 15, and/or positive breeding evidence is identified, nest searches will be conducted to determine breeding status and use of habitat. Targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.

- Yellow-billed Cuckoo
    - Standardized presence/absence surveys (Halterman and Johnson 2005 Draft) would be conducted after three growing seasons, depending on when the land cover type

structure and density indicates the habitat has achieved the reference conditions. A minimum of five surveys will be conducted beginning in June and ending in September. If an YBCU is detected during the breeding season, nest searches will be conducted and targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.

- Small Mammals
  - Standardized presence/absence surveys will be conducted at least once annually between September-November and late February-May. Trapping will be conducted overnight. Traps will be placed in parallel, linear transects of approximately 150 meters in length. A trap station will be located at 10 meter intervals along each transect. Transects will be located 10 to 15 meters apart, with the actual distance apart determined by the size of the area being surveyed. Trapping will be conducted for a minimum of 500 trap nights.

- Bats
  - Presence/absence surveys will be conducted utilizing active/passive AnaBat surveys at least 2 days per season (spring, summer, winter, and fall) annually. When the vegetation is at sufficient height to hide the equipment, data will be collected daily utilizing two stationary AnaBat/Sonabat systems. One system will be installed in a riparian phase and one system in a riparian/mesquite phase to be determined later. The stationary systems will be established for at least 10 years. After 10 years, data will be examined and future monitoring decisions for bat species will be made. All system locations will be chosen based on suitable habitat for the covered bat species and ability to maximize data collected.

- Reptiles and Amphibians
  - No monitoring will be conducted because no habitat for reptiles and amphibians will be restored or removed.

- MacNeill's Sootywing Skipper
  - Pollard Walks (Pollard 1977) visual surveys would be conducted in the *Atriplex spp*. habitat, when the skipper flies between April-October, to determine presence/absence. Surveys would be conducted when *Atriplex spp*. crown coverage is approximately 10'x 10'. A minimum of three surveys will be conducted.

