# Lower Colorado River Multi-Species Conservation Program

*Balancing Resource Use and Conservation*

## Beal Lake Conservation Area

## 2012 Annual Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

November 2012

# 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 Local Governments Authority
Desert Wildlife Unlimited

### California Participant Group

California Department of Fish and Wildlife
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

## Beal Lake Conservation Area

## 2012 Annual Report

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**Multi-Species Conservation Program**
**Bureau of Reclamation**
**Lower Colorado Region**
**Boulder City, Nevada**
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**November 2012**

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| BLCA | Beal Lake Conservation Area |
| DO | dissolved oxygen |
| HCP | Habitat Conservation Plan |
| HNWR | Havasu National Wildlife Refuge |
| LCR MSCP | Lower Colorado River Multi-Species Conservation Program |
| LUA | Land Use Agreement |
| mg/L | milligrams per liter |
| PIT | passive integrated transponder |
| 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 Beal Lake Conservation Area (BLCA) 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 2013, 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

To meet the conditions in the 1997 Biological Opinion issued by the U.S. Fish and Wildlife Service under the guidance of the Endangered Species Act, the Bureau of Reclamation's Lower Colorado Regional Office, in partnership with the Havasu National Wildlife Refuge, initiated the backwater improvement project at Beal Lake and subsequently riparian restoration. Because the lake and adjacent lands were immediately available to Reclamation when the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) began, the area was initially used to test and demonstrate restoration and management techniques.

In 2001, Beal Lake was dredged to create a refuge for native fishes. The dredge material was distributed over the adjacent area to be planted with native riparian vegetation the following year. The riparian restoration area was broken into two phases: the first started in 2002 and the second in 2004. Details of the plantings in each field can be found in the 2005 Annual Report. The project area, which is divided into fields that can be independently irrigated and managed, was designed to provide an area to test various riparian restoration methods and techniques for site preparation, planting, irrigation, monitoring, management, and maintenance.

As test fields grew into established stands of native trees, several LCR MSCP targeted species began to inhabit the site, and in April 2010, the site was confirmed as the BLCA by the program's Steering Committee. At the end of the 2012 monitoring season, the riparian area had nesting pairs of Sonoran yellow warbler, Arizona Bell's vireo, and summer tanager. Under this project, approximately 107 acres (43.3 hectares) of cottonwood, willow, and mesquite land cover types have been contributed toward the acreage goals of the LCR MSCP, and valuable valuable information about restoration techniques and management practices has been attained.

# 1.0 CONSERVATION AREA INFORMATION

## 1.1 Purpose

The Beal Lake Conservation Area (BLCA) was developed both for native fishes and terrestrial wildlife species. The lake is managed for razorback suckers and bonytail chub, whereas the riparian restoration area provides habitat for a variety of avian and small mammal species. Irrigation cycles are evaluated annually to determine if conditions are appropriate for the species targeted by the Lower Colorado River Multi-Species Conservation Program LCR MSCP, specifically the southwestern willow flycatcher (*Empidonax trailii extimus*).

## 1.2 Location/Description

The BLCA is located in Reach 3, between Beal Lake and lower Topock Marsh, on the Havasu National Wildlife Refuge (HNWR), near Needles, California. It is within the historic flood plain of the lower Colorado River and adjacent to River Mile 237 on the Arizona side (figures 1 and 2).

## 1.3 Land Ownership

The BLCA is located on the HNWR, Arizona, which is owned and managed by the U.S. Fish and Wildlife Service (USFWS).

Havasu National Wildlife Refuge
317 Mesquite Ave.
Needles, CA 92363

Linda Miller, Refuge Manager
(760) 326-3853

## 1.4 Water Right Information

At the time the HNWR was created, Topock Marsh was the primary attraction and the focus of most refuge activities. The HNWR possesses a 2nd and 3rd priority water entitlement provided by Supreme Court Decree No. (7) to fulfill the purposes of the refuge (Executive Order No. 8647 and Public Land Order No. 559). The HNWR's 37,339 acre-foot per year entitlement of consumptive use and 41,839 acre-foot diversionary right of Colorado River water is used to fill Topock Marsh through two instrumented inlet canals. The water used for irrigation at the BLCA is supplied from Topock Marsh.

