Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Cibola National Wildlife Refuge Unit 1 Conservation Area

2012 Annual Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

April 2013

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Lower Colorado River Multi-Species Conservation Program

Cibola National Wildlife Refuge Unit 1 Conservation Area

2012 Annual Report

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ACRONYMS AND ABBREVIATIONS

Cibola NWR	Cibola National Wildlife Refuge
FY	fiscal year
HCP	Habitat Conservation Plan
LSC MSCP	Lower Colorado River Multi-Species Conservation Program
MAPS	Monitoring Avian Productivity and Survivorship Station
NAU	Northern Arizona University
Reclamation	Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

Symbols

%	percent

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EXECUTIVE SUMMARY

The purpose of this annual report is to summarize all activities, including planning, designing, constructing, restoring, monitoring, and adaptive management, that have occurred at the Cibola National Wildlife Refuge (Cibola NWR) Unit 1 Conservation Area from October 1, 2011, through September 30, 2012. This document also contains sections describing the general background of the site, land and water ownership, current agreements, and constructed habitat areas as well as the past management of established land cover types. In addition, projected activities for fiscal year (FY) 2014, in terms of future development, management, and monitoring, will also be identified in this report. Adaptive management is expected to be a larger part of subsequent annual reports for this conservation area as more data regarding the effectiveness of management techniques and performance of the habitat become available.

Background

Cibola NWR consists of about 16,600 acres of land located along approximately 12 miles of the lower Colorado River in Arizona and California. It was established in 1964 as a refuge and breeding ground for migratory birds and other wildlife. The refuge is divided into six management units known as Unit 1, Unit 2, Unit 3, Unit 4, Unit 5, and Unit 6 (figure 1).

Unit 1 is located on the northern end of the refuge in Arizona and encompasses approximately 4,100 acres, with approximately 1,000 acres dedicated to agriculture and 3,100 acres currently undeveloped. The Bureau of Reclamation (Reclamation) has previously partnered with the Cibola NWR and currently has a number of established projects at Unit 1, which include previous habitat creation projects as well as research and demonstration projects. In 1999, the U.S. Fish and Wildlife Service (USFWS) and Reclamation planted the Cibola Corn Field/Nature Trail and established 34 acres of cottonwood-willow and mesquite land cover type within Unit 1. In 2002, the USFWS and Reclamation planted approximately 18 acres of cottonwood-willow in Unit 1 north of the trail.

Six fields of approximately 20 acres each in Unit 1 have been set aside for the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) to conduct research and development projects. To date, four of the fields are occupied by three projects that have been fully or partially funded by the LCR MSCP and include Work Task E6: Cottonwood Genetics Study, Work Task E7: Mass Transplanting Demonstration, and Work Task E8: Seed Feasibility Study. To the east of these projects are an additional two agricultural

