Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Palo Verde Ecological Reserve

2010 Annual Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

May 2010

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. 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

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
Chemehuevi Indian Tribe

Conservation Participant Group

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

Lower Colorado River
Multi-Species Conservation Program

Palo Verde Ecological Reserve
2010 Annual Report

Prepared by:

Restoration Group

Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada
http://www.lcrmscp.gov

May 2010

ACRONYMS AND ABBREVIATIONS

af	acre-feet
CDFG	California Department of Fish and Game
cm	centimeter(s)
CW	cottonwood-willow
DBH	diameter at breast height
FD	foliage density
FY	fiscal year
HCP	Habitat Conservation Plan
kg	kilogram(s)
lbs	pounds
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
m^3/m^2	cubic meters per square meter
PVER	Palo Verde Ecological Reserve
PVID	Palo Verde Irrigation District
Reclamation	Bureau of Reclamation
SWFL	southwestern willow flycatcher
TVV	total vegetation volume
USFWS	U.S. Fish and Wildlife Service

Symbols

%	percent

LIST OF COMMON AND SCIENTIFIC NAMES

Bird

Abert's towhee	*Pipilo aberti*
black-chinned hummingbird	*Archilochus alexandri*
black-tailed gnatcatcher	*Polioptila melanura*
brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
cliff swallow	*Petrochelidon pyrrhonota*
common raven	*Corvus corax*
Gambel's quail	*Callipepela gambelii*
greater roadrunner	*Geococcyx californianus*
great-tailed grackle	*Quiscalus mexicanus*
horned lark	*Eremophila alpestris*
house finch	*Carpodacus mexicanus*
killdeer	*Charadrius vociferus*
marsh wren	*Cistothorus palustris*
mourning dove	*Zenaida macroura*
northern mockingbird	*Mimus polyglottos*
northern rough-winged swallow	*Stelgidopteryx serripennis*
red-winged blackbird	*Agelaius phoeniceus*
song sparrow	*Melospiza melodia*
southwestern willow flycatcher	*Empidonax trailli extimus*
western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
white-winged dove	*Zenaida asiatica*
yellow-breasted chat	*Icteria virens*
yellow-headed blackbird	*Xanthocephalus xanthocephalus*

Small Mammal

cactus mouse	*Peromyscus eremicus*
Colorado River cotton rat	*Sigmodon arizonae*
deer mouse	*Peromyscus maniculatus*
desert pocket mouse	*Chaetodipus penicillatus*
house mouse	*Mus musculus*

Bat

California leaf-nosed bat	*Macrotus californicus*
cave Myotis	*Myotis velifer*
hoary bat	*Lasiurus cinereus*
pocketed free-tailed bat	*Nyctinomops femorosaccus*
silver-haired bat	*Lasionycteris noctivagans*
Townsend's big-eared bat	*Corynorhinus townsendii*
western pipistrelle	*Pipistrellus hesperus*
western red bat	*Lasiurus blossevilli*
western yellow bat	*Lasiurus xanthinus*

CONTENTS

Page

Background 1
Site Information 1
  Purpose 1
  Location/Description 3
  Landownership 3
  Water 3
  Agreements 3
2010 Habitat Development 4
  Planting 4
    Phases 1-6 6
  Irrigation 7
    Irrigation Management 9
  Site Maintenance 9
  Management of Existing Habitat 10
    Weed Management 10
    Pest Management 10
    Nursery Management 10
Monitoring 10
  Vegetation Monitoring 10
  Sootywing Skipper 14
  Small Mammal Monitoring 14
  Bat Monitoring 15
    Acoustic Surveys 15
  Avian Monitoring 16
    General Bird Surveys 16
    Yellow-billed Cuckoo Surveys 16
    Southwestern Willow Flycatcher Surveys 17
Established Land Cover and Habitat Credit 17
Adaptive Management 18
  Operation and Maintenance 18
  Soil Management 18
  Water Management 18
  Vegetation Management 18
  Wildfire Management 19
  Public Use 19
  Law Enforcement 19
  Future Habitat Development 19
Adaptive Management Recommendations 19
References 21

Tables

Table Page

1 Number of plants, shrubs, and trees planted in Phase 5 – Spring 2010 7
2 Phases 1–6 planted acres 8
3 Irrigation water applied through September 2010 9
4 Summary of habitat characteristics at Palo Verde Ecological Reserve 12
5 Plot sampling at Palo Verde Ecological Reserve by phase 14
6 Total number of call minutes recorded for the four focal species in created habitats at the Palo Verde Ecological Reserve, FY07 through FY10 16
7 LCR MSCP covered avian species detected at Palo Verde Ecological Reserve in 2010 17

Figures

Figure Page

1 Palo Verde Ecological Reserve managed acreage through 2010 2
2 Cover crop, blue grama grass (*Bouteloua gracilis)* planted with mesquite. 5
3 Mass transplanting. 5
4 Cottonwood plant. 6
5 Cottonwood and willow trees planted. 6
6 Phase 5 – As-built. 8
7 Soil moisture unit. 9
8 Vegetation removed to protect the integrity of the irrigation ditch. 10
9 Vertical foliage density (±SE) averaged across plots at Palo Verde Ecological Reserve: (a) PVER2, (b) PVER3, (c) PVER4, and (d) PVER5. 13
10 Sootywing abundance at Palo Verde Ecological Reserve, Phases 3, 4, and 5. 15

BACKGROUND

The Palo Verde Ecological Reserve (PVER) encompasses 1,352 acres of the historical flood plain 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 Bureau of Reclamation (Reclamation) (LCR MSCP 2004).

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 LCR MSCP throughout the 50-year life of the program.

