Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Palo Verde Ecological Reserve Restoration Development and Monitoring Plan: Phase 7

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

July 2011

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Lower Colorado River Multi-Species Conservation Program

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

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Contents

Figures

Tables

Background

An important requirement of the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is to create habitat (as defined by Anderson and Ohmart vegetation classification) and fulfill conservation measures for covered species. The Palo Verde Ecological Reserve (PVER) encompasses 1,352 acres of the historical floodplain of the Colorado River near Blythe, California, and is intended to help fulfill this requirement. 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 a minimum of 1,100 acres of active agricultural lands on this property for habitat restoration under the LCR.

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 website (www.lcrmscp.gov) in the report, *Palo Verde Ecological Reserve Restoration Development Plan*: *Overview*.

In Phase 1, during Fiscal Year 2006 (FY06) 61 acres of riparian nursery (to include cottonwood-willow and mesquite) were established (Table 1). In Phase 2 (FY07), 78 acres were established. In Phase 3, 45 acres were established in FY08 and 39 acres were established in FY09. In Phase 4 (FY09), 100 acres were established, and in Phase 5 (FY10), 216 acres were established. In Phase 6 (FY11), 220 acres will be planted.

Additional information on the design, planting, and monitoring of Phases 1-3 can be found in the reports: *Palo Verde Ecological Reserve Restoration Development Plan: Phase 1; Palo Verde Ecological Reserve Restoration Development Plan: Phase 2*; *Palo Verde Ecological Reserve Restoration Development Plan: Phase 3; Palo Verde Ecological Reserve Restoration Development Plan: Phase 4*; *Palo Verde Ecological Reserve Restoration Development Plan: Phase 5*; and *Palo Verde Ecological Reserve Restoration Development Plan: Phase 6.* These reports are available on the LCR MSCP website.