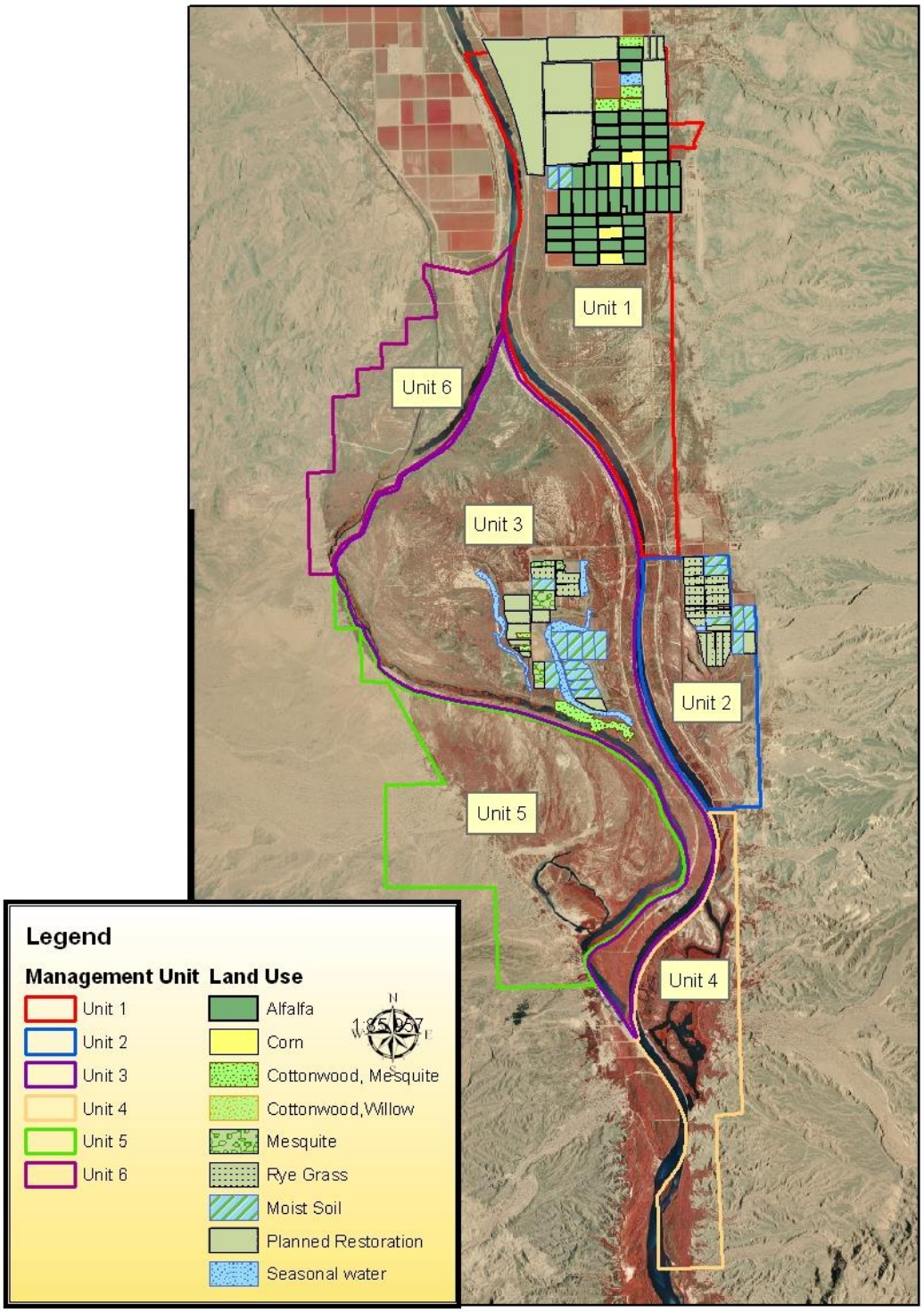

Figure 1.—The Cibola NWR's six management units.

fields that are still in agricultural production. The six fields combined are currently included in a 5-year Land Use Agreement with the USFWS to continue research activities on Unit 1 that expire in FY09.

The Cibola NWR Unit 1 Conservation Area incorporates the aforementioned existing projects and agricultural land as well as additional adjacent acreage into a single conservation area. The acreage in Cibola NWR Unit 1 Conservation Area has been categorized into five areas (figure 2). Area #1 includes active agricultural fields, existing (converted agriculture) cottonwood-willow land cover type, and ongoing LCR MSCP research and demonstration projects as described above. Area #2 (Hippy Fire) includes 338 acres that have been cleared as a result of the Hippy Fire. Areas #3 (Baseline 90) and #4 (North 160) were undeveloped land and fallowed agricultural land, respectively. Area #5 is Crane Roost. Figure 2 illustrates the current state of these lands as managed under the LCR MSCP. A Land Use Agreement, that supersedes the aforementioned agreement, was signed in 2007, securing the lands within this conservation area for the term of the program. Note that the CNWR Unit 1 Conservation Area (approximately 949 acres) only includes a portion of the total area designated as "Unit 1" by the Cibola NWR (about 4,100 acres).