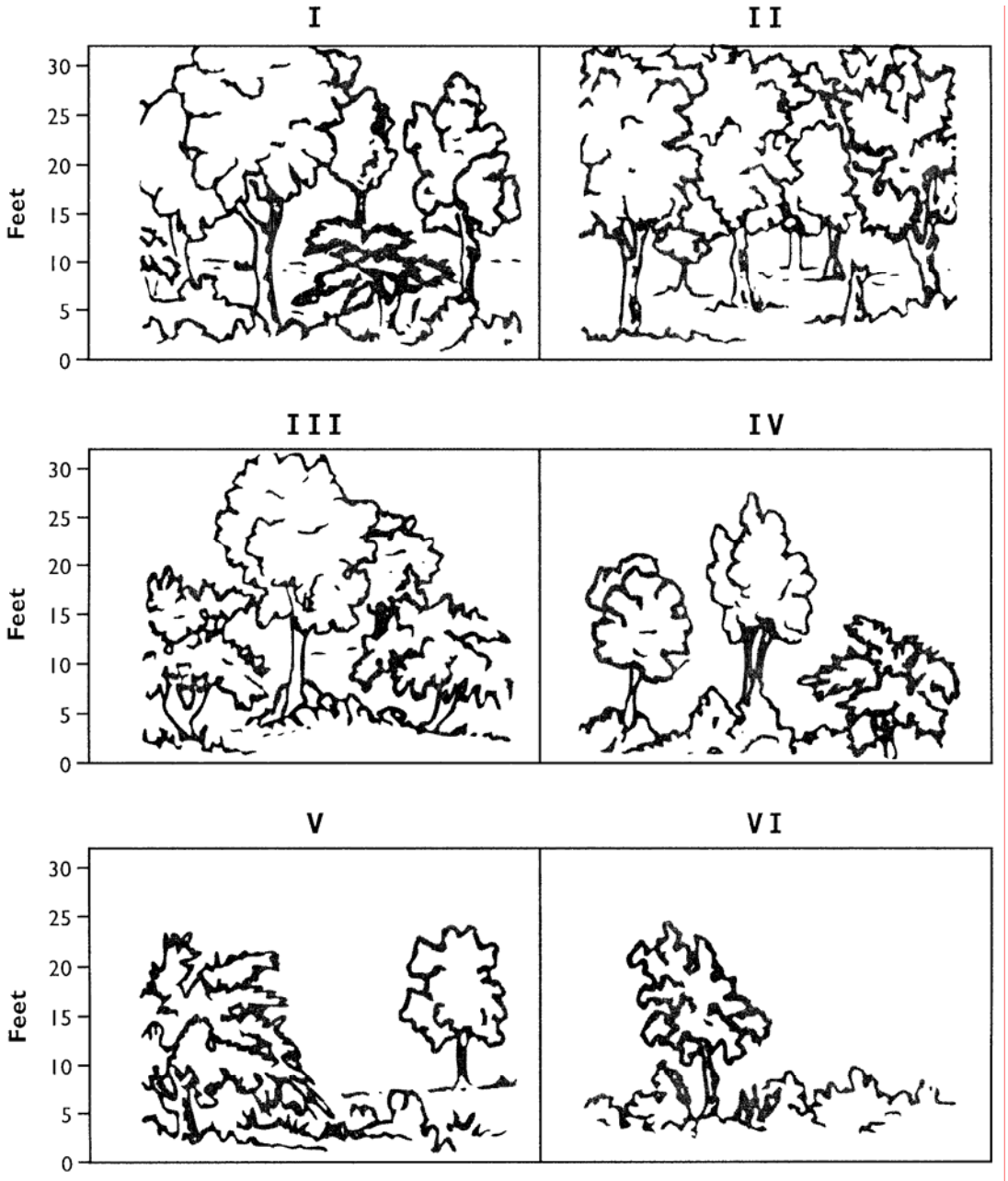
Vegetation Classification

The Habitat Conservation Plan (LCR MSCP 2004) outlines the specific habitat acreage to be created and classified utilizing the Anderson and Ohmart (1976, 1984) classification system (Table 3 and Figure 5). Using aerial imagery of the site obtained annually; each phase of the project will be mapped, classified, and ground truthed.

Table 3: Vegetation Communities, Criteria, and Types

Community Type	**Criteria**	**Vegetation Type**
Cottonwood-willow (CW)	*P. fremontii* and *S. gooddingii* constituting at least 10% of total trees	I, II, III, IV, V, VI
Salt cedar (SC)	*Tamarix* spp constituting 80-100% of total trees	I, II, III, IV, V, VI
Salt cedar-Honey mesquite (SH)	*P. glandulosa* constituting at least 10% of total trees	I, II, III, IV, V, VI
Salt cedar-Screwbean mesquite (SM)	*P. pubescens* constituting at least 20% of total trees	I, II, III, IV, V, VI
Honey mesquite (HM)	*P. glandulosa* constituting at least 90% of total trees	I, II, III, IV, V, VI
Arrowweed (AW)	*Tessaria sericea* constituting at least 90-100% of total vegetation area	I, II, III, IV, V, VI
Atriplex spp. (ATX)	*A. lentiformis*, *A. canescens*, and/or *A. polycarpa* constituting 90-100% of total vegetation in area	I, II, III, IV, V, VI

Figure 5: Vegetation Classification



Adapted from Anderson and Ohmart (1984).

Monitoring Analysis and Evaluation

Data collected during implementation will be analyzed to determine process effectiveness and vegetation classification. These results will be evaluated based on thresholds and trigger points identified by reference conditions.

Reference Conditions

PVER reference conditions will be modeled on conditions found during the SWFL long-term life history site studies along the LCR (McLeod et al. 2005, Koronkiewicz et al. 2005). These variables (Table 4) may change depending on future analysis of the long-term life history studies currently being conducted. Variables that will be referenced include canopy height, canopy closure, vertical foliage density, mean soil moisture (percent volume), mean diurnal temperature, mean maximum diurnal temperature, and mean diurnal relative humidity. These variables were chosen as there were statistically significant differences in use sites versus non-use sites at the SWFL life history study sites (McLeod et al. 2005, Koronkiewicz et al. 2005).