Figure 1. Proposed Phasing Map

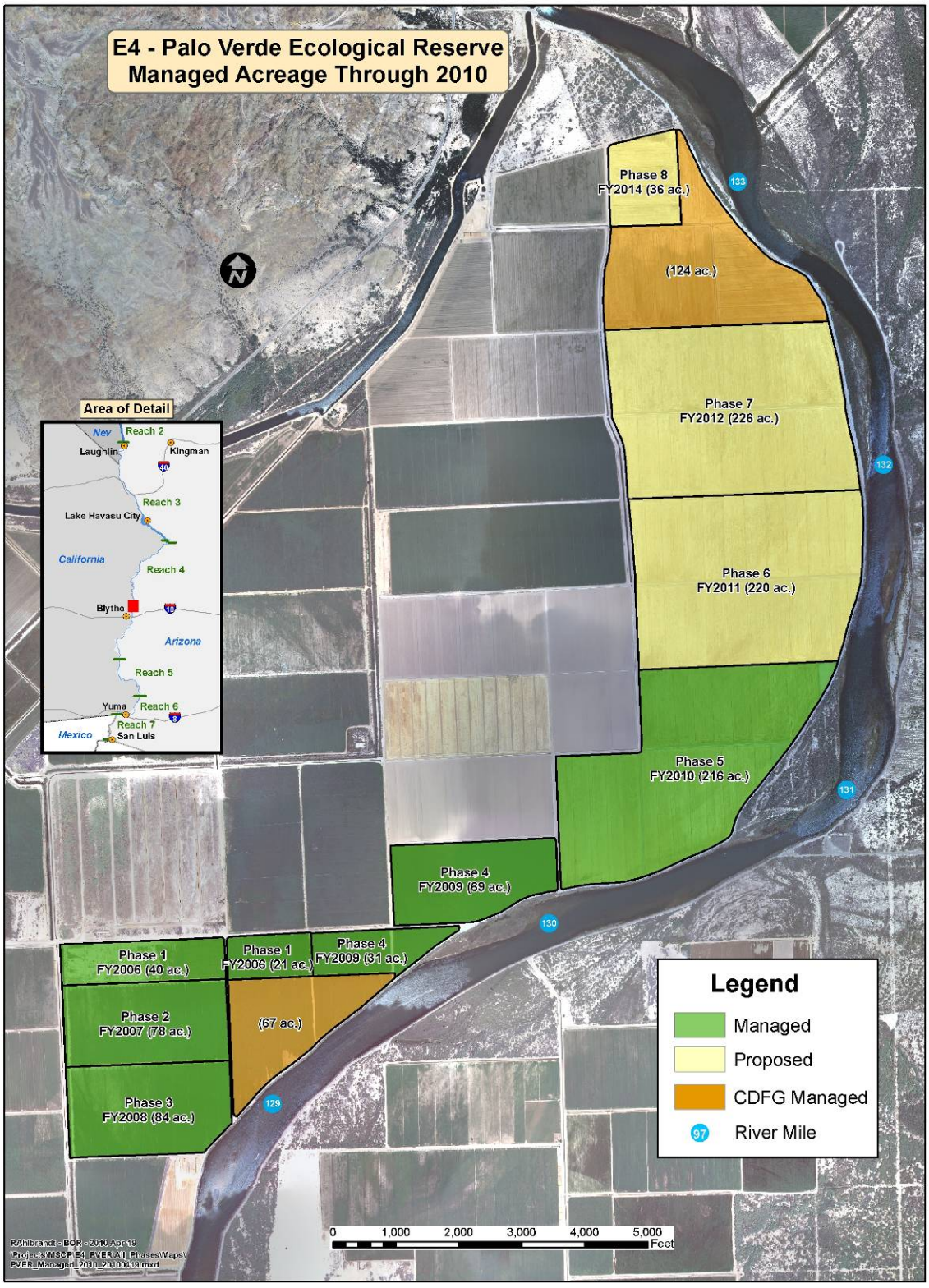


Table 1. Phase 1-5 Managed Acres

Phase	Fiscal Year	Acres Planted	Land Cover Type	Cumulative Total
1	2006	61	CW	61
2	2007	78	CW	139
3	2008	84	CW	223
4	2009	100	CW	323
5	2010	216	CW	539
6	2011	*220	CW	759
7	2012	226	CW	985

*acres to be planted in 2011

1.0 Purpose

The objective of Phase 7 is to create, develop, and maintain approximately 226 acres of cottonwood-willow (CW) seral stages I, II, III, and IV. Each phase builds upon previously created habitat mosaics within the site, with the eventual goal of creating approximately 1,100 acres of riparian habitat.

Phase 7 will be managed for the southwestern flycatcher (SWFL) and the yellow-billed cuckoo (YBCU), and will benefit other species covered under the LCR MSCP (LCR MSCP 2004) that use CW.

2.0 Design and Planting Plan

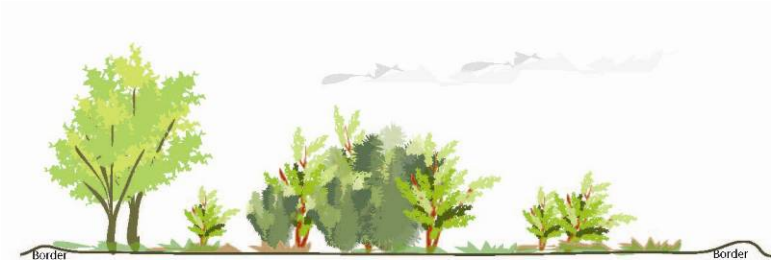
In Phase 7 of PVER development, 226 acres of CW will be developed with the intent of creating habitat using both mass transplanting and hand planting techniques. Riparian species composition and density will mimic a natural riparian landscape. The design incorporates cottonwood, willow, and *Baccharis* species, and open areas of native grasses, quailbush, and mesquite (Table 2). The acreage will be divided into 28 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 vegetation with lower water requirements, such as mesquite and quailbush, will be placed on a reduced schedule.