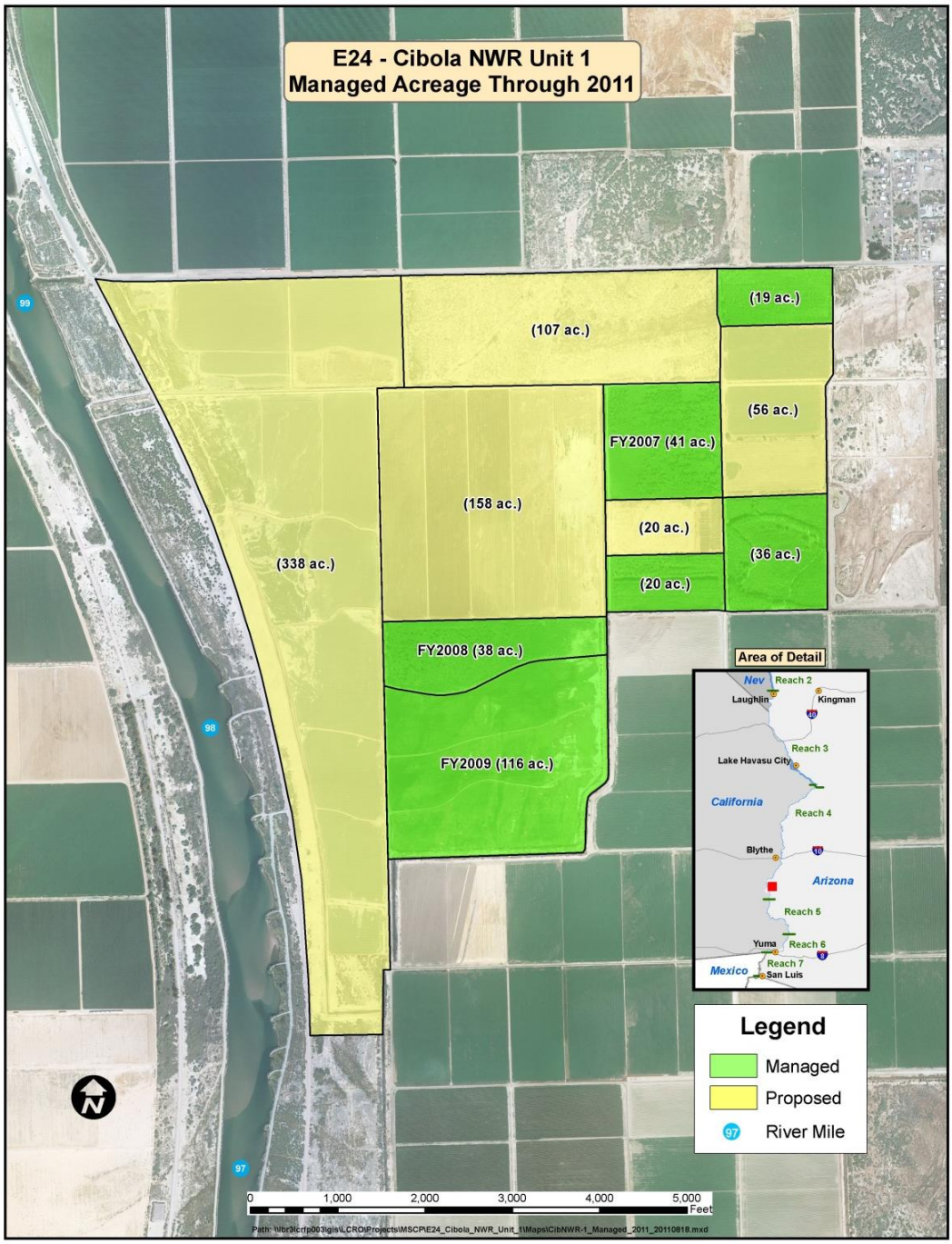

Figure 2.—The Cibola NWR Unit 1 Conservation Area.

1.0 CONSERVATION AREA INFORMATION

1.1 Purpose

Cottonwood-willow land cover created within the Cibola National Wildlife Refuge (Cibola NWR) Unit 1 Conservation Area will be managed for the southwestern willow flycatcher (*Empidonax traillii extimus*), yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and other species covered under the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). 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 for integrating seral stages of vegetation, moist soil, standing water, and open areas into mosaics of riparian vegetation.

Large habitat restoration sites such as Cibola NWR Unit 1 Conservation Area are developed over a number of years, and the restoration activities are divided into phases. The Cibola NWR Unit 1 Conservation Area Restoration Development Plan: Overview provides an overview of the restoration potential of the site as well as the projected phasing of development.

1.2 Location

The Cibola NWR Unit 1 Conservation Area consists of approximately 949 acres on the Cibola NWR, located in Arizona between River Miles 97 and 99 (figure 3). The initial partnership for management of the Cibola NWR Unit 1 Conservation Area includes the Bureau of Reclamation (Reclamation) and the U.S. Fish and Wildlife Service (USFWS), Cibola National Wildlife Refuge. The legal description of this area is as follows:

- Township 1 South, Range 23 West, Gila and Salt River Base and Meridian, La Paz County, Arizona: Section 6, lots 4, 5, and 6

- Township 1 South, Range 24 West: Section 1, lots 1 through 4, inclusive, S½NE¼, NW¼, SW¼, N½SE¼, and SW¼SE¼; Section 2, lot 1 and lots 2 and 3 – those portions lying east of the levee road

- Section 12, N½NW¼NE¼, SW¼NW¼NE¼, SE¼NW¼NE¼, excluding that portion lying east of the irrigation drain, NE¼NW¼, W½NW¼, excluding that portion lying west of the levee road, NW¼NW¼SW¼, excluding that portion lying west of the levee road, and NE¼NW¼SW¼