The project is being developed using a phased approach over a 8-year period, with an estimated completion date of 2013. An overview restoration development plan for the entire site was completed in 2006 (LCR MSCP 2006a). In July 2009, CDFG exchanged land at PVER that involved the fields located to the west and north of Phase 5 for land identified as Phase 8 and the eastern part of Phase 9. This exchange was determined to benefit both parties, resulting in a contiguous riparian land area. This exchange affected the phase schedule by increasing the acres developed in Phase 5 and decreasing the acres in Phase 8 (figure 1). In 2006, Phase 1, a 30-acre riparian nursery, was planted (LCR MSCP 2006b). In 2007, 2008, and 2009, 260 acres of cottonwood-willow (CW) land cover type were planted during Phases 2, 3, and 4 (LCR MSCP 2006c, 2007c, 2008c).

SITE INFORMATION

Purpose

This annual report will provide information pertaining to the development and maintenance of riparian habitat and summarized monitoring reports/results that would influence the adaptive management plan. The intent is to eventually convert approximately 1,100 acres to riparian habitat that will be managed for the southwestern willow flycatcher (SWFL) and other LCR MSCP covered species that utilize CW land cover type.

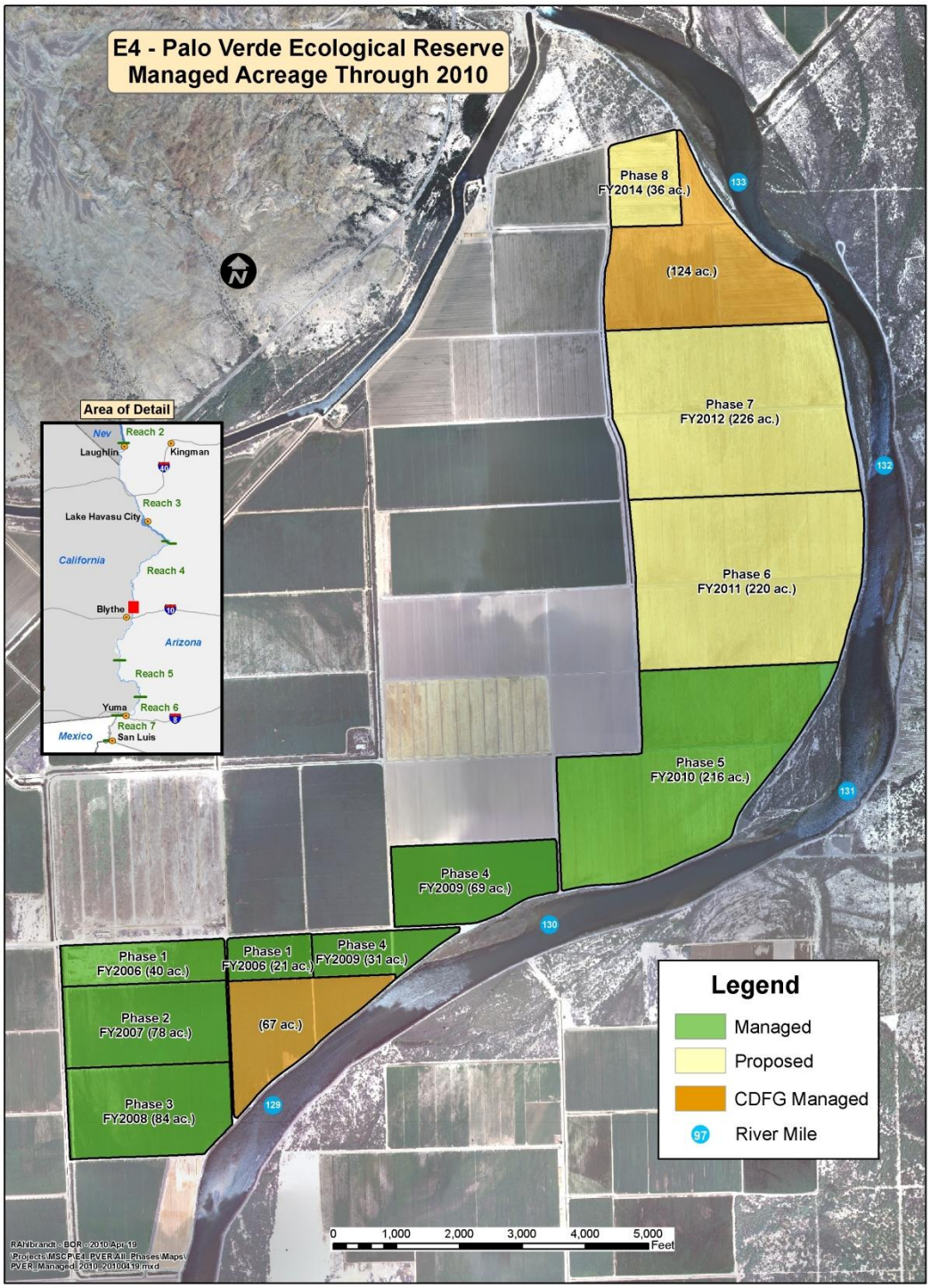


Figure 1.—Palo Verde Ecological Reserve managed acreage through 2010.

Location/Description

PVER lies within the historic flood plain of the Colorado River in southeastern Riverside County, California, at Townships 5 and 6 South and Ranges 23 and 24 East. PVER is one of the northern-most parcels of agricultural land within the Palo Verde Valley, which is approximately 5 miles north of Blythe, California.

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—grain, small melons, and alfalfa—since the late 1930s. Currently, the land not restored is leased and farmed with crops of alfalfa and grain.

Landownership

PVER is owned by CDFG who leases unrestored acreage to a local farmer who raises alfalfa and small grains. CDFG intends to continue the agricultural lease until the entire property comes under development by Reclamation.

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 PVID pursuant to a contract between the United States and PVID dated February 7, 1933. CDFG, as a landowner within 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.

Agreements

Reclamation and CDFG have signed an agreement to ensure that the land and water resources will be available for the 50-year term of the LCR MSCP (Agreement for Restoration Activities Consistent with the LCR MSCP, Palo Verde Ecological Reserve 2007).