Table 2. Phase 7 Native Plant Species List

Scientific Name	Common Name	Type
Populus fremontii	Cottonwood	Tree
Salix exigua	Coyote willow	Tree
Salix gooddingii	Goodding's willow	Tree
Prosopis glandulosa var. *torreyana*	Honey mesquite	Tree
Baccharis sarothroides	Desertbroom	Shrub
Baccharis salicifolia	Mule-fat	Shrub
Atriplex lentiformis	Quailbush	Shrub
Sporobolus airoides	Alkali sacaton	Grass
Bouteloua gracilis	Blue grama	Grass

The entire acreage will be disked and prepared for planting using standard farming techniques. Fertilizer will be applied prior to planting. Borders will be disked and placed, separating the fields into 28 checks (Figure 2). Prior to tree planting, a cover crop of alfalfa/ryegrass will be seeded in all checks except 1, 14, 15, and 28. In these checks native grasses and shrubs will be seeded as an understory. Cover crops planted in previous restoration sites have proven effective for reducing the amount of invasive weeds.

Figure 2. Typical Riparian Planting



Trees and shrubs with similar water requirements are planted between borders for control of irrigation. A typical check is planted with Goodding's willow, coyote willow, cottonwood, and *Baccharis*.

Check Size and Infrastructure

Checks 1-14 vary from 206 feet to 327 feet wide and 1,294 feet long. Checks 15-28 vary from 190 feet to 438 feet wide and from 1,296 feet long. Each check has four slide gates to control irrigation water to each field, except checks 14 and 28, which have one gate each. When planted, Phase 7 will include approximately 226 acres of CW cover type (Figure 3).

Checks 2-13 and 16-27 will be planted with cottonwood, Goodding's willow, coyote willow, and *Baccharis* at percentage rates listed in Table 3. All mass-transplanted trees will be spaced 6 feet in-line with 40-inch rows in between. This spacing allows for tree growth and density of vegetation identified for LCR MSCP covered species.

Checks 1 and 15 will be planted with mesquite trees 20 feet on-center and *Atriplex* (Figure 4), and checks 14 and 28 will be planted with clusters of mesquite and no *Atriplex*. Native grass will be seeded at the same time.