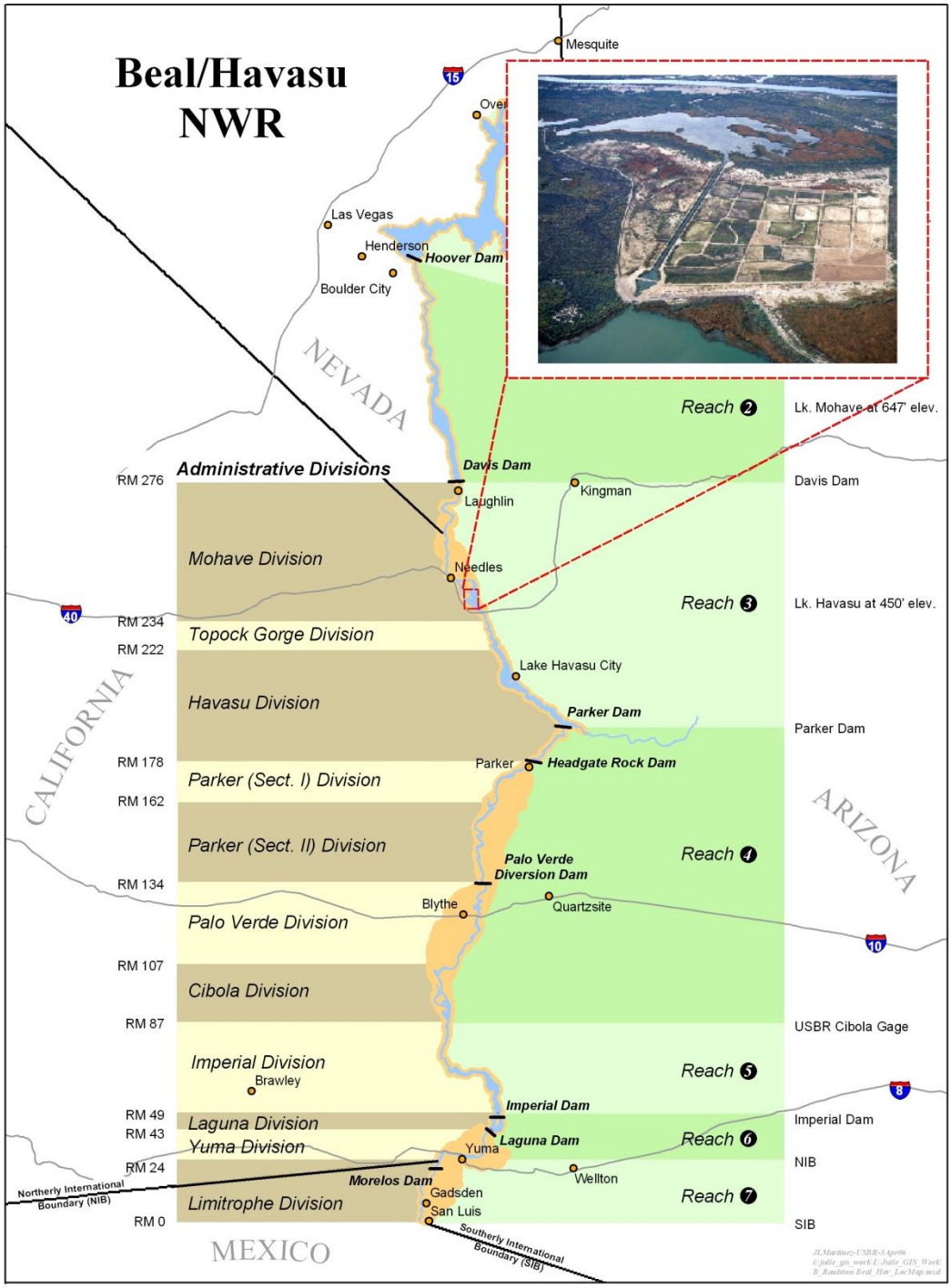


**Figure 1.—Location of the BLCA.**

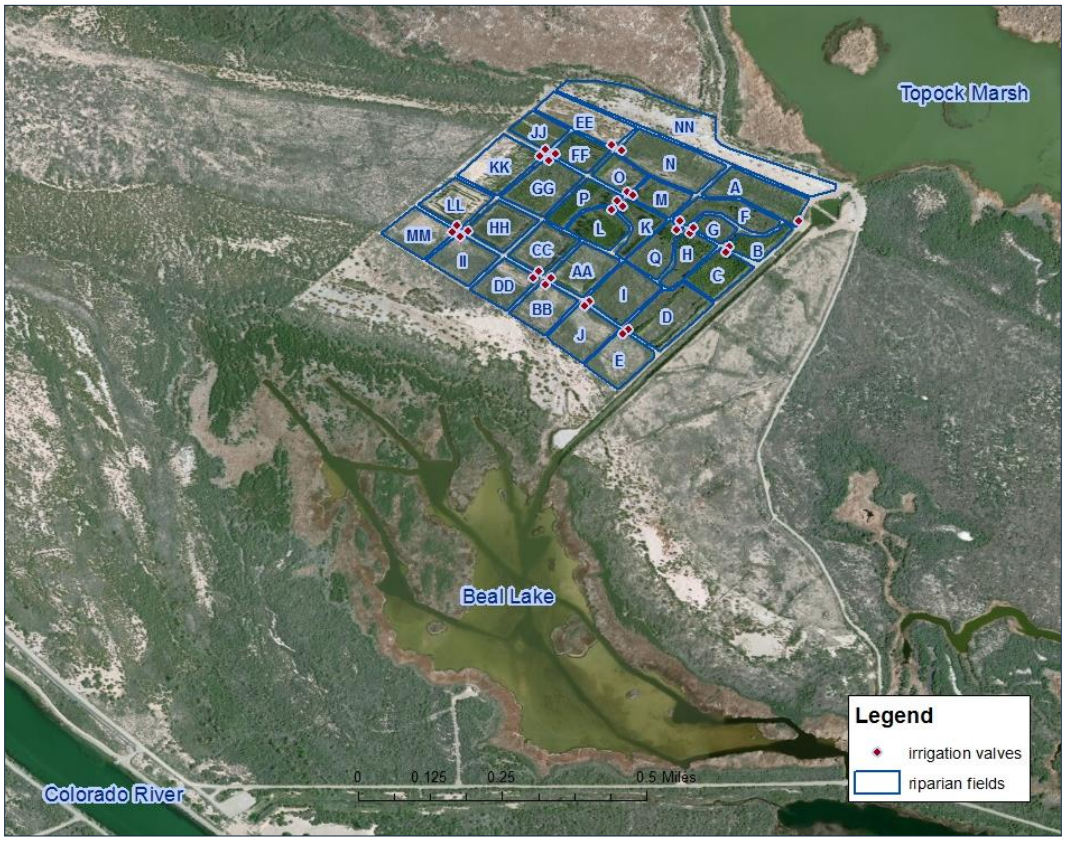


**Figure 2.—Overview of the BLCA.**

## 1.5 Land Use Agreement

A Land Use Agreement (LUA) was executed in 2010 between the Bureau of Reclamation (Reclamation) and the USFWS to secure land and water for the BLCA for the remainder of the 50-year LCR MSCP. The LUA outlines the rights and responsibilities of each partner in the project's development and maintenance.

## 1.6 Public Use

The BLCA is in an area that was closed to the public by the USFWS prior to becoming a conservation area, and it remains closed to the public.

## 1.7 Law Enforcement

Law enforcement activities are performed primarily by the USFWS's law enforcement officer for the Lake Havasu National Wildlife Refuges Complex (includes the Bill Williams River and Havasu National Wildlife Refuges) under

the LCR MSCP'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 Bureau of Land Management's Yuma Office.

## 1.8 Wildfire Management

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

The suppression strategy on the BLCA is to minimize fire size. That strategy 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 tactics that 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 Field Preparation, Planting, and Fertilizing

In 2012, three project areas were developed: the willow marsh fields (EE and NN), the soil amendment demonstration fields (MM and II), and the Seeding Salix gooddingii with Lassenite Pozzolan Soil Amendment Study fields (J and E) (figure 3).

Clearing, grubbing, and contouring of the 14-acre willow marsh began in November 2011 and finished in January 2012. In addition to the earthwork, two culverts were installed to allow for management of the marsh water levels if necessary. The acreage was planted in March 2012 with bulrush and salt grass in the marsh cell and Gooding's and coyote willow in the riparian field. Both cattails and cottonwoods voluntarily established onsite.

In conjunction with the willow marsh construction effort, Fields MM and II were cleared to demonstrate the feasibility of using the soil amendment Lassenite Pozzolan at the field scale. Field II was left as a control, while Field MM was


**Figure 3.—Aerial photo of BLCA with 2012 actions designated. Photo taken October 29, 2012 (# B1878-300-28783).**

treated. Treatment consisted of tilling in 5-percent (%) Lassenite Pozzolan by volume into the top 6 inches of the soil. The demonstration was conducted to determine if the product could significantly increase irrigation efficiency as well as the retention of moisture within the soil.