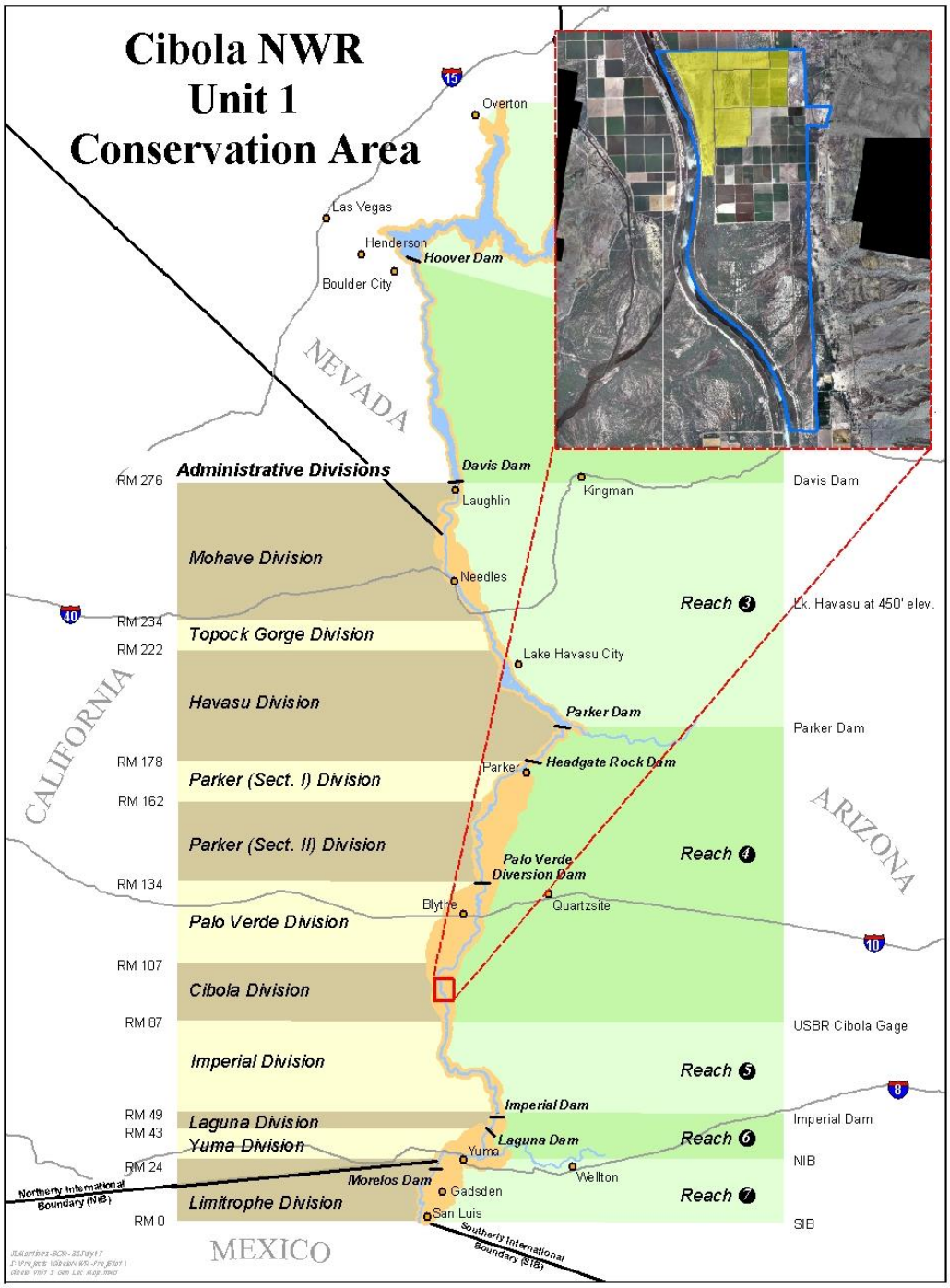

Figure 3.—Location of Cibola NWR Unit 1 Conservation Area.

1.3 Land Ownership

The property is owned and managed by the USFWS. The will dedicate land and water to Reclamation to develop and maintain native land cover types for the LCR MSCP.

1.4 Water Availability

Cibola NWR has 2nd priority water rights, which include a diversionary entitlement of 27,000 acre-feet per year and a consumptive use entitlement of (diversion minus return flow) of 16,793 acre-feet per year. The 900-acre Cibola NWR Unit 1 Conservation Area will have a maximum of 5,400 acre-feet per year (6 acre-feet per acre, per year) available when the conservation area has been fully developed.

1.5 Agreements

A Land Use Agreement for restoration activities has been finalized to secure the availability of land and water resources for the 50-year term of the LCR MSCP.

1.6 Public Use

The conservation area within Cibola NWR Unit 1 is being developed on lands that already had limited public access. Today and prior to any restoration, access was restricted to a driving trail referred to as “Goose Loop.”

1.7 Law Enforcement

Law enforcement activities are performed primarily by the USFWS’s law enforcement officer for the Southwest Arizona National Refuges Complex (includes Imperial, Cibola, and Kofa National Wildlife Refuges) under the program’s site-specific Fire Management and Law Enforcement Strategy. Additional local law enforcement assistance is available through the Arizona Game and Fish Department’s Yuma Office, the Yuma County Sheriff’s Office, and the Bureau of Land Management’s Yuma Office.

1.8 Wildfire Management

The USFWS will provide an appropriate management response to all wildfires that occur within Cibola NWR Unit 1. The full range of suppression strategies is available to managers provided that selected options do not compromise firefighter or public safety, cost effectiveness, or benefits or values to be protected.

The suppression strategy on the Cibola NWR Unit 1 is to minimize fire size and may utilize a range of tactics, including direct attack, parallel attack, and indirect attack with hand crews, engines, aircraft, and/or heavy equipment. Burning out fire lines, enhancing a defensible boundary, backfiring from strategic barriers, using existing natural barriers or constructed barriers, cold trailing, and other activities may accompany the more standard tactics. An initial action may be simply monitoring fire behavior while deciding which tactics would be most effective. All of these actions are employed with the intention of safely suppressing the wildfire with minimal overall costs and damage to resources.