Figure 3. Phase 7 Pre-Development Design

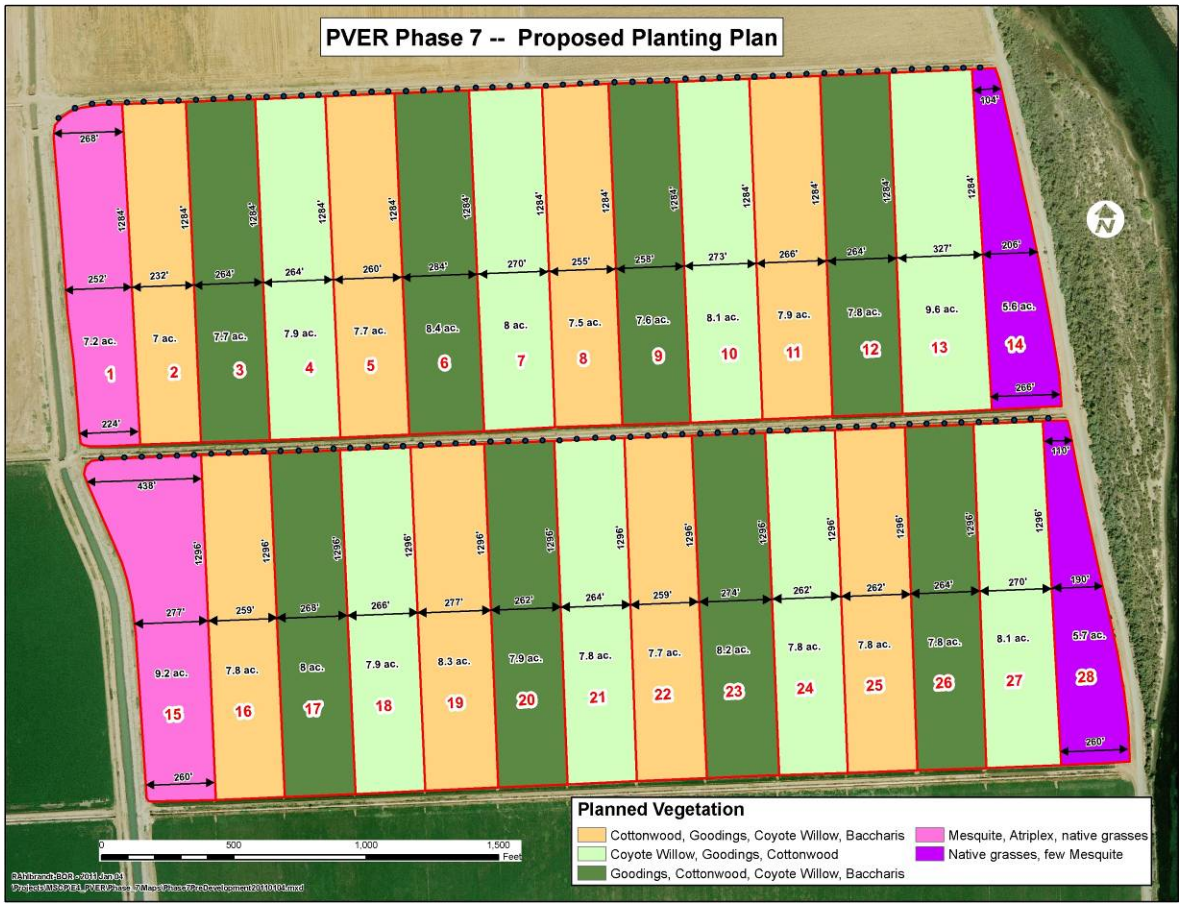
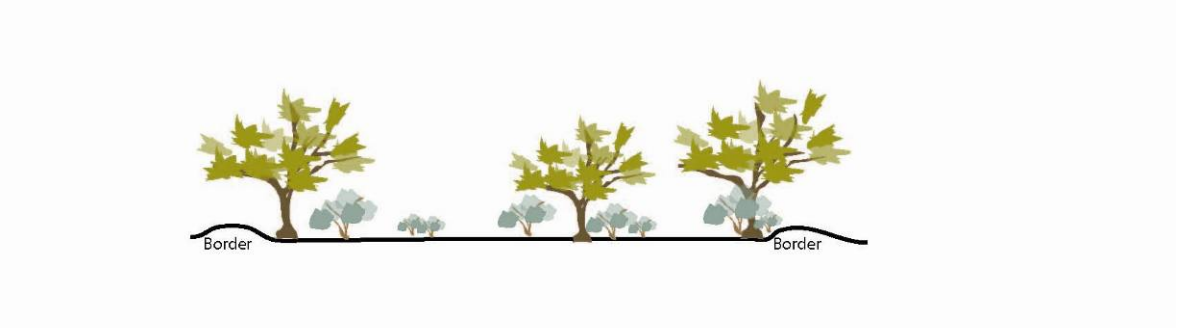


Table 3. Phase 7 Check Planting Percentage Rates and Spacing

Check	Cottonwood	Goodding's Willow	Coyote Willow	Desert-broom and Mule-fat	Honey Mesquite	Quail-bush	Native Grass Seed	6-ft inline 40-in rows	20-ft on center	Total Plants
1					2880	2880	X		X	5,760
2	50%	30%	15%	5%				X		15,138
3	30%	50%	15%	5%				X		16,989
4	10%	40%	50%					X		17,425
5	50%	30%	15%	5%				X		16,988
6	30%	50%	15%	5%				X		18,295
7	10%	40%	50%					X		17,425
8	50%	30%	15%	5%				X		16,552
9	30%	50%	15%	5%				X		17,055
10	10%	40%	50%					X		17,425
11	50%	30%	15%	5%				X		17,424
12	30%	50%	15%	5%				X		16,989
13	10%	40%	50%					X		21,345
14					500		X			500
15					3,630	3,630	X		X	7,260
16	50%	30%	15%	5%				X		16,989
17	30%	50%	15%	5%				X		17,424
18	10%	40%	50%					X		17,425
19	50%	30%	15%	5%				X		18,295
20	30%	50%	15%	5%				X		18,424
21	10%	40%	50%					X		16,990
22	50%	30%	15%	5%				X		16,989
23	30%	50%	15%	5%				X		17,860
24	10%	40%	50%					X		16,990
25	50%	30%	15%	5%				X		16,989
26	30%	50%	15%	5%				X		16,989
27	10%	40%	50%					X		17,425
28					500		X			

Figure 4. Typical Mesquite and/or Quailbush Planting



Plants with similar water requirements, such as mesquite and/or quailbush, are planted together in the same check for irrigation control. Typically, these areas will include honey mesquite and grasses.