A complete description of the trial is available in the Beal Lake Restoration Site Amendment Study: Irrigation Monitoring and Instrumentation Report. The field scale trial revealed no significant difference regarding irrigation efficiency between the field treated with Lassenite Pozzolan and the control. Given these results, Lassenite Pozzolan will not be employed at other restoration areas for the purposes of increasing irrigation efficiency.

Following the trial, fields MM and II were planted with a mix of cottonwoods and willows during the March 2012 planting effort. Data on soil moisture retention were collected through the first growing season but have not yet been compiled and analyzed. The final report will be completed in fiscal year 2013.

Additionally, Fields J and E were cleared to prepare them for the Seeding Salix gooddingii with Lassenite Pozzolan Soil Amendment Study, which aims to determine if the amendment at an application rate of 5% in the top 6 inches of soil will enhance the germination success of Goodding's willow. More information on the study can be found under Work Task C42.

Plant tissue samples revealed deficits in the nutrients nitrogen, phosphorus, and manganese. Therefore, during the last 2 months of the irrigation season, a combination of nitrogen, phosphorus, and manganese fertilizers were applied via the fertigation system (table 1).

Table 1.—Tissue analysis report samples collected on April 11, 2012

| Area | Irrigation frequency | Nitrogen | Phosphorus | Manganese |
|---|---|---|---|---|
| | | Nitric acid (%) | | Nitric acid (parts per million) |
| Cell FF | Twice a month | 0.25 | 0.083 | 34.8 |
| Cell L | Once a week | 0.18 | 0.042 | 33.0 |
| Cell O | Once a month | 0.14 | 0.035 | 27.3 |
| Optimum range | | 2.2–2.6 | 0.2–0.5 | 30–200 |

## 2.2 Irrigation

The fields at the BLCA are independently flood irrigated from one alfalfa valve positioned in a corner of each field (see figure 2). Fields are irrigated on a schedule that prioritizes establishing newly planted vegetation, creating microclimate conditions for LCR MSCP species, and preventing salts from accumulating in the soil (figure 4). Fields recently planted or seeded with native vegetation are irrigated on a weekly basis, while fields with established stands of trees are either frequently irrigated to create microclimate conditions for covered species or are put on a reduced irrigation schedule to merely keep salts from accumulating in the soil.

The groundwater at the BLCA fluctuates both seasonally and spatially throughout the site, but in the summer when groundwater elevations are high due to high riverflows and higher elevations in Topock Marsh, groundwater elevations at the BLCA are shallow, generally ranging between 2 and 8 feet below the ground surface. Given the shallow water table, established stands of native trees have access to groundwater and, therefore, require irrigation only to keep soil salinity levels from increasing over time.

In 2010, a study was initiated at the BLCA and two other LCR MSCP conservation areas to establish and monitor soil and groundwater salinity. One outcome of this effort will be a model that provides the LCR MSCP a tool to estimate the amount of water that should be applied to a field to maintain soil salinity below levels that could impact the long-term health of established stands. The final study report will be complete in fiscal year 2014.

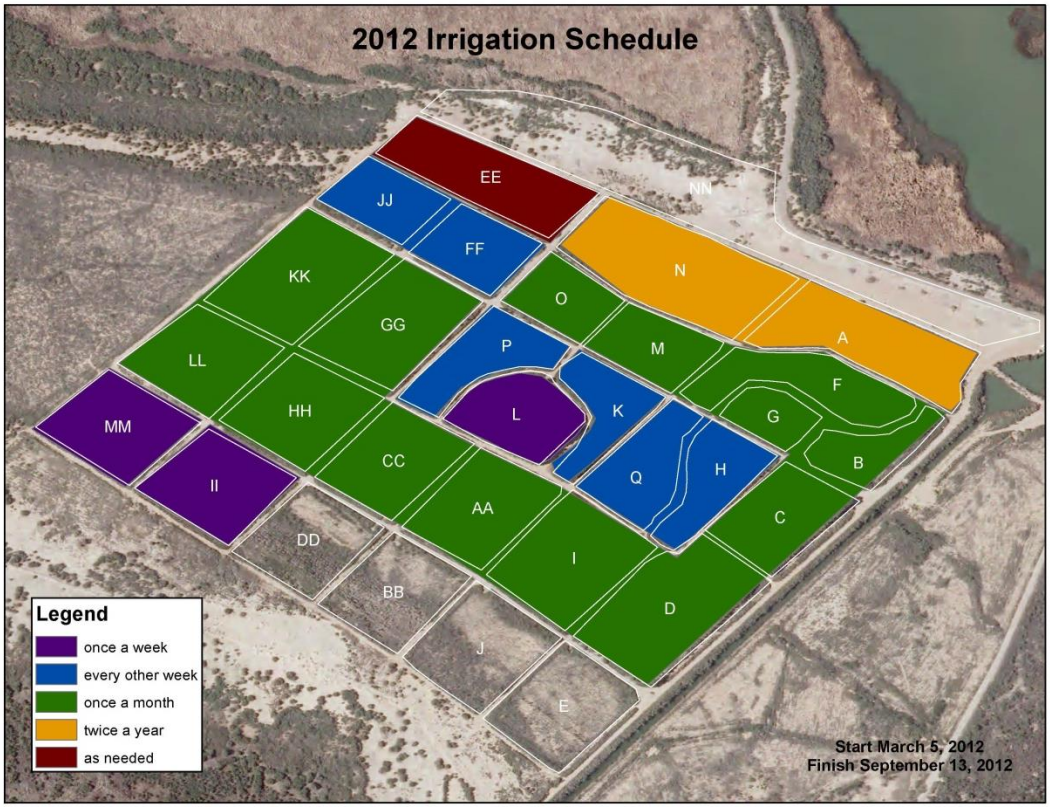


**Figure 4.—2012 irrigation schedule.**

During the 2012 irrigation season, a total of 1,017 acre-feet of water was applied to the BLCA riparian fields (table 2) compared to the 919 acre-feet in 2011. The 10% increase in irrigation water was due to sufficient water levels in Topock Marsh allowing irrigation to begin as scheduled. During the previous year, lower than normal water levels within Topock Marsh limited the irrigation season start date along with the duration and rate at which the pump could run.