2.0 HABITAT DEVELOPMENT AND MANAGEMENT

2.1 Planting

No riparian acreage has been established on the Cibola NWR Unit 1 Conservation Area since March 2009 when Crane Roost was planted. No additional riparian planting is projected for fiscal year (FY) 2012. Approximately 73 acres will be planted in the northern section of area #2 (Hippy Fire) in the spring of FY13 (figure 4). This area has supported a robust cover crop for the past 4 years and indicates that riparian tree establishment and survivorship should be high.
Funds have been expended, and trees were pre-purchased (in FY12) for this FY13 development (table 1). The planting design will consist of a logical arrangement of cottonwood and willow species and honey mesquite to ensure a diverse habitat mosaic and promote ease of irrigation water movement across the fields.

2.2 Irrigation

Flood irrigation was used to water the cover crops and saturate the soils at the appropriate seasons to leach the salts through the soil column and provide favorable conditions for future land cover establishment. The cottonwood-willow land cover type, when planted, will be irrigated in accordance with the schedule prepared by Reclamation.

Figure 4.—Aerial photo of Hippy Fire fields to be planted in FY13.

Table 1.—Total plants purchased in 2012 for upper Hippy Burn fields, Cibola NWR Unit 1, 2012

Common name	Scientific name	Number
Alkali sacaton	*Sporobolu airoides*	24,000
Coyote willow	*Salix exigua*	39,500
Desertbroom	*Baccharis sarothroides*	7,700
Fremont cottonwood	*Populus fremontii*	33,500
Gooding's willow	*Salix goodingii*	59,000
Honey mesquite	*Prosopis glandulousa*	425
Mule fat	*Baccharis salicifolia*	7,700
Saltgrass	*Distichlis spicata*	214,500
Total plants		386,325

2.3 Site Maintenance

Additional improvements across the conservation area included ongoing improvements to the existing drainage infrastructure. By deepening and connecting the drains adjacent to the fields of the conservation area, more rapid soil salinity mitigation is anticipated (figure 5). More of these types of infrastructure improvements are expected as development of the site moves to subsequent phases.

Figure 5.—Drain deepening and construction on Cibola NWR Unit 1.

2.4 Management of Existing Land Covers and Habitat

To maintain healthy stands of trees and to promote growth, flood irrigation was also used on other previously established fields within the conservation area for regular watering. Additional measures were taken, as necessary, to maintain field borders, and herbicide and/or fertilizer were appropriately used when necessary.

2.5 Restoration Research and Demonstration

A number of previously established long-term research and demonstration projects are ongoing on the Cibola NWR Unit 1 Conservation Area. The projects are described in greater detail in their respective work plans and in associated technical reports. If available, research updates will be periodically presented in

these annual reports for projects in the Cibola NWR Unit 1 Conservation Area; however, for more detailed information on these projects, please refer to the specific technical research reports for these projects.

2.5.1 Groundwater Monitoring Study

Research from previous studies has suggested that riparian-obligate trees will utilize groundwater when they have reached sufficient maturity. Studies have also suggested that this water source may be more important than the available soil water (applied surface water) for long-term health and survival of these trees. Our focus in large-scale restoration to date has been on agricultural conversion of production crops (primarily alfalfa and cotton). These crops are shallow rooted (relatively speaking) and rely on soil water to grow. In time, when the trees at our restoration (i.e., conversion of shallow-rooted crops to riparian tree species) sites begin to mature, they may be impacted by the groundwater that exists below the crop root zone. We have already observed variability in growth rates and longer term tree survival in some areas that cannot be explained by differences in soils or available surface water. Additional recent data suggest that irrigation regimes can affect groundwater salinity levels. To further investigate the importance of groundwater and groundwater salinity on the long-term health and survival of our restored areas, research is being conducted at the Cibola NWR Unit 1 Conservation Area and at additional conservation areas. A series of monitoring wells will be installed and sampled to record the effects of irrigation on groundwater chemistry. In addition, mitigating measures may be revealed to better manage groundwater at our restoration sites for the long-term success of these trees. The study was initiated in 2010.

