Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Consevation

Palo Verde Ecological Reserve Restoration Development Plan: Phase 3

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

June 2007

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Lower Colorado River Multi-Species Conservation Program

Palo Verde Ecological Reserve Restoration Development Plan: Phase 3

Lower Colorado River
Multi-Species Conservation Program Office
Bureau of Reclamation
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http://www.lcrmscp.gov

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Table of Contents

Acronyms and Abbreviations 3
Background 4
1.0 Purpose/Need 4
2.0 Design/Planting Plan 6
    Grading/Contouring 9
    Irrigation 9
3.0 Monitoring 10
    Predevelopment Monitoring 10
    Implementation Monitoring 11
    Habitat/Species Monitoring 12
    Vegetation Classification 15
    Monitoring Analysis and Evaluation 17
        Reference Conditions 17
        Thresholds 18
        Trigger Points 19
    Adaptive Management 19
    Literature Cited 20

Figures

Figure 1. Proposed Phasing Map 5
Figure 2. Phase 3 Riparian Habitat Design 7
Figure 3. Typical Cottonwood-Willow Land Cover Type 8
Figure 4. Vegetation Classification 16

Tables

Table 1. Phase 3 Native Plant Species List 6
Table 2. Phase 3 Irrigation Schedule—Cottonwood-Willow 9
Table 3. Phase 3 Irrigation Schedule—Mesquite/*Atriplex* 9

Acronyms and Abbreviations

CDFG	California Department of Fish and Game
CW	Cottonwood-Willow Land Cover Type
ESA	Endangered Species Act
HCP	Habitat Conservation Plan
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
PVER	Palo Verde Ecological Reserve
Reclamation	U.S. Bureau of Reclamation
SWFL	Southwestern Willow Flycatcher

Background

The Palo Verde Ecological Reserve (PVER) encompasses 1,352 acres of the historical floodplain of the Colorado River 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 2004 to offset degradation of wildlife habitat along the lower Colorado River. On September 3, 2004, the property was conveyed to the State of California. California has identified up to 1,300 acres of active agricultural lands on this property for habitat restoration under the Lower Colorado River Multi-Species Conservation Program (LCR MSCP), a 50-year multi-partner program administered by the U.S. Bureau of Reclamation (Reclamation).

The California Department of Fish and Game (CDFG) and the LCR MSCP 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 will be managed for species covered under the MSCP throughout the 50-year life of the program.