Weed Management

If necessary, invasive weeds such as morning-glory, pigweed, and dodder will be managed by a Certified Pesticide Applicator or controlled by manual hand picking.

Grading/Contouring

The fields will be laser-leveled to ensure efficient flood irrigation and drainage. No grading or contouring is expected on Phase 7. Borders will be reworked for efficient water control and delivery.

Irrigation

The anticipated irrigation schedule for the first calendar year is shown in Table 4 for CW and in Table 5 for mesquite and/or quailbush. Irrigation regimes may be modified due to climatic conditions such as rain, wind, and high temperatures, or to ensure vegetation moisture requirements are met.

Irrigation water will be delivered by two canals. Checks 1-14 will be irrigated with flows of water from north to south. The second lateral irrigation ditch will irrigate checks 14-28, north to south.

Table 4. Phase 7 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 5. Phase 7 Irrigation Schedule—Mesquite and/or Quailbush

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

3.0 Monitoring

Conservation area monitoring plans are based on elements described in the LCR MSCP Habitat Conservation Plan (LCR MSCP 2004) and Final Science Strategy (LCR MSCP 2007). Monitoring results will be used as part of the adaptive management process as discussed in Section 4.0 of this report. Monitoring at PVER is structured into two main categories:

- Pre-development Monitoring
- Post-development Monitoring
    - Implementation Monitoring
    - Habitat/Species Monitoring
    - Vegetation Classification

Pre-development Monitoring

Pre-development surveys and monitoring at former agricultural sites including PVER Phase 7 will be limited to initiation of photo point monitoring. Photo point monitoring will be initiated at PVER Phase 7 beginning in 2012. Initially, photos will be taken after the field has been plowed (before planting), immediately after planting, and 6 months after planting.

Post-development Monitoring

Post development monitoring will be implemented to assess the effectiveness of each habitat creation site and management activities in achieving the goals of the HCP. Post development monitoring includes implementation monitoring and response monitoring components that allow each habitat creation site to achieve the target goals of the HCP through an adaptive management process (LCR MSCP 2007).

Implementation Monitoring

Implementation monitoring includes evaluating habitat characteristics and documenting success of habitat creation techniques. Implementation monitoring includes biotic and abiotic components. Habitat characteristics including soil moisture, plant community composition, plant community structure, and microclimate will be evaluated at PVER Phase 7.

Habitat/Species Monitoring

Habitat monitoring was designed to determine whether habitat creation sites are providing the habitat requirements (as defined by performance standards) needed for the targeted covered species. Monitoring protocols have been developed and will document vegetation and microclimate characteristics. A three-tiered approach to habitat monitoring will be implemented at all developed phases. The three tiers are:

- Status Monitoring—Assess the current conditions of each phase.
- Trend Monitoring and Causal Analysis—Determine change over time and potential causes of change by evaluating specific habitat parameters.
- Effectiveness Monitoring—Determine whether management actions are having the intended impact to LCR MSCP covered species, and test the effectiveness of various experiments designed to assist the LCR MSCP in achieving conservation goals.

Objectives for tiers 1 and 2 at PVER Phase 7 include:

- Biotic Monitoring—Determine the current density of target tree species, cottonwood (*Populus fremontii*), willow (*Salix gooddingii* and *S. exigua*), and mesquite (*Prosopis glandulosa* and *P. pubescens*) at PVER Phase 7. Assess change in density, species richness, vegetation structure, and frequency of native and non-native plant species occurring at PVER Phase 7.
- Abiotic Monitoring—Assess the abiotic factors including temperature, relative humidity, distance to nearest irrigation inlet, distance to nearest open space greater than 3 m^2, and soil moisture that may influence the density of target tree species and community composition/structure at PVER Phase 7.