2010 HABITAT DEVELOPMENT

Planting

Approximately 216 acres (87.41 hectares) of CW land cover type were planted in spring 2010. There were some changes to the preliminary planting design (Palo Verde Ecological Reserve: Restoration Development Plan Phase 5, 2009) (see figure 6).

Soil samples were taken by the contract crop consultant in Phase 5. It was recommended to add an application of 10-34-0 (nitrogen-phosphate-potassium) in an irrigation cycle.

The field was prepared and leveled using standard farming practices. The field was then divided into 25 checks (divisions of the acreage bordered by earthen mounds in which irrigation water can be controlled). A cover crop of 25 pounds (lbs) (13.6 kilograms [kg]) of alfalfa seed and 5 lbs (2.3 kg) of rye grass seed per acre were planted in checks 2–11, 13–16 and 18–24. The cover crop was planted 4–18 days prior to the mass transplanting of the trees and shrubs. Generally speaking, the purpose of planting the dense cover crop included the following added benefits, which were to:

- Suppress weeds without the use of herbicide
- Protect valuable topsoil from wind and water erosion
- Reduce compaction caused by frequent mowing
- Increase organic matter, earthworms, and beneficial micro-organisms
- Increase the soil's available nitrogen and moisture retention
- Bring deep minerals to the surface and break up hardpans
- Provide habitat, nectar, and pollen for beneficial insects and reduce the populations of pests

Checks 1, 12, 17, and 25 were drill seeded with the following native species—blue grama grass and alkali sacaton seeds were mixed with rice huls so that the distribution of seed by weight was equal. The application rate for the seed mixture was 6.75 lbs per acre (3.06 kg) (figure 2).

In March 2010, trees and shrubs were planted in Phase 5 with 40-inch rows and 6-foot in-line spacing in checks 2–11, 13–16 and 18–24, utilizing mass transplanting techniques (figure 3). Over 392,000 trees and shrubs were planted within a 13-day period. There were some changes to the preliminary planting design due to the wet, rainy weather at the greenhouse site in Arroyo Grande, California. Some of the species, particularly the cottonwood, experienced slow or no growth during the crucial growing time in January and February (figure 4). Because of this event, 60 percent (%) of the planting was delayed to allow the majority of the plants extra growing time in the greenhouse in March. Phase 5

Figure 2.—Cover crop, blue grama grass (*Bouteloua gracilis)* planted with mesquite.

Figure 3.—Mass transplanting.

Figure 4.—Cottonwood plant.

was planted with the following averaged percentages: 19.4% cottonwood, 5.3% Baccharis, 43% Goodings willow and 25.7% coyote willow, 6.1% atriplex, and 0.5% mesquite (see figure 6). The average number of plants (1,961 per acre) in the riparian fields and 1,100 shrubs and trees in the mesquite fields (table 1).

Phases 1-6

In Phase 1, during fiscal year 2006 (FY06), 61 acres of riparian/mesquite were planted; in Phase 2 (FY07) 78 acres; in Phase 3 (FY08) 45 acres; in Phase 3 (FY09), 39 acres; in Phase 4 (FY09), 100 acres; and in Phase 5 (FY10), 216 acres of CW land cover type were planted (table 2). In Phase 6 (FY11), 220 acres of CW will be planted. Additional information on the design, planting, and monitoring of Phases 1–6 can be found on our Web site.

Figure 5.—Cottonwood and willow trees planted.

Table 1.—Number of plants, shrubs, and trees planted in Phase 5 – Spring 2010

Check	Acres	*Baccharis sarothroides*	*Baccharis salicifolia*	Cottonwood	Goodings willow	Coyote willow	Honey mesquite	Atriplex
1	6.6						575	10,540
2	6.3	400	190	1,765	3,525	5,880		
3	7.4			1,500	6,020	7,520		
4	7.4	500	260	4,203	7,997	2,290		
5	7.4	1,100	370	2,380	7,730	2,290		
6	7.1				7,520	7,520		
7	7.5	500	350		8,900	5,373		
8	7.5	700	236	2,592	6,120	3,168		
9	7.3	700	236	2,592	6,120	3,168		
10	7.3	700	236	2,592	6,120	3,168		
11	5.0	600	120	2,016	4,896	2,304		
12	2.3						100	
13	16.5	1,500	226	6,120	14,328	7,344		
14	15.6	1,500	226	6,120	14,328	7,344		
15	15.2	1,200	436	5,256	13,968	6,480		
16	15.4	1,200	436	5,256	13,968	6,480		
17	11.3						1,100	13,550
18	10.3	900	300	11,870	7,125	3,560		
19	10.6			2,220	8,900	11,100		
20	9.9	800	350	10,350	6,350	3,100		
21	9.7	700	300	5,050	10,130	4,100		
22	7.4	579			6,180	8,063		
23	5.3	1,000	440		5,904	2,736		100
24	3.2	1,300	212		2,520	1,784		100
25	1.5						50	
Total		**15,879**	**4,924**	**75,997**	**168,649**	**100,657**	**1,875**	**24,090**

Irrigation

The fields at PVER are flood irrigated; table 3 indicates the amount of irrigation water applied through September 2010. Irrigation water applied (acre-feet [af]) is calculated on the assumption that the irrigation delivery ditch is running at full capacity (25 cubic feet per second or 0.707 cubic meter per second) (Pair et al. 1975). The estimated average irrigation water applied in 2010 was 9.47 af over the entire site per acre.

Table 2.—Phases 1–6 planted acres

Phase	Fiscal year	Acres planted	Land cover type	Cumulative total
1	2006	61	CW	61
2	2007	78	CW	139
3	2008	45	CW	184
3	2009	39	CW	223
4	2009	100	CW	323
5	2010	216	CW	539
6*	2011	220	CW	759

* Phase 6 to be planted in spring 2011.