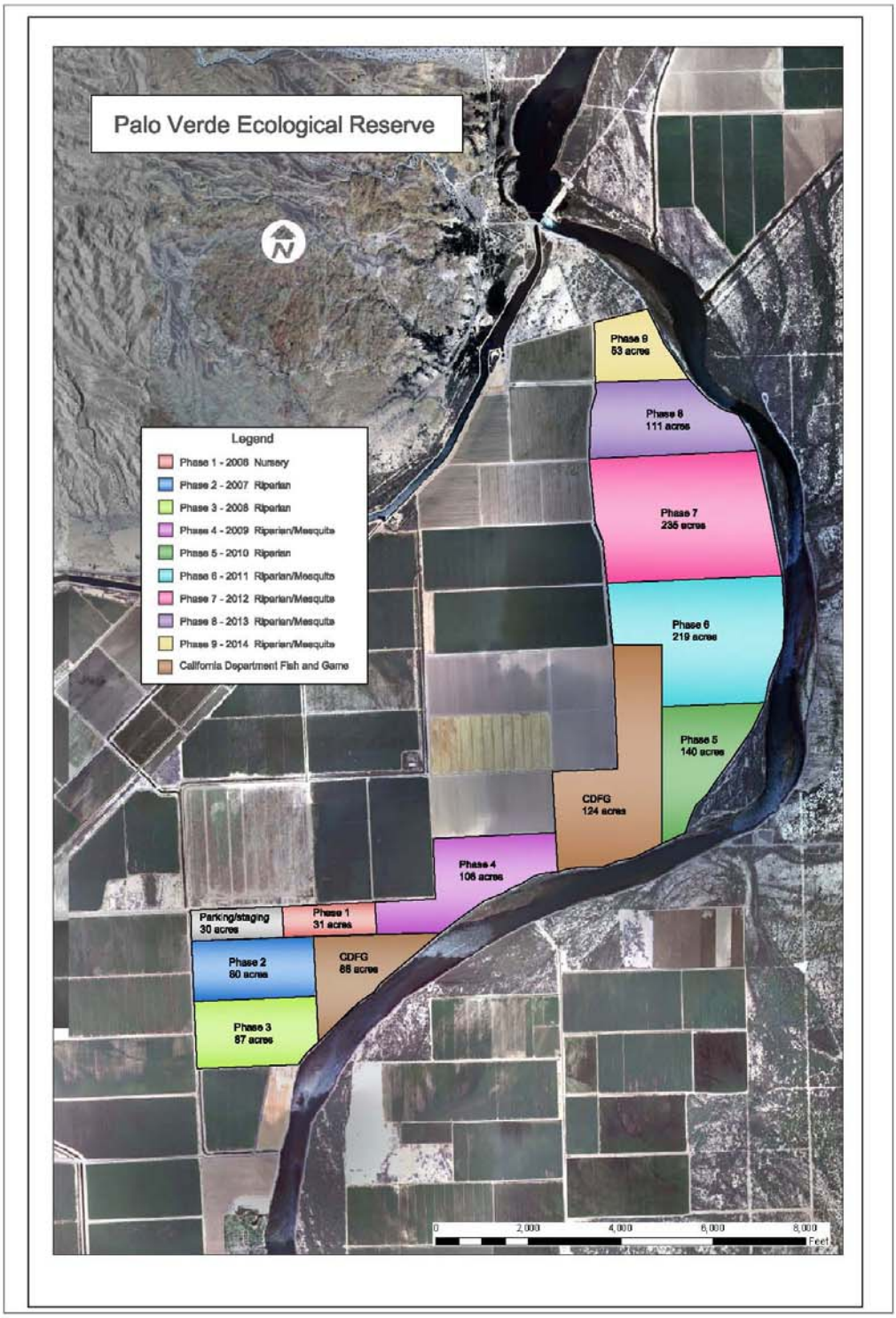
The proposed development of the property is shown in Figure 1. Additional site information can be found on the LCR MSCP Web site (http:www.lcrmscp.gov) in the report, *Palo Verde Ecological Reserve Restoration Development Plan*: *Overview*. In Phase 1, during Fiscal Year 2006, 30 acres of riparian nursery were planted. In Phase 2, Fiscal year 2007, 80 acres of cottonwood-willow land cover type was planted. Additional information on the design, planting, and monitoring of Phase 1 and Phase 2 can be found in the reports, *Palo Verde Ecological Reserve Restoration Development Plan: Phase 1* and *Palo Verde Ecological Reserve Restoration Development Plan: Phase 2*, available on the LCR MSCP Web site.

1.0 Purpose/Need

The objective of Phase 3 is to create, develop, and maintain riparian habitat for approximately 87 acres of cottonwood/willow seral stages I, III, and IV. Each phase builds upon previously created mosaics of habitat within the site, with the eventual goal of creating approximately 1,100 acres of riparian habitat.

Phase 3 will be managed for the southwestern flycatcher (SWFL), and will benefit other species covered under the LCR MSCP (LCR MSCP 2004) that utilize cottonwood-willow land cover types.

Figure 1. Proposed Phasing Map



2.0 Design/Planting Plan

Eighty-seven acres of cottonwood-willow land cover type will be established with the intent of creating habitat using mass transplanting and hand planting techniques. Riparian species composition and density will mimic a natural riparian landscape. The design incorporates cottonwood and willow species, open areas of grasses, edges of *Atriplex*, and *Baccharis* and mesquite (Table 1). The acreage will be divided into 10 checks (areas between borders) for water management. After the initial growing season, it is anticipated that irrigation schedules for vegetation species with higher water requirements, such as cottonwood and willow, will be kept on the same schedule, whereas for vegetation with lower water requirements, irrigation water will be placed on a reduced schedule after the initial growing season.

The entire acreage will be disked and prepared for planting. Borders will be disked and placed, separating the field into 10 checks. A cover/nurse crop of alfalfa/rye grass will be seeded just prior to planting of the trees. Cover/nurse crops have proven helpful in previous restoration sites for reducing the amount of invasive vegetation and adding nitrogen. Checks 1 through 8 are approximately 264 feet wide by 1420 feet long (Figure 2). Checks 9 and 10 are 198 wide by 1250 long and 202 wide by 1070, respectively.

Checks 1, 5, and 10 will be planted with *Atriplex* and honey mesquite. These areas will create edges that delineate drier areas. Honey mesquite is generally hand planted in the fall of each year. The trees will be planted 20 feet on center (2,500 trees) for a total of approximately 18 acres. *Atriplex* will be planted in the spring utilizing mass transplanting techniques.