Vegetation Sampling

Vegetation data collection will begin in September and continue through November. Phase 7 will be monitored annually for 3 years and then every other year in subsequent years. Detailed methods can be found in the LCR MSCP Habitat Monitoring Protocols (Bangle in prep.).

Rapid plots will be conducted to assess the goal of establishing cottonwood-willow land cover type (planting density per acre differs by phase). The rapid plots will be used for quick density assessments of target tree species. Intensive plots will be conducted to address trends in density, species richness, vegetation structure, and microclimate. The number of plots per phase is dependent on the size of the phase being monitored. Intensive plots will be evaluated for

overstory trees, intermediate story trees and shrubs, crown closure, foliage height diversity, and ground cover/herbaceous layer.

Microclimate Sampling

Within each phase, HOBO data loggers will be placed at a subset of vegetation plots to record temperature, relative humidity, and photosynthetically active radiation (PAR). Data will be offloaded approximately every 6 months.

Soil moisture will be monitored at a subset of the intensive monitoring plots and at additional random points. Specific methods are currently being developed.

Response Monitoring (Species Monitoring)

Species monitoring is designed to determine whether Phase 7 is providing the habitat requirements (as defined by performance standards) needed for the targeted covered species. Species monitoring will also document whether any other species are using the created habitat. Monitoring protocols have been developed for documenting species response to created land cover types:

- MacNeill's Sootywing Skipper
    - Quailbush planted at PVER will be surveyed for MacNeill's sootywing beginning when the plants are in their first year of growth. The entire quailbush-planted areas will be examined for adult sootywings twice during April-August, and arbitrarily selected plants will be sampled for sootywing eggs and larvae.
- Neotropical Birds
    - A standardized, double-sampling, rapid-intensive, area search survey will be employed (Bart et al. 2010). Surveys will be conducted annually during the breeding season (April-June) beginning the second week of April after planting Phase 7.
    - If covered species are observed, nest searches and mistnetting/banding may be conducted.
- Cavity Nesting Birds
    - Elf owl presence/absence surveys will be conducted once appropriate habitat is present. Because elf owls are secondary cavity nesters, the habitat will need to mature and cavities or nest boxes will need to be present prior to elf owl occupation. The habitat will be observed during neotropical bird surveys for the presence of cavities and primary cavity nesters (woodpeckers). If nest boxes are installed, they will be monitored during the breeding season. If elf owls are detected during the breeding season, nest searches and mistnetting/banding may be conducted.
    - Gilded flickers and Gila woodpeckers will be surveyed as part of the system-wide neotropical bird monitoring effort. Once suitable nesting habitat (snags and cavities) develops on the site, more directed presence/absence surveys may be

necessary for gilded flicker. If flickers are detected during the breeding season, nest searches and mistnetting/banding may be conducted.

- Southwestern Willow Flycatcher`
    - Standardized presence/absence surveys (Sogge et al. 1997, USFWS 2000) will be conducted in the riparian habitat after three growing seasons. 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 to document long-term use of the site and to define habitat requirements.
- Yellow-billed Cuckoo
    - Standardized presence/absence surveys (Halterman and Johnson 2005) will be conducted beginning after two or three growing seasons, depending on habitat suitability. 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 to document long-term use of the site and to define nesting habitat requirements.
- Rodent Surveys
    - Post-development monitoring will be conducted for presence of cotton rats. Trapping will occur at night and will be concentrated in areas where native grasses are being planted. The number of traps will be determined by how much of the native grass successfully develops in dense enough patches that a cotton rat population can be sustained. Once presence is established, a standardized protocol will be developed and implemented.
- Bats
    - A long-term acoustic station has been operating in Phase 2 since the spring of 2010. Phase 2 has been planted in a similar manner to Phase 7 and will serve as a surrogate for other phases. An additional long-term station may be installed at a later date.
    - In 2011, a pilot monitoring program involving driving acoustic transects will be implemented that will collect data around all phases of PVER.