2.5.2 Cottonwood Genetics

This research project was designed by Northern Arizona University (NAU) to determine the relative levels of genetic diversity in remaining stands of Fremont cottonwood across the Southwest and investigate the influence of this genetic diversity and local genetic adaptations on community diversity in the context of habitat restoration. The expression of these genetic adaptations may manifest in trees possessing superior traits with respect to growth, reproduction, survival, and the habitat quality they influence. NAU was awarded a Cooperative Agreement and contributed matching funds from a National Science Foundation grant to undertake these investigations. The project includes genetically screening remaining stocks of Fremont cottonwood trees in stands and selecting genetically distinct trees, representative of these locations, to be planted in an experimental garden with a replicated design. The experimental garden will be monitored to observe how these genetic differences may be expressed in terms of growth, reproduction, and survival in a typical restoration site, and genetic traits that influence superior habitat quality (including those that may support LCR MSCP covered species). These genetic traits will likely be important for long-term

survival and for maintaining habitat quality and health throughout the life of the program. Results to date suggest that populations of *P. fremontii* are highly structured across the Southwest, suggesting that genetic variation may be an important consideration when choosing trees for maximum fitness and adaptability, and therefore restoration success (figure 6).

Figure 6.—The NAU cottonwood genetics garden representing 16 genotypes of *Populus fremontii*.

NAU will continue the monitoring of this experimental garden. The term of the Cooperative Agreement with Reclamation will end in FY12, and a final report is anticipated in early 2012. This research may continue; however, funding sources will be from outside the LCR MSCP. The program will continue to benefit from the long-term research and the implications of genetic diversity on restoration efforts.

2.5.3 Seed Feasibility

Through a series of laboratory and field experiments, this study has documented the necessary steps involved in using seed to create dense mosaics of native riparian land covers. Steps in the process included seed collection, storage, treatment, planting, germination, and monitoring seedling growth and survival. Using seeds may be feasible if it involves less labor, is more cost effective, or preserves the genetic diversity of the riparian habitat created under the LCR MSCP. The amount of non-native to native vegetation resulting from using seed for restoration will also be an important factor in determining the feasibility of this method.

Over the past four seasons, the techniques to achieve riparian seeding have been refined using information and best practices from laboratory experiments and through the establishment, monitoring, and management of a series of small plot studies. The details of these experimental trials are available on the LCR MSCP Web site in the "Technical Reports" section.

Four years of study on the feasibility of using native seeds for riparian restoration have pointed toward the following conclusions:

- Fremont cottonwood, Goodding's willow, and coyote willow seed can be stored, cleaned or uncleaned, in freezers for over 2 years while retaining viability of greater than 80 percent (%).

- The optimal seeding method for Fremont cottonwood and Goodding's willow is hydroseeding onto furrows.

- Fremont cottonwood and Goodding's willow should be seeded separately to avoid cottonwood dominance of seeded areas.

- When co-established, Fremont cottonwood dominates volunteer saltcedar.

- Establishment of undesirable species (primarily saltcedar and grasses) can be controlled by reducing the seed bank on and adjacent to revegetation areas and by spraying revegetation areas with grass-specific herbicide during the first growing season.

- Infrequent, deep irrigation appears to enhance survival of Fremont cottonwood and Goodding's willow compared to frequent, shallow irrigation.

- Large-scale direct seeding of Fremont cottonwood would likely result in cost reductions of over 60% compared to mass transplanting.

- Large-scale direct seeding of Goodding's willow would likely result in cost reductions of over 40% compared to mass transplanting.

The applicability of seeding for large-scale restoration is still unclear. The results of this study show promise; however, a large-scale demonstration of these established techniques and protocols would be prudent to determine the true effort, logistics, and costs involved in establishing riparian cover type in a restoration setting (figure 7). In addition, long-term monitoring of the experimental plots should be continued to determine if the competitive treads

Figure 7.—The 2009 willow plots showing successful establishment of Goodding's willow (*Salix gooddingii*) from seed.

in these experiments will continue and if seeding can produce the desired species composition and habitat characteristics necessary for LCR MSCP covered species.

2.5.4 Mass Transplanting

This project evaluates mass transplanting techniques for cottonwood and willow using commercially available mechanized transplanting equipment. To meet the requirement to create 5,940 acres of cottonwood-willow land cover type habitat, a significant number of native trees will need to be established each year. Mass transplanting is an approach used successfully by commercial growers. If mass transplanting of native species proves effective, it is expected to provide a useful cost-effective tool in the creation of future habitat.

The effectiveness of this technique has been established and is currently being used as a primary means for large-scale establishment of cottonwood-willow land cover type for the LCR MSCP. For greater detail on this project, refer to the specific report for this technique demonstration. We are continuing to monitor the fields where these demonstrations took place to determine the long-term survival and growth of trees planted using this technique and at these high densities. Additional research has been conducted in these stands with respect to comparative arthropod use. These results are discussed in the "Monitoring" section of this report.

3.0 MONITORING

3.1 Avian Monitoring

Single species surveys were conducted for the southwestern willow flycatcher and yellow-billed cuckoo. General avian surveys were conducted for six LCR MSCP avian covered species and all non-covered avian species, and a Monitoring Avian Productivity and Survivorship Station (MAPS) was operated.

3.1.1 Southwestern Willow Flycatcher Surveys

The Cibola Nature Trail was surveyed using call broadcast methods five times during 2012. Three willow flycatchers were detected on May 23, and one willow flycatcher was detected on June 13. All birds detected before June 16 were considered to be migrants and not the covered southwestern (*extimus*) subspecies.