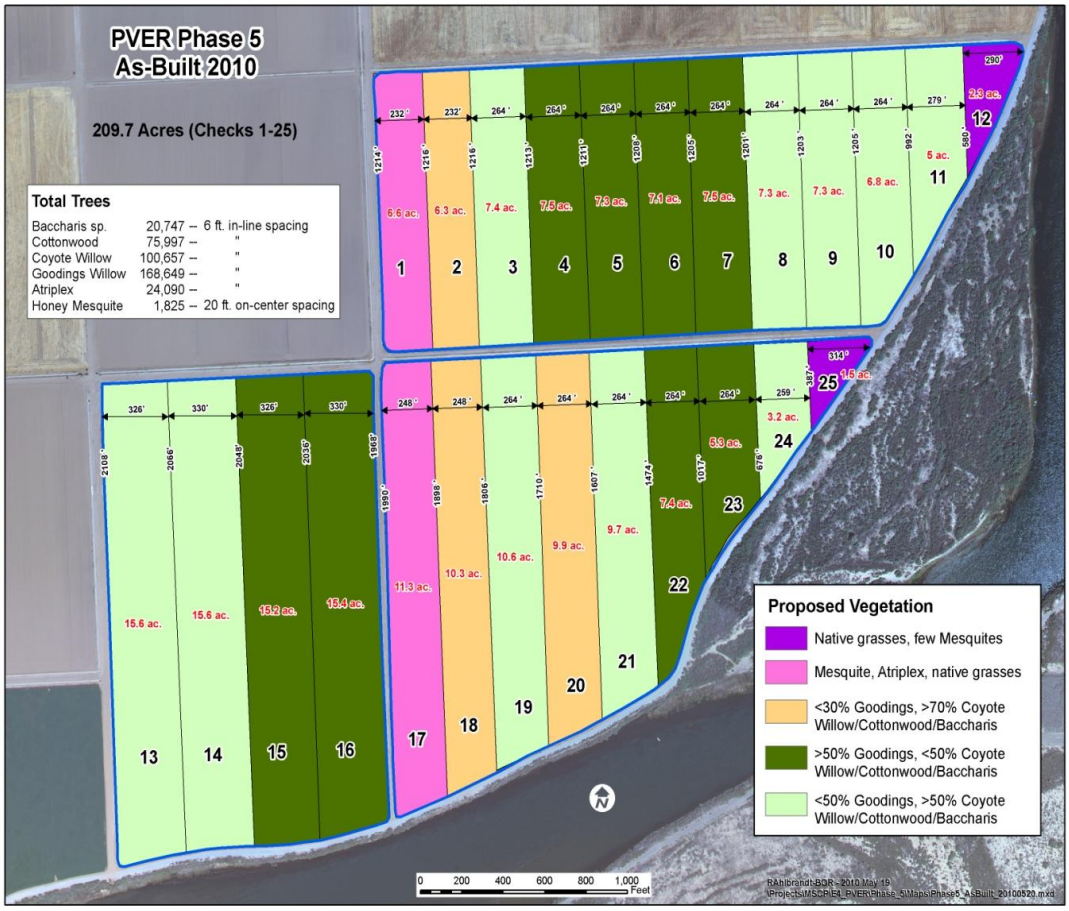


Figure 6.—Phase 5 – As-built.

Table 3.—Irrigation water applied through September 2010

Phase	Total hours of Irrigation water applied	Amount of irrigation water applied in af[1]
Phase 1 – Cottonwood/willow nursery – 20 acres	140	14.58
Phase 1- Mesquite nursery – 10 acres	15	2.08 af
Phase 2 – Cottonwood/willow habitat – 72 acres	422	11.27
Phase 3 – Cottonwood/willow habitat – 80 acres	743	18.42
Phase 4 – Cottonwood/willow habitat – 100 acres	622	12.95
Phase 5 – Cottonwood/willow habitat – 216 acres	509	4.90
Total: 539 acres	2,451	Average 9.47af/acre

[1] Amount of water applied does not reflect consumptive use or unmeasured return.

Irrigation Management

Soil moisture units were placed in the fields (approximately 1 unit per 20 acres) to monitor soil moisture levels (figure 7).

Figure 7.—Soil moisture unit.

Site Maintenance

No major site maintenance, such as irrigation ditch replacement or road maintenance, was performed in 2009. Normal road maintenance such as grading and gravel road base replacement was done as needed.

Management of Existing Habitat

Weed Management

Invasive weeds and plant material were removed adjacent to the irrigation ditches to protect the integrity of the ditch. Trees and shrubs were removed from the irrigation ditch south back 30 feet in Phase 2, fields 2–7 (figure 8).

Figure 8.—Vegetation removed to protect the integrity of the irrigation ditch.

Pest Management

No pest management was needed this year.

Nursery Management

Plant material will be collected from the nursery in December 2010. The plant material will be used for PVER Phase 6 planting in March 2011.

MONITORING

Vegetation Monitoring

A new monitoring protocol was implemented in 2010 at PVER. Four phases were monitored including: PVER2 planted in 2007, PVER3 planted in 2008–09, PVER4 planted in 2009, and PVER5 planted in 2010. Vegetation data were collected within several parameters to evaluate vegetation composition and structure from the ground layer to the upper canopy layer. Parameters included tree and shrub density, tree heights, canopy closure, total vegetation volume, foliage density, ground cover, and distance to nearest surface water. Detailed descriptions of sampling design, methodology, analyses, and discussion can be

found in the report, Results from 2010 Vegetation Monitoring at Four Multi-Species Conservation Program Habitat Creation Sites. Table 4 summarizes habitat characteristics at PVER.