Table 2.—Acre feet of water applied per month at the BLCA in 2012

| Acre-feet applied | Jan. | Feb. | March | April | May | June | July | Aug. | Sept.* | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 138 | 148 | 161 | 146 | 184 | 172 | 69 | | | |
| * Irrigation only occurred during the first 2 weeks of the month. | | | | | | | | | | Calculated total water use for 201 (acre-feet) | | 1,017 |
| | | | | | | | | | | Average water use/week (acre-feet) | | 36 |

## 2.3 Site Maintenance

Irrigation, maintenance, and screen cleaning were conducted onsite from mid-March through mid-September. The irrigation pump was operated for 916 hours during fiscal year 2012 compared to 774 hours in fiscal year 2011. Routine maintenance was performed on the irrigation pump throughout the year and on the fertilizer pump at the end of the irrigation season.

The 0.6-millimeter wedge wire screens that supplement the flow of water through the rock structure were manually scrubbed every other week during the irrigation season and every month during the off season. Tamarisk and Phragmites eradication was performed within the willow marsh area once a month throughout the year. Both irrigation and weed control were performed by Reclamation contractors.

# 3.0 MONITORING

## 3.1 Avian Monitoring

Single species surveys were conducted for the southwestern willow flycatcher and yellow-billed cuckoo as well as marsh birds. 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 was operated.

### 3.1.1 Southwestern Willow Flycatcher Surveys

Five surveys for southwestern willow flycatchers were conducted at the BLCA between May 1 to July 31, 2012. One territorial southwestern willow flycatcher was detected from May 23 to July 9 adjacent to Topock Marsh. The bird was color banded and spent the majority of the summer at the BLCA. However, breeding was never confirmed (see table 4). Three willow flycatchers (*Empidonax extimus*) were detected at the BLCA before June 16 and were considered migrants. For complete willow flycatcher monitoring methods and results, refer to the Southwestern Willow Flycatcher Surveys, Demography, and Ecology along the Lower Colorado River Tributaries, 2012 Annual Report (McLeod and Pellegrini 2013).

### 3.1.2 Yellow-billed Cuckoo Surveys

Five surveys for western yellow-billed cuckoos (*Coccyzus americanus occidentalis*) were conducted at the BLCA. Surveys were conducted between mid-June and the end of August. Cuckoos were detected on three of the five surveys conducted between June 24, 2012, and August 6, 2012. No nesting

was confirmed. One individual was detected on June 24, 2012, two individuals were detected on July 5, 2012, and two individuals were detected on July 26, 2012. For complete yellow-billed cuckoo monitoring methods and results, refer to the Yellow-billed Cuckoo, Distribution, Abundance, and Habitat Use on the Lower Colorado River and Tributaries, 2012 Annual Report (McNeil et al. 2013).

### 3.1.3 Marsh Bird Surveys

Surveys for the marsh bird species were conducted at the BLCA in March, April, and May at nine survey points. At least one covered species was detected on all three surveys (table 3). The least bittern showed probable breeding evidence. All detections of the Yuma clapper rail were of single males. For complete marsh bird monitoring methods and results refer to the report "Marsh Bird Surveys, Conservation Areas 2012 Annual Report" (Kahl 2013).

Table 3.—LCR MSCP marsh bird species detected at the BLCA, 2012

| LCR MSCP covered species detected | March | April | May |
|---|---|---|---|
| Least bittern | 2 | 9 | 14 |
| Yuma clapper rail | 0 | 1 | 2 |

### 3.1.4 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. Rapid area search surveys were conducted on Plots B and C, and an intensive area search survey was conducted on Plot B. Plots A and D were not surveyed in 2012. The Arizona Bell's vireo (*Vireo bellii arizonae*), Sonoran yellow warbler (*Dendroica petechia sonorana*), and summer tanager (*Pirangra rubra*) were confirmed breeding (table 4). For complete bird monitoring methods and results, refer to the Lower Colorado River Riparian Bird Surveys, 2012 (Great Basin Bird Observatory 2013) report.

A bird banding station was operated 10 times from May 1 through July 30, 2012. Four Arizona Bell's vireo, four yellow warblers, and two summer tanagers were captured. One summer tanager was recaptured from 2009, one Arizona Bell's vireo was recaptured from 2009, and two yellow warblers were recaptured – one from 2010 and one from 2011. All new birds captured were banded. For complete methods and results, refer to the Summary Report of Maps and Targeted Bird Banding at LCR MSCP Restoration Sites in 2012 (Dodge and Kahl 2013) report.

Table 4.—LCR MSCP avian species detected at the BLCA in 2012

| LCR MSCP covered species detected | Number of confirmed breeding pairs |
|---|---|
| Arizona Bell's vireo | 10 |
| Sonoran yellow warbler | 7 |
| Summer tanager | 1 |
| Western yellow-billed cuckoo | 0 |
| Southwestern willow flycatcher | 0 |

# 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 using the conservation area and to determine the age, sex, and reproductive status of the bats that could be captured.

### *3.2.1.1 Acoustic Surveys*

One long-term monitoring station was established at the BLCA in 2008 in Field K. This station continually collects acoustic bat data.

### *3.2.1.2 Capture Surveys*

Exploratory capture surveys were initiated in 2012 to determine the feasibility of making the BLCA a long-term capture site. Surveys were conducted once per month in May, July, and September. The California leaf-nosed bat was the only LCR MSCP species captured (table 5). All covered bat species were detected during acoustic monitoring (figure 5). For complete bat monitoring methods and results, refer to the Post-Development Acoustic Bat Monitoring 2012 Results" (Broderick 2013) and Post-Development Bat Monitoring of Habitat Creation Areas along the Lower Colorado River – 2012 Capture Surveys (Calvert 2013b) reports.

Table 5.—Total number of LCR MSCP covered bat species captured during mist netting in 2012

| Species | May | July | September | Total |
|---|---|---|---|---|
| California leaf-nosed bat | 0 | 1 | 0 | 1 |
| All other species | 27 | 37 | 5 | 69 |
| **Total bats capture** | 27 | 38 | 5 | 70 |