Checks 2, 3, 4, 6, 7, 8, and 9 will be mass transplanted in the spring with approximately 180,000 cottonwood, willow, and *Baccharis*. Spacing of trees and shrubs will be 6-foot in-line with 40-inch rows. This spacing allows for tree growth while providing area for vegetation density development (Figure 3).

Invasive weeds such as morning glory will be managed by a Certified Pesticide Applicator or controlled by manual hand picking.

Table 1: Phase 3 Native Plant Species List

Scientific Name	Common Name
Populus fremontii	Cottonwood
Salix exigua	Coyote Willow
Salix gooddingii	Goodding's Willow
Prosopis glandulosa v. *torreyanna*	Honey Mesquite
Baccharis sarothroides	Desertbroom
Atriplex lentiformis	Quailbush
Baccharis salicifolia	Mule's Fat
Distichlis spicata	Saltgrass

Figure 2. Phase 3 Riparian Habitat Design

Figure 3. Typical Cottonwood-Willow Land Cover Type

Grading/Contouring

The fields will be laser leveled to ensure efficient flood irrigation and drainage. No grading or contouring is expected on Phase 3. Borders will be added for efficient water control and delivery.

Irrigation

The anticipated schedule for the first calendar year is shown in Table 2 for CW and Table 3 for Mesquite/*Atriplex*. Irrigation regimes may be modified due to climatic conditions such as rain, wind, and high temperatures, or to ensure vegetation moisture requirements are met.

Table 2: Phase 3 Irrigation Schedule—Cottonwood-Willow

Day/Week/Month	Frequency	Comments
Planting day	Immediately post planting	
Week 1-4: April, May	Once per week	Or as necessary to keep root ball moist
Week 5-9	Every 10 days	Or as necessary to keep root ball moist
Week 10-12	Every 10-14 days	
Week 12 through August	Every 14 days	
September	Twice	
October	Twice	
November	Once	
December	No water	

Table 3: Phase 3 Irrigation Schedule—Mesquite/*Atriplex*

Day/Week/Month	Frequency	Comments
Planting day	Immediately post planting	
Week 1-4: April, May	Once every 3 weeks	Or less if plants shows signs of over watering
June, July, August	Once per month	Or less if plants shows signs of over watering
September	No water	
October	Once	Immediately after planting mesquite
November	Once	
December	No water	

3.0 Monitoring

Pre-development Monitoring

Pre-development monitoring of Phase 3 is to establish baseline data for evaluating post-development, and identify whether covered species currently inhabit PVER.

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

- Abiotic Monitoring
  - Soil
    - Random samples will be collected before the planting of Phase 3.
    - Samples will be analyzed for moisture, salinity, textural classification, depth to ground water, and nutrients, including nitrate, ortho-phosphate, and ammonia.
- Biotic Monitoring
  - Vegetation
    - Currently, PVER consists entirely of farm fields and no riparian or marsh habitat is present.
    - Small patches of *Atriplex* spp. exist; however, they are isolated and too small to support the MacNeill's sootywing skipper.
  - Avian
    - Marshbirds will not be monitored, as marsh habitat is not present.
    - Neotropical birds will be monitored utilizing a standardized point-count protocol (GBBO 2003) established for the entire PVER site.
    - 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 southwestern willow flycatcher 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.
    - Species-specific yellow-billed cuckoo (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 Phase 3 between late September-November 2007 and late February-May 2007.

Trapping will be conducted overnight. Traps will be placed in parallel, linear transects approximately 150 m long. A trap station will be located every 10 m along each transect. Transects will be located 10 to 15 m 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. Trapping may occur near Phase 3 in dense habitat along irrigation ditches, as previous trapping efforts in alfalfa fields had low catch rates.

- Bat
    - Presence-absence surveys will be conducted utilizing passive AnaBat surveys at least 2 days per season (spring, summer, winter, and fall), prior to the implementation of Phase 3, beginning spring 2007. 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 and October (Pollard 1977). A minimum of three surveys will be conducted.

Implementation Monitoring

Implementation monitoring will be conducted to assess whether creation of land cover type 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 will be used to determine whether the planting techniques employed were effective and whether the 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 will be analyzed if vegetation exhibits signs of stress not accounted for by other factors. Samples will be analyzed in the same manner as for predevelopment monitoring.
    - Water
        - Deliveries will be recorded as to time, quantity, and amount.