Table 4: Reference Variables

Canopy Height (M)	Average greater than 4.0 m
Canopy Closure (percent total)	Greater than 70%
Vertical Foliage Density	Density greatest between 1-4 m above ground. This may change as additional analysis is completed.
Mean Soil Moisture (percent volume)	Minimum of 17% Average of 23%
Mean Diurnal Temperature (Celsius)	Between 26° C and 33° C
Mean Maximum Diurnal Temperature (Celsius)	Maximum of 45° C Average between 32° C and 45° C
Mean Diurnal Relative Humidity (percent)	Greater than 33% Average between 33% and 63%

Thresholds

Thresholds signal that conditions are appropriate to continue current management practices. The thresholds are as follows:

- Microclimate and vegetation reference conditions are achieved.
- One or more covered species are utilizing PVER during non-breeding season.
- One or more covered species are utilizing PVER during breeding season.
- SWFL and/or YBCU are utilizing PVER during non-breeding season.
- SWFL and/or YBCU are utilizing PVER during breeding season.

In addition, if any monitoring activities document that SWFL and/or YBCU were occupying the site before reference conditions were achieved, management and maintenance activities would be adjusted, as appropriate.

Trigger Points

Trigger points signal the need to alter current management activities to achieve PVER goals of the restoration site or change the goals for PVER. The trigger points are:

- Microclimate and vegetation reference conditions have not been achieved.
- Previously suitable land cover type structures are no longer suitable for any targeted covered species.
- Targeted covered species habitat needs exceeded water availability.

Adaptive Management

Data will be evaluated annually to determine if the thresholds and/or trigger points were reached. If results indicate that the restoration activities meet or exceed thresholds, recommendations will be made in the annual report for future management activities at PVER as well as other restoration activities. If results indicate that restoration activities were deleterious to covered species and/or habitats, recommendations on prescriptions and modifications will be identified, and other methods tested.

Plant community and structural type are a component necessary for obtaining performance criteria for woody riparian cover types. Criteria used to define woody riparian land cover types are determined by the Anderson and Ohmart Vegetation Classification System (1984). Annual reports will summarize the performance criteria of newly created habitat acreage and the specific habitat type acreage that will be credited as restored habitat. Through the adaptive management process, any structural management determined from vegetation classification will be defined in the annual report.

5.0 Reports

Annual Report

An annual report will be prepared by Reclamation and made available each calendar year summarizing the following:

- General description of the Project status and the effects on covered species

- A table from the Mitigation Monitoring and Reporting Program (MMRP) indicating current implementation status of each mitigation measure
- A description of all restoration activities and monitoring actions conducted over the past year
- A summary of monitoring and research activities over the past year
- Results and analyses of monitoring and research data
- An assessment of the effectiveness of each mitigation measure in minimizing and compensating for Project impacts
- The total number of acres planted
- The total number of acreage that meets or exceeds the performance standards
- Any other applicable information

Through the adaptive management process, each June a Restoration Plan for each Phase will be prepared and submitted to the CDFG for approval. This plan will incorporate the monitoring results from the previous year. The plan will include the planting design, planting techniques, grading plan, and demonstration or research plan for the acreage that will be converted. The monitoring results will indicate the amount of structural management that will be accomplished in the next year and any modifications to previously restored habitats.

Final Report

A final report will be prepared by Reclamation and submitted no later than 180 days after the completion of all mitigation measures. The final report is anticipated in 2055 and will include the following information:

- A copy of the table in the MMRP with notes showing when each mitigation measure was implemented
- All available information regarding Project-related incidental take of covered species
- Information regarding other Project impacts on the covered species in the Permit
- An assessment of effectiveness of the Permit's conditions of approval for minimizing and compensating for project impacts
- Recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the species
- Any other pertinent information.

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