Size class 3 and 4 trees were measured for height (excluding mesquite species). Size classes were determined by diameter at breast height (DBH) and are defined as: size class 1 = <2.5 cm DBH; size class 2 = 2.5–8 cm DBH; size class 3 = >8–12 cm DBH; and size class 4 = >12 centimeters (cm) DBH. Mesquite species were recorded in two size classes based on height as follows: size class 1 = <1.4 m, and size class 2 = ≥1.4 meters (m). Average heights of all tree species combined per phase are shown in table 4 as well as the averages by species per phase.

Phase 2, the oldest stand, has the tallest upper canopy comprised of cottonwood and Gooding's willow. Phases 3 and 4 also have upper canopies comprised of cottonwood and Gooding's willow. Mesquite trees were planted in all phases and were similar in height across phases.

The total number of trees per acre is presented for each phase in table 4 as well as the number of trees per acre of each individual species. The "trees per acre" calculation was extrapolated to total acres to get an estimated number of trees at each phase included in 2010 monitoring (table 4). Cottonwood, Gooding's willow, coyote willow, and mesquite were planted at PVER Phases 2–5.

Canopy closure data were collected using a spherical densiometer. The average percent canopy closure by phase is presented in table 4. Phase 2 has the highest percent canopy closure at 80%, and Phases 3 and 4 averaged 62% and 65%, respectively. Phase 5, at 6 months old, averaged 2.6% closure.

Vegetation structure was evaluated using total vegetation volume (TVV) and vertical foliage density (FD). TVV is an index that estimates the total amount of vegetation in an area. Table 4 shows TVV for all phases at PVER, which are on the low end of known values from other studies in similar habitat (reportedly ranging between 0.1–1.1m^3/m^2). FD reflects the distribution of vegetation in vertical layers within the habitat. Figure 9 (a-d) shows FD during Phases 2–5. The highest density of vegetation at all phases was the 0–1 meter layer. The canopy was densest in the 4–5 meter layer at Phase 2, the 5–6 meter layer at Phase 3, and the 3–4 meter layer at Phase 4.

Ground cover estimates for live vegetation, litter, and bare ground are provided in table 4. Cover of live vegetation varied across phases ranging from 38.0% to 86.2% average cover. Cover of live vegetation decreases over time as the stands mature (table 4). Percent cover of litter increases with age of stand as expected (table 4).

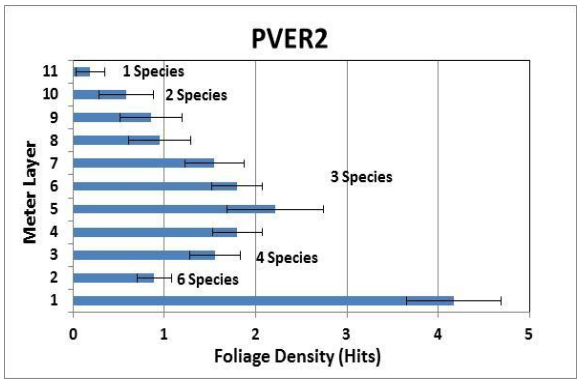
Table 4.—Summary of habitat characteristics at Palo Verde Ecological Reserve

Parameter		PVER2 (n=27)	PVER3 (n=30)	PVER4 (n=36)	PVER5 (n=80)
Average height (SE) range	**All species**	n=308 9.5 (0.1) 5.0–12.0	n=210 8.7 (0.1) 1.1–11.0	n=36 5.1 (0.4) 1.4–8.5	n=8 1.4 (0.1) 1.0–1.8
	Popfre	*n= 225 10.3 (0.1) 7.5–12.0	*n=203 8.9 (0.1) 7.0–11.0	*n=13 7.2 (0.2) 6.0–8.5	na
	Salgoo	*n=83 7.8 (0.2) 5.0–9.5	*n=1 8.0	*n=9 6.9 (0.2) 6.0–8.0	na
	Salexi	na	na	na	na
	Progla	na	*n=6 1.3 (0.1) 1.1–1.7	*n=14 2.0 (0.1) 1.4–2.7	*n=8 1.4 (0.1) 1.0–1.8
Estimated trees/acre Estimated trees/phase	**All species**	8,764/629,236	3,136/249,656	1,488/144,478	854/179,127
	Popfre	421/30,213	545/43,387	225/21,832	236/49,506
	Salgoo	703/50,440	196/15,606	534/51,814	524/109,902
	Salexi	7,640/548,583	2,387/189,994	715/69,425	87/18,246
	Progla	0/0	8/668	15/1,408	7/1,473
Average % canopy closure (SE) range		79.9 (5.9) 0.0–100.0	61.9 (7.2) 0.0–99.4	64.8 (5.1) 0.0-99.4	2.6 (1.0) 0.0–49.7
Total vegetation volume (cm^3/m^2) (SE)		0.21 (0.02)	0.23 (0.01)	0.24 (0.01)	0.25 (0.01)
Average % cover – live vegetation (SE) range		38.0 (3.2) 0.0–97.5	64.4 (2.8) 0.0–97.5	73.0 (1.6) 0.0–97.5	86.2 (0.6) 37.5–97.5
Average % cover – litter (SE) range		24.8 (3.4) 3.5–97.5	13.2 (2.1) 3.5–97.5	3.1 (0.8) 0.0–85.0	0.01 (0.01) 0.0-3.5
Average % cover – bare (SE) range		0.0 (0.0) 0.0–0.0	0.0 (0.0) 0.0–0.0	0.0 (0.0) 0.0–0.0	1.2 (0.3) 0.0–37.5
Distance to surface water (m) (SE) range		680.5 (29.5) 383–969	373.3 (30.8) 47–681	320.8 (21.3) 83–564	362.6 (21.9) 42–867

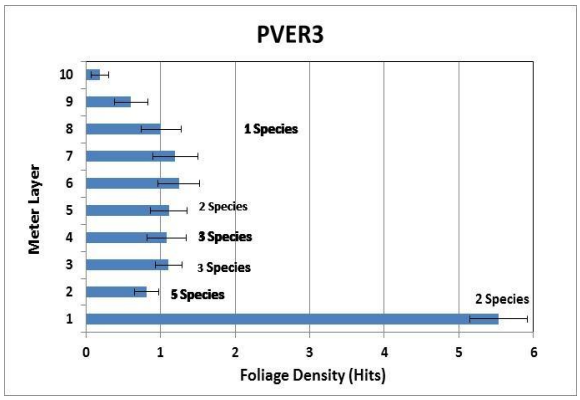
Notes: n refers to number of plots unless otherwise noted.