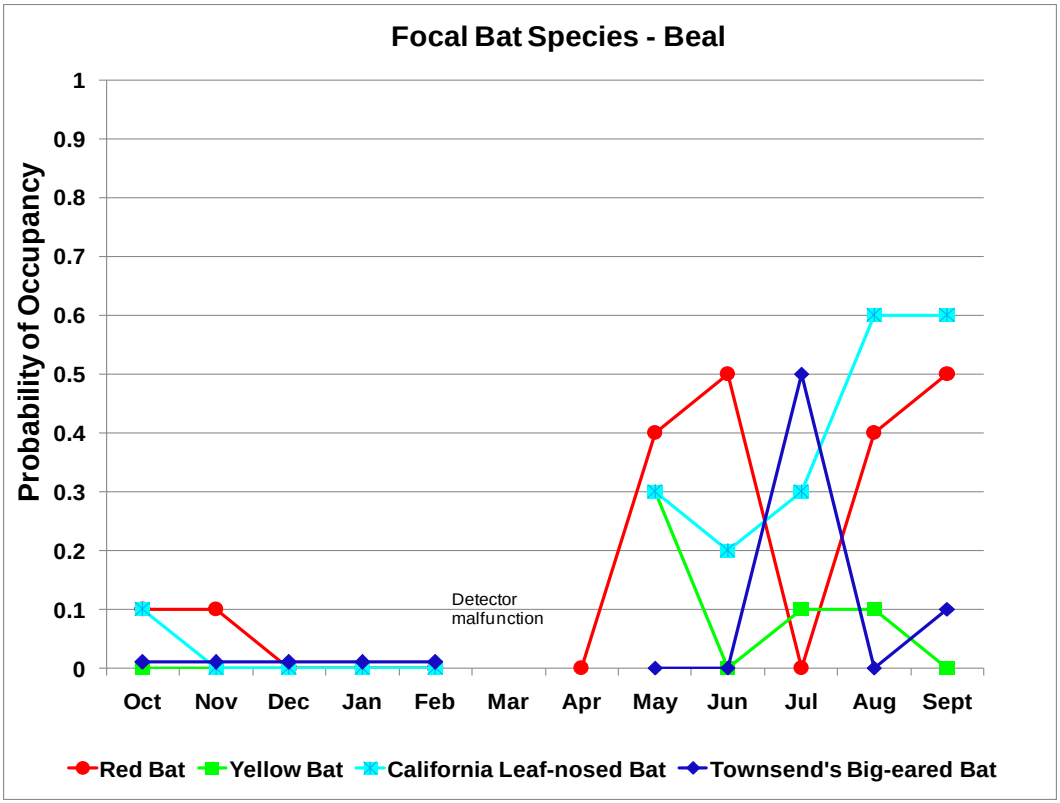


**Figure 5.—Proportion of nights occupied by LCR MSCP bat covered species.**

### 3.2.2 Rodent Monitoring

Traps were set on random transects in Field F for 55 trap nights in March 2012 and 40 trap nights in October 2012. One male Colorado River cotton rat (*Sigmodon plenus arizonae*) was captured in March, and one subadult was captured in October. The cotton rats were detected in grass, baccharis, and arrowweed habitat. For complete small mammal trapping methods and results, refer to the Small Mammal Colonization at Habitat Creation Areas along the Lower Colorado River: 2012 (Calvert 2013a) report.

## 3.3 Beal Lake Fisheries Monitoring

Beal Lake continues to be managed cooperatively by the USFWS Arizona Fishery Resources Office in Parker, Arizona, and the LCR MSCP. In recent years, Beal Lake was known to harbor a variety of fish species, which have included the LCR MSCP covered razorback sucker and bonytail, as well as a suite of non-natives. In 2012, fisheries related activities at Beal Lake included fish surveys, water quality monitoring, and zooplankton monitoring.

## 3.3.1 Fish Stocking

There were no native fish stockings in fiscal year 2012.

## 3.3.2 Fish Monitoring

### *3.3.2.1 Native Fish Populations*

Over the past 2 years, razorback populations in Beal Lake have been estimated using remote sensing (figure 6). The majority of razorbacks in Beal Lake contain a passive integrated transponder (PIT) tag. These estimates are therefore biased to represent a subset of the razorback population; remote sensing is only capable of detecting the portion of the population that is tagged with a 134-kilohertz PIT tag. An additional population estimate of 141 razorbacks was calculated in January 2012. This estimate was comprised of fish contacted through netting and electrofishing, which also included non-tagged fish; this resulted in an increase in the population estimate when compared with the estimates based on remote sensing alone. The 141 estimate is probably the most accurate since a sample of all fish contributed to the estimate regardless of the presence of PIT tag. Over the past 2 years, the stocking of razorbacks has resulted in a rapid decline in estimated fish. This drop in fish numbers attenuated after the first several months, and the razorback population appeared to equalize at around 100 individuals.

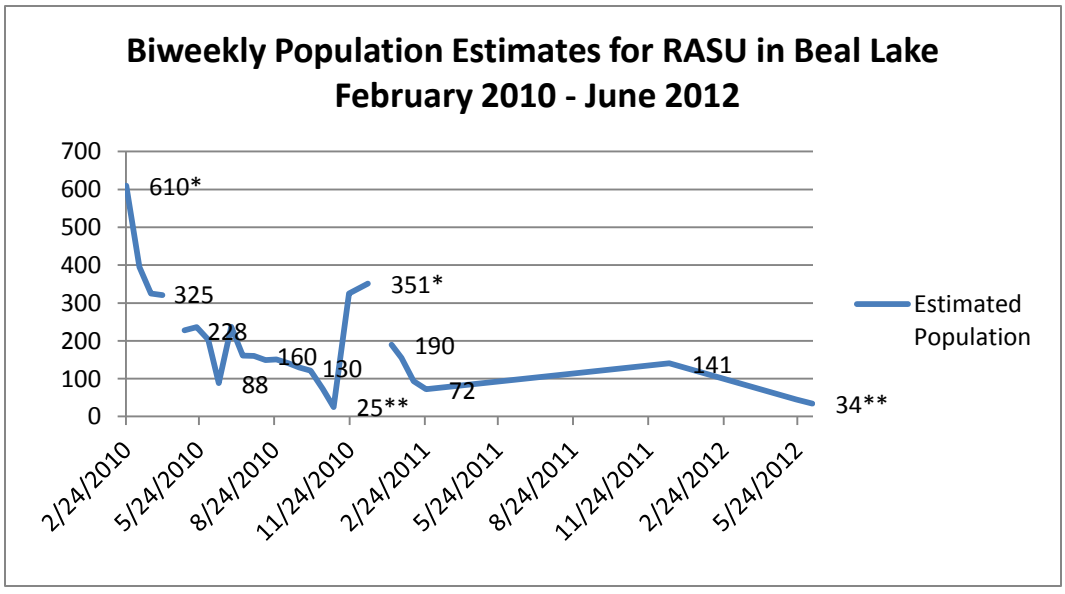


**Figure 6.—Razorback sucker population estimates for Beal Lake.**
*Razorbacks were stocked in February 2010 and November 2010.
**Harvested 50 razorbacks in November 2010 and 33 in January 2012; population decreases were suggested from subsequent surveys.