- Biotic Monitoring
    - Vegetation
        - Two to four weeks after planting, a sample of trees will be counted and an index of condition will be recorded (Table 4). These data will be used to assess survivorship and to guide initial management activities, such as water use and re-planting.
        - After the first growing season (2008), growth and survivorship will be sampled, utilizing transects through each phase during the dormancy period (October-January). Sample transects will be randomly determined. The number of sample transects 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 4) will be recorded for every hundredth tree sampled.

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 determine whether there are differences in wildlife use of the habitat depending on planting design, composition, and watering regimes. The monitoring is divided into habitat and covered species and will be analyzed incorporating both of these divisions.

- Habitat Monitoring
    - Abiotic Monitoring
        - Soil
            - Samples will be analyzed if conditions warrant (i.e., if vegetation exhibits signs of stress). Samples will be analyzed in the same manner as for predevelopment monitoring.
            - Soil moisture probes will be utilized during SWFL survey times during the breeding season for SWFL, and in SWFL habitat, beginning the year SWFL surveys are conducted.
        - Water
            - Deliveries to each phase will be recorded and analyzed to determine whether the scheduled timings were sufficient to grow the requisite habitat.
        - Microclimate
            - Random and strategic HOBO H8 Pro data loggers will be placed within the habitat. Data loggers record temperature and relative humidity. The number of loggers for each phase will be based on acreage of restored habitat. Data loggers will be downloaded

approximately every 4 months. If a SWFL or YBCU nest is located, a data logger will be placed within 2 meters of the nest. Data loggers will be placed within the habitat in 2010.

- Biotic Monitoring
  - Vegetation
    - At the end of the third growing season (2010), 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, Phase 3 will be sampled every 5 years to monitor successional change through the MSCP period. If a catastrophic disturbance (fire, flood, etc.) occurs to the stand, post-disturbance monitoring will mimic the implementation monitoring regime.
    - Vegetation monitored will include but will not be limited to: 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 per month beginning the first May after planting Phase 3.
    - Standardized breeding and winter season banding and 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 and mistnetting may be conducted.
  - Cavity Nesting Birds
    - Elf owl surveys will be conducted after 4 to 6 years, depending on when the land cover type structure and density indicates that the habitat has achieved the reference conditions. Installed nest boxes will be monitored during the breeding season (April-July) for elf owls. If an elf owl is detected during the breeding season, nest searches or targeted banding and 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. Installed snags will be monitored during the breeding season (May-July). If a gilded flicker or a Gila woodpecker is detected during the breeding season, nest searches or targeted banding and 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 in the riparian habitat after three growing seasons (2010). A minimum of five surveys each year will be conducted beginning in May and ending in July. If a SWFL is detected after June 15, or positive breeding evidence is identified, nest searches will be conducted to determine breeding status and use of habitat. Targeted banding and 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) will be conducted after three growing seasons (2010). A minimum of five surveys will be conducted beginning June and ending in September. If a YBCU is detected during the breeding season, nest searches will be conducted and targeted banding and 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 (beginning in 2007) between September-November and late February-May. Trapping will be conducted overnight. Traps will be placed in parallel, linear transects approximately 150 meters long. A trap station will be located at every 10 meters along the transect, and one trap will be located at each trap station. Transects will be located 10 to 15 meters apart, with the actual distance apart determined by the size of the area surveyed. Trapping will be conducted for a minimum of 500 trap nights. A trap night is defined as setting one trap over one night.
- Bats
    - Presence-absence surveys will be conducted utilizing passive AnaBat surveys at least 2 days per season (spring, summer, winter, and fall) annually beginning in 2007. When the vegetation is at sufficient height to hide the AnaBat system, data may be collected daily utilizing one stationary AnaBat or Sonabat system. The system will be installed in the riparian section. The stationary system will be established for at least 10 years and may be relocated within Phase 3 to maximize detections. 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 will be conducted in the quailbush habitat when the skipper flies between April and October to determine presence and absence. Surveys will be conducted when vegetation covers an area approximately 3 meters by 3 meters. A minimum of three surveys will be conducted.

Table 4: 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.