Popfre = *Populus fremontii,* Salgoo = *Salix gooddingii,* Salexi = *Salix exigua,* and Progla = *P. glandulosa*.

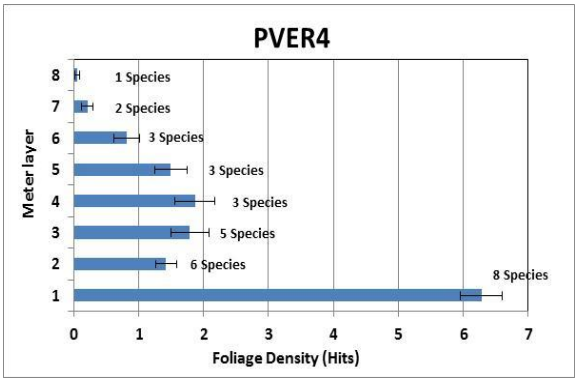
***** n for tree heights represents number of trees measured.



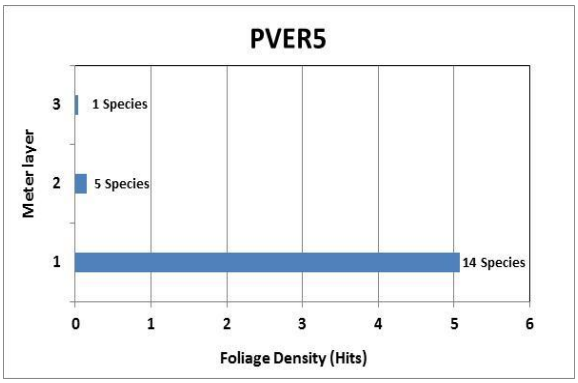
a



b



c



d

Figure 9.—Vertical foliage density (±SE) averaged across plots at Palo Verde Ecological Reserve: (a) PVER2, (b) PVER3, (c) PVER4, and (d) PVER5.

Distance to surface water, excluding irrigation, was measured using digital aerial imagery and ArcMap software (see table 4). The nearest surface water to PVER was the Colorado River.

Detailed descriptions of sampling design, methodology, analyses, and discussion can be found in the report, Results from 2010 Vegetation Monitoring at Four Multi-Species Conservation Program Habitat Creation Sites.

Sootywing Skipper

Atriplex plots were sampled at PVER seven times during April–September 2010. Plots were sampled by counting adult sootywings along transects within or adjacent to plots. Table 5 lists where plots were sampled.

Table 5.—Plot sampling at Palo Verde Ecological Reserve by phase

Restoration plot	Transect sampled
Phase 3	Entire west edge along drainage canal
Phase 4	Entire east edge along berm
Phase 5	Entire west edge along dirt road bordering quail brush

Very low populations of MacNeill's sootywings (< 3 per date) were observed at PVER. Sootywings were sparse at Phase 4 and absent at Phase 3 and the newly planted Phase 5 (figure 10).

Atriplex plots at PVER continue to support little or no sootywings. This is most likely due to the absence of nectar-providing plants such as heliotrope. Sootywings may become more abundant if heliotrope volunteers come up within the plots. Planting narrow strips of quail brush within other plants, as at PVER Phase 3, also has not been successful because the Atriplex has been crowded out.

Small Mammal Monitoring

Colorado River cotton rat (*Sigmodon arizonae*) have been detected in Phase 4 where a large amount of weeds, including alfalfa, Amaranth, Atriplex, and other non-native species, have created a dense shrubby, grassy layer approximately