### *3.3.2.2 Species Composition*

In December 2011, members of the USFSW and LCR MSCP initiated a mark-and-recapture survey to assess the abundance and relative biomass for all species currently found in Beal Lake (figure 7). Large-bodied species (carp, largemouth, and razorback) dominated the relative species abundance within the lake and, as a result, have occupied the majority of fish biomass within the backwater. Beal Lake was estimated to have approximately 3,800 individual fish of several different species. Carp comprised approximately two-thirds of the estimated individuals in the backwater (2,661; 69%). Largemouth accounted for nearly 20% (763), and razorbacks numbered the fewest (141; 3%) of all the species in which estimates were calculated. Small-bodied lepomis species were minimally represented (298; 8%).

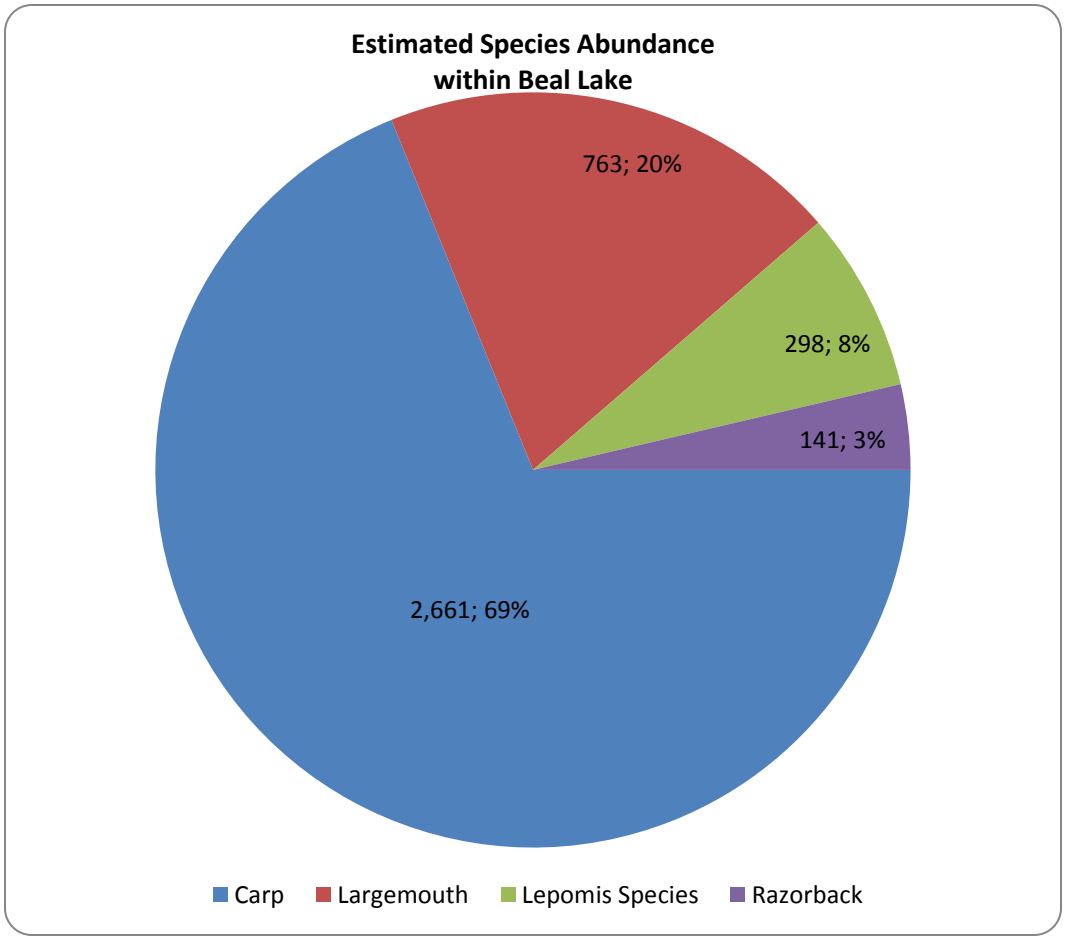


**Figure 7.—Relative abundance of fish species based on mark-and-recapture data from December 2011 and January 2012.**

### 3.3.3 Water Quality Monitoring

Water quality was logged continuously using four Insitu Troll© 9500s anchored approximately 1 meter below the surface at water quality stations 2, 4, 5-5, and 6 (figure 8). Readings were taken at 12-hour intervals to monitor diel changes. Start times were adjusted seasonally to allow for the morning reading to occur within 1 hour of sunrise when dissolved oxygen (DO) is typically at its lowest. Nominal parameters measured included temperature, conductivity, DO, and pH.