Vegetation Classification

The LCR MSCP Habitat Conservation Plan (LCR MSCP 2004) outlines the specific habitat acreage to be created. The Anderson and Ohmart vegetation classification system (Anderson and Ohmart 1976, 1984) will be used to track the total land covered type managed by the program annually. To map the vegetation at PVER, Reclamation will annually obtain aerial imagery of the site. Each phase will be classified using the Anderson and Ohmart system (Tables 6 and 7).

Table 6. Vegetation Communities, Criteria, and Types

Community Type	Criteria	Vegetation Structural 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

(From Anderson and Ohmart 1984)

Table 7. Vegetation Classification

Structure Type	Characteristics
I	Mature stand with distinctive overstory greater than 15 feet high, intermediate class from 2-15 feet tall, and understory from 0-2 feet high
II	Stand with overstory (>15 feet) constituting greater than 50% of the trees with little or no intermediate class present
III	Stand with largest proportion of trees between 10 and 20 feet high with few trees above 20 feet or below 5 feet
IV	Few trees above 15 feet present; 50% of the vegetation is 5-15 feet tall with the other 50% between 0-2 feet high
V	60-70% of the vegetation present is between 0-2 feet tall with the remainder in the 5-15 foot class
VI	75-100% of the vegetation is from 0-2 feet high

(From Anderson and Ohmart 1984)

4.0 Adaptive Management

Adaptive Management relies on the initial receipt of new information, the analysis of that information, and the incorporation of the new information into the design and/or direction of future project work (LCR MSCP 2007). The Adaptive Management Program's role is to ensure habitat creation sites are biologically effective, fulfill the conservation measures outlined in the HCP for 26 covered species, and potentially benefit five evaluation species. Post-development monitoring and species research results will be used to adaptively manage habitat creation sites after initial implementation. If it is determined through the monitoring results that additional information is needed to better define covered species habitat requirements, these data will be collected using the procedures outlined in the LCR MSCP Science Strategy (LCR MSCP 2007).

The Science Strategy provides for an adaptive management process for improving the effectiveness of HCP implementation and identification of monitoring and research priorities. Alterations or changes to habitat creation sites can be accomplished through management activities; these activities will be initiated through the adaptive management process. Habitat creation sites will be manipulated and/or maintained for covered species using the best available science throughout the term of the HCP.

Monitoring Analysis and Evaluation of Performance Standards

The LCR MSCP is determining the process for covered species conservation measure accomplishment, including species-specific habitat performance standards. Once this process has been determined, monitoring data will be assessed to determine whether the site meets the performance standards. The performance standards are considered to be the limiting factors for covered species habitat in accordance with current knowledge. Created habitats are not anticipated to be managed at these standards, but rather at a higher standard. In order to more effectively and efficiently manage created habitats, sites will be designed to a higher habitat quality standard and monitored over time to see whether habitat quality decreases as the sites change.

If it is determined that the site meets the performance standards, the habitat credit acreage will be reported in the PVER annual reports. If monitoring activities document the presence of target species before performance standards are met, the performance standards will be evaluated and updated as appropriate.

If it is determined that the site does not meet any of the performance standards, recommendations for site modifications may be made by the following means:

- Comparison of monitoring results with performance standards to identify those standards not being met that can be remedied by site manipulations (plant removal, additional plantings, site contouring, etc.) or changes to the watering regime.

- Comparison of other phase results with previous successful and unsuccessful habitat restoration projects to look for differences in site characteristics (elevation, distance to river, climate, etc.), baseline conditions, planting design, plant and animal species composition, watering regimes, and abiotic conditions that may help explain why the site has not met the performance standards.
- Review of other studies that may provide insight into additional covered species habitat requirements or different restoration techniques to achieve the desired conditions.

These recommendations of how to move towards achieving performance standards will be included in the annual report. These recommendations will also be used to improve future project designs, where appropriate.

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