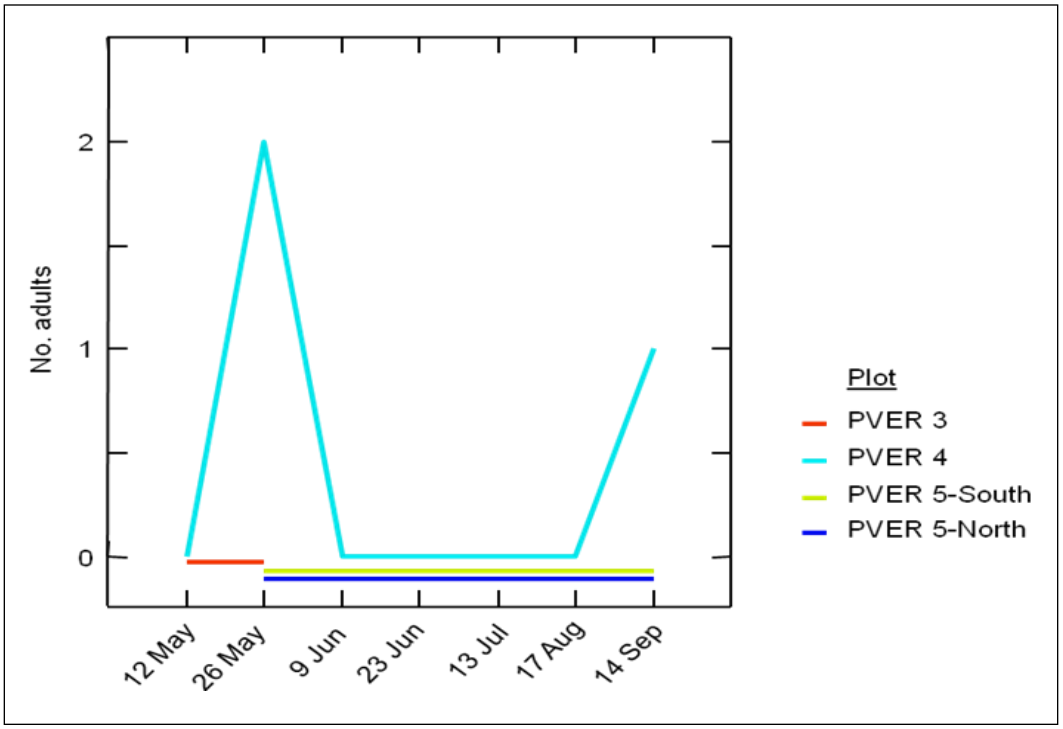


Figure 10.—Sootywing abundance at Palo Verde Ecological Reserve, Phases 3, 4, and 5.

0.5–1 m high. A total of 78 trap nights resulted in 2 males being captured and marked in this plot. This plot is directly across the dirt road from the accretion bench where a large population of Colorado River cotton rat currently being monitored under Work task C-27.

The grassy area on the edges of the fields at the border of Phases 2 and 3 was trapped with less effort (45 trap nights). This area is dominated by thick *Cynodon* (~30 cm), *Baccaris*, and *Conyza*. Only *Mus musculus* was capture in this area.

Bat Monitoring

Acoustic Surveys

Anabat bat detectors were deployed across the site quarterly to determine bat activity across habitat types. Bat activity is expressed in call minutes, which indicate that a given species is present if it is recorded at least once within a 1-minute period. Table 6 lists the raw data for the total number of call minutes of LCR MSCP bat species for each year sampled. Cottonwood, willow, and mesquite habitats were combined across 4 years of monitoring. Table 6 provides a very general view of the number of minutes of bat activity for the four focal bat species in comparison to the entire bat community at habitat creation areas. There

Table 6.—Total number of call minutes recorded for the four focal species in created habitats at the Palo Verde Ecological Reserve, FY07 through FY10

Species	FY07	FY08	FY09	FY10	All years
Western red bat	6	1	11	208	226
Western yellow bat	0	0	1	159	160
California leaf-nosed bat	22	3	23	66	114
Townsend's big-eared bat	0	0	1	6	7
All other species	1,380	1,898	2,005	11,689	16,972
Total call minutes	**1,408**	**1,902**	**2,041**	**12,128**	**17,479**

was a dramatic increase in western red bat and western yellow bat activity in 2010. For a detailed analysis of this data, see the report, Post-Development Bat Monitoring of Habitat Creation Areas along the Lower Colorado River – 2010 Acoustic Surveys.

Avian Monitoring

General Bird Surveys

Surveys for general avian species at habitat creation sites with more than 2 years' growth were conducted using an intensive area search method. In 2010, Phase 2 was split into two area search plots, and Phase 3 was covered with one area search plot. The Arizona Bell's vireo (*Vireo bellii arizonae*) and yellow warbler (*Dendroica petechia sonorana*) were confirmed breeding. Additional Bell's vireos (*Vireo bellii*) and yellow warblers (*Dendroica petechia*) as well as summer tanagers (*Piranga rubra*) were detected at the site, but not confirmed breeding. Details of the intensive area search method and further results are found in the Great Basin Bird Observatory (2010).

Yellow-billed Cuckoo Surveys

Cuckoo surveys were conducted following Halterman et al. (2008). Five surveys each were conducted at Phases 1, 2, and 3; four surveys were conducted at Phase 4. Surveys were conducted between mid-June and the end of August, spaced 12 to 20 days apart, and took place between sunrise and 12 p.m., or until temperatures reached 40 degrees Celsuis (104 degrees Fahrenheit). Call-playback, described by Johnson et al. (1981) and Gaines and Laymon (1984), was used to increase the probability of detection. Data were also collected on nesting, microhabitat, vegetation, and arthropods (McNeil et al. 2009).

Cuckoos were detected in all four phases and breeding was confirmed at PVER 2 and PVER 3. Breeding was probable at Phase 4 due to detection timing and pair behavior, and two birds were detected at Phase 1 during the third survey period, but not detected on following visits.

Southwestern Willow Flycatcher Surveys

All flycatcher surveys were conducted according to methods described in Sogge et al. (1997), following a five-survey protocol, as recommended by the U.S. Fish and Wildlife Service (USFWS) (USFWS 2000). At least one survey was conducted between May 15 and 31, at least one survey between June 1 and 15, and three additional surveys between June 16 and July 25. To elicit responses from nearby willow flycatchers, conspecific vocalizations previously recorded throughout the Southwest from 1996 to 1998 were broadcast within appropriate habitat. Detailed methods are described in McLeod and Koronkiewicz (2010).

Five surveys were conducted at PVER Phase 2. Two willow flycatchers were detected, one on May 27 and one on June 3. Both birds were considered migrants and were not detected on later surveys. Phase 3 was also surveyed five times, with no SWFL detections.

Table 7 lists all covered species and confirmed breeding pairs found at PVER.

Table 7.—LCR MSCP covered avian species detected at Palo Verde Ecological Reserve in 2010

LCR MSCP covered species detected	Number of confirmed breeding pairs
Arizona Bell's vireo	1
Sonoran yellow warbler	4
Summer tanager	0
Yellow-billed cuckoo	2
Southwestern willow flycatcher	0

ESTABLISHED LAND COVER AND HABITAT CREDIT

The process for habitat credit has not been finalized. Once the process is finalized, information in this section will be used to establish credit.

The established land cover types for PVER using the Anderson and Ohmart classification (Anderson & Ohmart 1976, 1984, and 1986) are as follows: Phase 1 = cottonwood-willow I and honey mesquite IV, Phase 2 = cottonwood-willow I, Phase 3 = cottonwood-willow I, Phase 4 = cottonwood-willow II, and Phase 5 = cottonwood-willow VI.