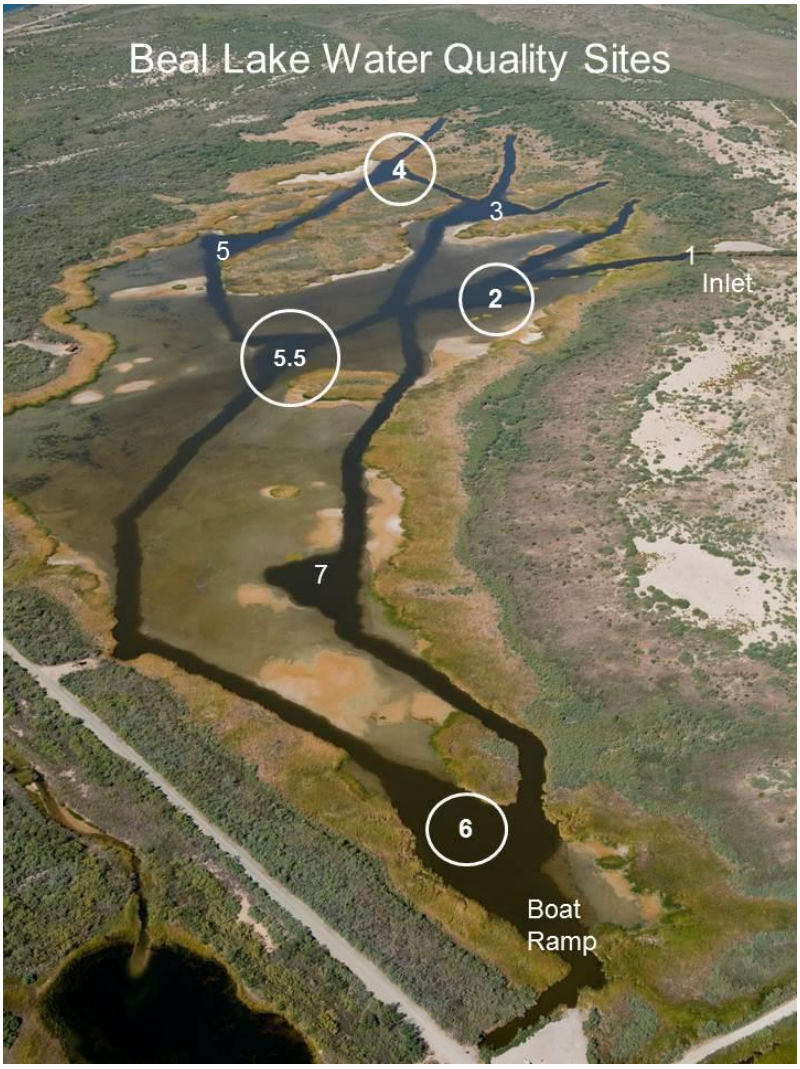


**Figure 8.—Beal Lake water quality stations.**
*Circled numbers indicate stations for continuous logging.

Beal Lake water quality was monitored for the habitat parameters of interest (temperature, conductivity, DO, and pH) (figures 9–12). Temperatures approached 35 degrees Celsius during the months of July and August, and DO periodically dropped below 2 milligrams per liter (mg/L) in August and September. The recordings of below 2 mg/L readings in June were the result of instrument error; this was evident in the subsequent readings, which returned to normal following a calibration event in mid-June. Large or disjointed fluctuations observed in the logging data were likely the result of seasonality or instrument error. Even though some parameters were nearing the ranges considered to be unacceptable for fish survival, these extremes were not concurrently detected lake wide on the other continuous logging probes and suggest localized variability in water quality.