3.1.2 Yellow-billed Cuckoo Surveys

Yellow-billed cuckoos were detected at Crane Roost, Mass Transplanting, and the Cibola Nature Trail using call broadcast surveys, and two nests were found at Crane Roost (table 2).

Table 2.—Yellow-billed cuckoo detections at Cibola NWR Unit 1 Conservation Area in 2013

Site name	Detections per survey period (date of survey)				
	1	**2**	**3**	**4**	**5**
Crane Roost	2 (6/24)	3 (7/8)	3 (7/18)	6 (7/30)	5 (8/11)
Mass Transplanting	0 (6/25)	2 (7/8)	0 (7/18)	0 (7/30)	0 (8/14)
Nature Trail	0 (6/25)	2 (7/8)	1 (7/18)	2 (7/30)	2 (8/14)
North	0 (6/25)	0 (7/8)	0 (7/18)	0 (7/30)	–
Total	2	7	4	8	7

3.1.3 General Avian Surveys

Surveys of habitat conservation areas with more than 2 years' growth were conducted using a double sampling area search method (rapid and intensive area searches) to determine their use for breeding by other LCR MSCP avian species.

One pair of Arizona Bell's vireos was confirmed at the Cibola Nature Trail. Four Sonoran yellow warbler pairs were confirmed at the Cottonwood Genetics fields and the Cibola Nature Trail.

Bird banding following the MAPS protocol was conducted at the Cibola Nature Trail for a total of 10 sessions starting in early May and ending in early August. Three yellow warblers were banded.

3.2 Small Mammal Monitoring

3.2.1 Bat Monitoring

Acoustic and capture survey methods were used to monitor and document the presence of bat species within Cibola NWR Unit 1 and to determine the age, sex, and reproductive status of the bats that could be captured.

3.2.1.1 Acoustic Surveys

Acoustic surveys are conducted using Anabat™ bat detectors installed at long-term monitoring stations. A station records all bats that fly within the microphone's zone of influence. A long-term bat monitoring station was established in the Mass Transplanting area in 2011. Figure 8 summarizes the probability of occupancy without detection for the four focal bat species. This station was susceptible to insect interference, resulting in data losses. Losses for May ranged from 50–75% and for June through September, losses averaged 26–50%. Mechanical problems resulted in data losses for September 17–30 and from October 1–12.

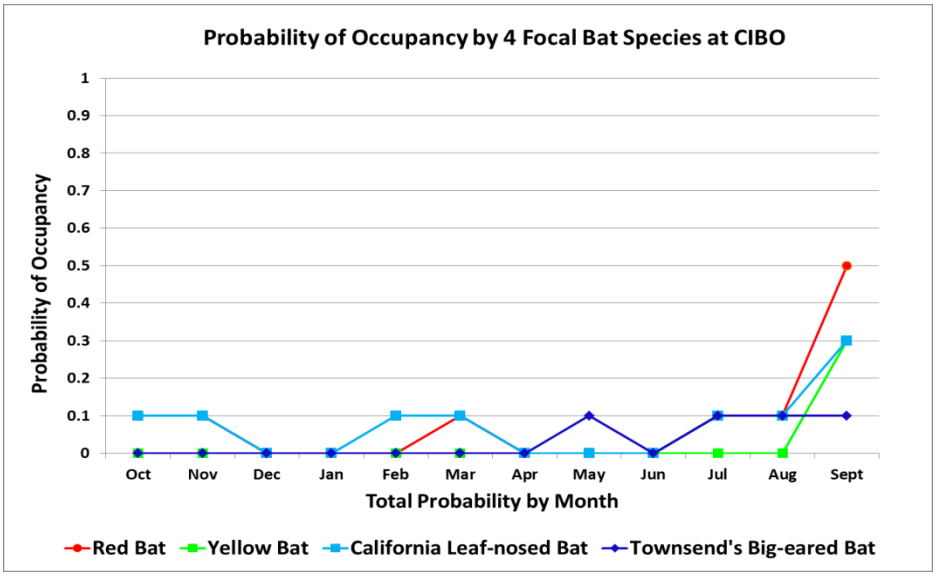

Figure 8.—Total bat minutes at Cibola NWR Unit 1 Conservation Area for FY12.

3.2.1.2 Capture Surveys

Bat capture surveys were conducted within the Cibola Nature Trail and Mass Transplanting areas. Mist nets were deployed one night each month from May – September. Table 3 shows the captures of LCR MSCP species compared to all other species across all years.