ADAPTIVE MANAGEMENT

Operation and Maintenance

There are no major irrigation canal repairs scheduled for 2011. Minor irrigation repairs and maintenance are done on an as needed basis. No major road work is scheduled for 2011, and maintenance and minor repairs will be done as needed.

Soil Management

A crop consultant will be contracted to take soil samples that will be analyzed to determine fertilizer needs. Fertilizer will be applied as suggested by the crop consultant's report.

Water Management

Irrigation water will continue to be applied as determined by Reclamation or contracted crop consultants. Site conditions and observation will provide the data necessary to determine an appropriate irrigation schedule.

Vegetation Management

The nursery will be used in the fall/winter (2010/11) as a source for plant material for propagation cuttings. Trees and shrubs will continue to be planted densely to provide habitat for covered species and to limit invasive species infestations. Manual and aerial weed control will be implemented, when necessary, until the planted vegetation has shaded out the invasive species. No other vegetation management is scheduled for 2011.

Wildfire Management

As guided by commitments in the Habitat Conservation Plan (HCP), wildfire management practices on PVER would:

- Reduce the risk of the loss of created habitats to wildfires by contributing to and integrating with local, State, and Federal agency fire management plans
- Develop a fire management plan to contain wildfire and facilitate rapid response to suppress fire
- Implement land management and habitat creation measures to support the re-establishment of native vegetation that is lost to wildfire

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.

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.

Future Habitat Development

Phase 6 at PVER will be developed for CW land cover type in 2011. Approximately 200 acres will be developed at that time.

ADAPTIVE MANAGEMENT RECOMMENDATIONS

Adaptive management recommendations will follow once PVER is fully developed and monitoring has been conducted for several years . The site will be assessed to ascertain whether the site is meeting the conservation measures and the established management guidelines.

.

REFERENCES

Anderson, B.W. and R.D. Ohmart. 1976. Vegetation type maps of the Lower Colorado River from Davis Dam to the Southerly International Boundary. Final Report. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada. pp. 27 and 32.

_____. 1984. Lower Colorado River riparian methods of quantifying vegetation communities to prepare type maps. Final Report. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada. p. 80.

_____. 1986. Mapping Methods and Vegetation Changes Along the Lower Colorado River Between Davis Dam and the Border with Mexico, Boulder City, Nevada. p.4.

Bangle, D.N. 2012 (in press). 2010 Vegetation Monitoring Results from four Habitat Creation Sites: Multi-Species Conservation Program. Bureau of Reclamation Annual Report. Boulder City, Nevada.

Broderick, S. 2011. Post-Development Bat Monitoring – 2010 Acoustic Surveys. Lower Colorado River Multi-Species Conservation Program. Bureau of Reclamation, Boulder City, Nevada.

Gaines, D., and S.A. Laymon. 1984. Decline, status and preservation of the yellow-billed cuckoo in California. Western Birds 15:49–80.

Great Basin Bird Observatory. 2010. Summary Report on the Lower Colorado River Riparian Bird Surveys, 2008–2010. Lower Colorado River Multi-Species Conservation Program. No 07SF300004.

Halterman, M.D., M.J. Johnson, and J.A. Holmes. 2008. Western yellow-billed cuckoo natural history summary and survey methodology. Unpublished draft report, Southern Sierra Research Station, P.O. Box 1316, Weldon, California 93283.

Johnson, R.R., B.T. Brown, L.T. Haight, and J.M. Simpson. 1981. Playback recordings as a special avian censusing technique. Pages 69-75 *in* C.J. Ralph, and J.M Scott, editors: Estimating numbers of terrestrial birds. Studies in Avian Biology. Allen Press Inc., Lawrence, Kansas, USA.

Lower Colorado River Multi-Species Conservation Program (LCR MSCP). 2004. Lower Colorado River Multi-Species Conservation Program, Volume II: Habitat Conservation Plan. Final. 385 p.

_____. 2006a. Lower Colorado River Multi-Species Conservation Program-Palo Verde Ecological Reserve Restoration Development Plan: Overview. Boulder City, Nevada. 28 p.

_____. 2006b. Lower Colorado River Multi-Species Conservation Program-Palo Verde Ecological Reserve Restoration Development Plan: Phase 1. Boulder City, Nevada. 6 p.

McLeod, M.A. and T.J. Koronkiewicz. 2010. Southwestern Willow Flycatcher surveys, demography, and ecology along the lower Colorado River and tributaries, 2009. Annual report submitted to Bureau of Reclamation, Boulder City, Nevada, by SWCA Environmental Consultants, Flagstaff, Arizona. 165 p.

Pair, C.H., W.E. Heinz, R. Crawford, and K.R. Frost. 1975 (Fourth Edition). Sprinkler Irrigation, The Irrigation Association, 13975 Connecticut Ave., Silver Springs, Maryland 20906. 553 p.

Shannon, E. McNeil, Murrelet D. Halterman, Eli T. Rose, and Diane Tracy . 2009. Lower Colorado River Multi-Species Conservation Program-Yellow-billed Cuckoo Distribution, Abundance and Habitat Use on the Lower Colorado River and Tributaries, 2009 Annual Report. Southern Sierra Research Station, PO Box 1316, Weldon, California 93283.

Sogge, M.K., R.M. Marshall, S.J. Sferra, and T.J. Tidbits. 1997. A Southwestern Willow Flycatcher natural history summary and survey protocol. National Park Service Technical Report USGS/NAUCPRS/NRTR-97/12. p.38.

U.S. Fish and Wildlife Service (USFWS). 2000. Southwestern Willow Flycatcher Survey Protocol, Year 2000 Protocol Revision. http://sbsc.wr.usgs.gov/cprs/ research/projects/swwf/wiflnew.asp. Accessed on April 2, 2007.