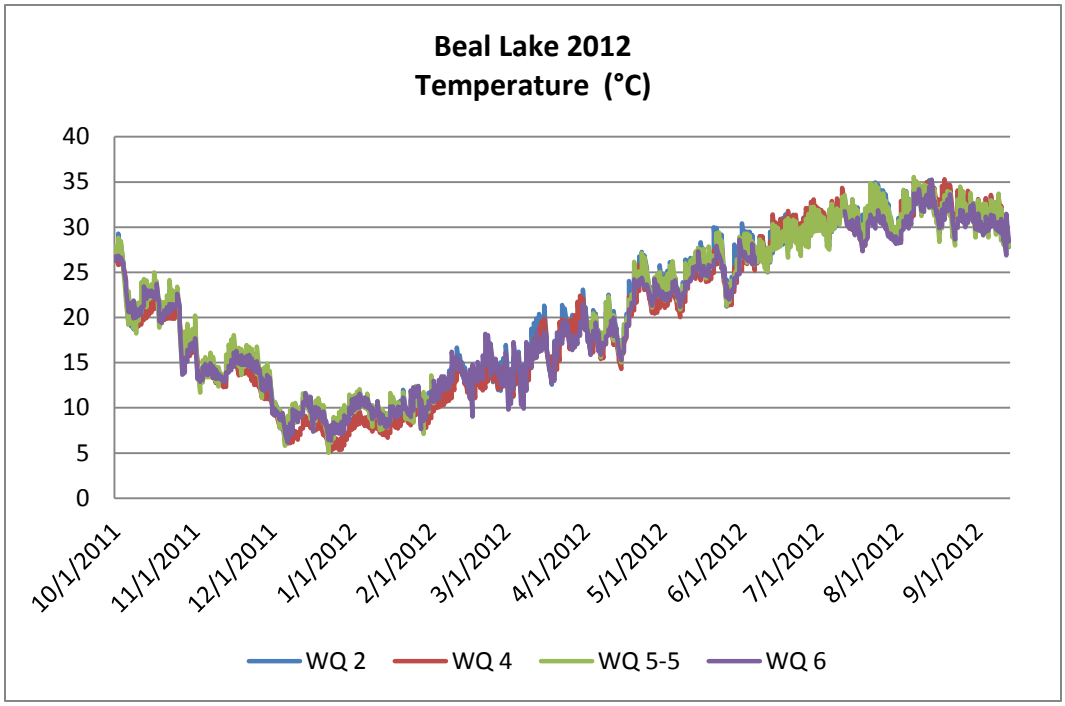


**Figure 9.—Beal Lake temperature – October 1, 2011, through September 1, 2012.**

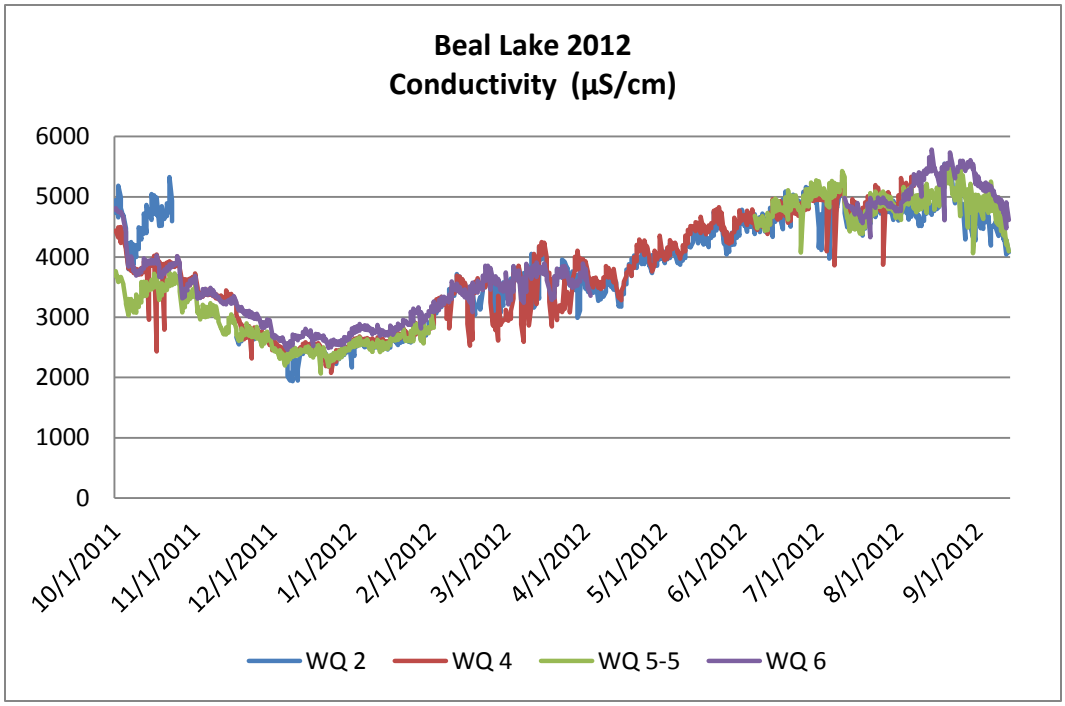


**Figure 10.—Beal Lake conductivity – October 1, 2011, through September 1, 2012.**

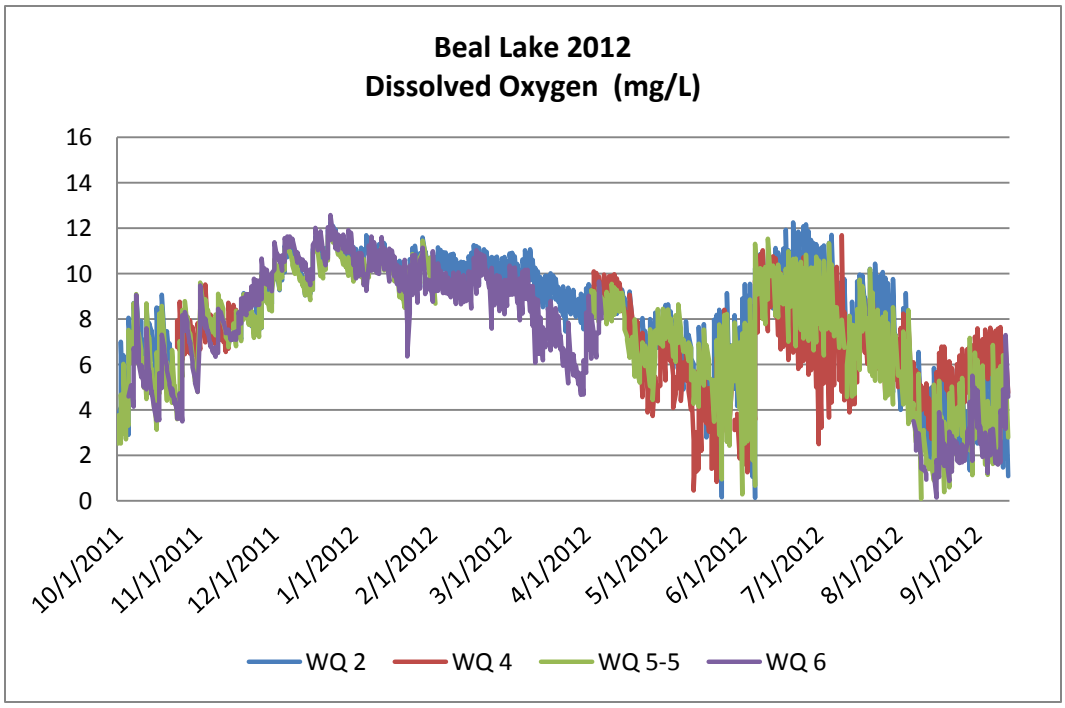


**Figure 11.—Beal Lake dissolved oxygen – October 1, 2011, through September 1, 2012.**

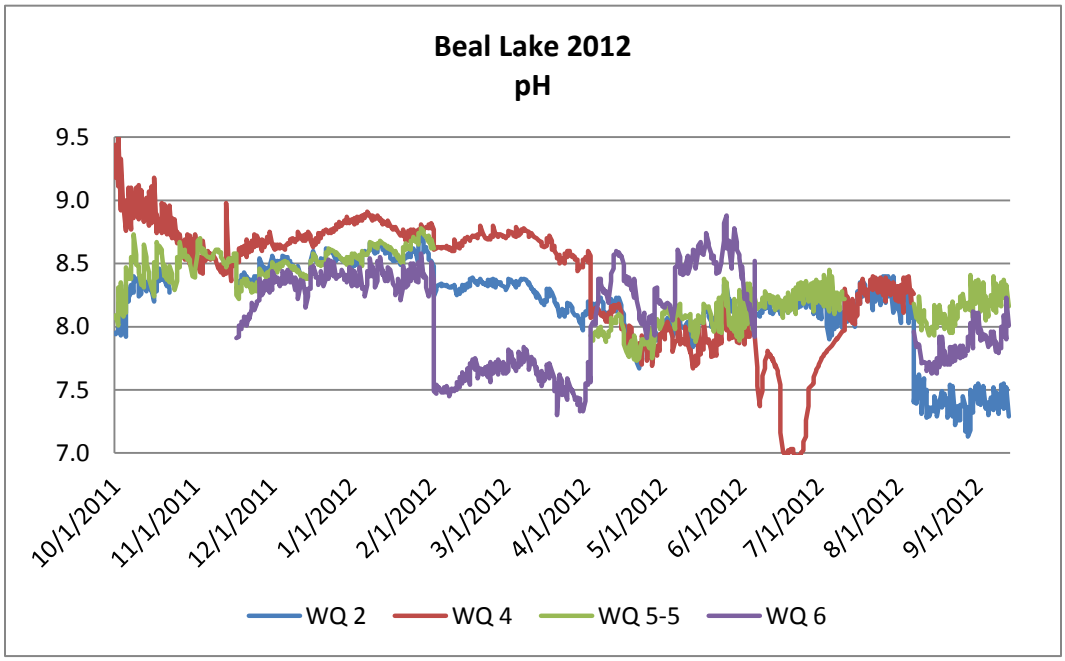


**Figure 12.—Beal Lake pH – October 1, 2011 through September 1, 2012.**

### 3.3.4 Zooplankton Monitoring

Beginning in October 2011, zooplankton and phytoplankton samples have been collected quarterly from the four water quality sites in Beal Lake. Two years of zooplankton data had previously been collected quarterly from a single water quality station (station 6). Zooplankton biomass in whole and by species is seasonally variable, but it is comparable to other regional locations. This dataset is very limited, and analysis will improve as collections continue.

# 4.0 Habitat Creation and 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.

On average, the tree density in cottonwood-willow (cottonwood, Goodding's willow, and coyote willow) was 1,840 trees per acre. The shrub (quailbush, willow baccharis, and saltcedar) density ranged from 99–717 shrubs per acre. Cottonwood, Goodding's willow, and mesquite tree height average ranges were from over 12 to 24 feet. The average canopy closure was 82%.

## 4.2 Evaluation of BLCA

The process for Habitat Creation Conservation Measure Accomplishment was finalized in October 2011 (Reclamation 2011). All areas within the BLCA 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, the BLCA supported 107 acres of cottonwood-willow structure type I and 9 acres of newly planted marsh. Table 6 shows how much habitat has been created for each of the targeted covered species at the BLCA. A total of nine species with habitat creation goals have creditable acres, with one additional species being added this year at BLCA. 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 the summer tanager (SUTA1).

Table 6.—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[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 107 | 0 | 0 |
| Total, including previous years | 0 | 107 | 0 | 0 | 107 | 107 | 107 | 107 | 107 | 107 | 107 | 107 |

[1] Although the BLCA 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, the BLCA 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, the BLCA 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 the BLCA, 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 BLCA.

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