Table 3.—Total LCR MSCP bat species captures across years at Cibola NWR Unit 1 Conservation Area
(n = number of survey nights)

Species	2007 n = 2	2008 n = 3	2009 n = 5	2010 n = 5	2011 n = 5	2012 n = 5	Totals
Western red bat	0	0	0	0	0	1	4
Western yellow bat	0	2	0	0	0	1	3
California leaf-nosed bat	14	4	4	5	8	6	41
Townsend's big-eared bat	0	0	0	0	0	0	0
All other species	5	31	162	58	62	117	487
Totals	19	37	166	63	70	125	535

3.2.2 Rodent Monitoring

Presence/absence surveys for the Colorado River cotton rat were conducted in the Cottonwood Genetics fields and Crane Roost. The Cottonwood Genetics fields were trapped for one night in the fall and one night in the spring. Crane Roost was trapped for one night in the spring. Table 4 lists all cotton rat captures at the Cibola NWR Unit 1 Conservation Area in 2012.

Table 4.—Number of Colorado River cotton rats captured at Cibola NWR Unit 1 in 2012

Location	Spring	Fall	Total trap nights
Cottonwood Genetics	4	0	90
Crane Roost	0	NA	45
Totals	4	0	135

4.0 HABITAT CREATION CONSERVATION MEASURE ACCOMPLISHMENT

4.1 Vegetation Monitoring

Vegetation data were collected within several parameters to evaluate the vegetation structure from the ground layer to the upper canopy layer. Parameters included tree and shrub density, tree heights, and canopy closure.

In Cibola NWR Unit 1, the tree density in cottonwood-willow (cottonwood, Goodding's willow, and coyote willow) was 10–3,464 trees per acre. The shrub (quailbush, willow baccharis, desert broom, and saltcedar) density was 5–1,540 shrubs per acre. Cottonwood, Goodding's willow, and mesquite tree height average ranges were from approximately 3 to 60 feet. The average canopy closure ranged from 42–97%.

4.2 Evaluation of Cibola NWR Unit 1

The Final Habitat Creation Conservation Measure Accomplishment Tracking Process was finalized in October 2011 (Reclamation 2011). All areas within Cibola NWR Unit 1 were designed to benefit covered species at the landscape level.

To meet species habitat creation requirements, the Habitat Conservation Plan (HCP) provides goals for habitat creation based on land cover types. These land cover types are described using the Anderson and Ohmart vegetation classification system (Anderson and Ohmart 1976, 1984a, 1984b). In 2012, Cibola NWR Unit 1 supported 74 acres of cottonwood-willow structure type I, 80 acres of cottonwood-willow structure type II, and 116 acres of cottonwood-willow structure type IV. Table 5 shows how much habitat has been created for each of the targeted covered species at Cibola NWR Unit 1. Nine species with habitat creation goals have creditable acres at Cibola NWR Unit 1. These species (including their corresponding conservation measure acronym) are: western red bat (WRBA2), yellow-billed cuckoo (YBCU1), elf owl (ELOW1), gilded flicker (GIFL1), Gila woodpecker (GIWO1), vermilion flycatcher (VEFL1), Arizona Bell's vireo (BEVI1), Sonoran yellow warbler (YWAR1), and summer tanager (SUTA1).

Table 5.—Species-specific habitat creation conservation measure creditable total acres for 2012

Species-specific habitat creation conservation measure	**WIFL1[1]**	**WRBA2**	**WYBA3[2]**	**CRCR2[3]**	**YBCU1**	**ELOW1**	**GIFL1**	**GIWO1**	**VEFL1**	**BEVI1**	**YWAR1**	**SUTA1**
Creditable acres in 2012	0	116	0	0	116	116	116	0	0	0	0	116
Total, including previous years	0	270	0	0	270	270	270	270	270	116	270	270

[1] Although Cibola NWR Unit 1 provides the appropriate structure type (cottonwood-willow I–IV) as defined in WIFL1 of the HCP, Reclamation is in the process of gathering the appropriate hydrologic data to determine saturated soils, moist soils, or slow-moving water. Once this has been determined, Cibola NWR Unit 1 will be evaluated.

[2] Reclamation is in the process of determining foraging and roosting habitat for the western yellow bat. Once this has been determined, Cibola NWR Unit 1 will be evaluated.

[3] The preliminary data suggest the Colorado River cotton rat uses both cottonwood-willow and fringe marsh habitats. Reclamation is in the process of evaluating data collected to determine marsh and cottonwood-willow habitat uses by this species.

5.0 ADAPTIVE MANAGEMENT RECOMMENDATIONS

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 (Reclamation 2007). Under the Adaptive Management Program, habitat creation sites will be assessed for biological effectiveness and whether they fulfill the conservation measures outlined in the Habitat Conservation Plan for 26 covered species and potentially benefit 5 evaluation species. Post-development monitoring and species research results will be used to adaptively manage habitat creation sites after initial implementation. Once monitoring data are collected over a few years, and then analyzed for Cibola NWR Unit 1, recommendations may be made through the adaptive management process for site improvements in the future. At this time, there are no adaptive management recommendations for the site.

LITERATURE CITED

Bureau of Reclamation (Reclamation). 2007. Draft Final Science Strategy. Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Lower Colorado Region, Boulder City, NV.

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