Vegetation Classification

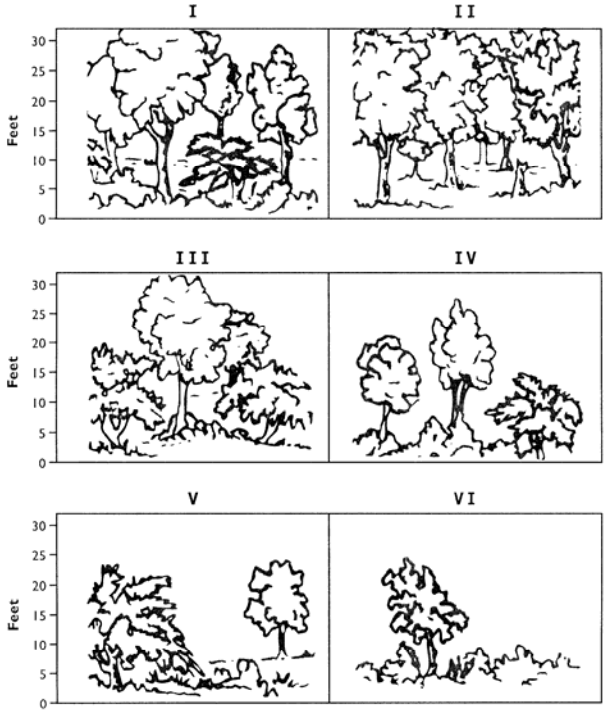
The Habitat Conservation Plan (LCR MSCP 2004) outlines the specific habitat acreage to be restored and utilizes the Anderson and Ohmart (1976, 1984) classification system as the performance standard. Reclamation will evaluate compliance with performance standards by determining vegetation classification annually until the target goals have been met.

To map the vegetation at PVER, Reclamation will annually obtain aerial imagery of the site. With the digital imagery, each phase will be mapped out utilizing the Anderson and Ohmart (1976, 1984; Table 5; Figure 4) system.

Table 5: Vegetation Communities, Criteria, and Types

Community Type	Criteria	Vegetation Type
Cottonwood-willow (CW)	*P. fremontii* and/or *S. gooddingii* constituting at least 10% of total trees	I, II, III, IV, V, VI
Saltcedar (SC)	*Tamarix* spp. constituting 80-100% of total trees	I, II, III, IV, V, VI
Saltcedar-Honey mesquite (SH)	*P. glandulosa* constituting at least 10% of total trees	I, II, III, IV, V, VI
Saltcedar-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 4: Vegetation Classification



Adapted from Anderson and Ohmart (1984).

Monitoring Analysis and Evaluation

Once the data collected during implementation, effectiveness, and vegetation classification is analyzed, the results will be evaluated based on thresholds and trigger points identified by the reference conditions.

Reference Conditions

Palo Verde Ecological Reserve reference conditions will be modeled on conditions found during the southwestern willow flycatcher long-term life history site studies along the LCR (McLeod et al. 2005, Koronkiewicz et al. 2004, 2006). These variables 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 (% volume), mean diurnal temperature, mean maximum diurnal temperature, and mean diurnal relative humidity (Table 6). These variables were chosen because there were statistically significant differences in use-sites versus non-use sites at the southwestern willow flycatcher life history study sites (McLeod et al. 2005, Koronkiewicz et al. 2004, 2006).

Table 6. Reference Variables

Canopy Height (M)	Average greater than 4.0 m
Canopy Closure (% total)	Greater than 70%
Vertical Foliage Density	Density greatest between 1 m and 4 m above ground. This may change as additional analysis is completed
Mean Soil Moisture (% 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 (%)	Greater than 33% Average between 33% and 63%
Contaminant Load for Irrigation Return Flow	Will be defined by water quality samples taken in adjacent drains prior to restoration
Average Soil Salinity Range of Soil Electroconductivity – a function of salinity concentration (mMHO/cm)	Will be defined by targeted plant species thresholds Cottonwood = <2.0 Willow = <2.0 Honey and Screwbean Mesquite = <9.4 *Atriplex* = <16.4 *Baccharis* = <16.4

Thresholds

Thresholds signal that conditions are appropriate and current management practices should be continued. 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.
- Southwestern willow flycatcher or YBCU are utilizing PVER during non-breeding season.
- Southwestern willow flycatcher or YBCU are utilizing PVER during breeding season.

In addition, if any monitoring activities documented that SWFL 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 goals for 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 of the targeted covered species.
- Soil salinity increased to thresholds above targeted plant tolerances.
- Targeted covered species habitat needs exceeded water availability.

Adaptive Management

Data will be evaluated yearly to determine whether the thresholds or trigger points were reached. If results indicates 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 or habitats, recommendations on prescriptions and modifications will be identified, and other methods tested.

Plant community and structural type classify performance criteria for woody riparian cover types (Anderson and Ohmart 1984). Criteria used to define woody riparian land cover types are determined by the vegetation classification. Annual reports will summarize the performance criteria, 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.

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